Technical Autobiography

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Below is a summary of my technical training and awards:

Education/GE & Lockheed Martin Training Courses

- BSEE degree, Summa Cum Laude, 3.84 GPA, 1st in Class, University of Hartford (1980)
- MSEE degree with 4.0 GPA - Syracuse University, Syracuse, New York (1983)
- GE A, B, & C Advanced Courses in Engineering
- Edison Engineering Program
- Introduction to Sonar
- Sonar Space/Time Signal Processing
- Advanced Matrix Theory and Adaptive Processing (1982)
- Discrimination and Classification
- Digital Signal Processing (MIT)
- A Second Course in Signal Processing, 1988 (Cornell University)
- Fundamentals of Turbulence (1991, Syracuse University)
- Underwater Acoustic Modeling and Sonar Performance Prediction (1992)
- Submarine Operations
- C++ Programming
- Signal Classification and Recognition (1994)
- AN/SQQ-89 Sonar System (1999)
- Advanced Tracking Algorithms (2014, Lockheed Martin, Moorestown, NJ)

General Awards & Memberships

- CRC Chemistry Award for Highest GPA in College Chemistry
- President of University of Hartford Microprocessor Club
- Member, IEEE
- National Broadband Processing Working Group, Leader
- National Defense Industrial Association (NDIA) Technology Working Group
- Member, Syracuse NY Advanced Technology Working Group

Lockheed Martin/Martin Marietta/General Electric, Syracuse, NY

- US Patent 8,816,632 B2 Award, 2011 (Jointly with D. Winfield and F. Rotundo, Radio Frequency Power Transmission System)
- Trade Secret Awards, 2009
- Named Lockheed Martin Fellow, 2006
- Special Recognition Awards, 2004, 2010
- USS SRA Team Award, DD(X) Integration, 2005
- Department Award - Tech Ops, 2001

- Program Manager's Awards, 1997 & 1998
- ASTECS Proposal Extra Effort Award, 1995
- Recognition Awards for Valued Employees (RAVE), 1991 &1994
- Section Manager's Award, 1992
- Stock Option Award for Valued Technical Contributors, 1992
- General Manager's Award, 1991
- General Manager's Technical Excellence Award, 1988
- Named Engineer of the Year, 1988
- Graduated First in GE A, B & C Advanced Courses in Engineering (ACE)
- GE Edison Engineering Program Graduate

(Note: most awards and memberships in junior high, high school, and college are not listed)

Technical Autobiography – John Smigel

I first started having a passion for learning math, science, and English in about 6th grade (age 11). In 6th grade I was selected along with about 3 other students to form a special language skills class that met outside of normal classes. We trained outside normal class time on reading, information retention, and literacy.

However, I had a learning setback in 7th grade. I still remember the test we were given to determine which of the 3 "smartness" class levels to which we would be assigned. The levels were J, F, and K (for John F. Kennedy). J was for smartest, F was average, and K was below average. I do not do well with timed tests; I will not stop trying to answer a question until I'm sure it's correct. Therefore, I didn't finish all the test. I knew my parents were extremely disappointed that I was not assigned to the smartest level, but only to the middle, F, level. However, I did achieve many scholastic awards in junior high school and was near the top of the class.

I became interested in quantum and atomic physics, reading library books on these subjects. But I had a 7th-grade science project disaster. I created a simulation of an atomic chain reaction. This was a box containing mouse traps (set) and ping-pong balls, sealed with plastic wrap on top. Adding a single ball through a hole started the chain reaction. Unfortunately, older students stole my project from the classroom before it was evaluated and had much fun with it. I was scolded, disciplined by the nuns, and failed the project because ping pong balls and mouse traps were all over the school!

I also started excelling in math in 7th grade, Mrs. Dufault's class, fortunately not a nun & I had a bit of a crush. Whenever she asked any question, I would raise my hand, anxious to answer. She eventually told me, "Don't raise your hand any more John, I know you know the answer." I'm pretty sure I would have been considered a "savant" in math and "on the spectrum," equally lacking in other skills, including social, geography, and art (the only D's I ever received were in geography and art from sister Nancy).

Unfortunately, the "smartness" group you were assigned in junior high school also determined your placement in high school. I was not initially assigned to the advanced, college-bound tier in high school, also to my parent's dismay. Rather quicky, my teachers recognized that was a mistake. I was only assigned to the basic geometry class with Mr. Argassi. I was so much above the other students that it became a problem for him. I always immediately knew all the answers and scored perfect on every test. The other students became aware of this and constantly tried to copy my test answers. Eventually, Mr. Argassi separated me from the class during tests and placed me in a different adjacent room. I graded other tests for him during the tests, rather than having to take any tests. He and my other teachers soon had me transferred to the advanced college-bound classes/curriculum.

