A Collection of Recollections—Professional and Personal

By Erik Goodman

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Foreword

Welcome! You are in a position to read some of my recollections about various aspects of my life. I have written this mostly because I found out how much fun it was to recall these things, once I got started.

It is organized in several sections. The first part describes my professional contributions, organized by the areas of those contributions, and generally following a chronological ordering, although there is certainly temporal overlap among the topics. To me, it seems like I “reboot” about every five-ten years, in both my professional and personal lives, so many of my activities have fairly distinct beginnings and endings, and I’ve tried to make those clear here.

After describing my professional contributions (as I see them), I set them out briefly in outline form... As you can imagine, the outline came first, but I retain it here as a handy reference in case it saves someone time locating something.

The remainder is about my personal life, although the professional does occasionally intrude into it, as you might expect. It begins with a generally chronological description of my childhood, my schooling, and early adulthood, through the time I completed my Ph.D. However, I have freely included asides about people and activities as they have come up in the chronology, following some topic story outside my timeline for the sake of continuity. Then, from the beginning of my life as a professor on, I have changed to describing interests and activities by topic area, following them for however many years they have persisted, rather than trying to keep them strictly chronological. I hope that will make it easier for you to find only the things in which you have some interest. However, some of the information about some of the later-described topics is actually introduced in the earlier chronological part.

I don’t think most people would find the details of what classes I took in high school and college to be particularly interesting, unless trying to understand why I ended up doing some of the strange things I’ve done. So feel free to skip ahead in the chronological section when you get to the parts about courses, etc., unless that particularly interests you.
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Description of Academic/Professional Activities

Doctoral Research

I did my doctoral thesis research in John Holland’s Logic of Computers Group, University of Michigan, 1969-71. My thesis work included the first use of a genetic algorithm to solve a “real-world” problem—i.e., one for which the answer was unknown and actually wanted—as opposed to “toy” benchmark problems. Of course, genetic algorithms would not be named that for many years, but the principles already articulated by Holland were exactly those later called a genetic algorithm. My work began from a computer simulation initiated by Dr. Roger Weinberg, a Ph.D. in Biochemistry and fellow (second) Ph.D. student in the Logic of Computers Group. We modeled the growth of an E. coli cell, using fourteen generalized “pools” of cellular constituents (think cell membrane, cell wall, ATP, ADP, MRNA, TRNA, ... pools like that). I added a more sophisticated replicon (Helmstetter-Cooper) and capability to grow on multiple media, producing a more robust model capable of simulating shifts among growth media, enabling the use of more data to indirectly parameterize the model based on its behavior. Based on what I had learned in Holland’s two courses on adaptive systems (covering what we’d now call genetic algorithms and complex systems), I developed a GA that used integer-mapped real representations of over forty rate constants, most of which were involved in calculating nonlinear enzyme activities for transitions among the fourteen “pools” based on a model of allosteric modification of enzyme activity. The integers were uniformly mapped to logarithms of real number rate constants, to allow search of exponentially distributed rate constants across many orders of magnitude. The GA used integer-truncated Gaussian mutation and two-point crossover. The search was possible only because it could be run on Logic’s IBM 1800 computer, being checkpointed whenever another user wanted the machine for another purpose, but then restarted. It ran cumulatively for over half a year. When I joined the faculty at Michigan State University in fall, 1971, I had access to another IBM 1800, where I finished the runs needed for my dissertation. After completing the defense in January, 1972, I published an article about a cellular-space embedding of the model, in the journal Biomedical Computing, based on my study of cellular automata under Prof. Arthur Burks, also of the Logic of Computers Group. However, my initial attempt to publish about the GA process used to evolve the model was not accepted, and the pressures of assistant professorship discouraged me from pursuing it further. At that time, it was very difficult to publish both because there was no GA community that could have reviewed it knowledgeably, and because the paper could only describe the results of a single, year-long run, which could
not practically be replicated in order to draw any statistically valid conclusions. However, the GA did produce a solution that generated good agreement with changes in doubling times resulting from shifts of growth media (e.g., changing environmental conditions) that approximated those seen for *E. coli*. That enabled me to begin to look at modeling colony formation.

**Teaching Ecologists and Systems Scientists to Collaborate**

In 1972, MSU's large NSF RANN grant required that many biologists—particularly ecologists—be able to work with systems scientists to develop mathematical models and computer simulations of biological systems, at many levels. When I was hired in Fall, 1971, before completing my Ph.D., I was asked by my mentor and the RANN grant PI, Prof. Herman Koenig, to develop a series of courses to train systems scientists and biologists to work together to develop such models and computer simulations. Dr. Patricia Helma (now Werner) and I developed two parallel courses, followed by a third course in which the graduates from the first two were grouped to work together on developing a computer simulation associated with the research of one of the biology graduate students. In the first course, "Systems Concepts for Biologists," I taught the principles of state modeling of dynamic systems, with special emphasis on developing the students' intuition for the qualitative behavior of differential equations. I then taught several numerical solution techniques (quadrature) for solving the differential equations constituting a state model. I taught them to write FORTRAN code to simulate such systems. I introduced the concepts of probability distributions and stochastic modeling, including generation of discrete and continuous random variables in the computer (uniform, Poisson, binomial, exponential, Gaussian, etc.). We studied classical population models as differential equations (logistic growth, predator-prey, etc.). At the same time, Pat Helma was teaching the systems science (and various other engineering) students about principles of population biology, including mathematical models and concrete examples. A plant ecologist, she taught about the interactions among plant populations, animal populations, and their environments. We typically had about 40 students in the course for biologists, and about 15 in the course for engineers, so in the spring, we formed 10-12 teams, each including at least one engineer and two or more biologists, organized in a self-selection process, in SYS 843, Ecosystem Analysis, Design and Management. Each team met weekly with Pat Helma and me on development of their model, and later, sometimes also involved the thesis advisor of one of the biologists. Teams generated over 100 models during that ten-year period. Many of these teams produced computer simulations that ended up as integral parts of the doctoral research of one of the biology graduate students, and some led to independent publication of the modeling work. As a result of this involvement, in the 1972-85
timeframe, I served on the doctoral committees of eighteen biology graduate students, guiding the modeling work of nine of them. After Pat Helma left East Lansing, I partnered in this course sequence with a succession of other biologists, including Bill Cooper, Phil Crowley (my postdoc), Don Hall, and Earl Werner, all of the Department of Zoology, and Stuart Gage, of Entomology. In the late 70’s, I developed classroom software (displayed on a giant color screen—quite the deal at the time) that graphically illustrated step-by-step three methods of numerical solution of differential equations: Euler, a second-order predictor-corrector, and the standard fourth-order Runge-Kutta, and this software even saw some distribution to other universities with good color graphics terminals (which were rare at the time). This three-course sequence brought MSU recognition as a leading place to study the newly emerging field of systems ecology, and more than twenty faculty members from many universities came on leave to MSU to participate in this course sequence. The three-course sequence became the model on which we based BEACON’s flagship courses almost 40 years later.

**Early Research Modeling**

**Ecosystem Dynamics (and Using a Genetic Algorithm)**

At Michigan State University, I continued to use genetic algorithms for parameterizing compartment models for nutrient and pesticide transport in aquatic and terrestrial environments, 1973-81, in a series of projects funded initially under an NSF RANN (Research Applied to National Needs) grant to Herman Koenig and Bill Cooper. I continued later under grants from EPA that I directed. The first EPA project looked at fate of pesticides in aquatic environments, including an artificial stream on the grounds of the Monticello Nuclear Power Station in Minnesota. That stream provided a recirculating environment in which we could monitor the distribution of pesticide among the various compartment types. For that project, I worked with Dr. Renate Snider on algal chemostats (which ended up being in a lab in the Natural Science Building that had once been my father’s lab). John Van Sickle completed his Ph.D. in 1975 as part of this effort. Our later EPA support was to model the fate and effects of the organophosphate pesticide Guthion (azinphosmethyl) in experimental apple orchards, funded by EPA out of their Corvallis, OR, lab, under program officer Jim Gillett. I collaborated again with Renate Snider, and also with environmental chemists Matt Zabik and A. W. A. (Tony) Brown, and with postdoc Bob Kon and grad student (later postdoc) Jeff Jenkins. Renate did a lot of work with Trachelipus rathkei (sowbugs), looking at absorption and toxicity of the pesticide in the orchard environment after it was sprayed on apple trees. To fit our data into the compartment models we developed, we again used a genetic algorithm, but were prevented from publishing about the genetic algorithm, because of an unfortunate turn in world politics. The GA work was done by my Iranian Ph.D. student, Mehrdad Tabatabai, who was “all but dissertation” in late 1978 when he suddenly left. He felt he
had to return to Iran, leaving an apartment full of furniture, etc., to protect his family at the time of the Islamic Revolution. He was never able to return to complete his degree, and we had no communication until at least 20 years later, so the genetic algorithm work was not published, only used.

**Early CAD/CAM/CAE Research and Case Center Leadership**

In the late ’70’s and early ’80’s, I supervised the computer facilities of the College of Engineering, including their IBM 1800, AD4 analog computer, remote card reader/line printer to the campus’s CDC 3600 (later 6600) computer, and a roomful of ASR33 teletypes. In 1983, that equipment was formalized to become the Engineering Computer Facility, under my direction. In 1977-78, Ron Rosenberg and I worked with Jim Bernard to establish the A. H. Case Center for Computer-Aided Design, the second university CAD center in the country, I believe. Bernard directed it until his departure in 1983, with me as Associate Director for Operations and Rosenberg as Associate Director for Education. I took over direction of the center when Bernard left for Iowa State. The center had a marvelous staff of graduate student consultants and undergrad staffers and programmers, and we did CAD/CAM/CAE research for many companies—including several automotives (GM, Ford, Chrysler, Motor Wheel) or CAD software developers (SDRC, CIMLINC). General Dynamics was also a major sponsor of CAD/CAM algorithm development, under the leadership of Mel Barlow (a vice-president and M.E. alumnus) and Russ Owen (a Case Center graduate who started as a design engineer at General Dynamics and rose to a vice presidency at Computer Sciences Corporation). Mel Barlow went on to lead the Case Center’s Endowment Fund Campaign, which meant that he and I visited many corporate headquarters across the country together in building a multi-million dollar endowment for the Case Center. The center’s “golden years,” when our mechanical engineering students were highly sought after by CAD developers and corporate users alike, lasted into the 1990’s, during which time I did research in computer graphics algorithms, numerically controlled machining toolpath verification (with Ki-Yin Chang and Leslie Hoppensteadt), robotic spray simulation (with Paul Haas and Leslie Hoppensteadt, sponsored by Russ Owen at GD), lost foam pattern molding for cylinder heads (with Dave Chesney, sponsored by GM), etc., under sponsorship of many companies. As the field developed, the center was renamed the Case Center for Computer-Aided Engineering and Manufacturing, with CAD then sounding out of date. Because of my involvement with aerospace CAD/CAM/CAE, I was appointed a member of the CAD/CAM Technical Committee of the American Institute of Aeronautics and Astronautics (AIAA). I really enjoyed working with the people, nearly all from industry, figuring out what standards were needed, how to deal with interfacing among various types of CAD/CAM systems, how to improve the
connection between CAD and CAM, and similar issues. I chaired the TC’s Research and Future Directions Subcommittee at one point, and the TC gave me their Outstanding Contributions Award in 1990.

Joyce Foley was the admin in the Case Center from its beginning in 1978, all the way through until its closing in 2003—25 years of great support for the center. Some of the outstanding grad students who worked in the Case Center then were Mark Pickelmann, Jane Hawkins, Jim Oliver, Adrian Sannier, Dave Mc Claughry, Dave Chesney, Guy Allen, and Dan Wysocki. Stellar undergrads with whom I worked or whom I mentored in the Case Center included Adrian Sannier, Rob Leland, Paul Haas, Ben Pfaff, and Antony Paul.

All throughout the 70’s and 80’s, I was involved in an advisory capacity with MSU’s Computer Laboratory—the folks who ran our central academic computing operations and later initiated and oversaw the campus-wide networking activities. I started out on the Research Computing Committee, including serving as chair, then founded and chaired the User’s Subcommittee of the University Computer Advisory Committee, and also served on the parent body, including after it became the university’s Computer Systems Policy and Planning Committee. (This was contemporaneous with my chairing of the College’s Engineering Computer Advisory Committee.) I also served on the university’s Computer Communications Committee and its successor, the Network Computing Committee, which advised the university regarding its networking needs.

In 1986, the Engineering Computer Facilities were merged into the Case Center, and then in 1993, while I was on sabbatical in China, the consulting and operations folks were separated out again as the Division of Engineering Computing Services, leaving the original Case Center to conduct and coordinate CAD/CAM research and to interface with industry.

**Development of Educational Software—SYSKIT**

In 1981, Ron Rosenberg and I began developing a software package for simulating system dynamics, with an advance from McGraw-Hill (the publisher) and under Ron’s company, Rosencode, Inc. We worked nights and weekends, truly loving the work, for more than a year to produce SYSKIT, in versions for MSDOS and the Apple II platforms. I think Ron and I both could have had happy careers just writing computer code, given the fun we had with this project. SYSKIT was built for ease of use, in the pre-GUI world of personal computers. As the McGraw-Hill publicity said, “The SYSKIT is a linear system software toolkit that contains a highly integrated set of programs with applications to system dynamics, controls and vibrations. It includes file management, a time processor for eigenvalue and time response, a conversion module for vibrations, a frequency domain module for frequency response and root locus, and output display modules for time, frequency, and root locus data.” SYSKIT achieved its ease of use by
always beginning from a pre-defined problem executable at any time, which the user then modified step by step to transform it into the user’s problem. SYSKIT kept the problem well defined, so there was no room for syntax errors and debugging a problem was “dirt simple.” Unfortunately for us, SYSKIT appeared in 1983, just after Apple announced the MacIntosh, which brought a GUI to the personal computer world, followed quickly by GUI-based systems dynamics packages, so McGraw-Hill never sold SYSKIT in any significant quantity.

**Early ALife Research in the Case Center**

Sometimes faculty members are lucky enough to work with a student for many years, and such was my experience with Adrian Sannier. He was an undergraduate Honors College student in Systems Science, and became interested in genetic algorithms. He stayed at MSU for his Ph.D. program, working with me on evolution of digital organisms. This was in the early-mid ‘80’s, a time when few had enough computer resources to evolve very interesting things, but we had a secret weapon: a series of Prime computers that were the mainframes of the Case Center. When they weren’t doing something else, they could be running our evolution programs, and did they ever. We wanted to see what would evolve in a landscape that had patchy forage available, growing logistically in a seasonal environment. The plants were not evolved, but the foragers were. They were not self-reproducing, but received energy from the plants they managed to eat, and could reproduce when they reached a specified energy threshold. They had movement instructions and ate when they landed somewhere with food, at a rate that depended on the amount available and how long they stayed there. Of course, since the plants grew logistically, their growth rate was affected by not only the season, but also by how much plant had been eaten from their “patch.” Fairly quickly, quite competent foragers emerged, but eventually, we were able to co-evolve two distinct populations with different foraging strategies. The “farmers” tended to stay at a food patch until it was nearly exhausted, whereas the “nomads” tended to feed for a while, then set out in search of other food (speaking anthropomorphically). Together, these two populations were able to utilize a much greater portion of the total food resource than either population could by itself... that is, they kept the plants cropped pretty close to half of their carrying capacity, which maximizes their growth rate in a logistic growth model. Eventually, the foragers evolved into a single population that had a “switch” at the top of their program, which jumped to either “farmer” or “nomad” code in the genome. We presented this work at the Second International Conference on Genetic Algorithms, which was the first one I had heard about! Imagine my glee when learning that we now had a solid community of researchers, even if journal publication was still to remain difficult for another few years.
Early Contact with China

In 1987, I heard from Margaret Wilke, then a systems analyst in the Case Center, that her husband, Prof. Jay Siegel, an internationally renowned forensic scientist, had started studying Chinese, in order to better communicate with his Chinese visitors. (Jay and Maggie were also the ones who brought Cheryl and me into the group that visits the Shakespeare Festival in Stratford every year, and we have been friends for more than thirty years. Since Jay's unfortunate death in 2017, I have been coordinating the group's annual Stratford trips.) Being a lover of language study, but rarely having had a chance to use the Russian I studied for three years in college, and having already had several Chinese graduate students, I resolved to follow Jay's lead. In Fall, 1987, I enrolled in Chinese 101 at MSU. I loved the classes, and after completing Chinese 103 in spring, 1988, I went to Fudan University, Shanghai as a student in MSU's Study Abroad program, led by the late Prof. Jimmy Wang. I made some great friends, and after returning, went into the 200-series Chinese courses. At that point, I started visiting China nearly every year, having resolved to do a sabbatical leave in China. My friend Prof. Pei Min, a Vice President at Beijing Union University and long-time visiting professor in the Case Center, helped me set that up, and in September of 1993, Cheryl and I and our son David, then three years old, headed to Beijing University of Aeronautics and Astronautics ("Bei Hang") for a six-month stay. We loved our time there, and wished at the end that we could have stayed longer. We became great friends with our next-door neighbors from Russia, Maksim and Inna Torgalo. Maksim was a Ph.D. student from St. Petersburg working on installing some of their chemical laser technology at BUAA, and we had such a good time with them, and loved our time at BUAA so much, that we even considered trying to stay for six more months. But, alas, duty was calling from MSU and we had to return. While at BUAA, I taught the first course in China on evolutionary computation, for graduate students from BUAA, Beijing University ("Bei Da"), Tsinghua University, and the Chinese Academy of Sciences, featuring 20 hours of lecture. At the same time, I worked with grad student Wang Gang to develop the first version of GALOPPS, the Genetic Algorithm Optimized for Portability and Parallelism. I ended up releasing it publicly and supporting it, with a continuing series of enhancements, for about five years. I offered Wang Gang a graduate assistantship at MSU when he completed his M.S. at BUAA, and he came to MSU to work on his Ph.D. That ended up being quite a story in itself: I had told the Department of Computer Science and Engineering that I wanted applicant Wang Gang (Wang is his family name) admitted, but when I contacted him at MSU in the fall, he had no idea who I was... it turned out that they had admitted at least three applicants from China named Wang Gang! I eventually found "my" Wang Gang, and he worked with me in the GARAGE for several years.
Early Contact with Russia

Even before the collapse of the Soviet Union in 1991, the age of glasnost had made academic exchanges between the US and the Soviet Union possible. Our Dean of Engineering, Ted Bickart, had already worked in Russia as a Fulbright Scholar and collaborated with many Russian scientists, and he introduced me to some of his visitors, including Aleksandr Tetelbaum and Viktor Kureichik, both of whom ended up collaborating with me in the GARAGE on the use of genetic algorithms for PC board placement and routing optimization. But I wanted to get to Russia myself, since I had studied three years of Russian in college and I was eager to revive my skills. My collaboration with the late Prof. Nikolai Smirnov—an expert in gear manufacturing and Vice-Rector of Volgograd Polytechnic Institute—gave me the first opportunity to visit. I soon met his colleague and friend, Prof. Stephen (originally Stepan) Radzevich, of Dneprodzerzhinsk State Technical University (Ukraine), another gear design/manufacturing expert. We had a very interesting technical interchange, as I was coming from the American CAD/CAM side, which did everything with computer-aided design tools and the associated NURB (non-uniform rational b-spline) surfaces, and my Russian/Ukrainian colleagues knew nothing of those, but worked with analytical models instead. They were absolute whizzes at doing enough co-ordinate transformations to make a complex gear design/manufacturing problem into one they could solve analytically. Wow, could they ever compose 4x4 matrices! Happily, I knew that stuff from my earlier computer graphics work, and we managed to bring these relatively disjoint toolsets together and achieved some interesting capabilities. Radzevitch ultimately landed a job in the American automotive industry.

I first went Russia in 1991, during the “August Putsch” in which old-line Communists attempted to oust Mikhail Gorbachev from power. But in fact, I almost cancelled the trip, since the U. S. State Department had issued a travel warning for Americans because of this coup attempt in Russia. I was to start my trip in St. Petersburg, meeting with colleagues there, then fly to Volgograd to see Smirnov. But when the day came for me to fly to Russia, Gorbachev was still in exile, and there were tanks rolling on the streets in St. Petersburg. I clearly remember leaving the house very early in the morning, getting most of the way to the Lansing airport, then turning around in semi-panic, saying to myself, “What am I doing?” But I didn’t than go home, which would have meant seeing my wife, whose analysis of the situation would certainly have prevented me from going. Instead, I went to my office and called the State Department again. This time, I spoke with a very knowledgeable woman there who asked about the details of my plans. She then told me she could not, of course, advise me to go ahead with them, but she also said that as long as I avoided public places and anywhere with tanks, I would probably be okay. So off to the airport I went, and the visit was absolutely marvelous. I was in the plane when Gorbachev’s return
was announced, and while there were still tanks around in St. Petersburg when I got there, I saw no evidence of hostility. In fact, the mood was one of jubilation, and people were delighted to talk with me. I had no difficulty in traveling to Volgograd, where Smirnov had me lodged in the Krasny Oktiabr (Red October) Hotel, formerly reserved only for high-ranking Communists. I clearly remember walking out from there alone one afternoon toward the center of Volgograd and feeling an enormous sense of wonder that I could be walking around "untended" in the heart of a country that was the most feared by our country a few short years before. It was truly amazing!

Prof. Vladimir L'vovich Uskov, of Bauman Moscow State Technical University, who had visited me in the GARAGe, and I worked for several years in introducing evolutionary computation into the annual CAD conference in Gurzuf (near Yalta), Crimea. We collaborated with Prof. Dmitri Ivanovich Batishchev of Nizhny Novgorod State University and Igor Petrovich Norenkov of Bauman Moscow State Technical University. We established the “Russian GARAGe,” with Bauman MSTU, SPSTU, and Nizhny Novgorod State University, introducing EC research projects there under sponsorship of U.S. companies working together in the Manufacturing Research Consortium that I directed at MSU. With Bill Punch and Ted Bickart of MSU, and Vladimir Uskov, we also established the Russian/American Joint Education/Research Consortium for Intelligent CAD/CAM/CAE and Genetic Algorithms ("ICAD/GA” Consortium) with four Russian universities as members, which operated from 1993-1998. This consortium sponsored many visitors to MSU’s GARAGe in the ‘90’s, many of whom eventually earned Ph.D.’s here and have stayed in the U.S.

**Case Center’s International Technology Incubator**

The skills of Prof. Nikolay Nikolayevich Smirnov (of Volgograd Polytechnic University) and Stepan Pavlovich Radzevich (of Dneprdzerzhinsk State Technical University, Ukraine) were highly valued by some of our American automotive gear manufacturers, including New Venture Gear, Wohlert Corporation and General Motors. I figured out how to keep them in the U.S. as consultants, doing research with me in the Case Center and also consulting for American companies about gear manufacturing. I called this operation in the Case Center the “International Technology Incubator,” and received some seed funds from the Office of the Vice Provost for Computing and Technology to get it launched. The incubator provided facilities and support for "Americanizing" technology, negotiating contracts with American companies, etc. Eight foreign visitors were hosted by the ITI. It went on well for several years, working mainly with New Venture Gear, Wohlert Corporation, and GM. At Wohlert Corporation, we worked directly with the CEO, the late Ken Patenge, who has also been a major benefactor of MSU. In a very sad turn of affairs, my good friend Nikolay Smirnov
eventually was found dead of a heart attack in his bathtub on one of his return visits to Russia.

For me, one of the most enjoyable parts of the International Technology Incubator was that the research sponsors (New Venture Gear in Syracuse, GM’s Kokomo (Indiana) transmission plant, etc.) needed the services of the Incubator (namely, Smirnov, Radzevich, and myself) at those locations for only a day or two at a time. That would ordinarily have meant a day of airline travel before and after or long drives and partial workdays. But since I had a commercial pilot’s license, an instrument rating, and co-owned an airplane, we could make our visits much more efficient: we’d leave early in the morning, spend the day consulting, then fly home that night, or sometimes, the evening of the second day. The university reimbursed me the equivalent mileage as if we had driven, which was enough to make the flying essentially free for me (given that my Mooney Super21 airplane got 18 miles/gallon at cruise, around 170mph). So everyone was happy! (Well, I was happy, and Smirnov and Radzevich never had any reason to be seriously scared, so I guess that counts as happy.) (Over the years, I also flew many of my other colleagues (Ron Rosenberg and Dean Aslam come to mind) on various business trips, and all survived... and most still have vivid memories of the trips... far more vivid than mine, in fact. Maybe that speaks somewhat to their level of anxiety being a lot higher than mine was. Much to my sorrow, when my last partner in the airplane got divorced and couldn’t afford the costs, I had to sell the airplane and stopped flying after twenty-some years, around 1998, with about 2,000 flying hours in my logbook.)

**Frequent Visits to Russia**

In the early 90’s, I became a regular contributor to the annual CAD Conference in Yalta (Gurzuf), Crimea, attending and presenting genetic algorithm work, aided strongly by my friend Vladimir (L’vovich) Uskov, a young faculty member at Moscow State Technical University (Bauman, or Baumanka, or “imeni Bauman”). He was a remarkable and very energetic fellow, and eventually also got me collaborating with his mentor at Bauman, Prof. Igor Petrovich Norenkov. In 1995, I “pitched” my colleagues in the International Society for Genetic Algorithms, the sponsor of the biennial ICGA Conference, the idea of organizing an East/West conference in Russia to help to bring them into the international community doing evolutionary computation. I gained approval from ISGA that they would underwrite this conference. The idea was to bring some of the senior people in genetic algorithms from the West to meet with faculty members and grad students from Russia who, up to that point, knew little about genetic algorithms, but had very strong skills in classical optimization and in adaptive systems. I recruited about 20 Western experts, who were eager to see Russia first-hand, for a three-day conference at the Presidium of the Russian Academy of Sciences, in Moscow, meeting with a somewhat larger number of Russian participants. We had simultaneous translation of
the talks, because none of the other Western experts spoke Russian and many of the Russians did not speak English. Thus was born EvCA’96, the First International Conference on Evolutionary Computation and its Applications. This conference solicited papers in advance of the conference and published a full proceedings volume, Proceedings of EvCA’96, of which I still proudly display a printed copy on my shelf. It was terrifying to organize this meeting, partly because I had to be the go-between with the Russians (with the very able help of Vladimir Uskov), and partly because I ended up having to carry into Russia $18,000 in cash to pay the expenses of the conference. As part of the package, I took the Western attendees for a tour of St. Petersburg for several days after the conference (which we set up as an inducement to attract as many of the top people as possible). We formed many collaborative relationships during that time, some of which persisted for years.

During my frequent trips to Russia in the mid-’90’s, a noted Russian mathematician, Aleksandr D’mitrievich Markovsky, came to my attention as possessing some very high-performance numerical algorithms (the math for them, not computer code) and a system he called M-codes for high-speed computer arithmetic. He was a professor in the “Lesotechnicheskiy Institut” (“Forest Technology Institute”) in Moscow, which was, despite its name, actually the home of many of the country’s leading mathematicians with skills important to their nuclear and defense industry. Markovsky was interested in licensing his algorithms to an American computer manufacturer. He provided me information and a running code example that I could check out with some companies, and they were interested, so I formed a company, Technology Gateway, Inc., and negotiated an exclusive representation agreement with Markovsky. I arranged a series of meetings with U.S. computer companies, and flew with him and two of his associates from Russia to visit Digital Equipment Corp. (DEC) in Massachusetts, Cray in Minneapolis, Sun in California and Texas Instruments in Texas. Cray and Texas Instruments were both interested in proceeding, and TI made Markovsky an offer, contingent on seeing the technology under a non-disclosure agreement. Unfortunately, Markovsky didn’t trust anyone (or any legal system) enough to conclude an agreement, so in the end, he went back to Russia with no agreement and reportedly drank himself into oblivion. In the meantime, I was out $28,000 in travel and legal expenses. I learned some important lessons from this experience.

The GARAGE: Genetic Algorithms Research and Applications Group

Bill Punch and I co-founded the GARAGE in 1993, welcoming graduate students, visiting faculty members, and visiting scholars interested in evolutionary computation. We addressed problems of many sorts, including bin packing, nesting, job-shop scheduling, protein folding, protein docking, feature selection (for classification problems) and many
others. The 1990's were a time of intense global competition in addressing scheduling/packing problems. The GARAGE introduced new evolutionary scheduling algorithms that, at various times, held the records for best/fastest solutions of various classes of problems, including job-shop scheduling and bin packing. Our work with biochemist Leslie Kuhn used a GA to do the most accurate prediction of water molecules retained during ligand/protein binding of any approaches up to that time. Students, postdocs and visitors during the GARAGE's early years included Mike Raymer, Min Pei, Shyh-Chang Lin, Ying Ding, Kurshid Qureshi, Slava Tcheprasov, Lakshman Thiruvenkatachari, Brian Zulawinski, Ahmad Shahid, Kelvin Sumlin, Brian Zulawinski, Ananda Debnath, Eric Myers, Huafeng Pei, Anand Uday, Zhijian Huang, Zhiwen Zou, Volker Schnecke, Valery Tchkalov, Victor Palaguta, Kisung Seo, Zhenhua Li, Ping Wu, and Meng Yao. Outstanding undergrads who worked as Professorial Assistants with me included Janelle Shane, Keith Barber, Al Anthony, Matt Durak, Grayson Wright, and Nick Durak.

Bill Punch and his student Doug Zongker authored LilGP, the first system for Genetic Programming (GP) that allowed direct execution of the GP program trees (i.e., compiled the trees), vastly improving execution time over interpreted execution. This software was widely downloaded and used over the next 7-8 years.

**GALOPPS—The Genetic Algorithm Optimized for Portability and Parallelism**

During my sabbatical in China in 1993-4, in addition to teaching a grad course in evolutionary computation, I decided to update my computing skills by learning to program in ‘C’. Up to that time, I had written lots of code in FORTRAN, some in various assembly languages, and some in BASIC. So I began learning ‘C’ and decided to hone my skills by writing a parallel version of the “simple genetic algorithm” presented in Pascal in Dave Goldberg’s 1989 classic book. It was to be parallel in two senses: 1) allowing execution of multiple communicating subpopulations on one processor, and 2) allowing distribution of the subpopulations across multiple processors. I wrote it to be either interactive (prompting for parameters) or file-driven (usually the case for serious parallelism). It did not use any non-standard libraries, so could run anywhere—the only requirement was that machines working on a job needed to have the same “endian-ness”—i.e., either both big-endian or both little-endian. All interprocess communications were file-based (either virtual or actual), allowing the system to be independent of any particular operating system. Initial programming help while I was still in China came from graduate student Gang Wang of Beijing University of Aeronautics and Astronautics, who later joined me as a grad student in the GARAGE. Later excellent help came from systems analyst Leslie Hoppensteadt, whose painstaking efforts at OS-independent
file syncing allowed the system to work flawlessly across multiple different operating systems for a single job.

GALOPPS came with good documentation and many example problems, for both parametric optimization and permutation representations. It was distributed free of charge on the Internet. I supported GALOPPS through Release 3.4, over a period of 6-7 years, and many people around the world used it—much to my surprise, I recently got an email from someone in Brazil about a broken link on the GALOPPS download page. Several people produced other versions of it, embedding it in a GUI or making use of PVM to simplify launching of parallel runs, for example.

Many people in the GARAGe used GALOPPS, especially for combinatorial optimization problems, including job shop scheduling, packing, clustering, nesting, knapsack, protein folding, protein ligand docking, etc., throughout the ‘90’s. I extended GALOPPS, introducing heterogeneous parallel genetic algorithms that allow different fitness functions and problem representations in different islands, with translation of representations during migration. I then specialized the heterogeneous parallel genetic algorithm to create “iiGA”, the injection island (AKA island injection) genetic algorithm, and it was used by many people for solving difficult design optimizations. I used it with Ron Averill and David Eby to evolve a radically different and superior design for automotive lower compartment rails, under sponsorship of GM’s Mid/Lux Engineering Division. That led GM to ask us to form a company, which eventually became Red Cedar Technology.

My Ph.D. student Wang Gang wrote and distributed the GALOPPS-based DAGA2, a hierarchical (meta-) GA in which the top population optimized the operator choice and parameters of many lower-level GA’s running under its control, all working on the same problem to be solved. It taught us about interesting trajectories of operators and parameters through the course of solving a problem.

Manufacturing Research Consortium

The Manufacturing Research Consortium was organized, with Ford and General Motors as the initial members, in 1993, under my direction, operating out of the Case Center. Bill Abbott (Ford) and Laird Johnston (GM) were key figures in putting it together. Later members included the Lear Corporation and the Defense Logistics Services Center, but Ford and GM were always the main drivers. I hired Tim Hinds as the Associate Director of the MRC, after the closing of Motor Wheel Corp., where he had been an engineer. He proved to be well suited to this kind of operation, and we worked together for nearly ten years before he moved to the Department of Mechanical Engineering. Much of the consortium’s work ended up focusing on hydroforming processes, under the leadership of Prof. Farhang Pourboghrat. One MRC project that was particularly interesting came
from Ford—to design an automated scheduling system for their printed circuit board assembly plant outside Toronto. The plant had many parallel lines, most of which could do some types of jobs but not others. So when a machine failed, an immediate decision was needed as to whether to leave the boards to be built on that line there, awaiting repair of the machine, or to move them to an appropriate place in the queue of some other line. We addressed this with what we called “pro-active” (as opposed to “reactive”) scheduling, optimizing off-line across many different machine failure and board requirements scenarios. We optimized a set of scheduling rules, not a set of schedules, including rules for what to do when any particular type of machine failed. Yet more interesting was that I contracted much of this work out (through the International Science Foundation) to two Russian university laboratories with which I had established good working relationships—those of Igor Petrovich Norenkov (Moscow State Technical University) and Dmitri Ivanovich Batishchev (Nizhny Novgorod State University), under the Case Center’s International Technology Incubator. Both labs produced good results (and publications) that helped us to develop this system.

At some time in the mid-1990’s, after the computer operations side had been separated from the rest of the Case Center as the Division of Engineering Computing Services (DECS), the College of Engineering went through one of its many space crunches, and in order to keep collocated space for myself, Tim Hinds, our admin Joyce Foley, and my many international visitors, we agreed to move the Case Center’s (and MRC’s) headquarters to the College’s facility on Jolly Road in Okemos. The facilities there were wonderful—large offices, good air conditioning, etc., but we were separated from the remainder of the GARAGE people, who remained in the Engineering Building. I went from interacting regularly with almost all faculty members in the College about their computing needs to interacting with almost none of them except those directly involved with the GARAGE or the MRC. It was frustrating to me, although my parking problems went completely away. The Manufacturing Research Consortium operated ten years, until 2003, at which time the Case Center was closed—CAD and CAM software had become ubiquitous and was provided entirely by vendors, rather than being developed in-house by automotive companies, as it had been in the beginning. My research interests by then were largely in the area of genetic algorithms and genetic programming, on which Bill Punch and I had been collaborating in the GARAGE since 1993, so in 2003, we closed the Case Center, while the GARAGE remained very active. Tim, Joyce, Pei Min (a visiting faculty member) and I moved back to the Engineering Building. With the closing of the center, Joyce took a job in Electrical and Computer Engineering and Tim joined Mechanical Engineering (and eventually, came to direct the College’s CORE residential program in Wilson Hall).
Team Gems: Training & Facilitating Globally Distributed Engineering Teams

In 1996, we had a series of grants entitled “Team Gems: the Effect of Collaborative Technology on Engineering Design Teams,” from EDS (Electronic Data Systems). Chip (Charles) Steinfield (of MSU’s Department of Telecommunications, Information Systems and Media—now Media and Information) was the Principal Investigator. We began working with Jack Lloyd (M.E.), Ken David (Anthropology), and Tim Hinds (Case Center and MRC Associate Director). We were trying to figure out the most appropriate tools to use to make globally distributed engineering design teams work together most effectively. We began by assembling teams of students in a special international design team project course each semester. Each team was partnered with a team in another country, through partnerships with faculty members able to recruit similar teams of students. Our initial partners were colleagues of Chip Steinfield at the University of Utrecht (Netherlands), then we added partners in China, Germany, Japan, Korea, and eventually, especially Russia. Part of the study was about what technology to use and how to use it, and another component was about how to train/supervise the students to establish effective working relationships. A key technology used was ISDN videoconferences (tools like Skype were not yet available). This was expensive, but very important, especially given that the teams never had the chance to meet face to face. The grants from EDS (a supplier of communication technology to many globally distributed corporations) were followed by a three-year grant from NSF’s Partnerships for Innovation program, from 1998 to 2001. We developed a number of practices, including “cross-cultural training” of our students prior to project start. That was followed by observation of the teams’ video meetings by anthropology students trained to look for factors that disrupted the building of team coherence. The faculty then provided feedback to the teams to mitigate the problems observed. An undergrad who had started as a professorial assistant with me his freshman year, Ben Pfaff, was hired to develop what we called MSU TeamSCOPE to mediate all team activity. As we had learned, one of the most common problems is that when people are not in frequent communication about what they are doing—on a day-to-day basis—each person quickly comes to assume that he/she is the only one doing anything, and loses motivation. TeamSCOPE was designed to fight that by showing each person on the team a message each time any file in one of the project’s work directories was updated by anyone, along with other types of notifications. This was a significant undertaking at that point, and Ben did a great job with it (subsequently going to Stanford as a grad student in Computer Science without having taken a single computer science course during his undergrad career at MSU).
As we worked with these globally distributed teams, I was struck by how good a tool this could be for training Russians to do engineering work for American companies. I looked high and low for government agencies that might sponsor a pilot project. My idea was to found two corporations: a not-for-profit 501(c)(3) training corporation (NewTeams Training, Inc.) and a for-profit C-corporation (NewTeams Design, Inc.). The not-for-profit corporation would work with university senior design teams like the ones we had worked with on the Team Gems grant, organizing them into teams with Russian engineers to work on U.S. industry-supplied problems (such as we always had for our earlier global teams). We would monitor the process and assess the outcomes of each team, and would make the Russians who met the training objectives eligible for participation in design work for pay through the for-profit corporation. A very common problem at that time was that Russian engineers associated with globally distributed projects sometimes got “better ideas” of what they should be doing, and proceeded to develop something that was very elegant, but did not at all meet the design requirements specified by the sponsor. Those were the engineers that the training program was designed to “weed out,” in order to avoid problems on the design-for-pay front. Because the design requirements of U.S. companies were often quite different from what Russian companies required, it was important to identify the Russian engineers who could understand in detail and were willing to heed the U.S. sponsors’ specifications.

The for-profit corporation, NewTeams Design, would be a U.S. corporation, but would come to be majority owned by the Russian engineers participating in its work. In order to reduce the risk of corruption, fees collected from customers would be held by the corporation in the U.S. until distributed into accounts controlled by the individual Russian engineers. There was an elaborate plan for share distribution and governance of the for-profit corporation.

I looked at all the sources I could find to support this idea, including the International Science Foundation and various other foundations. I quickly learned that I would need to prepare a detailed business plan for each corporation, including financial pro formas that were GAAP-compliant (that means compliant with generally accepted accounting principles, in case you, like me, don’t know about financial accounting). That required that I ingest a textbook on financial accounting, which, much to my surprise, I found to be a lot of fun! I ended up with a very complex system of interlaced Excel spreadsheets, Word documents, and PowerPoint presentations that I could update instantly whenever a change in assumptions was needed (as frequently happened for different prospective funders). I remember my frustration when, at one point, the whole thing failed due to an Excel bug that did not reveal itself until after I’d worked several weeks (nights and
weekends, mostly) beyond it. I did not want to go back and throw away two weeks of work, so I tried to work with Microsoft’s phone support. They were very helpful, looking over my spreadsheets, etc., but could not tell me how to recover. I finally found a way to keep my work and restore the functioning of the spreadsheets, after several days of additional work... maybe it would have been faster to just go back to a working version, but the idea of trying to re-do all of that work was just appalling to me, and happily, I didn’t have to do it.

Finally, I became aware of something called the Nuclear Cities Initiative, a piece of legislation that established a program aimed at reducing nuclear proliferation by providing good jobs for Russian scientists and engineers in their “nuclear cities”—that is, closed cities that, during the Soviet era, did not even appear on the maps. They had names like “Arzamas 16” and “Chelyabinsk 70” and the like. You could buy a train ticket to get there if you knew what to ask for, but could only get off the train if you had the proper identification. Some were closed and secret, and others only closed, but together, they housed a lot of Russia’s nuclear expertise. The Nuclear Cities Initiative was funded by Congress at US$15 million for the first year, and was to go to $30 million in its second year. It was administered through the U. S. Department of Energy (i.e., OUR nuclear folks), under the office of Bill Richmond. After poking around through several other federal agencies, I had made enough contacts to make it possible for me to pitch the NewTeams plan to Bill, and after vetting the business plans (and presumably, me) for a while, he agreed to fund the plan for $3 million from the second year’s $30 million. I was, of course, over the moon! I started having nightmares about the Russian mafia coming after me for a piece of the action, despite my having engineered the business model so that all the money stayed in the U. S. until put into the hands of the Russian engineers. But I was putting the wheels in motion when everything came to an abrupt halt. The funds for the Nuclear Cities Initiative’s first year ($15 million) had been administered for the DoE by the University of New Mexico, doubtless completely unconnected to the fact that Sen. Pete Domenici (New Mexico) chaired the committee allocating the funds. Bill Richmond was not happy with the work done by UNM, so he said that he would not run the funds through UNM for the second year. Soon thereafter, Pete Domenici announced that instead of the Nuclear Cities Initiative being funded at $30 million as planned, he was cutting that to $0. Later, the House/Senate Conference Committee considering the bill compromised at $7.5 million, which wasn’t even enough to keep going the programs started in the first year of the program. So, the money to launch NewTeams disappeared in one fell swoop, and I was too discouraged to look any further. But it was ALMOST a... well, we would have seen if it would have turned out great or been a complete flop... but I sure wanted that chance! This was one of the biggest professional disappointments of my career, because it had seemed potentially important, and felt like a done deal, then it evaporated. Of course, there is some non-zero
probability that I am still alive today only because NEWTeams was killed instead. My friend Nikolay Smirnov was not so lucky, after he won many lawsuits in Russia against the unethical and unlawful selling off of Russian government assets.

**International and Outreach Advisory Committees**

Because of my extensive international activities in the 1990’s, I was appointed to serve on the College’s Engineering International Studies Committee, the Advisory Committee of the Institute for Global Engineering Education, and the university's International Studies and Programs Advisory Committee, which I also co-chaired. My service and outreach activities landed me the job of starting the university’s Service/Outreach Technology Committee, which I chaired from 1990-93 and served on until 2003.

**Red Cedar Technology, Inc.**

Ron Averill and I worked on several structural design optimization problems in the mid-90’s, including a challenge problem from the Department of Defense that we heard about when another university was unable to solve it. It turned out to be a submarine propeller anti-cavitation problem, but we had always thought of it as an airplane wing stabilization problem. The idea was that under a strong loading causing the wing to deflect upward, the structure itself (with no moving parts) should deform and deflect the trailing edge upward (like an aileron), so the (air- or water-) flow would exert a downward force on the wing, counteracting the original deflection. This was to be done with composite materials, with woven layers placed in orientations determined so as to maximize this corrective effect. We used GALOPPS to address this problem and came up with solutions that allowed for large amounts of corrective action. This work was done with graduate student Dave Eby, and convinced us that we had some technology and know-how that could solve some significant design problems.

Following that “moral victory” (we had no contract to do that work—just took it on as a challenge), in 1998, Ron Averill and I got a grant from General Motors’ Mid/Lux Engineering Group (Buick/Cadillac) in Flint to try to come up with a design for a lower compartment rail. It is the structural piece that connects the front bumper to the car chassis and to which engine mounts and the front suspension are connected. That means it must not allow undesirable vibrations during normal operation, must crush “just right” to minimize passenger injury in a frontal crash, and must weigh less than the current designs. Mid/Lux Engineering was looking at adopting the hydroforming process already used for making truck rails to use in a new family of mid-lux cars. Ron and I worked with Dave Eby to design a representation for the rail on which we could apply a genetic algorithm to minimize weight and improve crash performance. We used my “injection island GA” to allow the problem to be solved on a 20-node PC cluster, using six different representations of the problem running simultaneously and intercommunicating. The process
worked spectacularly well, and we gave GM a design that was 20% lighter and cut the peak forces in half, among other desirable behaviors. So the engineers at GM, in particular, manager John Madakacherry, told us to form a company, and they would be our customer. That way, GM would not be in a position of possibly having to license future intellectual property associated with their core business from a university. Instead, they could pay the company for services and have full rights to the IP. So Ron, Dave and I formed Applied Computational Design Associates (later to be renamed Red Cedar Technology) in 1999. I was VP Technology. I worked with Dave in my summer vacation and consulting time to design and write the code for an evolutionary computation-based software for optimization, initially for in-house use without a GUI. Eby wrote the interfaces to commercial CAD/CAM/CAE packages, while I concentrated on the core optimization technology. Ron agreed to take on the massive workload of being the company’s CEO, a role at which he proved to be extremely capable, teaching himself whatever skills and tools were needed to run the company very well. We soon hired former grad student Ranny Sidhu as another software developer for the core technology. Joe Whitesell developed the initial GUI for Red Cedar’s first commercial software product, in the SmallTalk object-oriented programming language, which could run on any of the current engineering design workstations. Soon, we were joined by Johanna Burgueno as a second GUI developer. We introduced the company’s first commercial software for design automation, HEEDS (Hierarchical Evolutionary Engineering Design System), in 2005, with the proprietary (meaning trade secret) optimization algorithm SHERPA. Dave Eby had left the company in 2002, as he needed more financial stability than a startup could provide. Ranny and I, with very significant intellectual contributions from Averill, continued developing SHERPA through 2010. We did a lot of the algorithm development via pair programming, in which the two of us sat in front of one terminal, making joint decisions about the code as we went. That was a very efficient way to develop the code, and also about the most fun I ever had programming... I really hated to give up my role as VP Technology when BEACON was funded in 2010. I still can’t talk about the optimization methods we used in SHERPA, but I have continued to take great pleasure in hearing from the sales staff how we always win the “bakeoffs” against the competitors’ software whenever a potential customer sets up a “level playing field” and a set of benchmark problems on which the vendors compete. It was a big loss of standing in the EC community not to be able to publish about our SHERPA algorithm. But the company’s success was rewarding in other ways, both in seeing real customer problems getting solved with SHERPA when other optimizers had failed, and eventually, in getting paid something for the all of the sweat equity when the company was sold. Running the company was a very difficult job, and Ron and I had many discussions about how to make some months’ payrolls. Often that meant lending the company our own personal funds, and we did that when
we needed to. We also gained some very important investment from John “Chip” Hoagland, who learned of Red Cedar through Joe Whitesell, with whom he had previous business dealings. Three years after BEACON was funded and I left Red Cedar, it was sold to CD Adapco, the developer of StarCD and other CFD (computational fluid dynamics) software products. They had become familiar with Red Cedar by partnering with us and building SHERPA into their CFD software as an optimization option. The buyout meant that the investors like Chip and the sweat equity players like Ron and me received cash for our shares, so we eventually got paid for our years of little or no monthly paychecks. I was delighted to learn that CD Adapco, including Red Cedar, was sold to Siemens PLM in 2016 for nearly a billion dollars. While that had no financial implications for us, it meant that the further development of HEEDS and SHERPA would go on, and their sales have been skyrocketing. I was told that, among engineering design optimization software, as of 2019, HEEDS is #1 in sales in Japan and #2 in the world. That certainly brings me a great deal of satisfaction, despite not bringing financial gain.

The Founding of GECCO and SIGEVO

At the ’95 International Conference on Genetic Algorithms (ICGA ’95), I was selected to be the General Chair of the 1997 ICGA, to be held at the Kellogg Center at MSU. At and around ICGA ’97, a number of leaders involved in ICGA began discussions with other leaders in EC about possible unification of conferences in the field, in order to build the size and reputation of the field, especially for the benefit of new junior faculty members. Key participants included David Goldberg, John Koza (organizer of the Genetic Programming Conferences), Darrell Whitley, Wolfgang Banzhaf, Hans-Paul Schwefel (co-inventor of evolution strategies and organizer of the Parallel Problem Solving from Nature Conferences—PPSN), and myself. Representatives from another smaller group dealing with evolutionary programming chose not to affiliate, allying instead with the IEEE Neural Net Society, but the remaining parties all joined to launch a new, federalistic conference, Genetic and Evolutionary Computation Conference (GECCO) in Orlando in 1999, with 600 attendees—the largest for any conference in our field up to that time. It was organized primarily by the leadership of the ISGA (which ran ICGA’s, and of which I was a member of the Executive Council) and the Genetic Programming conferences, with cooperation of the leadership of the PPSN Conference in Europe. Shortly after the first GECCO, the Executive Council of ISGA adopted new articles of incorporation and bylaws as ISGEC, the International Society for Genetic and Evolutionary Computation, and I became a member of its Executive Council. Dave Goldberg chaired the first GECCO, and I was invited to chair the second, but deferred that until 2001, when I was General Chair of the third GECCO (2001), in San Francisco.

I was elected Chair of the International Society for Genetic and
Evolutionary Computation (ISGEC) in November, 2001, succeeding Dave Goldberg. Over the next three years, I worked intensively with Goldberg, Koza, Banzhaf, Whitley and others to seek ways to enhance the visibility of the field and to improve the recognition it provides to new junior faculty. In 2004, after much debate within ISGEC, we began the process of affiliation with ACM as a new Special Interest Group, the SIG for Genetic and Evolutionary Computation—SIGEVO. The move was designed to make our society more recognizable as an important part of the mainline professional organization in computer science, even though it came at a cost of loss of considerable independence for the society. I became the founding Chair of SIGEVO in 2005, continuing in that role until 2007, when Darrell Whitley succeeded me. I was twice re-elected to SIGEVO’s Executive Committee after that, and continued to serve on the Business Committees for all GECCOs through 2010. I am still on the Executive Committee, as are fellow BEACONites Kalyanmoy Deb and Wolfgang Banzhaf, and we all participate actively in its activities.

**De Novo Design of Mechatronic Systems—“Bond Graph/Genetic Programming”**

Ron Rosenberg and I had collaborated for years on everything from music (The Bluegrass Extension Service) to running of the Case Center to our SYSKIT software development project, so we thought we might as well finally put together the fields we were really best at. Ron was an expert on bond graphs from the time of his grad study at MIT where they were invented, and had developed a commercial bond graph software analysis package, ENPORT. I was experienced in evolutionary computation, so we thought we’d try to put them together to allow evolution of novel designs for dynamic systems described as bond graphs, using a genetic programming framework. The resulting systems could then be implemented with various combinations of electrical, mechanical or other components, as were most appropriate for a particular application. We applied for and received funding from the NSF, and recruited postdoc Kisung Seo and grad students Zhun Fan and Jianjun Hu to work with us on the project. This BG/GP method was used not only for design of new mechatronic systems, but also for redesign of existing systems, in what we might now call “Genetic Improvement” of dynamic systems, rather than of computer programs. It was used to redesign pneumatic railroad braking systems, to improve on early designs of “Selectric” typewriters, and applied to other systems. Because these systems required that both the topology and parameters of a system be evolved at once, the team developed “Structure Fitness Sharing (SFS),” a concept that allowed new topologies to remain in a population long enough on average that appropriate parameters could be evolved before a topology was discarded. Such a process today would be called a multi-level search algorithm. Because this de novo synthesis required very long searches, Jianjun Hu developed a new model for sustainable search, a process that allows continual injection of new
random genomes into the population and does not force them to compete with more highly evolved individuals until their fitnesses are in similar ranges. This approach, called Hierarchical Fair Competition (HFC), was eventually extended by the team to allow it to evolve its fitness thresholds and even into a continuous form in which the fitness distribution itself was sampled for breeding and fitness evaluation purposes without subdividing the population explicitly. HFC and its offspring, Adaptive HFC (AHFC), Quick HFC (QHFC), and Continuous HFC (CHFC) were used by many authors during the ten years after their introduction, and the papers were cited over 700 times, but eventually, more people in the community moved toward Greg Hornby’s Age-Layered Population Structure (ALPS), which appeared soon after HFC was published, to address sustainability of search.

The BG/GP work continued after the NSF grant expired, via collaborations with Zhun Fan after he joined the faculty of the Technical University of Denmark (DTU). His student Jean-Francois Dupuis came to the GARAGe to work with me for a year, before returning to Denmark. Our collaboration has become more intensive and much broader in scope today, covering many aspects of evolutionary computation and involving many of his colleagues in China. Prof. Fan, now directing the Guangdong Provincial Key Laboratory of Digital Signal and Image Processing of Shantou University, and we have established a joint research center on Evolutionary Intelligence and Robotics, and continue our collaborations through my annual visits to China and students from his lab coming to BEACON to work with me for one or two years. We now collaborate more broadly on evolutionary multi-objective optimization, robotics, machine vision, and other issues. He has hosted me for many visits to Shantou University and other universities in Guangdong Province, also introducing me to others who have become collaborators on evolutionary multi-objective optimization. I look forward very much to my annual visits to his laboratory, and to working with the students and faculty that he and his colleagues have sent for stays in BEACON.

Evolution of Control Algorithms for “Green” Greenhouses

In 2006, I began collaborating actively with Prof. Lihong Xu, Dean of the School of Modern Agriculture Science at Tongji University, although we had met as early as 2002. The topic of our collaboration is greenhouse control, and not surprisingly, we are seeking to evolve controllers with superior performance, in terms of crop yield and/or environmental impact, to the “standard” controllers that seek to maintain a fixed internal greenhouse temperature/humidity regardless of external conditions. Prof. Xu has visited MSU each year since then, sometimes for many months at a time, and has helped to guide the Ph.D. work of José Llera and the doctoral and postdoc work of Prakarn Unachak. He has also sent over a series of excellent Ph.D. students and
postdocs as visiting scholars, working with me for one- or two-year periods, including Chengju Liu, Qingsong Hu, Bingkun Zhu, Dawei Li, Chenwen Zhu, Haiqiang Nie, Leilei Cao, and Chunteng Bao. I have had a great time working with these researchers, not only on evolutionary computation, but also somewhat further afield for me, often on topics that I hadn’t thought about for years, which I loved. Prof. Xu was appointed as an Advisory Professor of BEACON in 2016.

Prof. Xu has a large and excellent team of researchers working in his lab at Tongji University, and his projects have important places in China’s Five-Year Plans. They work not only on greenhouse management, automation and control, but also on related problems such as fish farming. The complexity of these problems has taken us in many directions, including multi-objective optimization algorithms, machine vision methods for visualizing plant growth and food status on fish farms, and many others, both practical and theoretical. MSU Ph.D. student José Llera is nearing completion of his degree on this problem, and we hope to see his work tested in practice in a greenhouse in China. MSU Prof. Erik Runkle, Dept. of Horticulture, does extension work with Michigan greenhouse operators and has been an invaluable source of guidance for our greenhouse modeling and control work.

Bringing Computers and Internet to Five Schools in Tanzania

In 2008, Dean Satish Udpa told me of an offer from an engineering alumnus, who had become a vice-president at Lenovo, of a possible donation to carry on a project to investigate the most appropriate computer technology for deployment in rural African schools. I immediately expressed my interest, and with Prof. Jennifer Olson (an Africanist in Media and Information) and Prof. Kurt DeMaagd (a communications expert, also from Media & Information), selected an appropriate location and went to Tanzania to explore interest with Ministry of Education, Ministry of Economic Development, and local school and community leaders. In December, 2008, we took an ECE 480 capstone design team of MSU students, during winter break, on a service/learning experience to Mto wa Mbu, Tanzania and installed a solar power system, satellite Internet link, and a six-seat Lenovo server system in a very dusty, high-temperature environment at Baraka Primary School. We also trained teachers, primarily in email, Word and browser use. After the PC price crash, Lenovo stopped their charitable donations program, but MSU’s Office of the Provost stepped in with funding to continue the program for several years, to result in the establishment of an Information and Communications Technology for Development (ICT4D) minor or specialization as well as an annual Study Abroad service-learning program. As the instructor of the ECE Capstone Design course, I recruited
students to this “humanitarian” project each year, and groups ranging from 6 to 17 ECE and Media & Information students went to Tanzania in the following years, establishing computer labs in two more primary schools and two secondary schools. We partnered initially with two faculty members at University of Dar es Salaam, and some of their students were involved in the first two student visits. Later, Prof. Aloys Mvuma moved to the University of Dodoma, and we involved one of his graduate students, Alex Rutatinisibwa, in the computer and networking tasks. He continues working with us as a consultant to this day, providing indispensable technical expertise and frequent on-site support between our visits. Over the years, the teams improved the older labs with many more seats. Dr. DeMaagd left the university after a few years, and Dr. Lalita Udpa became involved in the program for several years. Each year’s visit begins with 10 days at TCDC, the Danish-operated Training Center for Development and Cooperation. There, the students learn “survival Swahili,” and enough about the culture, history, and economics to be able to avoid the most serious problems in interacting with the students, teachers and local population in Mto wa Mbu. I started studying Swahili during my time in Tanzania, then began working on it on my own back in East Lansing, eventually taking MSU’s third-year Swahili course sequence in 2012-13.

Over the years, the technology we installed in the Mto wa Mbu schools shifted from multi-seat servers to laptops. The student recruitment was eventually opened to all majors and all levels, as the basic computer skills of the typical MSU student were found to be sufficient to allow them to assist in the computer labs. In 2017, a fiber optic link replaced the satellite Internet, and a major impact milestone was achieved: at one of the schools, teachers were required to submit grades in Excel spreadsheets! In 2018, we learned that the Ministry of Education now requires that all schools in the Arusha Region enter all students’ final grades into a gigantic Excel workbook, broken down by districts and wards, then by school. In the Karatu district, which includes the wards in Mto wa Mbu, there are only five primary schools with any computers, and three of them are the schools where we have established computer labs. As a result, the other schools in the district must send someone to one of our schools to enter their grades.

**Attempting Microwave-based Breast Cancer Screening**

Prof. Meng Yao, of the Department of Electrical Engineering of East China Normal University, has been a frequent visiting research scholar to the GARAGe and to BEACON, since 2009. He has designed specialized antennas and impedance-matching technology to seek to improve the signal-to-noise ratio in reflected signals from breast tumors, which have characteristic impedance changes from surrounding tissues. While BEACON Ph.D. student Blair Fleet began using evolutionary algorithms to seek to select features to enable detecting tumor presence, the
technology was not yet well enough developed to allow that. Prof. Yao and his colleagues continue to develop additional technology aimed at eventually making this possible. In the meantime, Fleet is working on another signal processing problem having to do with predicting conversion of Alzheimer’s disease patients from mild cognitive impairment to the full disease state. In the meantime, I am working with Prof. Yao and fellow BEACONite Prof. Kalyan Deb to try to develop another collaboration dealing with using multi-objective evolutionary computation to address land use planning in China.

Addressing Land Use Issues Using Evolutionary Multi-Objective Optimization

Soon after Dr. Kalyanmoy Deb was recruited as the Koenig Endowed Chair, we picked up on an earlier collaboration I had had with Dr. Oliver Chikumbo, a control theorist and forestry researcher originally from Zimbabwe, who received his university education in Australia, worked there, then moved to New Zealand. Dr. Chikumbo and I collaborated originally on a forestry management problem in a part of New South Wales, where a deep layer of salt was in danger of poisoning the soil if forest clearcutting allowed water to penetrate to that level. However, the politicians did not like the scientific solution we produced, so they cancelled the project. We next worked on a problem of agricultural land use in the drainage basin of Lake Rotorua, New Zealand. With Prof. Deb, we developed not only the tools to make this many-objective optimization feasible, but also the entire methodology for providing it to the stakeholders in the community and getting their agreement on how to proceed. Although the Maori elders liked this approach very much, it too ran into political problems from the younger Maori farmers, and we had to abandon it, but not before being awarded the Wiley Practice Prize by the Society for Multi-Criteria Decision Making. We had had hopes that the work would be continued under the support of a company whose CEO had expressed strong interest in it, but that never materialized. Prof. Deb and I instead began collaborating with a team of land use researchers at ETH in Zurich and others from the University of Bonn in Germany. Graduate student Jonas Schwaab came to work with us for a year in BEACON, and we are continuing to work with him and his teammates in Germany and Switzerland.

BEACON Center: Surpassing All Expectations

In the early 2000’s, Rich Lenski and Charles Ofria approached me with an idea to apply for a Science and Technology Center to study evolution in action. They were already collaborating in study of evolutionary mechanisms in both bacteria (in Lenski’s Long-Term Evolution Experiment, or LTEE, involving 12 parallel cultures of E. coli transferred to new medium each day) and in “digital organisms,” using Ofria’s Avida platform of self-reproducing
computer programs. They thought I could bring to the center both evolutionary computation (genetic algorithms and the like, based on modeling of biological evolution) and my management skills, since I had directed centers and industrial consortia for more than 20 years. The evolutionary computation would also bring to the center a strong capability for knowledge transfer to industry, which is expected of Science and Technology Centers. Rob Pennock was another co-PI, bringing in deep experience in the battle about teaching evolution in schools, among other things.

I thought this was an absolutely spectacular idea, and despite my earlier resolve never again to direct anything but my own research, quickly said yes to what I saw as an irresistible opportunity. We recruited an excellent team, selected partner institutions including the University of Michigan and the University of Puerto Rico Mayaguez, and prepared the proposal, under the title “Center for the Study of Evolution in Action,” or CSEA. However, the proposal was not even selected for a site visit, so CSEA never came into existence.

However, in 2008, another call for STC’s was announced, and we quickly decided to try again. We added Kay Holekamp as the fifth co-PI, bringing in her experience with evolution in action among spotted hyena in Kenya, adding a charismatic organism to the research areas of the PI’s. This time, we chose as partners NCAT, where I was familiar with Gerry Dozier’s GA work and Rich knew Joe Graves, an evolutionary biologist; University of Idaho, where I knew James Foster, who was active in both evolutionary computation and evolutionary biology; University of Texas Austin, where I knew computer scientist Risto Miikkulainen; and University of Washington, where Rich and Charles knew Ben Kerr, an outstanding young evolutionary biologist.

We structured BEACON such that, aside from the central operations staff, all of the research, education and diversity support funds would be allocated annually based on BEACON-peer-reviewed “budget requests.” This was an innovative structure for an STC, and we feared that it might be attacked by reviewers as “trying to set up a mini-NSF.” However, that was exactly what we wanted to do, for the particular focus of evolution in action and for our five-university partnership. This time, the reviews were very positive, and the site visit went extremely well. I was astonished when MSU told us that they were proceeding with remodeling space in the BPS Building for BEACON, well before the decision to fund BEACON was announced by NSF. Selection of BEACON as an STC was announced in early February, 2010. I remember well that on February 8, when government offices were closed because of a severe snowstorm in Washington, D.C., I got a call from the person coordinating the 2010 class of STC’s, Dr. Joan Frye. She knew that we’d expected to hear that week whether or not we were funded, and she didn’t want us to have to wait through the weekend, so she called me with the good news. I was thrilled beyond words, of course, and will always be
grateful to her for not forcing us to wait.

BEACON’s model would never have worked had the co-PI’s been the least bit selfish about how the funding was to be used. In most STC’s, the PI’s decide how to divide most of the money among their labs, in order to achieve their center’s mission. But in BEACON, the mission is not tied to the labs of the PI’s; rather, the co-PI’s and I go through exactly the same process for getting funded any projects we might come up with as do any other BEACON members. Some of our projects are funded, and some are not. From the beginning, I have turned to the co-PI’s for advice about issues that arise, sometimes weekly, and for help in policy formulation, even if those policies are eventually taken to our larger Executive Committee for consideration. Rich, Kay, Charles and Rob have been unfailingly helpful in guiding BEACON.

In June, 2010, we were already moving into the completed BEACON Headquarters. We created the Managing Director, Diversity Director, Education Director and Business Manager positions in very short order, and proceeded to make spectacular (and very lucky) hires of Dr. Danielle Whittaker, Dr. Judi Brown Clarke, Dr. Louise Mead, and Ms. Connie James. Much of the success of BEACON has been attributable to the skills and dedication of these four and the other BEACON staff who were later added. I’d like to think that it was my highly tuned ability to spot top talent that helped us to make these hiring decisions, but I only wish that were true… I have to attribute a lot of it to luck that these perfectly suited people appeared in the pools of applicants.

We allocated the first year’s startup projects in March, 2010, using a clunky set of cobbled-together spreadsheets that I assembled with Brian Baer’s help. We held the first BEACON Congress in August, 2010. Meantime, NSF had not yet completed the paperwork to actually fund the new STC’s even in early September, and in fact, started the other STC’s in September or later. But because BEACON was already in full swing, they agreed to backdate our starting date to August 1, 2010.

Science and Technology Centers are required by NSF to have an External Advisory Committee, and BEACON appointed an outstanding group of scientists and engineers to that body. But that group is external, and advisory in nature, and I also wanted to get regular and detailed feedback on BEACON’s operation to help to guide in its development. So at the very beginning of BEACON, we also launched a team of assessment experts to do annual study of BEACON’s dynamics, surveying BEACONites to identify things that could be improved. Under the leadership of Drs. Patty Farrell-Cole and Marilyn Amey, they and their students surveyed BEACONites and quickly discovered a number of problems. We needed better communication with our members, and made our BEACON-wide seminars a weekly event. We expanded the BEACON Congress, bringing in more people from our partner institutions, and decided to hold it every year, rather than as originally proposed. We
initiated the BEACON Blog, under which ongoing research was highlighted with one or more posts every week on the center’s front page, keeping it continually new and worth visiting. We created a special training program for the grad students and postdocs who would be supervising summer research interns and apprentices, after learning that in the first year, the undergrads felt like an unwelcome burden on the senior researchers. That program paid immediate dividends, increasing the quality of the experience for the undergrads and helping the grads/postdocs to see it as a valuable part of their training for a future faculty role.

**BEACON Research**

BEACON’s research has been carried out in about four hundred projects so far, so it is not possible to summarize them here. The interested reader can consult each year’s annual report on the public website, in which Dr. Danielle Whittaker, BEACON’s Managing Director, has summarized each project in a paragraph or two. A very readable review of most of the projects is also available by reading back through the several hundred BEACON Blog entries. Suffice it to say that over 1,300 papers about BEACON-sponsored or BEACON-enabled research have been published already, including in journals such as *Science, Nature, Proceedings of the Royal Society, PLOS One, Proceedings of the National Academy of Sciences, Evolutionary Computation, IEEE Proceedings*, and many other top places. BEACON research is helping to address many of the important challenges to evolutionary biology, including evolution of cooperation, multicellularity, speciation, gene regulation, epigenetics, etc. BEACON researchers attack these questions in the domains of biological organisms and of artificial organisms, vastly increasing their capability to formulate and conduct experiments that illuminate the underlying mechanisms. Still other BEACON researchers are pushing the frontiers of developing new, more powerful evolutionary algorithms and applying them to solving real-world problems that have formerly been impractical to solve. This work can be found through BEACON’s Research web page, and I couldn’t begin to represent it well here.