I LOVED math, physics, chemistry, and biology in high school. I also developed a passion for computers and programming. At that time computers and programming were not used or taught in school, but the school was starting to plan to introduce them. There were not any "personal" computers yet, just some portable computers (basically large fancy calculators) and teletypes connected to remote main-frame computers using telephone dial-up modems. Apparently, teachers recognized my extreme nerdiness because I was singled out to use the new school computers. I did this after school. There was a stand-alone computer (probably a Wang, like my physics teacher, Mr. Leiper owned) in the back left of Mrs. Parton's room (Advanced Algebra Teacher). I was taught and trained how to use it. There was also a teletype terminal at the front right of our physics classroom. Mr. Leiper taught me how to use it. I was the only student taught to use the computers at that time (1974-1976).

I taught myself the BASIC computer language and became obsessed with a Star Trek program available on the teletype (being a Trekkie of course). The Star Trek game was originally developed in 1971: See history here: https://en.wikipedia.org/wiki/Star_Trek_(1971_video_game). You could enter commands like "Fire Phasors" and the program would tell you what happened. There was a random aspect to the game and what happened.

My obsession with computers and programming continued into college at the University of Hartford. I was in the Electrical Engineering program and quickly found the computer lab that contained a Data General Eclipse minicomputer, 2 teletypes, a line printer, a card reader, and a bunch of card punch stations. I immediately started learning everything I could about the equipment. I lived at the computer lab. I was there when it opened and they had to kick me out when it closed. I took the dozens of extra technical manuals they had home and had a stack of manuals about 4 ft high, and read them cover-to-cover. Fairly quickly, the computer lab decided to hire me as a computer operator, my first real job. I helped start, shut down, and

maintain the equipment. I also helped other students with programming and operating the equipment.

I wrote a Star Trek game version (derived from a high school version) that ran on the teletypes. At first there were no video terminals and all programs were entered with hole-punched cards. The center obtained one new computer interface device called a video terminal that had a video/CRT text display and a keyboard. At first only the operators were allowed to use the one new video terminal. I modified my Star Trek program to run on the video terminal and created video effects by writing and erasing characters all over the screen. The phasors were especially popular. I believe this was one of the first modern-style computer video games ever created. The head operator distributed my game (without asking me) to all other universities in the USA that had Eclipse minicomputers via the Eclipse user's group. I was told that my game (called Star T) became very popular at larger schools with multiple video terminals. Many years later, I went to a PC game museum exhibit in Syracuse, NY that featured what was credited as the first and most successful PC video game. It was a PC video Star Trek game version that was very similar to my Star T game. My latest game creation is JLMahJongg, an American Mah Jongg game.

After graduating 1st in my university class, I got a job with General Electric in Syracuse in their 3-year Advanced Course in Engineering (ACE). The ACE was considered the most grueling and difficult engineering training program in the country. This included getting a master's degree in electrical engineering at Syracuse University (SU). I continued to over-achieve, getting the highest grade on every weekly project and course. My weekly reports were saved and stored as the "model correct answer" for most projects. Other students hated me, especially in classes at SU where grades were on a curve and the instructor showed the grades. In SU matrix algebra class, I single-handedly caused students to drop out (fortunately not ones in the ACE).

My first 6-month rotating job assignment was a blast. I worked in test equipment engineering for Al Landry. I became his personal pet because I was good at BASIC computer programming, a new tool for him. I developed several computer programs for him to help manage the department, including an inventory manager and a construction lab scheduler/tracker. I designed and built (or had built by our model shop) many custom pieces of test equipment that were used to test the sonar and radar products we manufactured. I became the person interfacing with the model shop and tracking status using my BASIC programs.

My next assignment was developing a detailed combined radar and missile simulation to determine the most efficient techniques for radars to use against anti-radiation missiles (ARMs). After that I developed software specifications for sonar automated detection and tracking algorithms. I also worked on developing Enhanced Modular Signal Processor (EMSP) technology. I implemented and sized key algorithms in the new technology. My next

assignment was in Solid State radar (SSR) systems engineering on the AN/TPS-59 final integration and test team. I wrote the final technical document for the radar and helped perform radar calibration and first article flight tests, required for customer acceptance. Because of my job, I had special access to radar test data that was output using a special connection to a time-share computer. Radars at that time did not have the processing power to do real-time automated detection and tracking. All detection and tracking were done manually by the operators on the plan position indicator (PPI) display. I obtained raw radar output data and developed an automated detect and track program for the radar output, based on my sonar experience. This was new technology for radar and it helped find some unknown problems with our new AN/TPS-59 radar.

For most of the rest of my career, I worked in Advanced Engineering for Don Winfield, developing and evaluating new technologies. I developed several new breakthrough technologies based on adaptive beamforming. This included a new algorithm for passive submarine detection and a technique for evaluating towed array self-noise. I was still very young and unknown. My adaptive beamforming mentor, Dr. Ayhan Vural, thought my algorithm was so good that he presented it to the Navy at the Naval Underwater Systems Center in Connecticut (at that time – later moved to Rhode Island). I was shocked at the number of people who attended the presentation of my new algorithm (in an auditorium). We were discouraged from publicly disclosing any of our new technology. I submitted another patent disclosure to our patent attorney; but unfortunately, it was too late when it was discovered that he was negligent and not processing any disclosures into patents. He was immediately fired. That's why I don't have more patents. Eventually, another Navy lab engineer who attended the above presentation developed a similar non-adaptive algorithm that was implemented in all the sonar systems. It was considered one of the best new algorithms. It's probably still used. My version was even better.