**BEACON Education**

Many of BEACON’s initial graduate students were already at one of the BEACON universities before the center was created. So there was a backlog of students ready to take BEACON’s newly created trio of courses: Evolutionary Biology for non-Life Scientists, Introduction to Computational Methods in Biology, and Multidisciplinary Approaches to the Study of Evolution. They were structured such that students from the BEACON partner universities could participate remotely, if they did not have equivalent courses already available locally or did not create them. Our engineers and computer scientists took the fall course in evolutionary biology and the evolutionary biologists took the fall course in computational methods.
Then the two groups took the spring Multidisciplinary Approaches course, dividing into teams and creating computational models to experiment with. After a few years, the backlog of students was eliminated and the course enrollments decreased, and we are now opening them up more broadly to students across engineering and biology, including combining one of the courses with a similar one in the Department of Computational Math, Science and Engineering.

Many BEACONites proposed and carried out projects to create educational tools and curriculum to improve teaching of evolution, under the able leadership of Dr. Louise “Weezie” Mead. One of BEACON’s shining points has been the extension of many of these projects to serve the whole country, which is unusual in STC-developed education projects. These include the founding of the Data Carpentry Workshops, now run nationally as a not-for-profit organization with funding from the Moore Foundation and under the leadership of former BEACONite Dr. Tracy Teal. Another is the Data Nuggets project, which now includes over sixty sets of data and accompanying descriptions that are valuable for teaching students how to analyze real scientific data, and are distributed freely on the web. A third is the Avida-ED software, which provides free access to a first-class, web-based research tool for study of evolution of digital organisms and provides lesson plans for teachers to help them use it effectively in a biology class. Many Avida-ED workshops are offered each year to train teachers in its use. A fourth is the set of computer games continuing to be developed by BEACON’s Idaho partners, led by Terry Soule. Darwin’s Demons, the first of these games, features opponents that continually evolve, based on the player’s actions, providing a fun way to see evolution in action. All of these BEACON products are creating impacts nationwide. BEACON staff and faculty also assume leadership roles in many professional organizations, including those for biology teachers, helping to assure the prominence of evolution education in our curricula.

**BEACON Diversity**

While the National Science Foundation has strong expectations of its STC’s that they develop diversity within their centers, BEACON was determined from the outset that we would set ambitious goals and then actually surpass them. In the proposal stage, BEACON was able to draw on the unmatched skills of Prof. Percy Pierre, arguably the most impactful leader of graduate student diversity in the country. He helped to shape and start the graduate fellowship program of the Sloan Foundation, and in later years, to administer that program at Michigan State University. We set ambitious goals in the proposal, to exceed NSF’s national norms in all categories and all levels. Percy and I put together the diversity program outlined in the proposal. As soon as BEACON was funded, we hired Dr. Judi Brown Clarke, who became the prime mover behind our diversity programs, as BEACON’s Diversity Director.
Because Percy and I had already worked together before BEACON, we had a level of trust and mutual confidence that enabled us to set goals and then achieve them, with the understanding that we would cooperate and share resources to enable that. As a result, BEACON was soon able to exceed NSF’s national norms for underrepresented minority graduate students, including racial/ethnic minorities in all fields, females in engineering/computer sciences, and persons with disabilities. Through Judi Brown Clarke, we then targeted underrepresented minorities and females in the undergraduate, postdoctoral and faculty ranks. Achieving those goals required creation of several new programs. For undergraduates, Dr. Brown Clarke created and operated a huge summer program, with part being a traditional REU (Research Experience for Undergraduates) program, drawing many participants from BEACON’s partner NCAT and other HBCU’s. But we wanted to have something for younger students not yet ready for the REU experience, so she created a second program, the Research Apprenticeships Program, which in one summer prepared students for a subsequent summer as an REU participant. We then added a “bridge” between those two, the BEACON Luminaries Program, which provides academic-year support for ten hours/week of research back at the home institution, between the apprentice and REU summers or between REU and grad school. All of this is aimed at providing these students the skills and confidence to know they can succeed in graduate school. BEACON has been hosting 60-80 students in BEACON labs each summer for many years. Much of the funding has been arranged from other sources, so that BEACON pays only about 40% of the total bills, enabling support for such a large number of students. But all of these students benefit from the oversight and training provided and arranged by Dr. Brown Clarke. That training included her oversight of the postdocs and grads working with the students, assuring that they also benefited from their supervisory experience.

The early years saw BEACON not yet meeting its goals regarding diversity of postdocs and faculty. We therefore created a BEACON Distinguished Postdoc Program, under which faculty members could nominate postdocs working on evolution in action to be supported at BEACON for two years. This program brought excellent postdocs to BEACON and put us over the top regarding postdoc diversity in both gender and race/ethnicity. For faculty diversity, and to assist with future undergrad and graduate student diversity, BEACON recruited a few outstanding faculty members outside the BEACON institutions to be brought into BEACON as Faculty Affiliates. These faculty members received some initial research funds, and then became eligible for competition for all other project funds in the future, just as if they were at a BEACON institution. Once again, this program allowed us to exceed the national norms for faculty in all categories.

Dr. Brown Clarke also launched BEACON’s program to support persons with disabilities (or “this-
abilities,” as they are called here), and we now exceed these national norms by several fold.

Pierre, Brown Clarke and Goodman are now working on capturing the processes that have helped BEACON to achieve this notable success. Of course, part of the answer is the particular talents and dedication of Pierre and Brown Clarke, which cannot be replicated elsewhere. But we hope to capture other elements that can be used elsewhere in trying to achieve ambitious diversity goals.

And Finally, Rocket Science

I always wanted to be an astronaut, and for a while, even entertained the idea of applying to NASA... I was a pilot, I spoke Russian, and I had a Ph.D. in science, all of which should have helped me to get accepted for the Astronaut Corps. BUT I had also learned that I have a hiatal hernia—that is, the valve at the top of my stomach does not close completely, so when I am upside down (or weightless), stomach acid makes its way into my esophagus, causing heartburn and nausea. So that pretty much precluded becoming an astronaut.

Who knew that that wouldn’t be my last opportunity to get involved with NASA! We have a research subcontract from Siemens on a contract they have with DARPA, to develop tools for doing next-generation design of structures of structures (think of a lattice with beams that are lattices with beams that are lattices, etc.). I am a co-investigator on the MSU subcontract, which deals with optimization of structures that are too complex to allow conventional optimization methods to work well. Our team, including Ron Averill, Alex Diaz, Kalyan Deb and me, with grad students Abhiroop Ghosh, Ming Liu, Matt Ryerkerk and Zhichao Lu, worked on developing new algorithms for approaching such problems, interacting closely with Siemens engineers. But summer of 2018, DARPA introduced a new challenge problem, one that they had obtained from NASA, that really caught my attention. The problem is raised by the rapid advances in 3D printing, raising the possibility that someday solid fuel rocket propellants might be printable in arbitrary configurations, enabling much more control over the burning characteristics of solid fuel rockets. A key possibility that raises is the capability to eliminate most insulation from the rocket. If the grain (propellant) can be designed such that all portions of the grain burn to the shell of the rocket at the same time, then minimal insulation is required. That can have a huge impact on the payload of the rocket. But to optimize the geometric design of the grain when any part of it can consist of any of, say, 11 different propellant types, each of which has a different burn rate, is outside the scope of traditional optimization methods, potentially requiring optimization of hundreds to millions of design variables.

NASA provided an example of a small-scale rocket design for us to work on, and an example of how the propellant might be divided into segments, each consisting of multiple different layers of propellants. The geometry of the
rocket required that it be modeled in different segments, and that the original combustion cavity not be axisymmetric (cylindrical), instead being able to have the shape of a star or a distorted star, in order to provide more initial surface area burning. NASA also provided a simplified model for the burn dynamics, a steady-state model in which all pressures and temperatures in the combustion chamber are identical at any point in time. BUT NASA was depending on Sandia National Laboratories to provide simulation code for the rocket, and all Sandia provided in the initial months of the project was limited to calculating combustion in a spherical shape with a single propellant type. So I decided that, in order to allow us to proceed with our optimization studies in a timely way, I would write a simulator of the rocket burn, using the equations NASA had provided for the steady-state combustion model.

That turned out to return me to writing code in ‘C’, as I had done when working in Red Cedar Technology and in the ‘90’s in the MSU GARAGE. Both geometric modeling and writing code are things I love to do, so I went to work on this myself, rather than passing it off to a student, and probably averaged over 50 hours/week working on the simulator and the optimization code in which it was embedded, from September, 2018 through May, 2019. I decided to build the model within the GALOPPS parallel genetic algorithm optimization framework I had developed in the ‘90’s (the predecessor of the SHERPA algorithm in the Red Cedar Technology software package HEEDS), as that would make it easy and quick to take advantage of the parallelism that GALOPPS provided. I first modeled the burn of a cylindrical segment, then of the elliptical dome of the rocket, then of the non-elliptical exterior portion of the dome, then the nozzle area, and finally, the insulation around the throat of the rocket. I also spun off a “standalone” version of the simulator for the graduate students to use in optimizing the design with other optimization tools such as NSGA-II and with HEEDS itself, under a license we had to obtain from Siemens (although Averill and I had been the developers of HEEDS).

I had a great deal of fun learning about and modeling the rocket combustion. One of the problems NASA had pointed out was that if two adjacent segments have different propellant types in their layers, then at the interface where the segments meet, some lateral burning will occur... that is, whichever segment has burned less deeply exposes some propellant that will then burn sideways (laterally). In fact, given that the slower-starting segment must eventually catch up (if it is to burn out at the same time), that means that the interface will burn to the shell ahead of either of the adjacent segments! So I devised a “compatibilization” scheme, introducing a region between the segments with a very specific distribution of propellant types that prevents the interface region from burning to the shell prematurely. I haven’t found anything about this problem in the literature, but I know NASA has considered it, so I assume they have solved it internally and
simply not published it. I thought about patenting it, but convinced myself that it would be too easy to circumvent and still achieve acceptable results, so I have finally decided not to pursue a patent.

I was delighted that, rather than submitting jobs to the Texas Advanced Computer Center and waiting in a queue for them to start, I could do my optimization runs on my own office machine, a PC with 32 nodes, providing 64 parallel threads, on which I routinely ran 60 intercommunicating GA populations, evaluating literally billions of rocket designs each day. This machine was assembled for me by Tim Schmidt, BEACON’s IT specialist, who is a whiz with both hardware and software!

I also worked with an undergrad, Tyler Will, who developed a visualization tool for animating the rocket burn, which turned out to be important for both debugging and communicating about the rocket. In the end, the rocket simulator I developed, by taking advantage of the symmetries I imposed, ran many orders of magnitude faster than the simulator Sandia eventually provided, which uses the same burn equations but distributes propellant types at the voxel level, and for which optimization is much more difficult. I have been able to meet the goals set by NASA using GALOPPS, and the students have used the standalone version of the simulator to achieve similar performance in orders of magnitude fewer evaluations, making use of principles called multi-level optimization and innovization. The time period for the challenge problem ended in June, 2019, so the continuing work the students and I will be doing is to prepare the materials we need to publish our results.

This project gave me a chance to return to conducting my own research, rather than only supervising the work of my students, postdocs, and visiting scholars, who have been the ones having all the fun! This has been a great inspiration to me, finding out that I could still contribute in this way, and reminding me how much I enjoy it! I plan to make this kind of personally conducted research a continuing part of my work as long as I can.

The Parallel Activity—Teaching

I have always seen myself as a better teacher than researcher, but my interests and my enjoyment of collaboration have always dragged me into spending more time on research and team/center management than on teaching. But I have loved my time in the classroom, and enjoyed trying to engage students and especially, to challenge them to learn “on the spot.”

I have already described my development of the course sequence training systems ecologists by putting together teams of ecologists and systems/engineering people. At MSU, I basically put myself out of that business, because faculty from many of the biological disciplines sat in on my course, then built parts of the content into their own departmental courses. Also, Ronald Reagan stripped research funding from the
Environmental Protection Agency, dramatically cutting the resources available for research by systems ecologists, so demand for the field waned.

When that happened, I turned my teaching to the digital electronics courses in the department, developing a new capstone computer engineering course, Computer Interfacing, for which I received a semester of course-release time to develop six new projects for the course's lab sections. I enjoyed a great deal getting my hands back on actual hardware and writing software in assembly language. These projects were mostly done on Digital Equipment's LSI-11 systems, the new large-scale integration version of the old PDP-11 architecture, running the RT-11 real-time operating system. They included writing code for local networking and using A/D conversion to sample speech, then replay it after some filtering. I taught the Computer Interfacing course from 1980-1983.

In the 1973-1989 timeframe, I also taught many of the department's sophomore-junior-level courses, including Electric Circuits I, Electric Circuits II, Discrete-Time Systems, and Analysis of Control Systems. Since my training was as a mathematician, formal philosopher, systems scientist, and computer scientist, but never as an electrical engineer, such courses were always a stretch for me, requiring time with the textbook in planning each lecture. But one of the courses, ECE 311, Discrete-Time Systems, actually became near and dear to my heart, and I taught it very happily many times. This was a course in which I delighted in helping students gain an intuitive understanding of discrete convolution and Z-transforms, removing convolution and the Fourier transform from the realm of "magic" and helping them internalize the "tricks" of summing series. One of those times, Colleen Cooper, then a Ph.D. student in Higher Education (College of Education), picked me as the subject for her ethnographic study of a college classroom. Every lecture, for many weeks, she and her camera operator videotaped my class and me as I lectured, answered questions, and worked problems on the blackboard. She then spent hours with students reviewing the tapes, asking them what it meant when I did certain things, etc. She also went over these tapes with me, asking me similar questions. It turned out to be a fascinating process, revealing a lot of my teaching behaviors that to me were completely unconscious, but turned out to be completely predictable. An example is when I would go to a particular place in the room that turned out to be my "come let us reason together" place. I had no idea I was doing that, but it was very clear on the video. I still have a copy of her thesis!

I also taught the accreditation-required 1-credit course in Communications, Ethics, and Professionalism for many years, first as a stand-alone ECE 381, then later, as part of the ECE 480 Capstone Design course, then again independently as ECE 390. I did enjoy helping students learn how to do better presentations.

As part of the globally distributed design teams research project, I also
was a co-instructor in EGR 475, Global Engineering Design Teams, 1999-2002. Bill Punch and I co-taught or alternated in teaching CSE 848, Intro to Evolutionary Computation, many times from the ‘90’s and until it was recently taken over by Profs. Deb and Banzhaf. I taught CSE 410, Operating Systems Principles, from 2000-2002, and enjoyed that immensely. That course introduced computer science and computer engineering students to processes, process scheduling, interrupt handling, deadlocks, inter-process communication, race conditions, and many other concepts critical to understanding how user-written programs interact with the actual computer hardware.

I taught ECE 480, Senior Capstone Design, from 2002-2010. I modified the course so that the design teams worked on problems posed by industrial sponsors, who paid a nominal fee to sponsor a team for a semester. When I took the course over, the teams were engaging in robot design competitions with each other, rather than working on industry problems, but I thought it was important that they learn to interact with a real sponsor and to elicit a proper set of design specifications, then work to fulfill them. It also gave them a window on a potential employer, and vice-versa. They had regular meetings with their sponsors during the semester, and presented them a prototype and report at the end of the semester. The bad news was that it meant I had to recruit somewhere between 10 and 18 industrially sponsored projects each semester, which took a good deal of time and communication. But I certainly felt that it was worthwhile in terms of what the students learned.

I also introduced several new topics in the lecture portion of the senior capstone design course, including a series of lectures on Six Sigma Design given by Dr. Gregg Motter of Dow Chemical Co., one on intellectual property given by patent attorney Steve Noll, and one on project management using MS Project, which they were required to use throughout the semester. Each team made two oral presentations to the class and others to their sponsor. They met weekly with their faculty facilitator, updating on progress using their Gantt charts. Their projects were judged at the end of the semester by judges from industry.

**Students and Postdocs Mentored**

**Ph.D. Students Directed or Co-Directed, Department**

- Thomas M. Koplay (co-directed), Systems Science, 1974
- Mark N. Pickelmann, Mechanical Engineering, 1985
- Cameron S. Kayvan, (co-directed), Electrical Engineering, 1985
- James H. Oliver, Mechanical Engineering, 1986
- Adrian V. Sannier, Systems Science, 1988
- Jane L. Hawkins, Mechanical Engineering, 1989
- Ki-Yin Chang, Mechanical Engineering, 1991
- Shyh-Chang Lin,
Electrical and Computer Engineering, 1997
Ming Bao,
Electrical and Computer Engineering, 1997
Zhun Fan,
Electrical and Computer Engineering, 2004
Bulent Buyukbozkirli,
Mathematics, 2004
Jianjun Hu,
Computer Science and Engineering, 2004
Hiram Firpi,
Electrical and Computer Engineering, 2005
John Oliva,
Mechanical Engineering, 2010
Prakarn Unachak,
Computer Science and Engineering, 2010
Jinyao Yan (co-directed), Electrical and Computer Engineering, 2018

Postdocs Supervised/Sabbaticals Hosted

Phil H. Crowley, Post-Doctoral Research Associate, 1975-76
Jeffrey J. Jenkins, Post-Doctoral Research Associate, 1981-82
Nikolay N. Smirnov, Dean of the Faculty, Volgograd Polytechnical Institute, Volgograd, USSR, sabbatical leave 1990-91.
Pei Min, Professor and Vice President, College of Automation, Beijing Union University, Beijing, PRC, 1991-92.
Ding Ying, Instructor, Beijing Union University, Beijing, PRC, February 1, 1993 - January 31, 1994
Stepan Pavlovich Radzevitch, Professor, Dneprodzerzhinsk Industrial Institute, Dneprodzerzhinsk, Ukraine, (under support of National Research Council), March 15, 1993 - November 30, 1993; July - August, 1994; June-July, 1995; June - September, 1996; then as Professor, Kiev State Technical University (Kiev Polytechnic Institute), July - August, 1997; September, 1998.
Volker Schnecke, Post-Doctoral Research Associate (co-hosted with L. Kuhn, W. Punch), 1997 - 1999.
Kisung Seo, Post-Doctoral Research Associate, Jan., 1999 – August, 2003
Zhenhua Li, Visiting Scholar, Assoc. Prof., China University of Geosciences, Wuhan, April, 2006 – April, 2007.
Lihong Xu, Visiting Scholar, Professor, Control Theory and Control Engineering, and Dean, School of Modern Agriculture Science and Engineering, Tongji University, Shanghai, PRC, May, 2006 – May, 2011 (back and forth, but > 50% at MSU)
Ping Wu, Visiting Scholar, Associate Professor, Computer Center, East China Normal University, Shanghai, China, visiting MSU October, 2008-September, 2009.


Zhun Fan, Visiting Scholar, Associate Professor, Tongji University, Shanghai, PRC, August, 2011–February, 2012.

Kisung Seo, Visiting Scholar, Associate Professor, Seokyeong University, Seoul, Korea, April, 2011 – February, 2012.

Chengju Liu, Visiting Scholar, Postdoctoral Researcher, Tongji University, Shanghai, China, August, 2011 – July, 2012.

Yuanping Su, Visiting Scholar, Lecturer, Jiangxi University of Science and Technology, Nanchang, China, August 1, 2018-July 31, 2020.

Chunhong Lu, Visiting Scholar, Lecturer, Nantong University, Nantong City, Jiangxi Province, China, January 1, 2019-December 31, 2019.

**M.S. Thesis Students Supervised**

David A. Mc Claughry, ME, (co-directed), 1985
Chia-Yiu Maa, EE, (co-directed), 1987
David R. Chesney, ME, 1987
Daniel A. Wysocki, ME, 1987
Chiu Chin-Chuan, EE, (co-directed), 1989
Hari K. Kosaraju, ME, 1993

Kelvin Sumlin, CS, 1993
Brian Zulawinski, CSE, (co-directed), 1995
Ananda Debnath, ME, 1997
Eric Myers, ME, 2000
Huafeng Pei, ECE, 2001
Anand Uday, ME, 2001
Zhijian Huang, ECE, 2002
Zhiwen Zou, CSE, 2002

**Undergrad Research Assistants Mentored**

Robert Leland (won Rhodes Scholarship)
Paul Haas
Benjamin Pfaff
Antony Paul
Matthew Skalny
Janelle Shane (won Goldwater Scholarship and NSF Graduate Fellowship)
Keith Barber
Albert Anthony
Matthew Durak
Grayson Wright
Nicholas Durak

**Visiting Scholar Grad Students Hosted**

G. Pisarenko, Sept-Dec, 1994
V. Tcheprasov, Feb-October, 1995
Huafeng Pei, May - August, 1998
Baoli Yang, Jan., 1999 – June, 2000
Qingsong Hu, Visiting Scholar, Ph.D. student at Tongji University; visiting MSU September, 2007 – August, 2008
Jean-Francois Dupuis, Visiting Scholar, Ph.D. student at Technical University of Denmark, visiting
MSU September, 2007 – August, 2008
Bingkun Zhu, Ph.D. student, Tongji University, Shanghai, China, visiting MSU November, 2008-October, 2009.
Dawei Li, Ph.D. student, Tongji University, Shanghai, China, visiting MSU October, 2009 – October, 2010
Haiqiang Nie, Ph.D. student, Tongji University, Shanghai, China, visiting MSU August, 2013-July, 2015.
Leilei Cao, Ph.D. student, Tongji University, Shanghai, China, visiting MSU August, 2015-December, 2016.
Jonas Schwaab, Ph.D. student, ETH Zurich, Switzerland, visiting MSU 2016-2017 (with K. Deb)
Chunteng Bao, Ph.D. student, Tongji University, Shanghai, China, visiting MSU January, 2017-December, 2018
Chaoda Peng, Ph.D. student, Guangzhou University of Technology, Guangzhou, China, visiting MSU December, 2017-November, 2019
Shuwei Zhu, Ph.D. student, Tongji University, Shanghai, China, December 20, 2018 – December 19, 2020.

Other Mentorship

One current Ph.D. advisee, José Llera-Ortiz
Guided math modeling portion of thesis work, but not as advisor, for 9 biology Ph.D. students
Served on Ph.D. Committees of 62 other Ph.D. students
Directed non-thesis M.S. projects of 7 students
Directed two Diplomarbeit students from RWTH Aachen
Served on 5 other M.S. Thesis Committees
Summary of the Above Intellectual Contributions

1) Ph.D. research: developed a model of the growth of the bacterium *E. coli* under transfer among a variety of media (glucose, amino-acid-based medium, broth, glucose+lactose), based on an earlier simulation by Dr. Roger Weinberg. Used a genetic algorithm to derive over 40 rate constants governing synthesis of various cellular pools—the first known application of a genetic algorithm to solve a complex problem for which the answers were unknown, requiring about a year of computer time. For this problem, some algorithmic design decisions differed from Holland's classical model to better match the problem characteristics. The resulting cell model was then embedded in a von Neumann-style cellular automaton to enable investigation of effects of postulated intercell and stigmergic communication on colony formation.

2) Developed a training model for systems ecology, and trained over 400 biologists, including 20+ faculty members from other universities, in state modeling and numerical simulation of biological/ecological systems, 1972-1982, in Systems Science 442
   a. Imposed a useful organization of thinking in the modeling process
   b. Models did not need to be linear, so biologists could model arbitrary relationships—the dynamics they actually observed, not only what they could represent in a matrix, so long as it was expressible using ordinary differential equations
   c. Meant that must use numerical integration to simulate, not analytical tools to generate closed-form solutions, so also taught them FORTRAN programming and numerical integration

3) Collaborated on state modeling of over 100 biological/ecological systems in a project-based course, SYS 843, that followed the initial systems ecology training

4) Used genetic algorithms to parameterize models with nonlinear structures that were otherwise difficult to parameterize, in dissertation and subsequent modeling projects
   a. Given the computing resources of the time, it was usually not possible to replicate many times to allow making claims about the optimality of the search process, so did not publish about the methodology—simply used the results

5) Led CAD/CAM research in the Case Center for Computer-Aided Engineering, 1983-2002:
   a. Developed the surface fitting system used by Chrysler to translate their proprietary Tchebyshev sculptured surface part definition database into industry-standard Non-Uniform Rational B-Splines (NURBS)
b. Worked on CAD geometry use in manufacturing problems with many students, culminating in contributions to numerically controlled toolpath verification and high-precision robotic spray application simulation, both transferred to and employed by industry

6) Did early work introducing parallelism in evolutionary computation
   a. Ph. D. student Adrian Sannier used fine-grain parallelism (with reproduction triggered by behavior, influenced by others’ behaviors, but not requiring synchronization / generations) in his ALife and load-balancing work, published in mid-80’s
   b. My use of “island” parallelism was inspired by D.S. Wilson’s MSU (Zoology) thesis work in 70’s
   c. Shared an island parallelism GA toolkit with the community in GALOPPS (Genetic ALgorithm Optimized for Portability and Parallelism), 1994-2000
   d. Used GALOPPS in combinatorial optimization for scheduling/packing/nesting/knapsack/protein folding/docking problems throughout ’90’s, with many students and visitors in GARAGE
   e. Extended GALOPPS, introducing heterogeneous parallel genetic algorithms allowing different fitness functions and problem representations in different islands, with translation of representations during migration
   f. Specialized the heterogeneous parallel genetic algorithm to create “iiGA”, the injection island (AKA island injection) genetic algorithm; distributed it as part of GALOPPS
   g. Used iiGA with Ron Averill and David Eby to design radically different and superior lower compartment rails (parts of chassis) for cars. That led GM to ask us to form a company, which became Red Cedar Technology

7) With colleagues Steinfield, Lloyd, Hinds, David, et al., developed protocols and tools for helping internationally distributed teams to function more effectively, in the TeamGEMS project funded by EDS, then by NSF. This project included development of the TeamSCOPE software (written by Ben Pfaff) for tracking team activities

8) Developed business plan for and founded the 501(c)(3) not-for-profit NEWTeams Training, Inc. and an associated business plan for the for-profit NEWTeams Design to allow Russian engineers in closed nuclear cities to be paid for doing design work for U. S. companies. The plans were accepted for funding under the Nuclear Cities Initiative (U. S. Dept. of Energy), but were dropped when the NCI budget was cut by 75% for political reasons (thanks to Sen. Pete Domenici)

9) Redeveloped the ECE Senior Capstone Design Course to include industrially sponsored design projects, project management and six-sigma training; taught it 2002-2010.

10) In the Genetic Programming/Bond Graph project funded by NSF, Goodman and bond graph expert Ron Rosenberg worked with postdoc Kisung Seo and Ph.D. students Zhun Fan and Jianjun Hu to create a GP system that generated
novel designs in the form of bond graphs. These bond graphs could be translated into designs for dynamic systems including mechanical, electrical, hydraulic, pneumatic, thermal, or other types of components. This method was used not only for design of new mechatronic systems, but also for redesign of existing systems, in what we might now call “Genetic Improvement” of dynamic systems, rather than of computer programs. It was used to redesign pneumatic railroad brakes, improve on early designs of “Selectric” typewriters, and other systems. Because these systems required that both the topology and parameters of a system be evolved at once, the team developed “Structure Fitness Sharing (SFS),” a concept that allowed new topologies to remain in a population long enough on average that appropriate parameters could be evolved before a topology was discarded. Such a process today would be called a multi-level search algorithm. Because this de novo synthesis required very long searches, Jianjun Hu developed a new model for sustainable search, a process that allows continual injection of new random genomes into the population and does not force them to compete with more highly evolved individuals until their fitnesses are in similar ranges. This approach, called Hierarchical Fair Competition (HFC), was eventually extended by the team to allow it to evolve its fitness thresholds and even into a continuous form in which the fitness distribution itself was sampled for breeding and fitness evaluation purposes without subdividing the population explicitly. HFC and its offspring, Adaptive HFC (AHFC), Quick HFC (QHFC), and Continuous HFC (CHFC) were used by many authors during the ten years after their introduction, and the papers were cited over 700 times, but eventually, more in the community moved toward Greg Hornby’s Age-Layered Population Structure (ALPS), which appeared soon after HFC was published, to address sustainability of search.

11) With Ron Averill, co-founded Red Cedar Technology, Inc. (originally known as “Applied Computational Design Associates”), 1999. The optimization technology was originally based on GALOPPS, a parallel genetic algorithm package written and distributed by Goodman in 1993-1999. At Red Cedar Technology, Goodman quickly created a much more sophisticated, powerful and parameter-free blackbox optimizer and named it SHERPA, the optimization/search portion of the HEEDS design automation package. Because it was held as a trade secret, the SHERPA algorithm was never published or described in detail, but has continued to win head-to-head blackbox optimization “bakeoffs” against its many commercial design optimization rivals. Goodman gave up his VP Technology role at Red Cedar in 2010, when NSF announced the funding of BEACON. In 2013, Red Cedar was acquired by CD Adapco, which in turn was acquired by Siemens PLM in 2016. Most of the Red Cedar staff members continue development and marketing of HEEDS and SHERPA under the Siemens banner today, and licensing, primarily for access to SHERPA, brings in millions of dollars each year—but to Siemens, not to us. In 2019, HEEDS is ranked #1 in sales of design optimization tools in Japan and #2 in the world.
12) Co-founded, with Prof. Jennifer Olson of Media & Information, a Study Abroad program and associated specialization (now a minor) in Information and Communication Technology for Development, beginning in 2008. In the ensuing 10 years, the program has grown to serve five schools and we have taken over 70 students in total to Mto wa Mbu, Tanzania, for a month of service learning in the schools there. We continue to update the electrical systems, Internet access, and computing resources each year. The program received initial funding from Lenovo, then five years of support from the Office of the Provost, but now relies entirely on donations for its continuation. The advances in the schools, although they started slowly, have now been dramatic. Whereas most students and teachers in those schools had never touched a computer when the project started, teachers now routinely turn in their grades in Excel spreadsheets, and teachers come from nearby schools to use the computers at the project’s schools when they need to turn in grades. Many students now proudly present the MSU visitors art work they have created on the computers!

13) With Prof. Kalyanmoy Deb and others, developed methodologies for addressing land use problems, first in New Zealand and later in Switzerland.

14) My primary contributions to the BEACON proposal (and, after funding, to the center) were (i) my organizational skills, which helped us to establish the center’s structure and operations—very different from those of most previous Science and Technology Centers, (ii) my experience in training interdisciplinary teams, which was the basis for BEACON’s three-course transdisciplinary graduate training sequence, and (iii) my experience in tapping evolutionary principles from nature to improve evolutionary computation algorithms and their use to address industrial problems, contributing strongly to BEACON’s knowledge transfer to industry.

15) Under an MSU subcontract from Siemens as part of their contract from DARPA, on a challenge problem furnished by NASA, developed a simulator of a solid-fuel rocket burning a grain consisting of multiple-layered, segmented propellant types. Developed specialized optimization tools based on the GALOPPS parallel genetic algorithm package I wrote in the ’90’s, and worked with graduate students to also apply NSGA-II and HEEDS SHERPA to apply multi-objective optimization on the same rocket simulator. Achieved nearly simultaneous burnout of all rocket segments while meeting a variety of specified thrust profiles provided by NASA. Pioneering new techniques in multi-level optimization and innovization using NSGA-II and the rocket simulator.

**Major Professional Contributions**


2) American Institute of Aeronautics and Astronautics CAD/CAM Technical Committee Outstanding Contributions Award, 1990
3) Organizer of the first evolutionary computation conference in Russia, EvCA’96, at the Presidium of the Russian Academy of Sciences, under sponsorship of the International Society for Genetic Algorithms. Vladimir Uskov co-organized.

4) General Chair of the last International Conference on Genetic Algorithms, MSU, 1997; collaborated in its combining with the Genetic Programming Conference to become GECCO, the Genetic and Evolutionary Computation Conference, in 1999.

5) General chair of GECCO in San Francisco, 2001

6) Chair of International Society for Genetic and Evolutionary Computation, 2001-2004

7) Founding chair of ACM SIGEVO (Special Interest Group on Genetic and Evolutionary Computation), 2005

8) Organizer and co-chair of a special, ACM-SIGEVO-sponsored EC conference in China, the GEC Summit, in Shanghai, 2009

9) Member of Executive Committee of ACM SIGEVO from its inception to present

**Selected Journal and Conference Publications**

(From among 207 papers in journals or refereed conference proceedings, 22 book chapters and 9 books co-authored or co-edited)


Recollections from My Personal Life
(for Family and Friends)

Chronology of Early Life,
Grade School, High School

Copyright, 1944

I was born in Palo Alto, California, in 1944, in Stanford University Hospital, while my Dad was still in the army, stationed at the Presidio, studying German to work as a translator. After a short time there, Mom and I moved in with Dad’s parents in Minneapolis, at 3718 Aldrich Avenue North, waiting for Dad to get out of the service. Mom and Dad were both from Minneapolis, and Mom’s Mom (Mäma Lillie) was still living there, too, as was her Mom (Grandma Hansen). When Dad returned, he used the GI Bill to enter the University of Minnesota, where he was a zoology major. He had to take an entrance exam to get in, as he had never finished high school, having run away from a turbulent home while in the tenth grade. But he was an excellent student, and was readily admitted to Minnesota. His study was interrupted by an acute lack of money, and we spent a year in Red Oak, Iowa, while Dad worked as a traveling salesman for Massengill products. Mom and I (and a cocker spaniel named Cricket) lived there with him, and my sister Julie was born there in July, 1947. After a year, we returned to Minneapolis, living in “University Village” on the Minnesota campus, first in an “expansible”—sort of like a trailer with side compartments that pushed out, a motor home without the motor. (It was probably war surplus.) We eventually moved into half of a Quonset hut (another WWII surplus structure, but much more comfortable). I remember going through my first tornado there, with our family and my great aunt Flo (Mom’s aunt), buttoned up snug as could be in the wind-resistant Quonset while around us, roofs and insulation from the nearby barracks covered the ground like snow.

My Dad finished his undergrad degree, and enrolled (for a year each) in dental school and law school. He quit dental school when he decided he didn’t want to spend the rest of his life peering into people’s mouths, and quit law school when he figured out that it was about the law, not necessarily about justice. (Once, later in life, when Dad was in court being qualified as an expert witness in a human genetics case, the judge asked him why he had quit law school, and he gave that answer. The judge, fortunately, just laughed.)

All of the families living in Quonsets or barracks around us were similarly poor, living on the G.I. Bill while working on their degrees. So it was very much a community, with all the kids running back and forth between each others’ houses in a community of shared parenting. Nobody could get away with anything—some parent
was always watching! We were particularly close to the Schads, who had three daughters in the same age range as us. Donna was my age, and Patsy in the middle, and Connie was the youngest. There were also the Deals—the kids were Ann Elizabeth and Virginia. All of us played together a lot. My parents were also close friends with some of my Dad’s fellow students, like the McGladrys, with whom they kept in touch for years. I thought Bob McGladry was particularly interesting because he worked for a startup company called Lightning and Transit, Inc. I think they designed and built things like lightning rods, although I’m not sure, but I do know that they had a very powerful capability for generating and storing static electricity, and discharging it with a huge bang! That impressed me a lot, and I would always point at the company when we drove by it on the way across Minneapolis. And their building was near the radio station WPBC—I still hear their ditty in my head, sometimes:

“WPBC, WPBC,
The People’s Broadcasting Company!
It’s 980 on your dial;
It’s the station with a smile,
In Minneapolis and St. Paul.”

Dad eventually decided to study genetics, and got his Ph.D. at the Dight Institute of Human Genetics at the University of Minnesota. He tended Drosophila (fruit flies) in half-pint milk bottles for years, as a way of paying the bills, but his research interest was in heritability of human breast cancer. This was, of course, before the role of DNA in inheritance had even been discovered, but he was able to use his statistical acumen to show that hereditary factors played a role in breast cancer. He recognized early that most diseases with heritable components were very multi-factorial. Things he later studied intensively were heritability of susceptibility to dental caries (looking particularly at salivary amylase) and kidney stone formation, for which many types and mechanisms were eventually uncovered, each with its associated genetic factors. Dad loved to talk about such things at the dinner table, and I loved learning about his work. Unfortunately, many others at the table were less interested in talking about science, so I fear we hogged the conversation, leaving my younger siblings less involved, for which I owe them. Maybe that improved after I went off to college—I wasn’t there to see.

My sister Cindy was born on a gurney in a hospital in Minneapolis, in November, 1949. She had a rough start, having to spend more than six months in bed with rheumatic fever, and to have eye surgery, both before the age of four. The good news that resulted from Cindy’s being confined to bed was that we got one of the first TV sets in the neighborhood, and we all enjoyed that—Howdy Doody, Kate
Smith, Jack Benny, Queen for a Day, and Ozzie and Harriet come to mind right away. Of course, we’d been listening to Jack Benny on the radio every Sunday evening for years, while sipping cocoa and eating peanut butter and jelly sandwiches, but it was fun to see him on TV.

Mom was our primary caregiver, being mostly at home with Cindy and the rest of us during these years, while Dad, in addition to being a student, had part-time jobs as a streetcar motorman, garage mechanic, and various other things. We didn’t have a lot of money, but Mom always managed to keep us well fed, with such favorites of mine as sweet potato and Spam casserole. Now I hate spam, but back then, I loved it—just a different kind of spam.

On Sundays, we usually went across town to 3718 Aldrich Avenue North, where Mäma and Papa Goodman lived, for a wonderful Sunday dinner, often roast beef or roast chicken. That’s also where I acquired my love of pasties, which I think Papa brought over with him from his home town of Tavistock, near the Devon/Cornwall border. Tin miners used to take them to the mines for lunch, heating them up on their kerosene lamps when it was time to eat. Mom learned how to make them from Mäma, and then taught Cheryl and me, so we often enjoy them at home… first-rate comfort food! Sometimes in the summer,

I’d sometimes go and stay with Mäma and Papa for a week in the summer, enjoying walks down to Camden Park and its swimming pool with Papa, and having one of my favorite lunches, bean-with-bacon or chicken noodle soup and HiHo crackers with peanut butter, to my heart’s content. I also acquired my love of orange marmalade there, as they always had Crosse and Blackwell’s for our toast in the morning, straight from England.

Elementary School

My first school was Como Park School, to which I walked every day with no fear of predators or need for adult supervision—those were the days! My second grade teacher was Mrs. Peterson, but I don’t remember even the name of my first grade teacher. It seems to me I was in third grade when we moved to the Prospect Park “project,” low-income housing not far from the university and close to the Franklin Avenue bridge over the mighty Mississippi. I went to Sidney Pratt School, which was located right next to Tower Hill, a park with a hill and an old stone water tower that we thought was plenty spooky! My third grade teacher was Mrs. Shepherd, the first (but far from the last) teacher I had a crush on. In February of that year, 1953, my brother Greg was born, in Minneapolis. Mom was incredibly busy, between having a new baby, having Cindy be sick with rheumatic fever and needing eye surgery, and having Julie and me underfoot. But she made time to be a Cub Scout den mother for my pack, and I enjoyed Cub Scouts quite a bit. I do remember that there was a bully named George who lived down the block, who used to pester me when he could. I also remember that when we lived there, our parents sent Julie and me to the Daily Vacation Bible School offered in
the summer by the local Baptist Church. It was free childcare, so I don’t blame my parents. It’s where I got my introduction to traditional Christianity, and I learned all the songs that kids are taught in such places. I still groan inside when I hear some of the Unitarian hymns that are just re-lyricized versions of old bible school songs. I know the real words, and don’t usually like to hear the new ones, which are usually poor substitutes for the originals, at least in terms of making a good song.

In 1953, Dad finished his Ph.D. and went on a postdoctoral fellowship to the Bowman Gray School of Medicine (part of Wake Forest University) in Winston-Salem, N.C., one of the first medical schools that had a department doing human genetics, although it was called Preventive Medicine, I believe. He was hired as a postdoc by C. Nash Herndon, the head of the department. That meant I spent fourth grade as a Yankee amid the Rebs of Wiley School. I hated the teacher, Mrs. Hyatt, but made a few friends, especially in the neighborhood where we lived. Mrs. Hyatt was nicer to me after I did well in the school spelling bee, but I never liked her. Of course, in her defense, I talked too much. I think I can blame my Dad for those particular genes. All my earlier report cards had said the same thing under the category of “Deportment”: “Erik is (… whatever…), and he talks too much.” The story of my life, I guess. We lived in a rented house on Sunset Lane, about a mile from Wiley School, and a block from a very steep two-block hill with a little neighborhood store at the bottom (today, there’s probably a Seven-Eleven there). It turned out that our house was only a block from the paper route I eventually had when we moved back to Winston-Salem many years later. We adopted a stray dog we named Queenie—I now can say that she looked just like a run-of-the-mill African dog... tall, skinny, short-haired tan coat, long straight tail. She was a nice girl, and we were sad to leave her, but we couldn’t have a dog where we were moving—into on-campus faculty housing in East Lansing, Michigan. Dad took a job on the faculty of Michigan State University, in the Department of Zoology. There was no medical school at MSU then, so human genetics was just genetics, and lived in Zoology. But leaving the South—what a welcome change for me!

We moved into Cherry Lane on the MSU campus—not the “faculty bricks,” but again, Quonset huts left over from WWII. This time, though, as a faculty family, we got a whole Quonset, which was much more comfortable. The centrally steam-heated radiators made a lot of noise, but once we got used to that, and to the nearby trains, we were fine. The quonsets were located on the spot where the Breslin Center, MSU’s basketball arena, is located today. I went to Red Cedar School, a few blocks down Harrison Road, for fifth and sixth grades, and it was wonderful. My fifth grade teacher, Mrs. Hunnicutt, was young and enthusiastic, and of course, I loved her. My sixth grade teacher, Mrs. Harner, was also very good, but she went on maternity leave in the middle of the school year, so we had a substitute for quite a while. While Mrs. Harner was gone, I organized some of my classmates into a little choir to give her a concert when she came.
back, and I still remember being mortified when the performance wasn’t exactly stellar. But I’m sure she appreciated it. I joined the school orchestra in fifth grade, playing violin, and by sixth grade, was also taking private lessons, from violin teacher Fannie Harris, who lived on Magnolia street in the “Flower Pot” region of East Lansing. One of my classmates and friends, Grant Schoenhard, also studied violin, and went on to become a concert musician. (I had the pleasure of getting a phone call from Grant in the spring of 2018, and it was great fun talking about old times and friends we both remembered. I hope he’ll visit sometime!) He and my other good friends, Don Lapidus, who lived two Quonsets away, and Sharon Cameron, on whom I had a crush, although she was then a foot taller than me, made Red Cedar a delight for me. Partway through the sixth grade, our teacher saw that three of us were bored, and arranged with the Principal, a Mr. Reid Sinclair, to work with us outside of class every week. He let us choose a topic to study, and in the fall, we chose politics. He taught us a lot, and took us to talk with people at the headquarters of the Democratic State Central Committee in Lansing, among other places. In the spring, we decided to study baseball, and I remember that he took us to at least one Detroit Tigers’ game. I still like to go to baseball games (mostly the Lansing Lugnuts, now), although I don’t go as often as I did in the ‘90’s when my son David was also a fan and we had season tickets.

We knew lots of other faculty families in Cherry Lane, too. Our neighbors on one side were the Masters, who interestingly enough was, I think, a Master Sergeant teaching ROTC. They had a son, Butch, with whom I played some. On the other side were the Boazes—Charlie Boaz was on the Geography faculty. He was an excellent chess player, and gave me my first lessons in the game, which I enjoyed a lot. But his real love was the circus, and one day we learned to our amazement that they were “running away with the circus.” He had taken a job as a business manager, or some such position, with a circus wintering in Florida, and they left the university just like that! He was clearly pursuing his life ambition. Next to them was the Lapidus family, and I was good friends with Don. In the next set of Quonsets lived T. Wayne Porter and his family. Wayne was on the Zoology faculty with Dad, and had two sons, Tommy and Jimmy, with whom I played. I remember that one of our favorite games was swinging like Tarzan on the weeping willow trees that grew among the Quonsets... okay, it wasn’t exactly like Tarzan, but it was as close as we could get. We also spent a fair amount of time climbing around in the pine trees between the Quonsets and Harrison Road. I think those were the then-remaining parts of the pines referred to in MSU’s alma mater, MSU Shadows, which has a line “Beneath the pines we’ll gather, to give our faith so true.” They used to run for quite a distance, and the floor seemed like it was a foot thick with pine needles.

Junior High School

Seventh grade was at East Lansing Junior High (formerly East Lansing High, then later to become Hannah Middle School, and now, Hannah
Community Center). I liked it a lot, and continued playing violin in the school orchestra after school. We had free time at lunch, and I have fond memories of walking down Abbot Road to a bakery at the corner of Albert Street and buying a doughnut or long john for dessert—a guilty pleasure in which I still indulge in moments of weakness. The principal was Ray Budde, who later established quite a reputation at the national level by being the first to propose the concept of charter schools. I don’t remember a lot about my seventh grade time at East Lansing Junior High, but it was a happy year—I had lots of friends at the school from Red Cedar, so it wasn’t hard to get used to the new school.

At that point, my family was very involved in the Universalist Church, located at the corner of Holmes and Prospect in Lansing. Gerry (the minister) and Harriet Wyman were good friends of my parents. Buzz, their son, and I hung out a lot, especially in the summers. We used to ride our bikes everywhere, including to nearby towns like Mason. There were no bike trails back then, just sidewalks and roads, but the only injury I suffered was a nasty gash on the elbow when I hit some loose gravel next to the MSU Auditorium one day and crashed my bike. I got my first stitches then. Tragically, while in his late teens, and long after we had moved away, Buzz was diagnosed with multiple sclerosis, and while he was able to graduate from MSU in a wheelchair, he spent his later years in a residential care facility, unable even to speak.

Toward the end of my seventh grade year, in 1957, my parents bought a house in Lansing, on Herbert Street. Shortly after we moved in, my Dad set about transforming the attic into a bedroom for me. I got my introduction to carpentry from him, even before I took shop class in the eighth grade. I thought the bedroom was wonderful... it had sloping ceilings all around, so Dad maximized the space by building the double bed into the wall halfway, so it doubled as a couch by day. He also built in a dresser. So I liked that room a lot! Our house was about 100 yards from Walter French Junior High School, where I finished seventh grade and attended eighth grade. In seventh grade, I took general science, math, English, social studies, shop ("Home Repair"), strings (school orchestra), and gym. I got a C average in gym (skinny ectomorph with no particular sports skills, so not much cared for by the gym teacher). Got A’s and B’s in social studies, B’s in shop (although I liked it alright), and A’s in the rest. In eighth grade, it was more science, English, social studies, gym and strings, but I also took home ec, which, like shop, was required of both boys and girls—quite progressive, eh? Home ec included making blueberry muffins (yummy) and, of course, the boys engaged in sewing machine races. I also took drafting, and at the time, didn’t think it would ever be of much use to me. Later, when I came to direct a CAD center, I found that all the stuff we’d learned about orthographic projections, isometric views, etc., was pretty valuable! In addition to the academic subjects, at some point during junior high I took typing (which turned out to be a very useful skill for a computer guy)—a class in
which the teacher, a stern older gentleman, would whack our fingers with a ruler if he caught us looking at the keyboard. And this was a teacher in a public school, not the oft-feared nuns of parochial schools.

The junior high showed movies for the kids at lunchtime, in the free time after we finished our lunch. For some reason long forgotten, I was able to become one of the kids who got to run the projector. I don't even know how that was decided, but I remember being proud of it. Doesn't take much to please me, does it?

While at Walter French Junior High, I joined the Boy Scouts, in Troop 89, headquartered in a church nearby. We went on camping trips, including city-wide camporees that were a lot of fun. It’s a good thing I got used to camping, as we did a lot of it just with the family (and later with our neighbors and friends, the Loflands) when I was in high school. Flash forward to those camping trips: we lived in Winston-Salem, and my Dad bought a little aluminum boat with a 25-horse motor that we used in order to transport the family and our camping gear from the trailer unloading ramp to a relatively remote part of Lake James, one of the power dam lakes created by Duke Power. It took four trips to get all of us and our gear out there, but we’d spend several glorious days swimming, hiking around, and even water skiing. That’s right—that 25-horse motor could pull us up, although if we wanted to ski slalom, it was a lot easier to get up on two skis and drop one than to make it out of the water on one ski! I remember that my good friend from college, and eventually my sister Julie’s husband, Dick Smith, once came down with us to Lake James, and tried water skiing, but our boat wasn’t powerful enough to pull him out of the water—he was a little bigger than I was, and 25 horses just couldn’t do it. Later in life, when I skied behind a bigger boat, I learned how different that was from what we did with our boat—it wasn’t every boat that let the skier steer the boat!

Still flashing ahead to camping trips in high school, I remember that our dog, Nonnie, always went camping with us, and loved playing with us in the woods and in the water. One of our favorite family stories is about how when Mom would go in the lake, Nonnie would panic and paddle out to her to save her... she was pretty protective of Mom.

I liked the camping a lot, but strangely enough, I evidently got enough of it, as I have had absolutely no urge to go tent camping again during my entire adult life!

On Herbert Street, back now in the latter part of seventh and all of eighth grades, the neighborhood was filled with kids from other families who also had little money, so we all got along in a pretty classless subculture. I remember that my friend Phil Carr’s Dad, Ford (yes, that’s right, Ford Carr), was an amateur inventor, and had rigged a water injection system on his carburetor to get better power and gas mileage. The Carrs lived a half-block away, so we virtually lived in each others’ houses. Phil had a twin sister Phyllis, and I think four other sibs—I remember a kid sister named Connie, but I’ve forgotten the names of
the others. Next door to us lived Judy and Sharon Steinman, and across the street, Gavin somebody, who was a few years older. I think my sister Julie had a crush on him... but I couldn’t swear to it. Another guy my age also lived across the street and just down the block. Very often, after supper, we’d all (well, not Gavin) meet outside for a game of kick the can, a “capture the flag”-type game. We’d play until it was too dark to see—a lot of fun! Our constant playmate there was our beloved little mongrel, Nonnie (short for Anonymous). She was beagle-sized, probably 25 pounds, and white with a zillion small black spots. She was very smart, and we all loved her dearly, although she sometimes did give away our hiding places during the game.

During the summers, I used to mow lawns to earn spending money, including for my great uncle and aunt, Anders and Jill Orbeck. Anders was Mäma Goodman’s brother, and was a professor of linguistics in the English Department at MSU. We had many wonderful sessions in which he taught me lots about linguistics and the evolution of languages, particularly the Indo-European family. Grimm’s Law of consonantal shifts, how to classify sounds phonetically, and lots of other fascinating things that I had absolutely no idea I would ever use, but which turned out to be significant in my later studies. I used to love those talks—he even made me charts and diagrams. He was a scholar in Old Norse and Old Icelandic, with a translation of Egil’s Saga from Old Icelandic to English to his credit. Ironically, he used his knowledge of phonetics to practical advantage at the end of his life—he had been a heavy pipe smoker, and eventually lost most of his tongue to cancer. But he was still able to make intelligible speech because he knew how sounds were formed, and could still make them with what he had left of his speech apparatus. Unfortunately, he died in 1962, just six months before I came back to East Lansing as a freshman at the university. I was very saddened by that. Although Aunt Jill made me very welcome at Sunday dinners when I was an MSU student, and we enjoyed listening to musicals and talking about the news, I missed the intellectual excitement that Uncle Anders had brought to me.

High School Years

After four years at MSU, Dad was lured back to Bowman Gray School of Medicine (Wake Forest University), this time as a faculty member rather than a postdoc. It was still one of the few medical schools with a genetics department, and MSU did not have anything like that, so he took the job... I think my Mom also was happy enough to get out of the long winters of snow and ice of Michigan to someplace with a much more moderate winter. (I was told that many years later, when Dad was offered a job at the Mayo Clinic in Rochester, Minnesota, Mom flatly refused to move back there, so he didn’t take it!) We moved to Winston-Salem in the summer of 1958, and I entered the ninth grade in the fall, at R. J. Reynolds High School. Yes, it was named for the Reynolds of Reynolds Tobacco, who had given lots of money to the community, including for the high school auditorium, which was
also the largest auditorium in the city, so was used for civic events in the evenings. Back in the South again... I can’t say I was thrilled, but I soon learned what a great school Reynolds High was, and put the rest of it pretty much aside for four years. And what a school it was! It had offerings like four years of Latin and two of Greek, in addition to the usual German, French and Spanish. There were advanced placement classes, which were then the exception rather than the rule.

**Ninth Grade**

Schools in Winston-Salem operated with a different kind of system than the ones in East Lansing had: students were divided into homerooms and then scheduled somewhat cohort-like according to (past-performance-based) academic ability. As an unknown newcomer, my homeroom was 9LS2—LS meant Language/Science (i.e., college prep), as opposed to, for example, 9C (Commercial). By the next year, I was in 10LS1, and spent the rest of my high school years with the brightest students and the best teachers. At that time, under progressive governor Terry Sanford, North Carolina put a lot of emphasis on education, and Reynolds was one of the top few schools in the state. For example, the year I graduated, I think Reynolds ranked among the top public schools in the country in National Merit Finalists per capita.

We lived first in a rented house on Watson Avenue, a little over a mile from Reynolds High, and my sisters and brother went to Brunson School, which was on the way to the high school. Our neighbors there, the Pilands, had three boys in the age ranges of Julie, Cindy and me, and we played with them quite a bit. I think it was Julie who was fond of Gordon, the oldest boy. I remember that Watson house as being quite large, and brick, and heated by coal—the only coal-heated house I ever lived in, I think. Later, we moved to Sunset Lane, but a different part than we had lived on when I was in fourth grade, since the street had been divided by the expressway (I-70) when that went in. Our house was a little closer to school for all of us than the house on Watson had been. On Sunset, our neighbors were the Hamricks, who owned the snack bar in the Medical School, which I thought was pretty cool! Their daughter, Judy, was about my age, and we eventually did become friends.

In Winston-Salem, I took up the family business—delivering newspapers. At least that’s what I thought at the time. My paternal grandfather, Albert Venning Goodman, had come from a poor family in Tavistock, Devonshire, and I thought I had been told that as a lad, he worked selling papers on the trains to/from London. He was a bright and very personable guy, and through discussions of what was in the day’s paper, made friends with a regular passenger on the train who was rather wealthy, whom I have lately learned was named Arthur Smith-Graham, and who thought that my grandfather was a bright lad who should get a good education. That gentleman eventually paid for my grandfather to complete his high school education. However, more recently, my Mom had told me that I had the story wrong, and that it was
Papa Goodman’s brother, Harold (presumably for whom my father was named), who had worked on the trains and been sent to school, all the way through Oxford University, by Smith-Graham. So maybe it was only my Dad and my great uncle who preceded me in “the business.” All of this was recently confirmed for me in a delightful phone call I received from Angela Dodd-Crompton, who has just written a book about the fabulous Italian garden that the wealthy Smith-Graham created on his estate, Great Ambrook, in Devon. She had been trying to figure out how the Goodman family came to the notice of Smith-Graham, since he was known to have helped many members of the Goodman family financially, including bequests in his will. She had just discovered the newspaper/train connection the day before we spoke, and it was wonderful hearing her excitement at figuring this all out! She says that Smith-Graham also helped another brother, Howard, to attend another school. She had been able to talk with Madge, Howard’s daughter, to confirm that. But I don’t yet know whether Smith-Graham helped my grandfather, Albert, or his other brother, Conway, for whom my cousin Conway Wells was named.

“Papa” Goodman came to Vancouver, Canada, as a medic during WWI, met my grandmother, Magnhild Orbeck, who was working as a secretary for the Cunard Lines (top-of-the-line steamships), and they married and moved to Minneapolis. While my Dad still lived at home (so before some time in the tenth grade when he ran away), he had a paper route, and his parents and later, my Mom, passed on to me articles in the Minneapolis Star-Tribune about his winning of several contests for “carrier-salesmen”—i.e., paper boys. So, it was natural that when I entered high school, I got a paper route. In Winston-Salem, that meant delivering the Winston-Salem Journal in the mornings before school and the Twin City Sentinel in the afternoons after school, which I did for about three years. At some later point, for at least one summer, when I had a driver’s license and had bought an old “junker” car, I delivered shortages for the paper. That meant driving newspapers to wherever they were needed around the city if a paper boy didn’t get enough papers. So I definitely carried on that family tradition. Getting up at 4:30am every day but Sunday certainly helped to get me to bed relatively early in the evenings, and I used the time after my papers were done in the mornings to do most of the day’s homework. At one point, I watched WUNC public TV every morning at 6:30 or 7:00am, which was broadcasting the course in Modern Algebra developed by the School Mathematics Study Group (SMSG)—I think the professor’s name was John Kelly. I loved this stuff—introducing set theory and lots of concepts I would use a lot later in my studies.

I won a trip to Washington, D.C. from the newspaper—a bus trip with maybe 20 other carriers that was a lot of fun, and introduced me to many of the nation’s famous landmarks. I put away much of the about $20/week I made collecting door-to-door for the paper every Wednesday evening. I got to know a lot of people on my route that way, and almost all of them were
very nice to me. I was happy that my Algebra I teacher, Mr. Crowell, lived on the route. He was a very straight-laced (so far as I knew) Southern gentleman, with posture that was unusually upright, so he certainly looked straight-laced. (I eventually learned that his upright posture was because he had broken his back driving racecars in his youth.) He had an unusual speech pattern that was quite distinctive in the classroom, too... I can quote what he often said when he had asked a student to answer an algebra question, if the student got it right: “Well, ah don’ know, but ah do believe that is ‘a’ exact statement.” The first clause alone took about ten seconds to say, or at least so it seemed to me! And it was certainly never “an exact statement,” but “a exact statement.” He wasn’t very warm, but I did like him alright—he was not a bad algebra teacher, although we were learning the old-style manipulations rather than the modern-algebra-style rules for solving equations.

My paper route wasn’t in a wealthy neighborhood by any means, but some customers would tip me a quarter when I came to collect for the week’s papers every Wednesday or Thursday night (we had to pay our bills to the paper every Saturday). The other fun customers on my paper route were medical students, who lived in an apartment building just a block from the med school. They figured out that my Dad was the guy who taught them genetics, so they occasionally asked me for help with their genetics homework—probably just for a kick, but I was happy to work the problems with them. Other things I remember from my paper route include my sister Cindy sometimes coming with me to help deliver morning papers, especially on snowy Sundays, when she would pull the wagon, fold papers, and just make it more fun. The other thing is that my paper drop was right outside a bakery, and on those same cold, snowy days, when I would show up to start my route, someone would often come out and offer me a piping hot glazed doughnut. What a treat that was, and I still love glazed doughnuts, but that may just be because they’re incredibly delicious!

But let’s go back to ninth grade. According to my imperfect memory regarding high school, when I had much more important things to think about than academics, these are the courses I took. Ninth grade included Latin I (Mrs. Britten), my first foreign language, and I loved it. Such clarity and structure! I learned a huge amount about English grammar and about languages in general from studying Latin, and didn’t at all consider it a waste of time to study a “dead” language. It’s amazing what generalizations you can make when you have two languages to compare, even if much of English has Latin roots. I also took general science, social studies, math 1, and the required gym class, which I disliked owing to my general lack of athletic prowess and attendant disinterest. We also got a grade in Spelling, which I think was part of the English class—we certainly didn’t have a class in spelling, but there was such a grade on our report cards. I know that not from memory, but because Mom held onto many of my report cards, for which I am very grateful. But NOT appearing
on the report cards was the fact that English class in either ninth or tenth grade—I’m not quite sure which—was called “Old Testament Narratives.” We were in the South, and they were going to teach Bible studies whether or not we were in a public school. But they did restrict it to the Old Testament, which was less offensive to Jews and non-believers than the New Testament would have been. Nominally, at least, it was taught as literature, rather than as revealed word, so we were all brought along into the Judeo-Christian culture, whether we wanted to be or not, on the ground that it was our heritage. I guess it didn’t do me any damage—the stories I passed on, when I was teaching Sunday School to youngsters when I was in high school, came from the book “How Miracles Abound,” rather than the Bible. What I taught was essentially a science class, which was the curriculum for a particular age group in the Unitarian-Universalist Fellowship of Winston-Salem. My parents had been early members of the UU Fellowship when we lived in Winston in 1953-54, and then helped to lead it after their return in 1958. We kids all went to the UU Sunday School while in Winston, and many of our family’s friends were others in the Fellowship who had kids our ages.

**Tenth Grade**

Tenth grade included World History, with Mrs. Carolyn Peterson, who did her best to make the subject interesting. I liked her, but I looked at history as being memorization of names and dates and not much else. That was too bad, because later I came to appreciate history a lot, enjoying very much reading historical fiction, particularly about early naval warfare, the Napoleonic Wars on land and sea, etc. I just didn’t “get it” enough in tenth grade to grasp the big picture that history class was trying to teach me. But, happily, tenth grade also brought Latin II with Mrs. Annie Preston Fearing, a nice 60+-year-old lady from whom I also later had French classes. I still liked Latin, and happily absorbed as much as I could. But that process was short-circuited pretty effectively by German I. I immediately fell in love with that class, taught by Frau Hepler. We had a good German textbook, and as soon as I got the basics in hand, I went on as quickly as I could and finished German I on my own, then finished the German II text, as well, before the year was out. There wasn’t any German III, and I didn’t get credit for German II, of course, but when I later got to MSU, I was able to skip the first German course. I audited the second and third quarter courses in order to refresh myself, having not studied German at all for two years, then enrolled in second-year German. But back in tenth grade, I was also taking English class, of course, as well as biology (boring after fifteen years of conversations with my Dad), and geometry, which I liked a lot! Proofs for the first time! Great stuff! That year, in gym class, I fell over backward playing flag football and broke my left arm (radius, near the wrist). That got me a D in gym class for one marking period, and a C for the year, although I got an A on the final exam, of course. It did annoy me that gym class could affect my overall grade point average when it came time to apply to

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universities. But good old Herman Bryson, the gym teacher and eventually (well after I had graduated) the school’s beloved football coach, had no use for nerds and showed it in his grades. He was probably frustrated with playing second fiddle to the head coach, Shirley (“Red”—guess why... two correct answers) Wilson. Bryson may have been one of only two teachers that I ever actually hated. My friends and I, amongst each other, referred to him as “Snakehead” because of the unusual shape of his noggin, and none of us had any use for him. Of course, none of us was on the football or basketball team, either.

Near Drowning

When I was 13 or 14 years old, I used to swim regularly in the indoor pool at Wake Forest University, especially during the summers. We had access to both the Olympic-sized indoor pool and also a wonderful outdoor pool on the old Bowman Gray (of Reynolds Tobacco) estate, Graylyn, since my Dad was on the faculty of the university. My favorite activity was to see how far I could swim underwater after diving into the deep end of the indoor pool, and I quickly began to exceed the length of the pool, turning around underwater and seeing how much further I could go. It seemed to me that by taking a lot of deep breaths before diving in, I could extend my underwater swims significantly, so I hyperventilated more and more before each trial. At the time, there was no understanding of the effects of hyperventilation, and no indication that it was dangerous. After my incident and the resulting publication (and others as well, of course), it became clear that hyperventilation induces what is today called hypocapnia, a depression in the partial pressure of carbon dioxide in the blood. The sensation of needing to breathe turns out to be triggered much more by high carbon dioxide than by low oxygen, and hyperventilation does little to increase oxygen partial pressure, contrary to what I had assumed. So, as a result, one can hyperventilate and keep swimming and not feel the demand to come up and breathe, until one simply loses consciousness. For this reason, today, there are abundant warnings against hyperventilating when swimming. In fact, I was happy to find good explanations of it in the training books for SCUBA diving when I took those courses many years later. But in my teens, I had no inkling of the danger, and one day, when at the pool with my sisters, I did my diving/swimming contest (with myself) after hyperventilating, and simply passed out underwater. The mammalian diving reflex kicked in, so I didn’t breathe in any water, but simply settled to the bottom, lying on a grate in 13 feet of water.

I was extremely lucky that another youngster happened to go down the spiral staircase beside the pool into the room where divers could be observed underwater after their entries. We kids often went down there—it wasn’t off limits. This kid saw me on the bottom and ran up to tell the lifeguard, who dove in and got me out. He started giving me artificial respiration poolside. I was later told that I was sort of blue-black when I first came out. This event happened before the invention of CPR, so the
lifeguard did the old-style resuscitation: putting me on my stomach, grabbing my arms at the elbows and pulling my arms up and down to make my chest expand and contract... “Out goes the bad air; in comes the good air.” He got the poolside oxygen bottle and put the mask on me, and luckily for me, there was a second bottle of oxygen, as I hadn’t started breathing on my own when the first bottle ran out. Someone had called for an ambulance, and my sister, Julie, called my parents. They got to experience the excitement of having an ambulance tear past them on Reynolda Road as they drove out to the pool. I don’t remember exactly when I woke up, and don’t have any recollection of any bright white lights, long tunnels, or any other kind of near-death experience. I could hardly breathe, not because of bad lung capacity, but because my ribs hurt so badly when I breathed at all deeply that I simply couldn’t. I don’t know if that was from the artificial respiration or from the effects of the mammalian diving reflex, but it lasted through the first night, and it was the next day before I began to breathe more normally. My parents had to stay up with me all night, to be sure I didn’t stop breathing.

You might expect that I’d be scared away from water after this, but it had no such effect. I definitely stopped swimming for distance underwater, and never again hyperventilated, but today I’m very comfortable SCUBA diving, even in a cavern. So the psychological effects seem to have been minimal. But this story is definitely made much spookier, as was documented in our local newspaper at the time, by the names of the people involved. The kid who saw me on the bottom, from the underwater observation room, had the last name “Doom.” He was from Texas. And the lifeguard’s name was Daniel Webster—the name of not only a U. S. Senator, but also of the fictional hero of O. Henry’s award-winning short story and the later movie, “The Devil and Daniel Webster,” in which Webster fights for the life of a farmer who has sold his soul to the devil. Funny—I don’t recall any such sale on my part, but people certainly thought the names were a strange coincidence. (Cue Twilight Zone music…)

Eleventh Grade

Eleventh grade brought with it American Literature for English Class. I liked that fine—I liked studying poems, some of which I learned. In fact, I had learned a lot of long poems back in my Boy Scout days, for telling around a campfire. I knew many “standards”—The Cremation of Sam McGhee, Casey at the Bat (and several variations), The Shooting of Dan McGrew, The Face on the Barroom Floor, The Fence and the Ambulance, Invictus, Abou Ben Adhem, and a few others. Lots of Robert Service, the poet laureate of the Yukon. In high school, I added a few more: Die Lorelei and Heidenröslein, for example, for German class, the 23rd Psalm (in French) and some French poems, etc. They’ve stuck with me pretty much... given five minutes to run through one in my head, I can usually do alright with it. In college, I added more poems and songs in Russian, and more lately, a couple in
Chinese, but these take more work to resurrect on the spot.

I started French in eleventh grade, taught by Mrs. Annie Preston Fearnrington, from whom I’d already had Latin II. We got along well—I obviously loved languages, and she loved having a student who actually cared about learning one. I made her cry once—she was so happy with my French. Sure wish I’d been able to hang onto it, but it, like Latin, I’ve never used it at all in later life, so I have no vocabulary and my accent would be awful, I’m sure, if I ever used it. She did me a big favor in the summer after eleventh grade, hiring me as an assistant to run the Language Laboratory. Picture a bunch of high school kids in summer school (where they all longed to be), sitting in little booths, wearing headphones, listening to tapes in French, German or Spanish. I, at the console, could monitor any of them and converse with them if they pressed a button to alert me of a problem. Needless to say, I abused that privilege. The chief cheerleader, Pam Bain, was in a summer language class, and she and I were friendly from other classes, so I would talk with her to pass the time in the lab. Yes, a nerd actually talking with a cheerleader. I certainly didn’t travel in her circle, but I liked a lot that she was always nice to me.