I was assigned to a team working for the defense department to determine if a particular classified technology could be developed (and possibly used against us). We were responsible for the main design and construction. Another part of the team was from a government-contracted company (ARETE in beautiful La Jolla, CA) employing the country's smartest people in signal processing who were tasked with developing an optimal algorithm. I also developed and implemented our best algorithm and detailed test simulations. I remember checking the math of ARETE's algorithm at home in my spare time. It required one equation that was several pages long. My algorithm performed as well as ARETE's "optimal" one (again even better), with much less computational requirements. I won. The head of ARETE later flew across the country to meet me (at GE) and try to convince me to come work for them. I stayed with GE and was responsible for signal processing implementation. I did the field system installation and testing on a submarine out of San Diego; and later aboard surface ships in the Atlantic and Adriatic.

I developed a reputation as an expert in advanced adaptive signal processing algorithms and able to perform seemingly impossible tasks. We teamed again with the Navy and GE corporate research and development to demonstrate a new massively parallel computer technology (iWARP). I was responsible for defining the adaptive algorithm for the iWARP demonstration. It was successfully tested on a submarine. A classified journal reviewed my algorithm as "one of the most significant advances ever achieved." Most of the technology I have developed is classified, so I can't describe it here, except in vague, unclassified terms.

Another project for which I received an award is a proposal effort for a new Navy shipboard electronic surveillance (ESM) system (called ASTECS in 1995). This was a new business for us and we were trying to break in to it. An external team of ESM algorithm experts were called in to define the algorithms and write the technical proposal. I was called in by the red team proposal reviewers to fix the technical proposal that was considered horrible. I worked with the experts to learn about ESM algorithms and rewrote the proposal. We won the proposal; and that started a major new multi-billion-dollar business in Syracuse that is still going.

When GE's defense business was sold to Martin Marietta, their San Diego office that developed new technology had just started a major joint program between the Navy and industry to develop a lightweight, broadband, variable-depth sonar (LBVDS). I had already developed a prototype environmentally-adaptive sonar processor called the Environmental Evaluation Processor (EEP) on my own time and with GE IR&D funds. My processor was selected as the core of the LBVDS processing and I became the processing and analysis lead for the industry-side of this multimillion-dollar project. It was like I was a rock star for a few years because this was the only large technology project funded by the office of naval research (ONR). My prototype processor was successfully built and demonstrated; leading to a full-scale production system that was also built and demonstrated. Unfortunately, the LBVDS technology was targeted for the new DD-21 destroyer that was won by our competitor, Raytheon.

My Martin Marietta employer was merged with Lockheed and became Lockheed Martin. Much of the sonar/radar technology and development was moved to other locations. I decide to switch from primarily sonar to primarily radar. This was difficult since I was not a radar expert at my job level. The most difficult and dreaded job is getting assigned as a large proposal author. I ended up assigned to 2 large radar proposals at the same time, a ballistic projectile classify radar and a large surveillance radar. I was responsible for key parts of both proposals: the classification algorithm and the anti-jamming (Electronic Counter-Countermeasures (ECCM) or Electronic Support Measures (ESM)) subsystem. The current classification algorithm from a partner company was not meeting requirements; so I developed a new algorithm that was considered amazing. It is still used as a key component in this critical Army radar system. The radar ECCM area was relatively new to me. I had to rapidly become an expert to write my

assigned proposal sections. We won the projectile-classifying radar proposal, but not the ESM one. However, the proposal sections were rated with colors from red (bad), yellow, green, blue, to purple (outstanding). On the proposal we lost, my ESM sections were the only ones rated purple.

I was scheduled to go away on vacation during this two-proposal period, but told my wife I could not go (In hindsight, a mistake). She went without me and it almost ended our marriage. On the positive side, my hard work and success on these proposals helped get me awarded a Lockheed Martin Fellowship. Being a Lockheed Martin Fellow is the highest technical honor awarded.

I continued working on new radar and sonar technology, including improving the new Space Fence radar algorithms and evaluating my classification algorithm performance for the ballistic projectile classifying radar mentioned above. I was also asked to develop improved technology for the US ballistic missile defense systems. I was lead systems engineer for part of a large (multi-billion, decades-long) multi-national project (with Italy and Germany) for a new ballistic missile defense system (approved unclassified description here: Media Release (long), MEADS FT2 (short), and Ad). Part of my responsibility was the environmentally adaptive algorithms, including ESM and algorithms in the surveillance radar (SR) to counter nuclear ballistic missile threats. The SR was my baby; I eventually was appointed lead systems engineer. MEADS was designed for the Army as a major improvement and replacement for the well-known and old Raytheon Patriot missile defense system. MEADS is not used (to my knowledge) for mostly-political reasons.