Speaking of cheerleaders leads us directly to the high school football games, in which I became very absorbed. Reynolds High was in the South, and people there believe in football in a way Yankees can’t quite imagine. The high school team played in Bowman Gray Stadium, which seated perhaps 5,000 people, and where on other nights there would be stock car races on the ¼-mile paved oval around the football field. I especially liked Demolition Derbies there. Football nights would fill the stadium, and the high school band was gigantic, with not only over a hundred marching musicians, but also the majorettes, plus another troop called “Dancing Boots,” and the cheerleaders. We’re not talking school buses here—no, these were Greyhound-type buses, and very comfortable. We had to buy tickets for the buses, but they were cheap, and lots of students went, including always myself. I don’t know if I missed a game—probably, but I don’t remember doing it.

Okay... let’s return to eleventh grade. I didn’t much care for American History, but tolerated it alright, I guess. I can’t even remember who taught it, though, in contrast to most of my classes. But I sure remember Chemistry, taught by Mrs. Collette. I liked the labs a lot, and Paul Licker, my best friend in high school, and I sometimes got to help out in the lab, even in eleventh grade. When we were in twelfth grade, we were formally appointed as chem lab assistants, so got out of study hall in order to go to the chem lab to set up experiments or demonstrations... it was a nice break. And we were taking AP Chemistry at that time, so actually knew what we were doing, at least to some extent. I
think the math class in eleventh grade was “college algebra,” although I can’t swear to it, but that would precede the trig and solid geometry we took in twelfth grade, so I think that’s right. Eleventh grade was a good year for me, but not as memorable as some earlier or later ones were.

The money I earned with the paper route during the ninth through eleventh grades eventually served as a loan to my parents for the down payment on our brand new house on Birchwood Drive, which I loved. I was very proud to have earned and saved enough money to actually make a difference in a down payment for a new house. I liked that house a lot! It was light-colored brick with white woodwork, and was built on a steep dropoff, so the front of the house was only one floor, while the rear had two full stories. I had my own room (on the “ground floor”), and my own bathroom, which was a treat that I got to enjoy only for one year, my twelfth grade year, before leaving for college.

**Twelfth Grade**

My last year at Reynolds was a great year, but was not without one major disappointment—not getting into Harvard. But the full ride scholarship offers at the other two schools I applied to helped to temper that disappointment, and I’ll bet they eased my parents’ worries about how to send five kids to college. That’s right—five kids, because by this time, my cousin, Paul Murray, had come to live with us. Several years before, his Dad had died, and both Paul and his brother Bill had come to stay with us until his mother recovered enough from cancer to have them join her in LA. Before their Mom died, Bill went to stay with his Dad’s side, the Condons. Around the time their Mom died, Paul came back to live with us. I wasn’t around much after Paul moved in. But he turned out to be another musician, becoming quite good at bassoon and being invited to go to high school at the relatively new North Carolina School for the Arts, a residential high school located in Winston-Salem. He opted to do that, and became a good musician.

For me, twelfth grade brought AP Chemistry, the only AP class at Reynolds that I had any interest in (I think the others were AP Social Science and AP History, or something like that). AP Calculus and AP Physics didn’t come until after I had graduated. But AP Chem was a lot of fun. The teacher was Dr. Norfleet Jarrell, who was a young and demanding but excellent teacher. I think we all did well on the AP exams for college credit. And Trigonometry and Solid Geometry were interesting enough, as far as I was concerned. French II was fine, but uninspiring, and the big hurdle was English—this year, British Lit. It was taught by the holy terror of the school, Miss Hazel Stephenson. Her students were to call her “Miss Hazel,” in the Southern tradition. She was legendary for the amount of Shakespeare she forced students to memorize. Of course, now, when I go to the Stratford Festival every year with friends and we usually see at least one Shakespeare play, I’m truly grateful for all of those passages that I remember from Miss Hazel’s class. But my friends and I had problems with Miss Hazel. She was a
spinster and really didn't like boys. Now, I can understand that she'd find high school girls to be more sophisticated and pleasant to be around, and maybe even more aware of the interplays going on in the bard's work, but it didn't stop there. Boys in her class got bad grades, which hurt us in our college applications process (unless we could get applications in before her first grades came out). An egregious example of this was when we were assigned to write an essay, and one of our choices was to write one for the National Exchange Club Essay Contest. The topic for the year was “Crime Does Not Pay—But You Do!”, and I chose to do that assignment. I worked hard on the paper—after all, it was for a national contest. I spent time in the Winston-Salem Public Library looking up references—it didn't used to be as easy as Googling things! I submitted my paper to Miss Hazel, and the entries for the contest were sent to the national level for judging. I was disappointed when my paper came back from Miss Hazel with a grade of 'B'. However, a few weeks later, it was announced that my entry had won second place in the nation. To her credit, Miss Hazel did finally change my grade on the paper to an 'A'. But was she tough on the boys? Yes.

High School Friends

My group of high school friends was pretty well established by tenth grade. First on the list was always Paul Licker, a very smart guy who was in most of my classes and with whom I hung out all through high school. He was very good at electronics, designing and building his own radios and amps. I think he picked that up entirely on his own—his Dad worked at Western Electric (which built phones for the Bell Telephone System), but was an accountant. Paul had learned to play some guitar and got me started with it, too—something that turned out to be very important to me later. He lived a fair distance from me, in a nice part of town called Buena Vista (there, pronounced “Byoona Vista”). We shared duties as chem lab assistants, and during our senior year, both of us began studying Indian mysticism with our physics teacher, Charlie Fulcher. Fulcher gave us lots of classical Indian religious literature to read, and told us about the group he was a devotee of, Ruhani Satsang. Paul and I both read a lot of the literature and talked a lot with Charlie, but neither of us felt ready for a life of asceticism, I guess, because we didn't take it much further. Actually, when I was a college freshman at MSU, Charlie did get in touch with me and told me that Ruhani Satsang’s Living Master, Kirpal Singh Ji Maharaj, was coming to speak to followers (and open to the public) at the Fountain Street Church in nearby Grand Rapids, so I met Charlie there and heard the Master speak. It was impressive, but again, I wasn't ready to give up the external world for a life inside, so I went no further.

Paul and I didn’t need to spend a lot of time sitting in physics class to learn that material, so Charlie had us take on projects of our own, like regular measurement of background radiation levels (in this era of frequent hydrogen bomb testing). We’d lay out under a big tree on the school grounds, recording cumulative
readings from a Geiger counter every few minutes. It was nice having the run of the school—between our hall passes as chem lab assistants and our projects with Charlie, by our senior year, we could pretty much go where we wanted, as long as we weren’t missing some other scheduled class.

Paul and I were friends with some other Reynolds students, including Karl Clauset, Jim Ballard, and Hank Craddock, and later, Jim’s friend John Mock was around sometimes, too. We hung around in the lunchroom and the chemistry lab, being geeks. Among other things, we formed a bowling team (not exactly on a par with football or basketball, but then, we were not really the jock types). We were the Reynolds Retorts (a pun blending our smart-aleck mouths and involvement with chemistry). We weren’t either the best or the worst bowlers, and our team did just okay, as I recall. I eventually made it onto the Major League All Stars (we bowled at Major League Lanes). It was the lanes’ traveling team, and we went around the state competing with teams from other cities, which I enjoyed a lot. I envied the gigantic curve ball of a guy named Ronnie (last name lost) on the team, but I threw a nice hook. And did this ever draw the attention of the high school girls… not.

Jim Ballard and John Mock were a year younger than Paul and I, and after my freshman year at MSU, Jim and John came up to MSU and roomed with me in Wilson Hall. After a year together, we drifted apart and they moved into a fraternity. They made a strange choice: they joined Farmhouse Fraternity, which was somewhat like it sounded—mostly kids from rural Michigan—but that’s where they went. They were much more fond of drinking than I ever was, and I expect they got enough of that in the frat. I lost track of Jim, but saw John a couple of times in later years, learning that for a while he had been in charge of MSU’s Japan Center for American Universities, and had lived in Japan for many years. Paul and I, on the other hand, kept in touch through all the years. Paul was practically a member of our family, and both my sisters liked him a lot, as did my parents. He went to Penn for his undergrad, then was around there when my sister Cindy lived in Philadelphia, so she saw him sometimes. Whenever he came back to Winston-Salem to see his family, he would always stop in to see my family, too... I think maybe it was more fun at our house than at his. He had a farflung career, as a computer science/business analytics guy, but teaching in business colleges—in Calgary, then University of Capetown (S. Africa), and finally, at Oakland University in Rochester, Michigan, the former MSU Oakland. So we got to see him and his third wife, Susannah, about once a year for quite a while. We both enjoyed going back to Reynolds High for our 50th reunion in 2012.

The summer before I started college, I worked for the local paper, the Winston-Salem Journal and Sentinel, delivering shortages to paperboys around the city. I had a beat-up old rust-colored Dodge or Plymouth for that purpose. I sure learned my way around Winston-Salem that way, but was still navigating by knowing which
roads intersected which roads, not with any sense of north, south, east or west. Using compass directions didn’t start for me until I started flying, many years later.

**College Days at MSU**

*Choosing a School*

I was very fortunate to come to MSU for my undergraduate education—it was among the national leaders in recruiting top students and giving them freedom to study whatever they wanted! It was far from certain that I’d come to MSU... I had applied at several other schools, including Harvard and Duke. While I had thought my test scores would get me into Harvard, Harvard said no... I don’t know exactly why. I was invited by MSU to come to campus to take the Alumni Distinguished Scholarship test, an opportunity I think they offered to all National Merit Finalists applying to MSU. (They still do it now, 50+ years later.) They helped me get to East Lansing for the test by giving me the name of a student whose dad was driving him up from Tennessee, so I took a Greyhound bus to Gatlinburg and rode up and back with them from there. When I saw a couple of thousand students taking the ADS test, I didn’t hold out much hope of winning one, but thought maybe they’d offer me some kind of financial aid. I was awarded a full ride at Duke, and had accepted it when MSU offered me an Alumni Distinguished Scholarship. I was torn, but I think my years of living on the MSU campus, and my preference for going back to the North, were too strong to deny, so I chose MSU. It turned out, I think, to be very fortunate, as it immediately put me in the Honors College and exposed me to their zealots for liberal education. The director, who had founded it six years earlier in 1956, was Prof. Stan Idzerda, and he and others in the Honors College gave me wonderful advising for four years. At the same time, the ADS scholarship connected me and the other winners with Vice President (for Special Projects) Gordon Sabine, another outstanding leader with whom I talked on several occasions. The ADS program was really Sabine’s baby. Under MSU’s legendary President John Hannah, Idzerda and Sabine were seeking to improve the academic standing of MSU, and one of their strategies was to recruit more National Merit Scholarship finalists and other top students than any other university. They would shepherd them carefully and give them opportunities to do research and other such chances to excel, and then would graduate more Rhodes Scholars and other winners of prestigious scholarships than any other university. You can look at the record: all during their time at MSU—it was right up there with Yale, Harvard, and the other Ivies, vastly outperforming the University of Michigan and any other Big Ten school in major fellowship winners. So I felt very lucky to be a part of that group of students who were going to get excellent guidance at MSU, and later, when I was a faculty member, felt even luckier to have been a part of that program as a student.

*Freshman Year*
My folks drove me up to MSU with all my stuff for a year at school... my portable typewriter was the highest tech I had at that time. I was assigned to East Wilson Hall, which was just opening in fall, 1962, and that was very exciting. Wilson had a suite arrangement: two rooms connected by a shared bathroom. It was designed for two students per room, so four in a suite, but enrollment pressures forced tripling of room assignments for most of my four years, at least in the fall quarters. My freshman roommates were an African-American named Charlie, from Detroit, and Tom Kreger, a country boy from Clarkston, where his parents had an apple orchard. Charlie didn’t hang out much with us, which I can certainly understand, but Tom and I became fast friends. He was quiet but fun to hang around with. He studied mechanical engineering, and was a car nut, which was something I enjoyed talking about, too. We lived in room 614 of East Wilson Hall, in Winchester House, one of twelve half-floors in East Wilson, all of which had names beginning with “Wi.” Our suitemates were also tripled up. One was Charlie Pressler, from Newaygo, a small town north of Grand Rapids; another was Bill [somebody], who was from the Detroit area. The third was a shy guy, Tim somebody, with whom we didn’t really hang out much. I remember that Pressler was pretty unkind to him, which I didn’t care for, but then, I didn’t care for Pressler much, anyway. He had a crush (unrequited) on a girl in West Wilson named Joanie Rassicotti, whom he referred to as the “Owossowop,” as she was Italian and from Owosso, MI.

We had a couple of people on the floor who were older: one was Jon Pumplin, a senior who was a physicist and probably a pretty fair version of one of the guys on Big Bang Theory—a science nerd. He ended up a physics professor at MSU, although I didn’t see him but once after he graduated. Another guy I remember was John Szal, who lived across the hall from me, I think in my sophomore year. He also went on to become an RA, and later worked for Dave Reagan, who had been the manager of Wilson Hall my senior year, before he left MSU to found PlasLabs, which built plastic enclosures for lab rats and the like.

The other Winchester House student I remember from freshman year was Stormy Rice, who was a member of a rock band that included other East Lansing musicians: Bob Baldori, Jeff Baldori, and some others. They were a one-hit wonder, with a song called “Who Do You Love” that made the national charts, but they dissolved after touring for about ten years. I ran into “Boogie Bob” Baldori later, though, when my band (see elsewhere) cut its first album in his studio, in an old converted barn in Okemos. He gained more fame in two other ways—as the piano man who toured with Chubby Checker for many years, and also played boogie-woogie piano around the state, but also as an attorney who was suspended for a while for growing and distributing pot. I always liked him, as he seemed to me to be more of an ACLU type than a corporate lawyer, so I was sorry to see him get in trouble. Anyway, he became an East Lansing notable.
Almost everyone on the floor, other than the RA, was a freshman, and we got along pretty well, with late-night euchre games going into the wee hours. I liked our RA, Jim S. (I can’t remember his last name), who ran our house meetings and was generally knowledgeable about MSU and was helpful to people. The head advisor of East Wilson was Jim Appleton, a candidate for a Ph.D. in Student Personnel, as were most of the head advisors in MSU dorms at the time. Each “house” fielded a team for intramural touch football, but that really wasn’t my thing, so while I showed up, I neither wanted nor got much playing time. I didn’t even bother with IM basketball. However, I helped our IM bowling team a lot, having carried a 180+ average in high school. We had officers elected in each house, and I was chosen as scholastic chair in my freshman year. That entailed going to meetings with eleven other students representing the other houses, and one of the grad advisors. The committee didn’t typically do much that was very exciting, as far as I recall, but each residence hall had such a committee. That inactivity was something that I would change in my sophomore year.

My declared major was chemistry, since I had taken advanced chemistry as an AP course in high school. My first quarter, I enrolled in CEM 351, Organic Chemistry, and I hated it... it seemed to be nothing but rote memorization, and while I was able to do that and got an ‘A’ in the course, I chose not to take CEM 352 in the winter, and changed my major to physics. In the meantime, in the first quarter, I had started Russian 101. I loved the Russian, and was happy to be studying it, as it was well known at the time (post-Sputnik) that any scientist had better be able to read Russian. My teacher was Prof. Sergey Andretz, who also ran the language laboratory in Morrill Hall. I liked him a lot, and was shocked to learn, when he died many years later, that he had had two families (yup, bigamy) living in the Lansing area. I don’t know how he kept them apart, but evidently he managed it for many years. I think he did a lot of “traveling.” Anyway, he encouraged me to learn some Russian poetry, and coached me on my pronunciation, so that I was able to win the department’s Russian Poetry Recitation Contest both my freshman and sophomore years. That netted me two nice sets of books in Russian—one of works of Chekhov and the other of Tolstoy. Of course, you likely know by now that learning poetry is one of my favorite pastimes, so this contest was right up my alley!

I also took Math 103MH, the first course in the honors math sequence. It was interesting... disguised as a lower number than the regular MTH 111, 112, 113, 214, 215 sequence, which also had honors sections 111H, 112H, etc. But 103MH was open only to those selected into it by the math department (I think mostly only the Idzerda/Sabine group). I met some excellent students there, including some I kept seeing later in my program, but I had a problem. I had watched the SMSG Modern Algebra course on Public TV every morning after my paper route in high school, which made me proficient at proofs. The emphasis of the 103MH course was on proving everything, rather
than wasting time on manipulation (i.e., solving problems). As a result, I was both bored, getting only a B since I didn’t study at all, and at the same time, ended up fairly poor at integration. That didn’t matter a lot in my later career, as I became quite comfortable with numerical methods, but it did hurt me when I started studying electromagnetics in my physics curriculum. So I didn't like EM, and eventually changed my major away from physics, too. It’s very strange what sequences of events lead to particular outcomes, no?

But my real delight in my first quarter at MSU was PHL 137, Principles of Right Reason, taught from his book of the same name by Prof. Henry S. Leonard. I absolutely fell in love with semiotic, the science of signs, and all of the formality of philosophical reasoning. Leonard was a brilliant scholar—past president of the American Philosophical Association, among other honors—and his book was wonderfully organized and clearly written. But the class was one that was routinely recommended for freshmen to take, and was held in the Horticulture Building Auditorium... holding several hundred students, most of whom seemed to be reading the State News (campus newspaper) during the entire lecture (don’t forget, we didn’t yet have cell phones or laptops to pass the time). I, on the other hand, was captivated, hanging on every word, trying to find some contradiction or unsupported assertion. Listening was difficult, because Leonard had a sort of speech impediment—he loudly cleared his throat, or something that sounded like that, in nearly every sentence, and often in the middle. That made it hard to concentrate on what he said. But I would often go up after class if I had a question that had popped up during his lecture, and he was always happy to answer. At the end of the semester, he asked if I would like to take a one-on-one reading course with him in the winter, to complete the reading of his book and write a paper on some aspect of it, and I jumped at the chance! That was an excellent experience for me, and as my project, I translated a lot of the English assertions in the book into formal mathematical (logical) notation. At the time, I saw it as a “formalization” of what he said in his book, but after my subsequent study, I came to realize that his work was already well formalized, and he had just translated it into English in order that freshman students might be able to read it. Leonard was very kind to me, and I was hooked on formal philosophy by the time that was over, so I continued taking philosophy courses right up to and including my M. S. program. Language and logic became very important words to me, and both turned out to be pretty handy for a computer scientist.

Rounding out my first quarter were the required 1-credit HPR (gym class again) and 0-credit ROTC Orientation. I didn’t join ROTC, so at that point, all that was required was that one orientation class. In my age group, draft deferments were being given until college graduation, and then extended for grad school, for marriage, and by the time I finished the Ph.D., I was too old to draft (28). That is fortunate, because early on, when the lottery was done early in the
Vietnam War, I drew a fairly low number.

Winter quarter held the continuations of the math (Calculus 1) and Russian courses, plus the philosophy reading course (PHL 494), but added the first Honors Physics course, which was about measurement. The idea was to let us play with the concepts of accuracy, precision, significant figures, etc., in several contexts. The ones I remember were weighing objects and measuring radioactive decay. We used Geiger counters to measure decay rates of a variety of samples, with attention to what we could assert about precision and accuracy. It was interesting, and we learned things that would be useful in any career in science. I also audited the second course in German, in order to bring it back and enable me to enroll in second-year German the next fall. I completed the HPR (physical education) requirement by taking a bowling class, which was not much of a challenge, so I ended my college phys ed requirement with straight A’s! Actually, since I’d gotten one B in the fall quarter, I decided that in winter quarter, I’d better show the scholarship grantors that they didn’t screw up, so I worked pretty diligently on all my classes, and did get a 4. average. That was the last time, if the truth be told, until I got to grad school.

Spring quarter was pretty much a blow-off quarter, as I didn’t care much for the second physics course or the second calculus course. Russian was fine, but not as exciting as it had been at first. I took Psych 405, Modern Viewpoints in Psychology, to count toward my social science requirement.

I seem to recall that a fair amount of the course was about psychometrics, or measuring of sensations, and that has proven to be useful to me from time to time. I also audited German 103, to review my high school German and prepare for the next German course at MSU. But this was my first spring quarter at college. Back then, the quarters lasted into mid-June, almost 5 weeks later than the current spring semester ends, so my roommates and I spent much of May out on “Case Beach,” the field across from Case and Wilson Halls, where there were always coeds tanning, playing cards, and napping whenever the weather was decent. That did impact my studying, I admit. I could take a book out there, but I wasn’t very good at concentrating. My roommates and suitemates and I hung out with some of the same West Wilson girls we ate with in the Wilson Hall cafeteria, which was fun. I remember one of the girls was named Mary, and I liked her, but as freshmen, we had no cars, so didn’t really date much that first year.

**Summer, 1963**

I returned to Winston-Salem and lived at home for the summer of 1963. I had a job working as a lab assistant in the laboratory of Prof. Hugh Lofland, a biochemist studying atherosclerosis using a pigeon model. The main tool was a Technicon Autoanalyzer, a fancy device that used capillary pumps to deliver controlled amounts of reagents to a sample chamber at precise times. My tasks started with washing glassware (which I’d learned to do as a kid in my Dad’s lab—you know the drill: wash, rinse, then...
double rinse in distilled water). Then I moved on to sample prep and feeding the Autoanalyzer. Hugh’s wife, Norma Lofland, ran the lab, and there was also a very nice lab tech, Nancy, who took me under her wing.

**Sophomore Year**

Sophomore year was full of languages—second-year German, Russian Composition, and Scientific Russian. I took Philosophy of Science from the then legendary Professor Hal Walsh, which was an excellent course. I also took a course that proved to be very useful to me later, Statistics 485, Probability. The final course was electromagnetics. Because I didn’t like it at all, I gave up on the idea of being a physics major, and began considering myself a philosophy major. But actually, I didn’t change my major away from physics until the next summer, and by then, I had decided on a math major, since it gave me the most flexibility of any of the majors I considered.

I continued with German, Russian Composition and Scientific Russian in the winter, and added some of the general education requirements—Natural Science and Humanities, from the University College. I took Math 431, Theory of Numbers, and enjoyed that. I also bit the bullet and took Philosophy 230, Ethical Theories, which wasn’t “my kind” of philosophy, but which would have been required for a philosophy major. I actually enjoyed the class quite a bit—it was taught by Rhoda Kotzin, who I thought was an excellent teacher. But little did I suspect at that time that I would someday be teaching engineering ethics to electrical engineering students and actually drawing on that background in ethics from the Department of Philosophy. You never know what will later prove useful!

In the spring, I continued with second-year German and Scientific Russian, but stopped taking Russian Composition. Russian Comp had been taught by Sergey Andretz’s mother, and I didn’t like her teaching style very much, so decided to quit the composition track. I took Advanced Calculus, required of all math majors, and also took my first graduate course, PHL 870, Seminar in Philosophy of Language, which I just loved. A few grad students and I would meet each week with the professor, Herb Hendry, sometimes even at his house, to discuss the articles we had been assigned to read. This gave me a lot of great experience working with grad students in philosophy, which sharpened my analytical processes a lot.

In extracurricular activities, I became chair of Wilson Hall’s Scholastic Committee. This put me in regular contact with one of the Grad Advisors in Wilson Hall, who was responsible for oversight of the Scholastic Committee, whose name was Pete Gustafson. I found him to be very supportive of my ideas for the scholastic committee, and his support helped my confidence that I could achieve something with that committee.

I was struck by how many students still hadn’t decided on a major in their sophomore years, or had already changed it one or more times, like me.
When I talked with fellow students about it, they said they didn’t know of a good way to find out about the various majors, so I thought it would be a good idea to organize some sort of activity allowing students to meet with advisors (faculty members, then) from as many departments as possible. I bounced this off of some of my faculty friends who had offices in Wilson Hall (like Prof. Maury Crane of the Department of Humanities and some of his colleagues). They thought it would be a good idea, so I began organizing what became South Campus Major Night. (At that time, South Campus included Case, Wilson and Wonders Halls—about 4,000 students altogether.) I invited faculty from about 100 programs to come to Wilson Hall for an evening of one-on-one meetings with students, and it turned out to be a great success. In fact, long after I had left MSU, the program continued to run annually, and was duplicated on other parts of campus.

Summer, 1964

I became an RA for the summer orientation program for new freshmen, about 90% of whom came to MSU for a week’s orientation before showing up as students in the fall. This meant about 50 new students on my floor each week, and lots of questions, and some testing of limits. It was interesting, and good preparation for my later duties as an RA during the regular season. Each week, I presided over a hootenanny with my 12-string guitar, held evening meetings with the students on my floor, and answered questions about college life. The rest of the time, when not busy with assigned duties, I got to spend with my fellow RA’s (both men and women), and would go to the MSU pool, movies, etc.—a nice way to spend a summer, and we got paid a little bit, too, in addition to free room and board.

Junior Year

My junior year, I continued my study of German (Readings in German Literature) and Russian (Introduction to Russian Literature). The course I liked best was Philosophy 337, Formal Logic, where I learned a lot of the concepts that ultimately would be useful in my study of computer science. I took Math 432, Abstract Algebra I, and liked it quite well, although I should have spent more time on it. Again, it was a good foundation for later study of automata theory. Fall quarter was rounded out by a political science course, International Communism, helping to fulfill my social science requirement and giving me some background in case I ever got a chance to go to Russia.

Winter quarter brought the second quarter of formal logic, the second quarter of advanced calculus (MTH 425), and the second quarter of abstract algebra. I also arranged an independent study course with a faculty member in the College of Education, in which I conducted a telephone survey of about 200 undergraduates concerning their experience with academic advising. I felt very lucky to have had the kind of advising I had gotten, but that seemed very different from what most students got. I did the survey under
the auspices of AUSG (All-University Student Government), and had a couple of volunteers (fellow members of the Green Helmet Honor Society) join me in administering the survey questions by telephone. We did a careful random sampling of undergraduates using the student phone directory, of which every student was given a copy and all students were listed. The results were interesting and disturbing: for example, about 40% of the students surveyed did not even know who their academic advisor was. I wrote up a full report for AUSG, including confidence intervals, etc. I don’t know whether any action was ever taken based on that report, but I think AUSG provided it to the MSU administration as representing a problem to be addressed.

But the real excitement in that quarter was my discovery of computer programming! That changed my life, in fundamental ways. I enrolled in EE 101, Computer Coding (there wasn’t yet a department of computer science), and the instructor was Glenn Keeney, one of the guys who had been involved in building MISTIC, MSU’s first digital computer, based on vacuum tubes. He taught CDC 3600 FORTRAN, running on MSU’s brand new CDC 3600 machine, serial number 2. That machine put MSU at the forefront of university scientific computing, since it was quite a bit advanced over the IBM 7090’s with which it competed. MSU’s Computer Laboratory was a major software developer then, creating its own time-sharing operating system, called SCOPE/Hustler, for the CDC architecture. It was an exciting time.

Students got an assignment to program, keypunched their cards, and submitted their jobs, receiving output and their card deck back the next day, typically. To be succinct, I absolutely loved this stuff, and proceeded on my own through all of the FORTRAN book fast enough that I also joined the next course, Machine Language Programming, during the same quarter, as an “auditor” or “visitor” (i.e., receiving no credit or grade). I learned all of the ins and outs of that CDC computer as fast as I could stuff it into my brain! It was a euphoric experience, bringing together my love of languages, math, and logic. I immediately knew what I wanted to pursue for the rest of my studies and career... but since no such major yet existed, I stayed with a math major, which let me take as much computer science as I wanted.

Spring quarter of my junior year, there wasn’t another computer science course offered, since I’d started out of sequence in winter quarter. So I took Formal Logic III and a philosophy course surveying “representative philosophical systems.” That would have been required for me had I decided to continue with philosophy. I also took PHL 470, Formal Semantics, which I found very interesting, and in which I’d been interested since my freshman year philosophy experience. This may have been one of the philosophy courses taught by Ron Suter, who was the prof in at least a couple of my philosophy courses, but I can’t remember exactly which ones. Added to the three philosophy courses was the final quarter of advanced calculus. I was glad to have that out of the way,
as the last of the courses specifically required for the math major—the remainder could be any 400-level math courses.

**Summer, 1965**

This was the second summer I worked as a summer RA for MSU’s orientation program for new freshmen. This was the summer I became good friends with Jim Litwin (who unfortunately passed away in May, 2019) and his bride-to-be, Lynette Jenkins. Through Jim, I also got to know Dick Smith, who had been an RA with Jim in Akers Hall the previous year or two. The three of us became great friends that summer and in the year that followed. (Dick eventually married my sister, Julie, so we became brothers-in-law.) That summer, Jim and Lynnette did some double dating with Sandy Fitzgerald and me. Sandy was not interested in me, nor I in her—she was way too Christian for me—but she and I were stuck there for the summer, so we hung out. She was from Columbus, Ohio, and her dad was a divorce lawyer, and loaded. One weekend, she invited several of us to go for a sail on her dad’s boat, which he had just docked at the Detroit Yacht Club. We were checked in at the gate, then told to go to Slip 00. Well, that meant nothing to me, but as we walked along the pier, the slip numbers were getting smaller and smaller, and there, at the end, across the whole end of the pier, was slip 00, with a small ocean liner docked there. I couldn’t believe the size of that boat—teak decks, stateroom after stateroom, beautiful places to lounge. It was staffed by a captain and two crew members. If anything could convince me that Sandy and I came from very different worlds, that was it!

**Senior Year**

My senior year began with two philosophy courses—Metaphysics Part I and Logic and Philosophy of Science. The Department of Computer Science had finally been formalized, and I took CPS 301, Digital Computers, which was an introduction to computer architecture.

My program was filled out with ED 416, the required course for RA’s, entitled “Personnel Work in Student Housing.” It was taught by Don Adams, a notable person in the field of student personnel. MSU’s residence hall system was then likely not only the largest at any U.S. university, but also was kept so by providing excellent food, lots of activities, a great support system for students, and a livable housing arrangement, with its many “suites” that joined two rooms with a shared bathroom. Lots of students never moved off campus, as they were doing at so many other universities. The head advisor in East Wilson Hall during my second and third years was Art Sandeen. I learned a lot from him and from the two graduate advisors who had been there when I was a sophomore and junior, Dale LeFevre and Mo Bybee. I think Sandeen was a protégé (and successor) of Don Adams, and became a distinguished student personnel administrator, as well—dean of students or VP Student Affairs at some major university. But Sandeen had moved “upstairs” by the time I became an RA, so I had a new head advisor, Ben Sprunger. I missed
Art Sandeen (and his lovely wife, Sue, who was also very nice to the RA's), but Ben's staff meetings were still informative and fun, and I thoroughly enjoyed my senior year. When I had become an RA, I had moved from Winchester House (north half of sixth floor) to Windsor House, the south half of the second floor. The duties of an RA included not only providing information about MSU and the procedural aspects of campus life, but also helping students who were having difficulties—particularly, watching out for depression, homesickness, alcohol abuse, trouble with room-/suite-mates, and various interpersonal problems.

The RA's got to work with a staff member at MSU's Counseling Center, to help us sharpen our listening skills and be more aware of when someone should be referred for help. I had the good luck to work in a group led by Dr. Sam Plyler, a young counseling psychologist. We hit it off, and I still remember once dog-sitting with their two beautiful Weimaraners, when he and his wife, Diane, went out of town for a week or two. I liked that a lot, having been a dog person my whole life, but not having had one during my college years.

Each house had a study lounge and a luggage room, and in Windsor House, we converted part of the luggage room into an art studio for a student living in Windsor named Chris Gabel. Chris made jewelry using a lost wax centrifugal casting process, and I thoroughly enjoyed watching him do it. He also used a silastic compound to make a negative mold of the original object (ring, pendant, or whatever), then poured wax into that to make new wax positives. They were then embedded in sand and forced out as a gas when the hot metal was poured in and spun. (Many years later, I ended up working with grad student Dave Chesney to develop an expert system for General Motors for their lost foam casting of cylinder heads at GM Central Foundry in Saginaw, and my casting experience helped me understand what some of the problems were.)

I remember well one other RA from East Wilson—Bob Halsall. He was an amateur racecar driver, and had worked with the hall manager, Don “Squire” McMillan, to build a Lotus 7 from a kit. I thought it was amazing, and couldn't believe how it could corner in a parking lot!

Larry Bauer was another RA in East Wilson at the time, and he and I became good friends in our senior year. We would often go out in the evening for a drink in the Ilforno Room of the Coral Gables—not the Showbar, but a quieter place where I would sip on a Manhattan or Old Fashioned, he on whatever he was drinking, and we would talk about philosophy, about RA stuff, and about his family business. He came from the Holland, Michigan, area, and his Dad had invented and commercialized a control system for mobile home furnaces. I think the company was called Home Furnace, but I'm not certain any more. Anyway, they also invented many other things, and one of them, the self-dimming mirror, made them quite a bit of money. The company they founded, Gentex, became a major automotive supplier.
But even back when we were in school, Larry had the coolest car I had ever seen, a Corvette coupe. Because it had almost no back windows, they had equipped it with a periscope where ordinarily the rear-view mirror would be. I thought that was fabulous! Larry and I lost touch for a while, although I was aware of the success of Gentex as an automotive supplier of self-dimming mirrors in my role as director of a CAD/CAM center, and of the role of Larry’s family in founding that company. We’re now back in touch, which I am happy about!

Winter quarter brought UC 499, Great Issues, the “capstone” of the humanities requirement for graduation. I had taken only a few of the 12 required courses from the University College (three each in Natural Science, Social Science, Humanities, and American Thought and Language), usually replacing them with more specialized courses with the approval of my Honors College advisor. But the great issues course was a good one, and I enjoyed it. A lot of my fellow Honors College students also took that course, so I saw many students I had known for a long time. I also took Math 451, Numerical Analysis, which has proved to be a very valuable course for me, given that I have done a lot of simulation of dynamic systems, and a thorough understanding of integration techniques has been important, even to this day. I also took CPS 302, Machine and Assembly Language, which I loved. During this semester, I also served in an unusual role: I was a “native informant” for the CPS 301 class (entitled Machine Language Programming), as I have already described elsewhere.

Spring quarter of 1966 was my last as an undergrad, and I dually enrolled in the M.S. program in philosophy (I think computer science wasn’t yet an option at the graduate level, so I chose philosophy as the closest thing I could find). That quarter, I took CPS 490, Special Problems, a temporary course name and number for a course that dealt, as I recall, with operating systems. That completed my B.S. program in math. I also took PHL 471, Philosophy of Mathematics, and CPS 303, Compilers, Languages and Monitors, as the beginning of my M.S. program.

MSU had been very good to me financially during my undergrad years; my full-ride ADS Scholarship paid tuition and gave me money for room and board and books, etc. But my work as an RA gave me free room and board, and I was paid as an undergrad teaching assistant in CPS for one quarter. I also had two other part-time jobs. I did Russian translation work for an ag economics professor, scanning through Pravda and Izvestia every day for news reporting agricultural production in the Soviet Union. I filtered these articles for things he was interested in, giving him a synopsis every few days. My other job was for MSU’s Learning and Evaluation Services, which included the Office of Institutional Research, which was later a home of Dr. Lou Anna Simon, MSU’s future president, and the Scoring Office, which was for machine-grading of examinations. My job was to run statistical analyses on the CDC
3600, using a canned statistics package created at MSU, on whatever was sent my way. As a result of all of these money-generating activities, I was able to save enough to let me buy a used motorcycle in the spring of my senior year. The one I bought was a Jawa, a Czech-built bike that had been used for ice racing, so had big slashed knobby tires. Turns out, it had already seen its best days, as I often had problems with it. But, who could beat a bike that had on its gas tank a hand-painted grinning guy holding a beer stein and the words “Chug-a-Lug.” Well, I didn’t much like beer, but the bike looked great. At the end of spring, I trailered the bike home to North Carolina to ride for the summer. My parents were, of course, thrilled to see me riding a motorcycle, but I guess it was something I had to get out of my system. I haven’t ridden one since I sold it in the fall of 1966.

First Year of Master’s

In the fall of 1966, I was a full-time graduate student, and earning my keep by being a Graduate Advisor in the brand-new, 12-story Hubbard Hall, twice as tall as any other building at MSU. I had a fairly large apartment off the main hallway on the first floor, and it came equipped with nice new furniture, a small kitchen (which I rarely used), and a living room big enough for a staff meeting with a dozen RA’s.

Summer 1966

For the summer after my graduation, my Dad helped arrange a summer job for me in the scientific computing operation, a service unit of Bowman Gray School of Medicine, where he was on the faculty. The unit was run by Dr. Leonard Rhyne, a Ph.D. who was trained as a biometrician. The lab had an IBM 1620, a machine about the size of a large desk. My job including writing software in FORTRAN to call “canned” statistics packages, and the like. I enjoyed programming “for real,” helping to generate answers for people. The staffers were very nice, and I learned some more statistics in the process. I rode my motorcycle to and from work when the weather was nice, and sometimes just rode around town, but I never took any serious road trips with it, as it was just too unreliable.

I enrolled in CPS 451, Mechanical Languages 1. That was the first of MSU’s renowned three-course sequence in compiler writing. When I took it, across the three quarters, we wrote all of the components of our own compiler, but we didn’t actually get them all assembled into a working system. However, in later years, each student completed this sequence having written a working compiler. That was highly unusual across computer science departments, and big companies like IBM recruited computer science students from MSU very heavily, as among the best trained software engineers in the country, for many years. I thought it was a shame when MSU dropped this course sequence.

Another course I took in the fall was EE 825, Linear Systems 1. That was taught by my future colleague, the late Bob Barr, and was an excellent introduction to state modeling. I didn’t realize at the time how important
state modeling would be to my future simulation activities, but I ended up using it and teaching it to many biology grad students for use in modeling particular organisms or ecosystems. The book we used was written by Prof. Herman Koenig, the chair of the EE Department, and eventually, the supervisor of a research project I worked on in the second year of my master's program, to model the flow of demand for courses as a function of the number of students in each major and level. Can you believe it—once again, I was worrying about students and their majors! The world is certainly interesting when life returns us to old and familiar questions despite our having abandoned them. Of course, it was state modeling, and my skills were sharpened a great deal by applying what I'd learned in the state modeling class.

The last of my fall courses was ED 883, Independent Study in Guidance, which was the required course for all new Graduate Advisors in the residence halls. I don’t remember much about the subject matter, but I think it introduced us to Eric Berne’s "transactional analysis" as a way of understanding people’s behavior. Interesting enough, but I don’t think I found a lot of application for it in my duties as a graduate advisor. It probably would have been of more use when I was an RA. As a grad advisor, I worked with the twelve RA’s (and sometimes all 24, when the women joined us). We talked about difficult students, helped the student leaders plan activities, and generally acted as a "safety valve" when RA’s got frustrated. The rules on paper were very rigid at that time, regarding both alcohol and women in the rooms, so we helped the RA’s to walk the line to keep a reasonable atmosphere for studying on the floor, but not be policing for alcohol to get students thrown out of school. Things generally went pretty smoothly that year, in part because the students were excited about living in a brand new residence hall—twice the height of any other building on campus. The food in the cafeteria was pretty good, for dorm food, and the atmosphere was a lot more relaxed than it had been in my freshman year, when men were required to wear dress pants and collared shirts to dinner every day, and a coat and tie to Sunday dinner. The war in Viet Nam and the reactions to it on college campuses had acted to change the social climate and attitudes toward authority at a phenomenal pace between 1962 and 1966.

I remember that the head advisor of South Hubbard Hall (the women’s side back then) was Barb Sawyer. She later became Barb McMillan when she married Squire McMillan, the former manager of Wilson Hall. Because a lot of our training of the RA’s was done with the dozen men and dozen women together, the North Hubbard staff saw a fair amount of Barb and her grad advisors and RA’s, too.

Winter brought the continuations of Linear Systems and of Mechanical Languages; of the two, I was much more interested in Mechanical Languages, but the Linear Systems work has turned out to be more important to me. I also took MTH 831, Matrices and Groups, taught by the
legendary J. Sutherland (“Sud”) Frame. He was absolutely amazing with his knowledge about matrices… I swear, some of them were his personal friends. You could write down a 4x4 matrix, and he’d proceed to tell you all about it, just looking at it. What intuition he had! Needless to say, matrix algebra is a great tool, and I consider myself lucky to have been taught by such a master.

The third quarter of the Mechanical Languages course was in the spring, and I also enrolled for two “special problems” courses. One of them was working with Prof. Glenn Keeney to develop a state model to try to predict plays in a football game, using data from MSU’s team. These were some of MSU’s glory years in football, with the famous “Game of the Century” pitting numbers one and two MSU and Notre Dame against each other, resulting in a 10:10 tie. So there was lots of interest in anything that might confer any advantage on MSU. I just wrote code that handled data for Dr. Keeney, rather than learning much about the statistical ins and outs of football myself.

**Summer, 1967**

At the end of the academic year, I had to move out of my fancy new apartment in North Hubbard Hall. Dick Smith and I had decided to room together for the next year, while I completed my M.S. and he, having just completed his, was in his first year of teaching Sociology at the Farmington Hills campus of Oakland Community College. That meant that we drove off in opposite directions on I-96 each morning. I was in my old green VW Beetle with the pedal to the metal trying to keep my speed above 60mph, the success of which depended on the day’s wind direction and speed. Meanwhile, Smith was driving a lovely yellow Porsche 911, which he could afford because he was actually earning a salary! But we did occasionally have to jump the Porsche from the VW. We had a lot of fun that summer, playing cribbage, pinochle (with Denise and Smith’s girlfriend Susan), playing tennis across the street on the high school courts, and eating lots of casseroles. We occasionally even managed a trip to the Bloated Goat Saloon, a block away, for dinner. We were living in a second-floor apartment in an old converted funeral home, so had lots of space, but had to stay out of the basement.

**Second Year of Master’s**

In fall quarter, I took EE 981, General Automata Theory 1, which was taught by the late Carl Page, a fairly recent graduate of the Computer and Communication Sciences Program at the University of Michigan. He was later best known as the father of Larry Page, co-founder of Google. I liked automata theory, and Carl was a strong proponent of the CCS program at Michigan. I also took CPS 825, Theory of Combinatorial Circuits, which made good use of my background in logic.

Winter brought Theory of Digital Machines, General Automata Theory 2, and a valuable course taught by Tom Manetsch called Simulation of Stochastic Systems. That turned out to be pretty easy for me, as I’d already
been teaching simulation of telephone traffic systems to telephone engineers from the “independent” (non-Bell) phone companies for several years. I completed my M.S. degree in Systems Science in winter quarter, and was admitted to the Ph.D. program to continue my studies until the end of the academic year.

In spring quarter, I took three courses—switching theory (essentially more logic), design of deterministic systems (more logic design), and the third quarter of general automata theory. Since I had been admitted to the University of Michigan’s Ph.D. program in computer and communication sciences, Denise and I applied to be head advisors in the residence hall system (we were to be married in August), and, on the basis of my experience in residence halls at MSU, we were assigned as head advisors in East Seeley Hall, an apartment-style dorm for women, located just off the main campus on Geddes Road.

Summer, 1968

This summer was spent getting ready for the wedding in Greenwich, Connecticut, where Denise’s parents lived. We got married in a huge old Episcopalian church, where her Mom, Jackie, was a member. The honeymoon was postponed until later, when we went to visit my parents (and brother Greg) in London, where my Dad was doing a year-long sabbatical. I remember long flights on Air Icelandic, in a turboprop airliner, stopping in Gander, Newfoundland, among other trans-Atlantic stops. Denise and I were married in late August, 1968, and had to move into East Seeley Hall at Michigan right after we got back from Connecticut.

Ph.D. Program at Michigan

In the second year of my M.S. program, I started thinking about where to do the Ph.D. I liked automata theory a lot, and it blended nicely the math, logic, and language I’d been studying for years. My advisors at MSU thought it would be good for me to go to University of Iowa, where they said Jerry Weeg was a good automata theorist. It turned out that he had come from MSU, so they knew him well because they trained him. I applied to Iowa and Michigan and maybe a few other schools—I don’t remember the others. Iowa offered me good financial support, and that was the top choice of my CS people here, so I accepted. However, shortly thereafter, Michigan made me an offer from their Department of Computer and Communication Sciences, and I thought theirs sounded like a much better program, where I could do automata theory if I wanted, but also had many other choices. So I retracted my acceptance at Iowa and chose Michigan, hard though that was for a Spartan fan. I’ve certainly never regretted that choice!

For Ph.D. students in CCS at Michigan, the initial course work was aimed at preparing them to pass the Ph.D. Qualifying Exam. That exam consisted of three sections, and each section included three or four faculty examiners. It was entirely oral. The sections were formal systems (automata theory, information theory, probability theory), natural systems
(information flow in biology, natural language, brain anatomy and physiology, etc.), and engineered systems (computer architecture, digital logic, analog computers, etc.). The exam came one year after initial enrollment, so students had to be sure that either their background or the courses they took in the first year would span the exam subjects. People actually failed the exam each year, but over a number of years, the students who took the exam seriously and organized study sessions covering one of the topics each week, repeating in increasing depth, typically did well. Our year was no exception: of 12 new students in the program, ten chose to study together weekly, and all ten passed the exam; the other two failed and were gone. The exam was such that the examiners could start with simpler questions, then if the student did well with those, they could proceed with more depth until the student ran out of gas. I don’t remember much about those sessions except that I got hung up on a question about linear systems, and they were trying to get me to say “superposition” or something akin to it. I couldn’t see what they were getting at, although I clearly knew about superposition, but they reposed the question several times before I finally tumbled to what they were after. I had simply taken that for granted, and thought they were looking for something else. Once I answered that, the rest of the exam went much more smoothly.

The courses I took my first year were quite multidisciplinary. One had us learning neuroanatomy with medical students, another was on speech processing, in which we learned to make speech spectrograms and studied how formants were made in the vocal tract. One was on stochastic systems, taught by Bill Root, a noted guy in the field. Joyce Friedman taught another on some aspect of programming/software architecture. Hank Swain, a pharmacologist, taught one about informational aspects of biology. Julian Adams, a microbiologist, was also involved in the department, and I recruited him to my guidance committee when I decided to do bacterial growth simulation. I took a psychology course (mostly psychometrics) from Walt Reitman, too. Gene Lawler taught another computer science course in the department, as did Harvey Garner, Bruce Arden, Larry Flanigan and Bernie Galler—I think I had one course each from Galler and Arden, but not from Lawler, Flanigan or Garner. Cleve Moler, the co-inventor of MATLAB, was also there at the time. His wife, Nancy Moler, was a member of our cohort of ten students who started the Ph.D. in CCS the same year (1968).

As you can tell from the offerings above, this was not a stock computer science department, but one that was miles ahead of the curve in providing multidisciplinary thinking to computer science and to biology. That department has inspired me ever since, despite its cruel demise at the hands of the computer science people in the College of Engineering, who first merged with it then eliminated it, forming a much more “standard” Department of Electrical Engineering and Computer Science. Holland never forgave them (changing his primary
affiliation to the Psychology Department), and neither have I. What a loss to the world! The Center for the Study of Complex Systems was an attempt to revitalize that kind of interdisciplinary thinking, and has been successful, but I don’t think it has ever reclaimed the intellectual power that CCS had in its heyday. The success of the CCS program, then department, in turning out amazingly well educated students inspired first my interdisciplinary training of biologists in systems science, and later, the BEACON courses providing computing and modeling concepts to biologists, evolutionary biology concepts to computer scientists, and teaming them to work on models associated with evolution.

Three people in that department were of special significance to me: John Holland, Art Burks, and Bernie Ziegler. When I arrived, Holland was a recent Ph.D. (he earned the first B.S. in the predecessor program, I believe). He was associate director of the Logic of Computers Group, which had been founded and directed by Art Burks, of the Philosophy Department. Burks was one of the inventors of the ENIAC computer at the University of Pennsylvania, one of the early general-purpose digital computers. He had been a colleague of John von Neumann, and was the one who completed von Neumann’s last book on cellular automata after von Neumann’s death. So my study of cellular automata was guided by one of the key figures in the fields of both computers and automata, and I really felt privileged to spend time learning from him.

John Holland

Let’s go back to Holland. He had been thinking for years about how to use computers to model natural processes, particularly evolution. In the 1960’s, he began publishing articles about complex adaptive systems—in particular, about ones in which a chromosome encoded traits in a binary representation. A population of these underwent mutation and recombination, with probability of selection for survival (to crossover or mutate) proportional to their fitness in performing a specified task. Well, that was a genetic algorithm, although it wasn’t named that until one of his later students, Ken DeJong, introduced the name in about 1975. But when I took Holland’s sequence of two courses about complex adaptive systems, he had already derived the Schema Theorem and proved the Turnpike Theorem. So the theory of genetic algorithms was already alive and well.

Those courses were the second big turning point in my education. The first had been discovering my love of computing, and the second was my absolute fascination with genetic algorithms and evolutionary computation in general. I’m sure part of my interest had been stimulated by my many years of conversations with my Dad about heredity, genetics, and evolution. But Holland’s work absolutely lit me up! I decided that I would do my thesis on some aspect of genetic algorithms, and began casting around for a suitable domain to work in. At the time, a non-traditional (second-career) student named Dr. Roger Weinberg was studying in CCS,
and he had developed a simulation of an E. coli cell growing and doubling. A big problem with his model was that it involved a number of reaction rate parameters between abstract chemical pools, and he had no way to estimate the rate constants from the literature. I was also appalled to discover later, when trying to make a better model, that the model contained many conceptual errors, at least some of which I was able to fix. I thought that if I could gather data about E. coli growth rates when shifting among different growth media: (a) glucose, (b) a mixture containing many amino acid building blocks, and (c) a broth that produced the most rapid growth, I would have enough independent observations, including of the dynamics of the shifts. Then I could do a better job of fitting the model, albeit one with many unknowns not readily measurable in the lab. My idea was that since the genetic algorithm did not require any particular form for the models, I could estimate the rate constants quite freely.

I talked with people in the Logic of Computers group about it, and they thought it was worth pursuing. No one had ever before tried to use a genetic algorithm to solve a problem for which they did not know the answer, so I was pushing into new ground. Also, with such a huge search space (think forty-some real constants with orders of magnitude ranges), it was going to be a challenge to the computing power of the day.

Holland had recently graduated a Ph.D. named Bernie Ziegler, who was an automata theorist/semigroup theorist turned simulation theoretician. He was appointed in a non-tenure track position in Logic, and Holland wanted to give him someone to supervise. That turned out to be me. Happily, Bernie’s familiarity with both genetic algorithms, and especially with theory of simulation, was a great match for me and the problem I’d chosen. And having John near at hand wasn’t a bad thing either.

This work was going on in the period quite soon after the discovery of the role of DNA in heredity, and the world of microbial physiology was growing by leaps and bounds. I did a lot of reading, and with guidance from Julian Adams, a microbiologist associated with CCS, and others, I introduced the Helmstetter-Cooper replicon into my E. coli model. The Helmstetter-Cooper model was revolutionary in recognizing that cell division could occur after initiation of the next generation or even two of DNA replication had already been initiated, with each daughter cell receiving a chromosome already partially duplicated. That turns out to be a crucial mechanism in understanding the behavior of cells moved among different growth media.

The Logic of Computers Group

The Logic of Computers group had been heavily supported by the Office of Naval Research, with a sequence of good-sized research grants. In fact, the group included Dick Laing, a very bright guy trained in writing who actually wrote the text of many of Logic’s successful research proposals. One of those had been used to buy an
IBM 1800 digital computer and a PDP-7 computer system with a 337 display system. The PDP-7 was in the family that led to the PDP-11, of which DEC sold about 3 jillion—the 11 just used LSI circuitry, whereas I think the PDP-7 was a wire-wrap machine. The display used a separate display processor to continually refresh a CRT system with fairly low persistence. That meant that the CPU of the PDP-7 could be continually changing the contents of the display buffer, and it would be shown on the screen, allowing dynamic displays or animation. One of the Logic students, Ron Brender, had devised circuitry to allow the PDP-7 to exchange information with the IBM 1800. Doesn’t sound so tricky, except that the 1800 used a 32-bit word and the PDP-7 used a 36-bit word. So the circuitry took 8 words from the PDP-7 and loaded them into 9 words in the IBM. What that enabled was the use of the IBM 1800’s disk drive to store programs to load into the PDP-7, which otherwise had only a fanfold paper tape reader/punch. But I digress (only because I’m so fond of that gear).

The IBM 1800 was used for many different purposes and projects, but never for a very large proportion of the day. People would read in their card decks, wait a while, and get their printed output. So I organized my genetic algorithm so that it wrote checkpoint files at the end of each generation. That meant that the same run could be checkpointed and restarted (since I saved the complete state of the program, including of the random number generator) to produce the same results as if it had never stopped. I posted a sign on the machine saying, “If you want to run, raise Sense Switch 7 and wait for the lights to stop flashing. Run your job, then put in the 4 (or so) punched cards to restart my job.” (At least that was the meaning of the sign.) People were very helpful. I ran the program for a few days, saw some behavior I didn’t want, revised the program. Then rinsed and repeated. But after a month or so, I was happy with the behavior of the genetic algorithm, and “THE” run began. It ran for most of the time in a six-month period, but had not converged by the time I was to leave UM for the faculty job at MSU. But happily, MSU had an IBM 1800 in the College of Engineering, too, so I did the same thing with that as I had at Michigan. And since I was using that computer far more than anyone else, the Dean also put me in charge of it, and of the stuff that provided remote access to the university’s CDC 3600 (and eventually, 6400, 6500, 6600 and Cyber 170/750). After that, by the 1980’s, IBM won out over CDC, not based on performance, but on familiarity and available software. Engineering no longer ran a remote card reader/printer. Most computer use, by that time, was time sharing via CRT-based terminals.

Under the genetic algorithm’s evolution of rate constants, the behavior of the E. coli model gradually improved, and by November, it was good enough that I could write it up and submit my thesis. The thesis also included embedding of the model as a generic cell, rather than specifically E. coli, into a colony model represented as a cellular automaton, and simulated on the PDP-337 system with the fancy
display scope. That part investigated the neighborhood effects (mediated by nutrients) of adjacent cells on the shape of colonies formed on an agar plate, and what happened if those rules were altered. I didn’t feel that I had made any fundamental discoveries on the biological side, which was disappointing, but I did think I had learned a lot about how to get a genetic algorithm to behave in a desired way. That paved the way for a lot of my future work.

I can’t leave my discussion of the Logic of Computers Group without talking about how Holland set a playful atmosphere for all of the group members. Holland was an accomplished Go player, and taught many of us to play, which we often did at lunch time. He could give most of us many stones handicap and still whip us. It turns out to be a great game for artificial intelligence, as recent advances have shown.

Members of Logic also played a board game called Consensus, invented by John Koza, which dealt with winning an election taking advantage of the properties of the electoral college. Interestingly, it turns out that Koza learned a lot from inventing and playing that game, and eventually developed the National Popular Vote political movement to eliminate the effect of the electoral college without a constitutional amendment. The method hinges on the mechanism of a compact among the states, which is provided for in the constitution, and as soon as enough states sign the particular compact Koza created, representing more than half of the votes in the electoral college, the compact goes into effect. That means that each of the states in the compact pledges to cast ALL of its electoral votes for the candidate winning the popular vote. That means, in effect, that the electoral college is abolished in terms of impact, although still constitutionally present. So far, the National Popular Vote movement has had the compact adopted by states controlling about half of the electoral votes needed to put it into effect. John continues to work with many other supporters to achieve this significant goal, which would have reversed the outcomes of the elections of both George W. Bush and Donald Trump. What a different world we would have!

The third major pastime of the members of the Logic of Computers Group was Spacewar. This was a game played on Logic’s DEC PDP-337 display system. It evidently originated at MIT on an earlier PDP-1 system, but by the time I joined Logic, it had been ported to the 337 and enhanced extensively. Adding some new feature to Spacewar was the way a new group member “made his bones.” We didn’t have to kill a lion with a spear and a knife, as the Maasai warriors did, but just add some nice feature to Spacewar. It was a two-player game in which each player controlled a space ship in orbit about the sun. Each player could fire missiles with a gravity-affected trajectory. The game was played with each player having a box with about six pushbuttons. For each player, one button was to fire a missile, another to accelerate, another to rotate the ship clockwise or counterclockwise, etc. The key to the offense was to fire a missile while
pointing mostly backwards to one's route of flight, which caused the missile, with a slower velocity, to be attracted toward the sun, where, if your opponent were not clever, it might destroy him. The key defense was to maintain a highly elliptical orbit, so as to spend as little time near the sun as possible. But the problem with that was that the ship's energy for maneuvering and firing missiles came from proximity to the sun (i.e., solar collectors), so one had to maintain a careful compromise between staying away and passing near to the sun. The undisputed champion at our Spacewar was Dan Frantz, the student who had brought it to our PDP-337, but a close second was John Holland.

My contributions to Spacewar were two: first, I added retro rockets to the ships, and second, I collaborated with an office mate, Dennis Geller, a graph theorist, to install a secret "cheat" in the system to kill one's opponent instantly and another to subtract a fixed amount from his orbital velocity. Both of these "cheats" were for only one purpose: to befuddle Dan Frantz, our fellow grad student. He left for a few weeks to get married, and Dennis and I went to work installing these cheats. Then when Dan returned, we played with him as usual, but would surreptitiously alter his orbit, and occasionally, when he was close to the sun and trajectories were sort of compressed, we'd hit our magic kill button and his ship would die. Other times, we'd just work on his orbit a little, but that was enough to throw off his keenly developed Spacewar reflexes. All of us played enough to be completely unaware of the buttons themselves... our fingers just danced on the buttons, as we watched our ships intently. But poor Dan couldn't understand how he could have lost his edge. We were quick to suggest to him that it was likely because he was now enjoying the benefits of married life, and that slowed his reflexes down just a little.

After a while, Dan got quite frustrated, and we decided that enough was enough. So we began being flagrant with our "cheat" manipulations, making his ship die when it was completely in the clear. He simply couldn't conceive that someone had messed with the program, so he was befuddled trying to find an explanation. Well, we finally said "Watch," then hit the button destroying his ship. His immediate reaction was anger, and we really felt bad, but he soon came around and realized that we'd gone to a lot of trouble to play an elaborate joke on him, and forgave us. I later learned that John Holland had found out about our trick on Dan and thought it was good fun, even mentioning it in some of his talks. So, as you can tell, Spacewar was an integral part of the bonding that went on in the Logic of Computers Group! Of course, it didn't hurt that we were among a very few lucky people in the world who were able to play an interactive video game in the 1960's.

I made many grad student friends in the Logic of Computers Group. Dennis Geller, a graph theorist, was certainly the closest. We played Go together and talked about his work and mine... he did teach me some graph theory. Will Tajibnapis was another, who also
studied evolutionary computation, and eventually went to work for the Soo Line Railroad using what became called GA’s to do freight scheduling, a combinatorial problem at which GA’s proved to be excellent. Will also learned to play fiddle, and at some point, took fiddle lessons from my fiddle player, Chuck MacCluer, so I saw Will from time to time after we both finished at UM. Tom Schunior (renamed Tom Plum after his marriage) was also in the group, and I used software written by Ron Brender and him in my thesis work. Dan Cavicchio and his wife, Jan, became friends. He worked with Holland on exploring the concept of inversion in the GA context, but that never turned out to be a very powerful tool.
The Women in My Life

I think my admiration for girls and women, other than my mother, of course, began in about the third grade. I was crazy about my third grade teacher, Mrs. Shepherd, and my fifth grade teacher, Mrs. Hotchkiss. I had a crush on my fifth and sixth grade classmate, Sharon Cameron, but that remained completely unexpressed. In ninth grade, my first year of high school, I didn’t have any special favorites that I can remember, but by tenth grade, I was very interested in several of the girls in my class. Of course, they were way more socially advanced than my nerdy self, so my attraction was very one-sided. They mostly dated seniors. I participated in a lot of school activities that put me in contact with these girls outside of class during the remainder of my high school days, but I only went on a few dates in high school. The dates I remember were with a girl from a summer drama “camp” I enrolled in and with the ex-girlfriend, Susan, of a friend of mine, Jim Ballard.

My freshman year at MSU was in the newly opened Wilson Hall, and the west half of the hall was all women. That meant we had breakfasts, lunches and dinners in the same cafeteria, and my suitemates and I got to be friends with a group of girls with whom we would share a table. In the spring, we all spent time at Case Beach together, suntanning and playing cards. But I didn’t date any of these girls—we just hung out.

The summer after my freshman year I spent working in the lab of Prof. Hugh Lofland, a biochemist, and his wife and director of his lab, Norma Lofland. Their family and ours had been friends for a long time, and when we moved into the same neighborhood about 5 houses apart, spent even more time together. Norma was a Girl Scout leader, and my folks loved to camp, so in summers, we would often drive to Lake Norman, towing an outboard motor boat, to spend a weekend camping. We had great times over many years, and the summer I worked in the Loflands’ lab, I also started dating their daughter Dee Anne, who was a year older than me. She was a student at the Women’s College of UNC (later called UNC Greensboro), but was home for the summer. We started going out as a group, with my sisters and Dee’s sister Lisa, and sometimes their little brother, Max. We would take them to a drive-in movie, which were very popular back then, load up on sugar and popcorn, and have a great time. Eventually, Dee and I started going out alone, and it just seemed very natural, not like a “date” to me. That did a lot to cure my social awkwardness, just having a female be a normal person, rather than this abstract object on a pedestal, the way I’d always looked at the girls in my high school. Not surprisingly, I fell in love with Dee Anne, and was really distraught when I learned during my next year at MSU that she was marrying her long-term boyfriend from high school, Wilson Lamb. Not
that it had ever been in my power to offer her an alternative—I was in no way mature enough to even think about marrying someone. But it pained me nonetheless—I could think about hearing her voice even years later and still get a twinge—both she and her voice were wonderful.

My sophomore year at MSU was full of adventures, both academic and social. I had my first real “girl-friend,” a freshman named Nancy Pletcher. She had had a boyfriend back home in Livonia, but they weren’t too serious, so we started dating in the fall, and dated most of that year. I went home with her once—maybe it was over Thanksgiving?—and met the family, but it was NOT a “meet the parents” kind of thing, more like a friend who had nowhere to go for Thanksgiving. I think she eventually got back with her high school sweetheart, and we never went out after the school year ended.

This was the first year I had a car on campus, and it was finally a car that I liked... it was a blue-and-white 1956 Pontiac with a 317 cu. in. V8 engine. My friend from high school, and sophomore year roommate at MSU, Jim Ballard, had carved a miniature wooden whiskey bottle with a Jack Daniels label as the shift knob for the car, and I thought that was very cool. I had this car for four years, and as an RA, gained parking privileges at the dorm, so it was really nice to have for dates. I kept it until it was totaled by an MSU snowplow in 1967, while twelve RA's and I watched through my grad advisor apartment window, wildly waving at the snowplow driver not to plow that big snowdrift that contained my car. He didn’t see us, and set the blade about two feet above the ground and went in to take the top off the drift. He ran into the trunk of the Pontiac, taking out the taillights and denting it pretty well, then scurried off. I had twelve witnesses and MSU gave me no trouble in paying for the damage... I think they gave me $300 and let me keep the salvage. I soon junked it and bought an old VW Beetle to replace it.

Having a car on campus made dating a lot more convenient and enjoyable, since without a car, there was really no place to go that offered any privacy—a hotel room didn’t even seem like a possible consideration. But the campus had lots of places where it was safe to go and “park.” The MSU cops were pretty nice to the students—they'd see steamed-up windows and take their time in approaching the car, asking us to “move along.” They were more interested in stopping drinking and driving than in interfering with whatever else you might be engaged in.

During my junior year, I dated Marna Carver, who lived in West Wilson Hall. She was smart and pretty, and a little geeky—in other words, perfect. She was in the chorus of MSU Theater Department’s production of West Side Story, and I remember fondly going to rehearsals to see her, although I can’t remember for the life of me whether she was a Shark girl or a Jet girl. I went home with her at Thanksgiving and that was a real experience—her father was the commanding officer of Naval Air Station Atlanta, and I was a bearded college student opposed to the war in Vietnam. So I don’t think I
was his ideal pick as a boyfriend for his daughter. But he was nice to me, arranging for me to fly a full-fledged multi-engine jet flight simulator on the base. For someone like me, interested in flying my whole life, it was a memorable experience. I did manage to get lined up with the runway alright, but had no idea how to manage the power, and ended up crashing. But what a fun time! Marna and I liked each other, but I don’t think either of us thought the relationship was going to get serious, and we stopped seeing each other when she went home for the summer.

I had joined the campus organization sponsored by the Unitarian Universalist Church, called the Channing-Murray Fellowship, eventually becoming president during my senior year. I coordinated the group’s activities, including Sunday evening meetings, with Tom Greer, a member of the church in Lansing and a former UU minister himself. He was very helpful, and we scheduled outside speakers and internal discussions on many topics. It was, of course, also a place where men and women of like minds met, and I ended up dating a few of the women I met there, including especially a fellow senior named Ann Kerry. She was an East Lansing native, pretty, and very smart. We dated for a while, and I liked her a lot, but she dumped me when she got involved with someone older.

That’s when I started dating Denise Dyktor, who eventually became my first wife. I had been a “summer RA” after my sophomore and junior years, for the orientation program at MSU, which brought almost all incoming freshmen to MSU to learn about the campus, register for classes, live for a week in a dorm, etc. I had met her when welcoming new students to Wilson Hall, during the last orientation just before the quarter started, especially for students from faraway places who couldn’t make the trip to MSU twice. She was arriving at MSU from the American School in Japan, where she had gone to high school. That was exotic enough for me, and I liked her immediately, but I was “otherwise involved” at that time. We were friends during her first two years, then dated from late in my senior year onwards.

Denise’s father was an executive with the nuclear power plant division of Westinghouse, and had been stationed in Japan for several years. Denise’s younger sister, Colette, came to MSU a year after Denise, and she dated my fellow Wilson Hall RA, John Lynn. The four of us got along really well, and John and Colette eventually married, too. In my first year of grad school, I was a Graduate Advisor in Hubbard Hall, MSU’s new twelve-story skyscraper dorm. Denise and I were a regular item, and it was very comfortable. I got to meet the rest of her family—sister Toni, father Gus, and mother Jackie. Jackie was a piece of work, and I did my best to limit my interactions with her, but Gus was a very interesting and very nice guy, although pretty quiet. Toni seemed to be more like Denise in disposition, with Colette being by far the most even-tempered and level-headed.

During the second year of my M.S. program, I moved to Fowlerville,
sharing an apartment (part of a former funeral home), with my good friend Dick Smith. We departed in opposite directions each morning—he to teach sociology at Oakland Community College in Farmington Hills, and I to finish my M.S. at MSU. We had great weekends in that apartment, usually with Denise and I playing euchre or some other game against Dick and whoever he was then dating. I especially liked his girlfriend Susan, who was smart and funny. We’d all go “downtown” to the Bloated Goat Saloon for dinner sometimes, but often ate mac and cheese or hamburger casserole or something else simple at home. We kept scores for euchre, cribbage, and tennis posted on the refrigerator, frequently rubbing in our bragging rights about any of those pastimes. Dick came home to Winston-Salem with me several times, and was best man at my wedding, so saw a lot of my family—in particular, my sister Julie. They started dating and were eventually married near Winston-Salem, in Tanglewood Park. The ceremony was presided over by my father, who became a minister in the Universal Life Church especially for the occasion. Denise and I really enjoyed spending time with Julie and Dick, but neither of our relationships was destined to last. It turned out that “brother-in-law-hood” was thicker than marriage in both cases, so Smith and I never had to part ways.

After our wedding in August, 1968, Denise and I moved into the Head Advisor’s apartment in East Seeley Hall at the University of Michigan, where I was just starting my Ph.D. program. It was a women’s apartment-style dorm. We were hired as a couple because of my residence hall work experience. We did that for one year, including one terrifying night when one of our students didn’t show up at home. Her roommate told us, and we checked with police and her parents. It was when John Norman Collins, a serial killer in the Ann Arbor/Ypsilanti area, was still unidentified and at large, so women feared for their lives. We spent the night with the girl’s parents, who came in from Detroit, and when she showed up later the next morning to get ready for class, her parents were too glad to see her to be very mad. She’d had a fight with her boyfriend, then stayed out all night, neglecting to tell anyone. I’ll bet she never did that again!

I finished my M.S. program in Systems Science at MSU in 1968, having been a Philosophy M.S. student for the first year and a half. My training was really more in the field of computer science, but since that hadn’t been around as a department or major when I started school, my majors were always something else.

In my second year at UM, we moved to an apartment complex near North Campus, and it was an easier year, since I had by then passed my qualifying exam in the Department of Computer and Communication Sciences. I had been invited by John Holland to join his Logic of Computers Group, and did so immediately. That was for me a real turning point, introducing me to the brand new and as yet unnamed field of genetic algorithms or evolutionary
Denise and I lived in Ann Arbor for three years, while I was working on my Ph.D. However, we left Ann Arbor before I had finished, when my former boss, Herman Koenig, from Electrical Engineering and Systems Science at MSU, told me that he had just gotten a huge NSF grant to apply systems science to the field of ecology. It was a RANN (Research Applied to National Needs) grant that could support many systems science grad students to work with ecology grad students, and the co-PI was Bill Cooper, a fairly young ecologist in the Department of Zoology. Herman said he needed me to come back to MSU as soon as I could, to develop and teach a course in systems science for biologists. He promised he’d give me enough spare time to be able to complete my dissertation at UM. He started me as an instructor, with appointment as an assistant professor in the tenure track to follow as soon as I finished my Ph.D. So I accepted his offer, and Denise and I moved back to East Lansing in the fall of 1971. Herman was true to his word, and assigned me nothing in that first quarter other than to prepare that class for winter quarter. Very luckily for me, the College of Engineering had a twin to the IBM 1800 computer on which I was running my genetic algorithm at Michigan, so I was able to transfer my run to continue at MSU. That run took most of a year of CPU time to evolve a good solution, but by late in fall quarter, I had the results I needed and completed my dissertation, defending it in January, 1972.

Denise and I bought a house a half-block from campus, on Kedzie Street, where we lived until our divorce four years later. We got a dog whom we named Siggy, short for Sigmund Freud, because he had a whitish beard under his chin, although he was predominantly black and curly. He was maybe 20 pounds, and a very smart and affectionate guy.

One of the projects in the house that I remember the best was the picket fence I built in the front yard, with the help of my brother, Greg, who had just come to MSU as a freshman. The yard was not perfectly level, but the top of that fence certainly was! We measured and cut to length each individual picket, so it would fit the terrain on the bottom but be level on the top. We painted it white, and I thought it added a lot to an otherwise old-looking house. We had some very nice neighbors, Gary and Margaret Crawley, Australians with two daughters. Gary was a professor of high-energy physics, so MSU was a great place for him, with Hank Blosser and his superconducting magnets enabling Blosser to design and build the best cyclotrons in the country. Some of our other neighbors were students, but behind us on Orchard Street lived our friends the Gallaghers. Ken was a prof in Vet Med and specialized in horses—race horses, in fact. Carol was the manager of College Travel, so I always had the best possible assistance with any travel planning. We very much enjoyed spending time with these folks.

I liked my work—both teaching and research—a lot, and was very invested in our NSF grant team. Bob Boling, a
brilliant engineer and Vietnam vet who I think continued to suffer from some form of PTSD, was a good friend, as were biologists Bill Cooper, Don Hall, and Pat Helma.

Denise spent a lot of her time weaving, spinning, and the like. Our dining room contained a big hand loom. She was a graduate of MSU’s Human Environment and Design program, and made some beautiful things. Through her, I got to know some of the Human Ecology faculty, one of whom was Jon Vredevoogd, who did a lot of CAD work in interior design. I actually collaborated with him a little on computer-aided design stuff.

But I think Denise was bored, at least during the week, given that I was so busy with work. Our weekends were often great, though, as we drove to Ann Arbor almost every weekend to hear the RFD Boys, our adopted bluegrass band. As I mentioned elsewhere, Denise had discovered them during my second year of grad school, and we had been regulars at their gigs ever since, while I also learned to play bluegrass banjo. About the only thing that kept us away from weekends in Ann Arbor for the rest of our marriage was if my own band, the Bluegrass Extension Service, had a weekend gig.

Denise and I had ups and downs, but eventually, more downs than ups, and I eventually gave up on the relationship and filed for a divorce. She kept the house and half the savings, and also Siggy, but I started feeling much better very quickly. That was quickly followed by a sense of loneliness and feeling thrown back to my earlier years, with no idea how to meet people and desperate for company. Denise and I had been regulars at the Beggar’s Banquet bar and restaurant, eating several meals a week there and hanging out with friends. I had ceded that place to her as her territory after the divorce, so it was closed off to me. I moved to an apartment in Ville Montee, on Abbott Road in East Lansing, and bought a fish tank for some company... that’s pretty desperate, no? I really didn’t like eating meals alone, and eventually found ways to meet people other than sitting in a bar.

But, come to think of it, I did spend a fair amount of time at the Alley Ey bar or in its upstairs incarnation, the America’s Cup. My brother Greg had become first a bouncer then a night manager at the Alley Ey (named for the Eyde family, prominent developers in East Lansing). That job, surprisingly, led to the remainder of his career. He helped the management deal with the employees when a group tried to unionize the staff, and the consulting company that had been brought in to help was so impressed with his skills that they hired him to join their union aversion consultancy. This is somewhat ironic, as at about the same time, our sister Julie and her husband Ebony were very active in the union at the Zug Island steel mill on the Detroit River. I guess they just cancelled each other out, but Greg had to deal with a fair level of antipathy toward his work when we went home to Winston-Salem, as everyone else in the house was more pro-union. I never let that interfere with my relationship with Greg, as I saw him as ethical and having the best of intentions, but just
having had a different set of life experiences than the rest of his sibs. We continue to love each other and enjoy very much spending time together, to this day. And as far as unions go, I don’t favor them for faculty at MSU or other similar research-intensive universities. I think that the threat of unionization is often a more useful tool than an operational union, in gaining benefits and fair treatment for workers. But, of course, you have to have some actual union shops to make that threat real, and their role in some industries has historically been extremely important.

During the first couple of years after my divorce, I dated a few women, but the most significant was someone I met at the MSU Folksong Society, Karrie Potter. She had a lovely singing voice, and I enjoyed spending time with her, but there was something missing, so eventually we stopped dating. I then began dating a woman I met at the RFD Boys gigs, Suzanne Dice. She, too, loved bluegrass and folk music, and was quite a free spirit, in keeping with the 70’s. I felt another tie because she was the granddaughter of the late Lee Dice, who had been a prominent geneticist at the University of Michigan. So she also had genetics in her veins, in addition to in her DNA. She was much younger than I, but for a while, I was quite taken with her and thought maybe something could work out. She wrote me some very touching love poems—I’ve got to admit, that was something I had never expected, never seen before, and have never seen since. But, in the end, I think the age difference was too great (her 23 or so to my 34 or so). She was more adventurous than I would have been able to handle, I guess. Anyway, it was she who broke it off.

By that time, I was playing in the RFD Boys band (as well as in the Bluegrass Extension Service). One might well wonder how I did that while trying to get tenure at MSU, to learn to fly a plane, and to find a significant other, and the answer is that I was very busy. But the RFD Boys banjo player, Jim Spencer, and his wife, Cathy, fixed me up with a blind date—a friend of Cathy’s who was also unattached at the time. Her name was Cheryl Barris, and I found her to be unbelievably cute and fun to be with. Jim and Cathy had us for dinner at their house, then we all went to the RFD Boys gig, and during set breaks, Cheryl and I had a great time. I guess she thought a bluegrass-playing engineering prof was pretty strange, but we quickly warmed to each other anyway. In fact, we invited Jim and Cathy out for our 24-hour anniversary, to thank them for introducing us. Cheryl had been casually dating some guys I regarded as losers, one of whom was an older, divorcing prof at UM. After we’d been dating a few weeks, I asked her to break off any other relationships, and she did. Not very much later, she moved in with me at Ville Montee in East Lansing, in a memorable moving day. The moving van suffered numerous delays, and didn’t get to her apartment in Flint until late in the evening. We unloaded her stuff in East Lansing about 2am. After that, she said she was NEVER moving out! Happily, she never had to.
Cheryl Goodman, My Wife of Forty Years!

When I met Cheryl, she was living in Flint and employed to write the planning grant for the first HMO to be established in Flint, and one of the early ones in the country. She had just completed her MPH in health administration at Michigan, and had only been on the job for a few months when we met. She was not meeting a lot of eligible bachelors among the “Flintstones,” as she called them, so was happy to move in with me in East Lansing, even though it meant a 45-minute commute to Flint almost every day. But she did a great job on the grant, and the funding to establish the HMO was granted. However, rather than continue with that project, she opted to begin a Master’s of Social Work program at MSU.

Cheryl and I not only fell in love, but we really liked each other, too, and treated each other well. In the beginning, we had to learn how to fight without leaving emotional scars, but that actually came along pretty quickly, and hasn’t been a problem for almost all of our relationship. When either of us is having a rough time, we know absolutely that we can count on the other to support us in whatever ways we need and they can.

We both felt lucky to have found each other, and both of us were eager to have the “meet the in-laws” events. I was very happy with how well Cheryl got along with my folks when we visited them in Winston-Salem, and they were clearly happy to see me in a much healthier relationship than my first one had been.

I liked Cheryl’s Dad, who even started to teach me to fish at their cottage on a lake north of Howell. Cheryl’s Mom wasn’t easy, and I felt bad for Cheryl that her Mom hadn’t treated her better. But recognizing the level of emotional rejection Cheryl had had to deal with as a child helped me a lot to understand when she reacted defensively—that was a skill she had had to develop in order to survive. Happily, Cheryl has gotten past a lot of the emotional baggage that she was carrying, and we are able to talk very freely about things that cause her concern, because she can see them for what they are and react appropriately.

I have learned an enormous amount about people from Cheryl, and I credit her a great deal for my ability to work with people and help them to resolve interpersonal problems that arise. I am a very different person today than I was before we met. In my early years, I was very much a conflict avoider, as I had learned to be from my Mom, who had had to minimize conflict in order not to set off my Dad, who, as much as I loved and admired him, had a temper that I also feared. So Cheryl taught me a lot about dealing with people, and even more about myself, for which I have always been grateful. I feel lucky to have had both my Mom and my wife as my civilizers.

We got married in August of 1978, after we had been a couple for about 18 months. We pretty much planned the ceremony ourselves. We chose to have the ceremony in MSU’s Alumni Chapel, and had a classical guitarist do
the music for the ceremony. He was already way too good for us to be able to afford, but he was from Williamston and knew our Williamston High School teacher friend Paul Nilsson, so it worked out. We had the reception at the University Club, and for dinner, had Chuck MacCluer playing jazz bass to Jim Bateman’s jazz piano. That was wonderful. Then, for the dance portion, we had the Bluegrass Extension Service, with Paul Nilsson standing in for me on guitar and singing. First they played our traditional dance music repertoire—two-steps and waltzes, and then called a Virginia Reel and a square dance. The band always gave lots of instruction on these dances, dry running the whole dances before starting to play. We had done many wedding receptions by that time, so it was no stretch, and everyone had a good time. I got up and did a couple of numbers with the band, but otherwise was just the happy groom.

We honeymooned in London, attending lots of theater in the West End, which we both loved, and seeing all the traditional sights. Strangely enough, Anne Hudzik, who was our friend and travel agent, also met us in London during our honeymoon, which we thought was a lot of fun. Anne was Carol Gallagher’s successor as manager of College Travel, so our great assistance with travel continued. Anne was the Australian-born wife of John Hudzik, another RA friend who had been in Akers Hall with Smith and Litwin. John later became Dean of International Studies and Programs at MSU. It’s amazing, with as large as the MSU community is, how many connections still happen if you hang around long enough!

After she finished her MSW, Cheryl began working as a hospital social worker in Sparrow Hospital. It was hard work, and led many social workers to burn out, but she was working with some professionals who never did—particularly Margarita Sanchez and Steve Anderson. So when she was frustrated, she had friends she could vent with, and she stayed at it for several years.

I have to admit that I have always been pretty fond of cafeteria food... meat, potatoes and gravy... you know the stuff! As a result, I would sometimes meet Cheryl at the end of her workday and we’d eat dinner together in the basement at the Sparrow cafeteria. I’ve never forgotten the nickname given to her by Steve Anderson: Grace. One day, Cheryl dropped something, then muttered to herself, “Oh, grace!” Steve overheard it and stuck her with that nickname. She would sometimes get pages over the Sparrow PA, like, “Grace Goodman, 624.” I always got a kick out of that!

I think Cheryl’s next job was at the state’s Office of Services to the Aging, and she found that bureaucracy to be quite trying, too. But she still occasionally runs into people she worked with at the state. She then went through what I called her “guest disease of the month” period, where she often traveled the state speaking to physician groups (CME, I suppose—Continuing Medical Education) about diseases like hemochromatosis, osteoporosis, breast and cervical cancer screening, and pushing
smoking cessation, on behalf of either state agencies like the Michigan Department of Community Health or MSU’s Genetics Clinic. At one time, she was the coordinator of the alpha fetoprotein (AFP) screening program at MSU. I found it funny and wonderful, given my Dad’s profession, that Cheryl was working for my Dad’s successor in Human Genetics at MSU, Jim Higgins, and my work also involved modeling of genetics and evolution. He got a kick out of that, too! Apples and trees, and all that. But it sure wasn’t a straight road that led us there!

When we went on sabbatical to China in 1993, Cheryl was on leave from the Michigan Department of Community Health, and she gave several lectures for physicians at hospitals in Beijing about smoking and cancer. In those days, the conditions in those hospitals were not what they are today... they had leaking roofs, spittoons in the halls, dirt floors in some buildings, and families had to feed the patients if they wanted them to eat. The published statistics said that 70% of the doctors still smoked.

But Cheryl didn’t confine herself to her “day job.” Sometime in the mid-80’s, she took the Dale Carnegie course in Human Relations. She loved the material and soon became a Dale Carnegie instructor. She was so good at hearing the messages behind what her students were saying in their 2-minute talks that she frequently astonished them, during the “comments” she made after each talk. I sat in on some of her classes, and she astonished me, too. I had listened to the same talks, but got none of the same messages from them! So I eventually agreed to enroll in the full Dale Carnegie course, with Cheryl’s Carnegie mentor, Mary Wahl, as the instructor, and was very glad I did. I had thought of it as many others did, as a course for people who were afraid to stand up and talk to a group, and I certainly didn’t have that problem. But it turns out to be much more a course about learning how to listen to other people, empathize with them, and recognize how much you have in common with them, however different their circumstances of life may be from your own. I liked the course a lot, and although I couldn’t help acting out a little (once jumping up on a table during a talk, to make a point), I learned a lot. Cheryl was such a good instructor that she was eventually invited to join the “real” Dale Carnegie organization—the people who SELL the course, not teach it. The teachers are paid very little, because it’s fun to teach and there are lots of people who like to do it. But the real money comes in selling the course, mostly to companies as a way to train their employees to work better with customers and each other. One of Cheryl’s clients ended up being the MSU Department of Public Safety (“the cops”). She had all of the officers in the department (I think sergeants and above) in her classes over a year or two, and although many of them started off VERY reluctant to be there, I think most came away much better for the experience, and liking Cheryl a lot! And Cheryl sure enjoyed teaching them. But she soon tired of the sales side, and went back to jobs building on her MPH/MSW training.
Cheryl took a break from social work/public health jobs when our son David was born, in April, 1990. We had started our marriage not necessarily planning to have kids (after all, I was already 34 years old), but eventually, decided we didn’t want to miss out on that, and even more eventually, we had David, when Cheryl was 39 and I was 46. While there are disadvantages to being an older parent (“What’s your grandson’s name?”), the advantages were quite evident to us, too. I had a lot more patience at 46 than I would have had at 26, and Cheryl’s and my relationship was much stronger, which makes the stresses imposed by a kid a lot easier to take.

David’s early years were wonderful for us, as I’ll describe elsewhere. He was a very active kid, crawling, then walking, then running everywhere. We had a great time with him during my six-month sabbatical in Beijing, where he went to a Chinese preschool. His kindergarten was at the nearby Glencairn School, and having him go off to school was really hard for Cheryl, but she managed to power her way through it and come out much stronger for it.

During David’s high school years, Cheryl took a very full-time job, as Interim Director of Student Success at Lansing Community College. During her 18-month tenure, she was responsible for all of the counselors and other support services at the college. The job was made difficult by several things: the president and the dean were both in flux, and the college was chaotic. The counselors had been hired as faculty members, and members of the faculty union, yet did no teaching. Contractually, they worked only 170 days per year, and some of them were essentially “retired in place,” seeing very few students and not being very helpful when they did. This made for a very tough group for Cheryl to manage, but she managed to find ways to work with everyone, while moving the department ahead.

Her career took an interesting turn later, around 2006, when she decided to form a training company with our longtime friend, Ann Andrews, the wife of my ex-fiddle player and very old friend, Chuck MacCluer. Ann had gone to law school at Michigan after resigning as Sparrow Hospital’s head of HR, and had gone to work for Honigman, Miller, Schwartz and Cohn, a major law firm in Lansing. After a very successful career there, making partner quickly, she decided she wanted to do other things. She and Cheryl decided that with Ann’s entrée into the legal profession and Cheryl’s experience with Carnegie and other training, they could help young attorneys sharpen their human relations skills and become better “rainmakers.” (For those of you not familiar with the terminology, a rainmaker is a member of a law firm who goes out and brings in the business, thus becoming the most valuable person in the firm. Winning at trial, writing briefs, picking jurors, etc., are all important, but a firm can’t do any of those if it doesn’t first get the business.) So they decided to form a company, and I helped them come up with the name “Redstone Results,” using the same expert advice that had helped us earlier rename Applied Computational Design Associates to
Red Cedar Technology. We all thought it was a fine name, and filed the articles of incorporation, trademark, and all that jazz. Business cards, computers, an office in downtown Lansing near the Capitol, … what more could you need? Well, the answer turned out to be “customers.” They booked a couple of trainings, and people liked them, and they even did one DISC training (for free, for practice) for my Senior Capstone Design Class at MSU. But they soon ran through their prospect lists, and it just never took off. So they closed up shop, reluctantly, about a year after they got started. That was tough on both Ann and Cheryl, but they once again powered through it and are good friends today. Ann subsequently took a job with a company handling Medicare reimbursements, and liked that a lot. She also let her entrepreneurial spirits soar and founded a doggie daycare, Annabelle’s, in downtown Lansing. There, people can drop off their pets for the day, visit them at lunchtime, get them groomed, etc. That business is going much better than did Redstone Results!

After that, Cheryl became much more interested in exploring her spiritual side, in a series of involvements that have all led her in a shared direction. When David was fourteen, we became involved in the Unitarian Universalist Church of Greater Lansing, the same church where, as a child, I had been in Sunday School and a good friend of the minister’s son. In fact, I was the kid burning the church’s mortgage in a picture in the Lansing State Journal when I was about 12 years old. Cheryl began co-leading what are called “co covenant groups,” groups of maybe five or ten people who met weekly to talk with each other, subject to covenants on acceptance of the views of others and on confidentiality of what was said. She is a natural for that sort of thing, and did a lot of it for a while. But she has found that while she very much admires the openness and lack of dogma of the UU philosophy, many of the UU’s do not share her feelings of spirituality, so she has also sought other outlets (many of them) for those feelings.

One of the first of these was involvement in a group called Sage-ing International, which is based on the teachings of Rabbi Zalman Schachter-Shalomi, as put forth in his book “From Age-ing to Sage-ing.” She took, then taught, sage-ing courses in the Lansing area for several years, and became active in the international group, assuming one of the top offices in the organization. She also branched out and for several years taught courses in MSU’s Evening College in “Legacy Writing,” helping people learn to capture their lives for the sake of passing on their life lessons to their loved ones. (No, I didn’t take that course… this writing was my idea.)

But other ideas caught her attention, and she soon began to take training in Spiritual Direction, to prepare her to do one-on-one work with people seeking to deepen their sense of spirituality. You need to picture this nice Jewish girl in a class being taught by Catholic nuns! They were very welcoming of Cheryl’s involvement, and tolerant of her lack of knowledge of the concepts and stories that formed the religious background of
most of the other students. Cheryl had outstanding listening skills and a lot of training in a multitude of schools of psychology. Her understanding of human behavior had given her amazingly strong skills for Spiritual Direction. She tells me that she has developed excellent relationships with her (anonymous to me) several spiritual directees, and I certainly believe her. She completed a two-year training program to become a Spiritual Director, and also sees her own spiritual director, in part for professional supervision regarding her direction of her clients.

More recently, she has gotten involved in Lansing’s Fellowship for Today. She has enrolled in their three-year ministerial training program, and has completed two years. Cheryl has had to study hard, and has learned a lot about both Christianity and the world’s other major religions. Her recent presentation to the class was about Sikhism, about which I also enjoyed learning as she prepared for her talk. We visited a Sikh temple with my friend from Red Cedar, Ranny Sidhu, and had a lot of questions answered. Cheryl is not certain what she will do with credentials as a minister, as she does not plan to take on a congregation, but the training has been something that has complemented well her other work on spirituality, and given her a lot of understanding of a large number of religious traditions from which her potential spiritual directees might emerge.

Even more recently, Cheryl has become involved in the Network for Spiritual Progressives. As usual, she is not a passive participant, but has jumped right in, helping in 2018 to organize and sponsor a three-day training program by one of the movement’s national leaders. She is currently pondering whether or not to accept a local leadership role she is being urged to assume, but is not sure she wants, given her other responsibilities. She now considers herself “retired,” but may be busier than ever!

Starting about six years ago, Cheryl took the training program offered by the City of East Lansing for people interested in volunteering for appointment to the city’s commissions, councils, boards, etc. She was appointed to the Board of Directors of ALFA, Active Living for Adults, later renamed LAP, Lansing Area Parents, an organization providing respite care. It was recently renamed again, becoming Helping Hands Respite Care, which describes its mission much more accurately. That organization provides places and supervision where families with dependents needing constant care (children with various disabilities, parents with Alzheimer’s, etc.) can bring them for a time, to have time to get other tasks accomplished, or just to get a break. That organization has had a difficult time in recent years, seeing declining funding from the city, declining tax incentives to reward private contributors, and a generally more hostile environment for NGO’s (non-governmental not-for-profit organizations). The Board has changed executive directors and bookkeepers, and dealt with extreme financial hardships. It is a stressful situation, and Board members are
now even being called on to voluntarily staff the phones in the office for a time, while awaiting appointment of a new executive director and admin.

**Our Son, David**

David was born at 12:15am on April 11, 1990, after Cheryl had been in labor for about twelve hours with little progress. Finally, our OB, Dr. Oliver Beamon, said it was safer to do a C-section than to risk David’s getting into trouble with continued labor. We agreed, and because he knew I was a science geek, Dr. Beamon let me come into the OR to watch the surgery. I did not pass out, but I certainly was frightened when I saw how much Cheryl bled during the surgery. I guess that was pretty normal, but it was sure scary seeing her get cut open. David emerged with good Apgar scores and Cheryl eventually stopped shivering—the anaesthetic had made her shiver uncontrollably, but once she was sewn back up, covered with blankets, and the anaesthetic wore off, she stopped shivering.

They let me take David as soon as Cheryl had had a chance to hold him, and I walked the halls of the OB ward singing Bobby Shaftoe softly to him—it’s a lullaby my Mom had sung to us kids—for what seemed a very long time. Eventually, we all got some rest, and didn’t start worrying about feeding him until the next morning. Cheryl wanted to breast feed him, but that took a while to get going. While initially the nurses were concerned that David wasn’t getting enough milk, a few days later, when we took David in for a checkup, the doc told us we’d better cut back on the feeding or he would become a blimp! Despite the difficulties, this was a wonderful time for us, and my folks were there to help dispel our worries about every burp or cry—we had a lot of confidence in Mom’s advice. David was in the high percentiles for lots of measures, and soon started smiling and cooing... we were beside ourselves!

It was around the six-month mark that my friend, the late Nikolay Smirnov, was at our house and saw David sitting up in his carrier on the dining room table. Nikolay approached him, and David smiled at him. Nikolay exclaimed, “Look, American baby.” Cheryl responded, “All babies smile.” Said Nikolay, “Not Russian babies.” Evidently smiling is learned behavior from the parents, and if they don’t smile at the baby, the baby doesn’t learn to smile until much later. Isn’t that sad? But I know that smiling is much less common in Russia... if you walk down the street there smiling at people who pass, they think you are mentally ill. Smiling in private, smiling at a friend, those are fine, but smiling at a stranger just isn’t done. Too bad, no?

David was a very sociable kid, from his earliest days at the Spartan Preschool. He didn’t suffer much separation anxiety... not nearly as much as we did! At home, although David had no brothers and sisters, our next-door neighbors, Frank and Monica McAlpine, had two boys, Michael and James, a little older than David, and later, another one younger, Chris. There were three more boys across the street at the Dunn's house, including Danny, who was David’s age.
And just a block away were the Simmons twins, Stevie and Tommy. So David had kids to play with all the time, even before he went to preschool. We also had a standard poodle named Cargo—short for Escargot, which we continue to eat each year on our wedding anniversary in honor of our first (canine) child. Cargo understood that David was just a puppy, so allowed himself to be pulled on and run into without retribution.

David’s “terrible two’s” were as advertised—he was one strong-willed guy, and I don’t think it helped that he was an only child and we hovered over him perhaps more than needed. One interesting aspect of his language that we found cute and completely unexplained was that he would say “aye” as an affirmative, sounding for all the world like a sailor. But we knew it meant “yes,” so it was just fun. By the time David was three-and-a-half and we had moved to China, he was quite rational, could express himself well, and really adapted quickly to the new environment. We had taken to China with us about a dozen of his favorite movies on VHS tapes (Mary Poppins, Thomas the Tank Engine, Chitty Chitty Bang Bang, Willie Wonka and the Chocolate Factory, The Sound of Music, etc.), and a huge set of wooden Thomas the Tank Engine tracks, engines, and cars that David loved to assemble into different layouts. Okay, I admit it—I liked doing that, too. Another fringe benefit of living in China was that kids’ plastic and mechanical toys were already all made there, and were dirt cheap, so he and I both had fun with them.

At Beijing University of Aeronautics and Astronautics (Bei Hang), we rented two married student apartments across the hall from each other—that is, we rented one for sleeping, cooking, bathing, etc., and the second as TV room, playroom, and evening office space for me. My office was in the modern building right next door, the “Yifu Guan,” named for its donor. I had an office with a Sun workstation and had brought a laptop PC with me, so could work in both Windows and Unix. In the beginning, I went back to my office after we tucked David in bed in the evening, but soon learned that the woman who was tasked with locking up the building at night couldn’t go to bed until I came home, so I gave up that practice and brought my PC home with me each day. Once we had enrolled David in the pre-school at Bei Hang, our day would start with breakfast, then taking David a few blocks to school on the back of my bicycle, then a stop at the “White Market” on campus for the day’s groceries, then a stop at the corner with the “egg lady,” then home. Then I’d go next door to my office and Cheryl would work on her lectures for the doctors or get together with other expats, or do whatever else she needed to do. I would come home for lunch and a xiuxi (midday nap—a Chinese siesta), then head back to the office. Cheryl would pick David up and make supper.

David did well at the pre-school, although none of the teachers spoke English. But he could see what the other kids were doing and copy that. He won first prize for his flower finger-painting... actually, thumb-painting. But he didn’t complain much
about the pre-school, and toward the end of the six months, was understanding the teachers pretty well.

David made friends with the children of some of the other student families living in our building. We had Pakistanis (from the Pakistani Air Force) with two boys living upstairs. Bangladeshi couples (said to be from “a company in Bangladesh”—that “company” no doubt actually being the Bangladesh Air Force, but kept quiet for some reason) also lived in the building. On Sunday mornings, when there was no school, David would make the rounds of his friends to see who was having the best breakfast, and then eat there. The kids were in and out of all of our apartments all the time—it was great. The Pakistanis and Bangladeshis were amused when David would kneel on a prayer rug when they were praying, although he didn’t know the prayers, of course. We learned that David was a pretty adaptable guy, able to win friends in any situation.

Somewhere in his second year, David had contracted RSV (respiratory syncytial virus), and that had led pretty quickly to a diagnosis of asthma, as often happens. We were worried about getting good medical care for him when we were in Beijing, where the air pollution was already pretty bad, especially when people were burning coal in the winter. But we found a very good Western medical clinic downtown, and visited that whenever he got a cold, which inevitably went bacterial and required antibiotics to get rid of.

Our next-door neighbors were Maksim and Inna Torgalo, a couple from St. Petersburg (Russia), who quickly adopted David as if their own son. Maksim would delight David with magic tricks (“fokus-pokus”) after dinner, which we often ate together. David especially looked forward to Sunday nights, when we usually took a break from Chinese food—Maksim and I would ride our bikes to a Pizza Hut about a mile away and bring home a pizza—usually a “Royal Feast.” David would just say, “Mmmmmm...” whenever we had pizza, and it probably addicted him to it for life!

When we came home from China shortly before David’s fourth birthday, David was just starting to understand some Chinese and to speak a few words. We thought it would be great if he could participate in the Chinese Language program put on by the (graduate student) parents of young Mainland Chinese kids, so he could solidify what he knew and maybe grow up bilingual. The kids got together every Saturday or Sunday for a couple of hours, learning songs, words, games, etc. After suffering through it for a few weeks, David told us that he wouldn’t go any more, because he wasn’t Chinese, didn’t want to speak Chinese, and (I don’t remember what else). But as a strong-willed kid, he had made up his mind, and that wasn’t something we could really force him to do, so we gave up. Of course he and we now all wish he had been willing to keep going, but that just wasn’t to be.

David was really a fun kid for us, because he got involved in lots of stuff. He started playing soccer and T-ball
very early, and I got involved as an assistant coach, which guaranteed that I got to all of his games and most of his practices, too. Since I had never played soccer, I knew very little about the game, so when David got to fourth or fifth grade, I couldn't really coach, so just became a spectator except during the indoor season in the winter, when our neighbor, Frank McAlpine, let me be his assistant coach. Similarly, although I started played catch with David from as soon as he could throw a baseball, and we were able to do that for a lot longer, I couldn't coach beyond his early T-ball years, but still made it to almost all of his games. It was great fun for Cheryl and me to get to know all the parents of his teammates, most of whom also lived in the Glencairn School area. David started playing basketball, too, in about the third grade, and gave up baseball pretty soon thereafter, never playing on a school baseball team. He kept playing basketball through middle school, but it was clear that soccer was his first love, and that's where he excelled. I think it was in the fourth grade that David first competed in inter-school sports, and at the city track and field meet, he won the hundred-yard dash "going away," two years in a row—the fastest kid in the city! It was funny—some kids accused him of having an unfair advantage because he had asthma!

His asthma was indeed a factor in his soccer playing, both indoor and out. If he had to do a long series of runs, he'd start wheezing and have to come out for a rest. Happily, at this level, substitutions were free, so he could come in and out as needed. He played mostly defense, where his speed saved a lot of goals, and sometimes midfield, but that was hard because it involved going back and forth almost constantly, which gave him breathing problems. But he was a good enough player that he was on the area-wide "Capital Area Soccer League” team, and in high school, started in his last two years and was a co-captain his senior year. What this meant for Cheryl and me was that we spent a lot of evenings and weekends driving all over the state, and absolutely loving it!

That was the fun part. Let's see, was there anything else? Oh, yeah... the school part. That wasn't any problem at all at Glencairn Elementary School. David was well liked, although mouthy (gee, I wonder where he got that?), and both the kids and teachers liked him. We had some of the usual arguments about whether or not he felt well enough to go to school, but it really wasn't bad. And then came middle school. Apparently, someone threw a switch that made David dislike school, fail to do or inform us about homework, and cause one teacher to tell us that David was basically no good. Wow, that was a nasty response, and although we didn't believe it for a second, we certainly reacted. Fearing that he had somehow been allowed to fall behind without having been given bad grades in elementary school, and now simply couldn't keep up in middle school, we took him to a highly recommended counseling psychologist for testing and counseling. Well, David didn't initially open up much, but it eventually became clear that he was convinced that this middle school stuff just didn't matter, and he'd do better when and if it did start to matter. We
weren’t too thrilled with that, but then his scores came back and we learned that he was reading at the twelfth grade level, so we decided we could back off a notch.

Going into high school, we decided that positive motivation might work where constant hovering had not, and we set up an incentive plan. Starting in ninth grade, we would put into a savings account $100 for each A he got, and $50 for each B. The funds were to become available to him to buy a car as soon as he turned 16. Well, that certainly worked! He made nearly straight A’s between then and his sixteenth birthday. We went used car shopping, and at the Toyota dealer, talked with a salesman who didn’t have anything that interested David on the lot, but as we were leaving, mentioned that he was looking to sell a car of his own, a 1998 Lexus ES300. It was the classic gold-colored Lexus, and loaded. He offered us a price that was below the Blue Book, and David jumped at it. It wasn’t a sports car, but it was one fine ride! He drove it all through high school and college, and later, I drove it until he traded it in on a BMW 325ci. I drove the Beemer when David didn’t need a car during his first year in Chicago, which was great fun for me—it was easily the most fun car I had ever had. Sadly, when someone rear-ended me and totaled the BMW, I, and later, David, had to go back to driving the Lexus until he bought himself a Ford Fusion and I bought the new hybrid version of the Lexus, the ES300H.

As soon as the Lexus had been bought, the grades went out the window... and the car supported some activities we weren’t too keen on, like more alcohol and more dope. We had known he used both, but he had not gotten into serious legal trouble in high school, so we had never taken the car away for more than a couple of weeks. David did well enough in his late junior and early senior years to have good enough grades to be admitted to MSU, which is where he wanted to go. We were happy with that, although we fought a lot about his completing of various assignments. But our major interactions were around his sports activities. In addition to his high school soccer, David joined the tennis team in his junior year, playing junior varsity the first year and varsity in his senior year. He wasn’t one of the tennis stars for which East Lansing and Okemos are so well known, since he hadn’t started taking private lessons at Court One when he was five years old. But he was a good enough athlete to play third or fourth doubles, and I especially enjoyed going to his matches, since tennis is also my game.

David started as a freshman at MSU in fall of 2008, and lived in Bryan Hall, a part of the Brody Group. Many of his friends from high school also chose MSU, so he had lots of people to hang out with, and made many new friends from the dorms, as well. We have been very proud that David has always had friends from many different races and ethnicities. He considers himself Jewish because Cheryl is Jewish, although David has never practiced Judaism in a significant way. But his family is very mixed... among his first- and second-degree relatives (including by marriage) are some more Jews, eight African Americans,
many “Christians” (among them lots of Unitarians who are not really Christians, but celebrate all the holidays, and also some real Christians). Perhaps all of this diversity, together with his experience living as a racial minority in China, has helped to broaden his acceptance of people of many backgrounds. All I can say is that not one of his long-term girlfriends has been a WASP. His girlfriends have been of Vietnamese, Jewish, or mixed ancestry including Filipino. Most of his college roommates were African Americans. So as far as I can tell, he is about as post-racial as a young person can be. It does give me some hope that eventually, if current forces can be withstood, our country may, after a few generations, become a place where race is not such a determining factor in a young person’s destiny. But that will take progress on many fronts, not only a lack of personal racism, but also overcoming the damages of centuries of poverty.

As a Business major (more specifically, Marketing), David took a lot of classes that he liked pretty well, including some that now serve him well in his work life. But to me, more important than all the academics in high school and college in determining his readiness for the human resources work he is now doing, was his relationships with people, particularly the friends with whom he spent so much time in both high school and college. Like his mother, David is able to talk comfortably with people, and to sense what is important to them, and has the work ethic to help them, which is a pretty valuable career skill, too.

David’s sociality may be what encouraged him to pledge a fraternity at the beginning of his sophomore year. He pledged Lambda Chi Alpha, which is a very old frat with lots of well-connected alumni, and I thought that their networking might serve him well in his professional life. But that turned out to be an unfortunate choice for him at that time and place. The fraternity’s initiation got him in trouble with alcohol, and at one point, when he said he needed to leave the frat house to go to work, they told him that if he left, he was out of the frat. So, instead, he lost his job working for the City of East Lansing on maintenance of the East Lansing Soccer Complex. It was really too bad, because that was a pretty nice job—good money and easy work. After that, David could see that joining this fraternity was not going to be a good idea for him, so he dropped out. We were very glad of that, and the wisdom of his choice soon became apparent to all. MSU’s Lambda Chi Alpha chapter was suspended by MSU and prevented from operating by the national fraternity for unspecified reasons (I have my theories...). From that point onward, David showed a lot more maturity, and stayed sober until his 21st birthday. We were not thrilled to see him go back to drinking then, but he was certainly not drinking and driving... he and his friends are pretty careful about that, given that they recognize the potentially fatal or legally drastic consequences.

David heard a lot from me about my Tanzania trips, and saw the pictures, and wanted to come as a Study Abroad student to Tanzania. He signed up and came in 2011, after his third year at MSU. David participated just as
the other students did, but then Cheryl joined us as soon as we arrived in Mto wa Mbu from the ten days at the MS-TCDC training center in Usa River. David was very helpful on that trip, as Jenny and I asked him to room with a student whom the others were not particularly eager to get paired up with, and David was a very good sport about it. David was also the subject of prayers by three other students who were, unbeknownst to Jenny and me, evangelical Christians. They had even obtained bibles in the Maa language of the Maasai, and were distributing them, which is, of course, a major no-no and could put the whole study abroad trip in jeopardy with the Tanzanian government. We only learned about it after the trip, from David. When we went to the Office of Study Abroad to suggest that they revise their written agreements with students to make it clear that proselytizing was not to be part of a study abroad trip, they said that we could put it into the forms for our particular trip, but that they were not going to make any changes at the university-wide level. Needless to say, I wasn’t too thrilled with that response.

At the end of the Study Abroad trip, David, Cheryl and I joined Dr. Lalita Udpa, who was another faculty member on our study abroad team for several years, and her husband, Satish Udpa, then Dean of Engineering and now Executive Vice President for Administrative Services. Satish was my boss for many years, and also a good friend, and the five of us had an amazing week-long photo safari through Tarangire, Ngorongoro, and Serengeti. Cheryl, David, Lalita and I also played euchre in the evenings, while Satish, who isn’t a card player, read or answered emails nearby. We had a marvelous trip, and Satish has told us many times since how much he enjoyed the time with David, because of his winning personality.

By the time of his graduation from MSU, David had lined up a job with Aerotek. It is one of the largest contract employment firms in the country, and I believe the largest in the architecture/engineering field that David works in. That means that when a company needs an architect, for example, but does not want to hire someone permanently, they contract with Aerotek to fill the position, and Aerotek hires someone (with customer approval) and places them at the company, but with Aerotek paying the salary and benefits. The company pays Aerotek the costs of the employee (salary and benefits) plus what is known as “the spread,” which must include Aerotek’s costs for the recruiting, for supporting its own employees, and profit. Then the customer company will eventually either hire the person themselves (paying an additional fee to Aerotek for finding them) or release them, at which either Aerotek places them somewhere else or lays them off. The two primary roles at Aerotek are recruiters (who find the appropriate people to fill a position) and the account managers (who work with the companies to get positions for Aerotek to fill). Like most Aerotek employees, David started as a recruiter, and made “contest” (a certain desirable amount of spread) in his first couple of years, then was promoted to an account manager. In that role, he not only
visits customers, but also supervises two (typically) recruiters, teaching them the job and ultimately preparing them for promotion to account managers themselves. It’s a company in which everyone works very hard, but the reward structure is good and very transparent. The company does not hire senior people from outside, but promotes from within. So the people the new employees see running the office and making a lot of money are known to have started as recruiters not so very long ago. That’s a great motivator. David has certainly drunk the Kool-Aid, and is working very hard, but enjoying it as well, and learning a lot about management, sales, and training/supervision. I think it’s a job that really takes advantage of his strengths with people, and Cheryl and I are both happy that he’s found a good spot and made himself financially independent so quickly. As many of our friends have told us, that’s not an “automatic,” and many of them still have kids living at home and “looking for themselves.” We feel very fortunate that David is the amazing man he has become! And imagine, David working to find jobs for people, after my Mom’s career in North Carolina’s Employment Security Commission! Not so far from the tree!

More about My Family of Origin

I talked a lot about my parents and siblings in the section about my growing up, but there is a lot more to say... especially, I have a lot to be grateful to my parents for. As I also said earlier, Cheryl has done a lot to civilize and socialize me, but all the rest I owe to my parents and siblings. My Mom gave me my musical exposure, leading to my great love of music. She also nurtured my ability to relate to people, and a lot of my social conscience and basic values. My Dad gave me his scientific curiosity and was a great role model for becoming a scientist, in addition to teaching me how to do a lot of things. My sibs were all younger by 3, 6, or 9 years, but I learned a lot from my taking care of them from time to time, too, and just from playing with them. Julie actually shared a lot of that caregiving, too, being not so much younger than me.

My parents were pretty young when I came along, and my sisters and I pretty well prevented Mom from pursuing college work until we were grown, or close to it. Mom sometimes worked part-time, trying to make ends meet. Even while a student, Dad often worked more than one job, to feed the family. He worked in a garage, as a streetcar motorman, and other semiskilled jobs. He was also receiving support from the University of Minnesota to do things like feeding Drosophila in their half-pint milk bottles for experiments in genetics at the Dight Institute for Human Genetics, which I believe was the first such institute of its kind, at least in this country. His advisor was Prof. Sheldon Reed, an early human geneticist. All Dad’s work and study meant that Mom spent a lot more time with us kids than Dad could, although he was usually home for dinner, and I learned a lot from the dinner table conversations I had with him. He taught me lots of genetics as part of telling me about what he was doing. Dad was a great talker... much as his
father had been. We used to cringe when we had the whole family in the station wagon buying gas, and Dad would keep talking to the attendant long after the gas pump had gone off... maybe taking a family history for genetic counseling... who knows!

When the kids got older, Mom went back to Wake Forest to complete her education, and took a professional job with the North Carolina Employment Security Commission. The office she worked in was responsible for helping unemployed people find work, and Mom was really very good at that, harnessing all of her people skills. She was promoted several times within the organization, and got to be on state-wide committees working on new initiatives. Her co-workers loved her, as was evident when they came to parties at our house that she often gave at holiday times. But even more striking was the many testimonials from people whom she had helped to find work, sometimes landing them permanent jobs for which their gratitude to her never ceased. It was quite inspiring to all of us, given that so many of the people she worked with had little formal education and had suffered economic hardship for a long time.

When I was in high school, I was completely oblivious to it, but later, learned that my success at Reynolds had made things tough for Julie and Cindy, since they were expected to live up to the standard I had set. Julie did well in high school, but probably didn’t get as much recognition as she should have, because teachers still remembered me. But she came out of the process in excellent shape and went to UNC, a very good school, and got a great education. She also shared my passion for music, continuing to play guitar and sing to this day. She also loved dancing, a skill that I never acquired, and still does a lot of it, especially contradance.

Julie had one daughter, Amanda, with husband Emory Pence, and a second daughter, Angela, with later husband Ebony Stitt. Amanda married Jason Ronis, and they have two kids—Nadia and Emmett. Amanda and Jason both recently gave up teaching and IT jobs and took six-month programming training, and both are now happily pursuing careers in computer programming! That is very near and dear to my own heart, so I am pleased that they are able to earn their living in such an interesting and enjoyable way.

I think Cindy didn’t get compared as much with me at Reynolds, since she was clearly on a very different path from mine—namely, art. So her struggle was not with my record, but with keeping Dad off her case regarding her performance in all of her classes other than art. I wasn’t at home when she was in high school, so only heard about their fights second-hand, but I have always felt sorry that she had to deal with so much of Dad’s anger. That can’t have been fun. But despite all the struggling, Cindy went to East Carolina University, in Greenville, and got a good education, majoring in art as she had wanted. She went on to graduate study at the Pennsylvania Academy of Fine Arts in Philadelphia, where she has become a well-established artist, with many shows to her credit and a first prize
for her drawings in a show as recently as 2018!

Cindy and former husband James Brantley, also an artist, had a daughter, Kelcey, who was a joy to watch grow up. Kelcey has two wonderful daughters, Naya and Zouri (more formally, Nina Missouri), who are turning into sophisticated and well-traveled young ladies themselves, with a lot of influence from their Mom. Kelcey has started what is now a national movement called Kids Rank, a club for children of military families, helping them more quickly develop relationships when transferred from base to base. This not-for-profit has attracted attention all the way up to Michelle Obama, so Kelcey may end up being the best known person in the family!

Cindy has played a difficult and indispensable role in the family since my Dad died in 2001. Mom was left living alone in their home in Winston-Salem, and Cindy spent large amounts of time with her there, either staying in the house or even renting a place across the street where she could have her own studio. Mom did well with Cindy’s help in the house for a number of years, but eventually couldn’t deal with the work of keeping up a house and moved into a wonderful retirement community nearby, Salemstowne. While the people and the food there were outstanding, it still required a lot of help from Cindy to handle the issues that always arise, and Cindy made herself available for that. The rest of us made visits to see Mom each year, but not enough to really assume any of the workload, so Cindy carried a huge load with only occasional moral support from the rest of us.

Eventually, Mom needed more help than Cindy could provide with visits to Winston-Salem, so she decided to move to a retirement home close to Cindy, in Royersford, Pennsylvania. The first place Cindy had helped her to pick wasn’t ready on schedule when Mom needed to move, so she went to another place. However, the quality of care there was not satisfactory from either Mom’s or Cindy’s point of view, so Mom decided to move again, to the place she was originally scheduled to go to. That has worked out much better—the food is good, the staff is very attentive, and Mom is doing well, although she deals continually with the painful effects of a hip surgery gone bad, leaving loose screws and a poorly secured implant that confine her to a wheelchair. She also deals with a large amount of hearing loss, beyond what hearing aids can completely correct. She suffers from macular degeneration, which makes reading and even watching television difficult if not impossible. Dealing with those problems affects not only Mom, but also Cindy, and of course, her husband Rick, who has displayed saintly demeanor in helping out and putting up with all of this! The saving grace is that we kids and grandkids and great grandkids and Mom still enjoy very much getting together, especially when reminiscing over pictures from long ago, which she is assembling into scrapbooks, and sharing our current adventures via pictures and conversations.

Greg is nine years younger than me, so when I still lived at home, I only knew
him as a baby brother and grade school kid. But as soon as he got to college (at MSU), we began spending a lot more time together, and he was a great support for me when I was going through my divorce. Once he was working in the consulting business, I was flying, and he began calling on me to take him and his colleagues around the Midwest. Then he, too, started flying, and we bought a much better plane together. We had a lot of fun together, with him and Karla living only about a mile away, near Frandor Shopping Center, and flying out of Capital City Airport. I saw him a lot less after he moved to Kalamazoo, but was always eager to hear about his work at Summit Polymers, an automotive supplier, where he worked his way up to being Vice President for Human Relations. He turned out to get a lot of training in lean manufacturing and related ideas from Toyota, working with their leading North American expert, Oba San. He became quite skilled at finding problems in Summit’s factories—I think managers were a little surprised when the HR guy turned out to be the one who knew how to find and fix their production problems, too! He learned a lot of lessons, and talking with him always gave me good ideas of things to teach to my engineering students, especially when I was teaching the capstone design course. I stopped flying in about 1998, but still loved to hear the flying stories Greg acquired in his V-tailed Bonanza. Since we are both dog lovers, I also loved seeing and hearing about his long string of rather large dogs, from Great Danes to greyhounds, of which he still has a pair today.

More recently, I finally got tired of hearing second-hand about Greg’s SCUBA diving adventures, so I took up the sport myself. I can’t believe I waited so long—I just love it. And Greg is my #1 best dive buddy—not only a great diver, but also, having about 30 more years diving than I’ve had, knowing a lot more about where to go! We try to do at least one trip together every year, and more when we can sneak them in! We have a great time when just the two of us go, and when we’ve got family along, they are very tolerant of our underwater needs.

My brother Paul Murray and I have not spent much time living in the same town—I was out of the house soon after he became part of the family, so we haven’t been as close as Greg and I. But professionally, we have a lot in common, both having written lots of computer code, both loving Unix and ‘C’, and so forth. So when we do get together, we like to swap stories about what we’ve been working on, although since leaving Red Cedar, I don’t have any coding stories to swap. But Paul is the guy who wrote the software that runs your gas pump every time you fill your car, if it happens to be a Gilbarco pump, which is one of the most popular brands. So he knows how to get down and dirty with a real-time operating system and write high-reliability code!

Paul and his wife Mary Lou have two kids, Ben and Anna. Ben started film school at Penn State, but finished at NYU, where a lot of film greats come from. He works on the technical side of movie and television production, doing post-production, and has had a
lot of success with the companies he has founded. He personally made an outstanding documentary about Cuba, It is called Unfinished Spaces, and it describes the art school that was commissioned by Castro. It features interviews with the architects who started it, were later banished by Castro, and then later, were re-commissioned to complete it, although parts of it remain unfinished today. Ben’s sister Anna got her undergraduate degree in biology and worked for a time at the Detroit Zoo, where she was lead researcher on animal welfare research projects, directing the work of interns and publishing her work about animals as different as Blanding’s turtles and gorillas! She is now studying robotics at UM-Dearborn and is getting married to Steve Krause in August of 2018!

Nearly from the beginning of our relationship, Cheryl and I loved spending time with my parents. We would go to North Carolina to visit them, or often met them somewhere to vacation together. Dad sometimes trailered his sailboat along on these vacations, so we could spend relaxing days on the water. My Dad was a good sailor, and knew a lot about things I thought were very interesting, like celestial navigation. He taught that and other subjects as a member of the Power Squadron, a boating organization he was active in for many years. So when we would go out sailing, he would teach me the basics. I took his boat out solo in one of the lakes a couple of times, but never sailed in the Atlantic without Dad. He and my Mom had some adventures, too—once, he ran aground during a storm and had to get rescued by the Coast Guard. The boat was okay when they could get back to it after the storm.

We loved playing pinochle with my folks, too. They had played bridge when they were younger, and I have been taught several times how to bid, but have never played enough to really learn it. So the games we’ve played have been pinochle, mostly with my folks, and euchre, mostly with David and his girlfriends. Of course, I also played euchre in college.

I can’t talk about the family without relating how Dad died, in 2001. He was way too young and vital to die then, and it was very unexpected. He had had non-Hodgkins lymphoma in his late 60’s, and had had chemotherapy that was successful in destroying the tumor. He’d lost his little remaining hair during chemo, and at one point was wearing a wig that gave him a lot more hair than he’d had in years, but I think the totally bald look wasn’t so common then, so he didn’t want to go that way. He officially retired from Wake Forest’s faculty when he was battling the non-Hodgkins lymphoma, where he had not only taught and done research, but also served as Dean of the Graduate Program for the medical school. But as soon as he recovered, he went back to work full-time in his research lab, where he continued to collaborate (unpaid) with his colleagues for several years. Working was what he wanted to do, and they authored several papers about the heredity of kidney stone formation after he had officially retired.
But when he was about the age I am now, he learned suddenly that he had a thoraco-abdominal aortic aneurysm. That means that the descending aorta walls were weakened and the aorta swollen and in danger of bursting. It was a time bomb that could go off at any minute. As I recall, he sneaked in one last sail with Ben, his grandson, and then he and Mom went to Houston, where they had learned that the best surgeons in the world for correcting his aneurysm were to be found. When the surgeon there did the ultrasound, he told Dad that they should do the surgery as soon as possible, to avoid an imminent and certainly fatal bursting of the aorta. Dad and Mom agreed that it was the best course—the surgeon quoted them only a 5% chance of complications, as I recall. The whole family waited for word about the surgery, and it started far later in the day than we had expected because of other surgeries. It also went on for far longer than we had expected. Dad survived the surgery, but a multitude of very serious complications arose. The surgeon said that when he got in there, he was surprised to find that there was essentially no healthy tissue to attach a graft to. So Dad came out of the surgery with very poor circulation to his legs, and never recovered. He was kept on a ventilator, and never was able to survive without it. In the beginning, we hoped that the swelling in his legs would go down and he would recover, but that didn’t happen. His mind was intact—he even made a few jokes with us. None of us kids was there for the surgery, which we expected to be routine, so Mom was in Houston with him alone. I went to see him there soon after the surgery, when we knew it had gone badly. He communicated with a signboard and was able to write a little, initially. He couldn’t talk because of the ventilator. It was a horrible way for this person who had been so active and healthy to die. In hindsight, if we had known the surgery could go so badly, I’m sure that he and we would have elected to have him live his normal life and die suddenly rather than having him survive for months, unable to move or speak, on a ventilator. After this experience, Cheryl and I did living wills and all the powers of attorney paperwork to try to minimize the chances that we could suffer such a fate, after seeing what Dad and Mom, of course, went through. I remember that I was driving a rental car on my way to a meeting at Lawrence Livermore National Laboratory in the Bay Area (where I was born) when I got the call that Dad had died. It was very sad, but given what he had been going through, also merciful that it was finally over.

The Pets in My Life

Pets, and particularly dogs, have always been important to me, and I love them dearly. My first dog was a cocker spaniel named Cricket, who lived with us when we spent a year in Red Oak, Iowa, where Julie was born. Dad was a traveling salesman that year, so Cricket was great company for me (three years old) and for Mom. I don’t remember much of my life when I was three, so can’t tell any Cricket stories, but I’m sure there were some. When we moved back to Minneapolis for Dad to go back to Minnesota, we lived in student housing and could never have a dog, so the next
opportunity was when Dad did his post-doc in Winston-Salem when I was in fourth grade. There, we adopted Queenie, who I think was just a stray, and she looked for all the world like an African dog—short, tawny-colored hair, and skinny with a long tail. It was sad for us to leave her when we moved to East Lansing, but once again, it was no dogs allowed, as we were going into faculty housing on campus (the Quonsets on Cherry Lane) for three years. As soon as we bought a house in Lansing, we immediately got a dog, who was named Anonymous, but called Nonnie. She was around 20-25 pounds, medium height, and white with black spots. Her tail would go between her legs when she was unhappy, but curled around above her in a complete circle most of the time. She was the family dog until she died of old age, many years after I had left for college. She would play outside with us in the evenings, giving people away when we played Kick the Can, but we didn't mind. One of our favorite family stories is about Nonnie's need to jump in and rescue Mom whenever Mom went into the water to swim at Lake Norman, when we were camping. I didn't have a dog, of course, during my college days, but when Denise and I moved back to East Lansing in 1971, we soon acquired Siggy (short for Sigmund Freud). He earned the name from the patch of white hair on his chin, resembling a well-trimmed beard. He was about 25 pounds, black with a scruffy medium-length coat, and a very attentive guy. We worked at training him so he was well behaved when people came to the house. When we divorced, I left the house and Siggy to Denise, which was tough for me, but I was away from home so much that I don't think I could have kept a dog, anyway.

When Cheryl and I married, we started out at Ville Montee, where we had been living, but soon bought our current house on Clarendon Road. Soon after that, we worked with the neighbors to get the back yard completely fenced, and we were ready for a dog. This time, we didn't visit the dog pound, but bought from a breeder “Up North” a pedigreed standard poodle whom we gave the registered name of “Erik's Special Cargo of Clarendon.” We abbreviated it to S. Cargo (you know me and puns), which is why we chose the name in the first place, but we called him “Cargo.” He, being a much larger dog than either of us had ever had, was a handful, and we faithfully took him to puppy training class, then obedience class. He learned all the commands—heel, sit, stand, stay, fetch, down, etc. For a while, he seemed pretty well behaved, but we hadn't had the sense to crate train him, so when we were out, he had the run of the house. That was a problem, because there was an evil character who regularly violated our personal space, and Cargo’s— the mailman. When the mailman would come to the mailbox, Cargo would go nuts, and we still have the marks on our downstairs windowsills where Cargo would chase from window to window, barking his head off and scratching at the sills to get a bite of that evil guy. But Cargo was a love around our friends, and very good with kids, and especially with David, when he came along. He was very smart and loved to play or just snuggle with us, so we were very sad
when he developed a severe intestinal problem at about 12 years old and had to be put down. We were very lucky that he didn’t die before David was born, or it would have been even harder.

In 1988, while Cargo was still with us, I went to China for the summer for a two-month Study Abroad for Chinese language, as a student. It was great, and I had a roommate, Joe, a college student from the East Lansing area, but I still wanted a pet. So I went to one of the open-air markets and bought a cricket in a cage, which was a popular pet there. It doesn’t take much effort to maintain it... just slip it a few grains of cooked rice each day, through the holes in the woven bamboo cage. And, believe it or not, the cricket became quite responsive, coming over to look for the rice as soon as I approached the cage. So I imbued it with all sorts of pet-like feelings, whether or not an insect merits that level of investment. In my typical humanitarian spirit, at the end of the summer when I had to leave, I released him to return to his natural habitat, only learning later that Shanghai was not home to these crickets, but that they were imported from somewhere else. Ah, well, so many humanitarian gestures suffer the same fate...

We didn’t want to start out with another puppy while David was so young, and we were already planning our sabbatical to China, so we didn’t get another dog right away when Cargo died. In fact, when we got back from China, I wanted to have a pet, but wanted something that wouldn’t take a lot of care, and could be fed and left for a few days, so after careful research, I settled on a degu. A degu is a South American rodent about the size of a large hamster, but with short hair and a very long and lightly haired tail. I wanted to socialize Slick, and what good is a pet in a cage, anyway, so I built an “encounter enclosure” for Slick and me. It was a square made of four pieces of Masonite-like composite board, with a slick white surface, which I put toward the inside. It was too tall for Slick to jump out of, and short enough for me to step into. The walls were just joined with duct tape on the outsides, and the carpet was the floor. Soooo, it went like this: I would take Slick out of his cage and carry him into the enclosure, then sit down on the floor and give him the run of the place. He soon learned that he could run all over me, climbing up on my shoulders or my head to get a view of the world outside. I did let him venture under my shirt, but I kept him out of my pants. I had a lot of fun with the little guy, and my sister Cindy, an artist whose skills include sculpture and pottery, made him his very own fired clay bowl with his name set into it, which I liked a lot. The pet store had told me a degu might live eight or nine years, but that turned out to be completely wrong. At about three years, he became very arthritic, insofar as his movements were much less vigorous and free, and he didn’t run in his wheel any more, but he didn’t seem to be in pain, and kept eating just fine, so I didn’t take any extreme measures, and he died before reaching the age of four.

When David was in about the fourth grade, we decided to get another dog, and we learned of a breeder who had
a litter of miniature Dachshunds for sale. Wow, was she ever little! When we got her, she was probably ten weeks old and weighed only a couple of pounds. We named her Pokey, after the dog in one of my favorite children’s books, The Poky Little Puppy. Why we changed the spelling, I don’t know. But I remember when the three of us took her for a walk one day (okay, we just carried her) down to the East Lansing Art Fair, we were positively mobbed by people oohing and aahing over her. She was unbelievably cute, with still a fairly short puppy nose, big paws, tiny legs, and a very long back (for her size). She was a classic black and tan, looking for all the world like a very funny-looking Doberman or one of the other classic black and tan breeds. She’s been our doggy daughter ever since. We didn’t finish obedience school with her, I think, because she was freaked out by the bigger dogs, but she learned to heel, sit (not very hard), stay, come, etc. But she never learned to accept other adults, especially men, in our house, so we always have to put her in her crate when we’re entertaining. We won’t make that mistake again with another dog, but just didn’t see it coming with Pokey.

Being a Dachshund, Pokey was likely to have back trouble, and indeed she did. At about twelve years old, she jumped off the couch one day, and the next day, couldn’t get out of her crate... she had no control of her back legs. We took her to her vet, who said we needed to take her to the MSU Vet Clinic if we wanted to see if she could be saved. We went over there immediately and met their Veterinary Neurosurgeon. I didn’t know they HAD a Veterinary Neurosurgeon, but if anyplace would, it would be the MSU Vet School. He examined her, did a CAT scan, and told us that a disk had bulged out and was compressing her spine. Her only chance was surgery to remove the disk, and while he was in there, if he could, he’d remove several more disks, as they might also interfere with her spinal nerve at any minute. The surgery would cost a total of $4,000, but he said the chances of a complete recovery were pretty high. Since she wasn’t yet near her life expectancy, we decided to go ahead, and he did the surgery. However, we was not able to remove any more discs, because her vitals had started slipping during the surgery, and he didn’t want to take a chance of losing her. He said it would take several weeks for the swelling to recede and her to get much function back, and several months to know how far she would recover her leg function. We were really discouraged for the first week or so, as she could still not use her back legs. We had a special sling to distribute her weight all along her back so we could take her out to do her business. After a week or so, we started taking her back to the Vet Clinic for physical therapy, including an underwater treadmill to keep her weight off her legs but still let her make the motions. To our delight, she soon could stand on her back legs, and within a few weeks, she was able to stagger around, but no longer needing the harness. Then, over the next few months, she recovered essentially full function. Today, she runs around the house just as before. Her hind legs are not as strong as they were, and she is sometimes a little unsteady, but she can do a full gallop across a carpet or
after a squirrel in the yard. So we are very happy, almost two years later, that we opted for the surgery.

While Pokey was still fairly young, my Mom had to move out of her house in Winston-Salem, into a retirement community called Salemtowne, and she could not take her dog, Taffy, so we agreed to take her. She and Mom clearly missed each other, and Taffy, while perfectly well behaved, was never as affectionate toward us as our other dogs had been—she was clearly my Mom’s dog, and we were just substitute caretakers. Mom had thought Taffy was on her last legs when we took her, but she lived with us for another three or four years, which Mom was very happy about. Our ten-pound Pokey got along okay with Taffy, who was about 50 pounds, but they really didn’t have much to do with each other, as Taffy was so much older.

When David was in his pre-teens, we bought a goldfish and a classic flat-faced, round-sided goldfish bowl. David named the fish “Jim,” after the father of his friends across the street, the Dunns. I think David got a kick out of that. David and Cheryl didn’t have much to do with Jim, as he was really my fish. I, on the other hand, liked him a lot. After a year or two with us, he would see me enter the kitchen and begin swimming rapidly back and forth at the nearest surface of his bowl, waiting for me to give him a little food, which I most often did whenever I came in. So I enjoyed seeing him get excited when he saw me. You see, it doesn’t take much to make me feel appreciated! It was a very sad day indeed when we came downstairs in the morning to find Jim dead on the kitchen floor, having jumped out of his bowl during the night. I hadn’t realized he might do that, so we had never covered the bowl with anything. However, I comforted myself with the thought that he was not depressed and suicidal, but merely didn’t know what was on the other side of that bowl.

Music in the Goodman House Growing Up

Everyone in my family was musical, going back for generations. We attended a family reunion of the Orbeck family in Minnesund, a village near Eidsvoll, Norway, the town where the Norwegian Constitution was written, and situated just above Lake Mjøsa (largest in Norway). My maternal grandmother, Magnhild Orbeck, had lived there as a little girl, and it was like coming home when we saw the family. They were mostly teachers, clergy, and especially, musicians. They showed us tombstones in the graveyard next to the church and we saw relatives from hundreds of years back. A special treat was when Øle Ljødal gave us a copy of the book he had written, Slekten Orbeck (Orbeck Generations), tracing the family back into the 1400’s. We have it in both English and Norwegian, and I treasure it.

In my grandmother’s house in Minneapolis, there was a piano that my Aunt Florence and Uncle Bruce both played. Aunt Jeannie played the violin, and Aunt Alberta studied (and later taught) voice. Both Aunt Florence and my Dad played cello, and
while my Dad stopped when he dropped out of high school, my Aunt Florence was a professional musician all her life, as was Aunt Jeannie. So, my Dad’s side loved music. Well, luckily for us, so did my Mom’s side. My Mom listened to music all the time... on the radio, then on our “hi-fi,” then later on the stereo. She sang while working around the house, and I’m sure my ability to carry a tune came from both the good music genes from both parents and the constant music exposure from my Mom. By the time I was in high school, we had LP records of all the popular musicals, and also lots of the folk musicians, and I learned all of their songs—words and guitar chords. Joan Baez, Susan Reed, Judy Collins, and lots more—especially the women, with whom my Mom could sing along. There was always music in the house, and when we went on long trips in the car, we’d sing in the car, when we got tired of playing Twenty Questions or license-plate spotting. The whole family sang, and most of us knew how to pick out our own harmonies. I know I could figure out and teach three-part harmonies when I was in the sixth grade, because I did it then. When we went on our camping trips to Lake James, we’d sing for hours around the campfire, and when the Loflands, who were also singers, joined us on those trips, it was quite the chorus! My family would go to friends’ and neighbors’ houses Christmas caroling each year, after a week or two of practicing all the standards. I’m sure this was at least as important a part of my musical education as were the violin lessons.

My folks both sang in the choir at the UU Fellowship in Winston-Salem, and later, also sang in a municipal group, the Singers’ Guild of Winston-Salem. They could both read vocal music, a skill I never acquired since I never sang in an organized choir, and all of our bluegrass was learned “be ear.” I’ve often thought it would be fun to get back into singing—maybe choral or barbershop, for example, but so far, I haven’t had time to do anything with it. Maybe someday...

In seventh grade, I continued taking private violin lessons from Fannie Harris, who lived on Marigold Street in the “Flowerpot” neighborhood of East Lansing. I also played in the junior high school orchestra, first at East Lansing Junior High, then after we moved, at Walter French Junior High. By eighth grade, I’d had several years of private violin lessons, so won the concertmaster position in the orchestra. The height of my violin career was when I got to play the very recognizable violin part of the William Tell Overture at our concert for the parents—you know, the Lone Ranger theme. Other than that, I didn’t play the violin much for audiences, except that Phil Carr, my best friend in junior high and fellow orchestra member, and I were both hams, and did a couple of performances for PTA meetings and the like, playing twin fiddles and singing. That never went anywhere, and we were pretty bad, but I did find out that I liked performing. But I stopped fiddling when we moved back to Winston-Salem and I got a paper route. I eventually came to regret a great deal
that I had had to give up violin, after I discovered Bluegrass and realized what a good fiddle player I could have become after all the classical training I would have had by then! Too bad!

Later Music: Hootenannies, Twelve-String Guitar, Discovery of Bluegrass

My playing violin in fifth through eighth grades was where I learned to read music—all my prior experience had been only with singing, and only by ear, not by reading music. In high school, having given up orchestra for a paper route, I stopped playing violin, but somewhere around eleventh grade, I started playing guitar. My friend Paul Licker taught me some chords, and I began playing along with records or singing and playing folk songs I already knew. I didn’t need tablature or sheet music to pick out songs, as I could “hear” the chords and pick them out on the guitar. By the time I got to college, I had bought a 12-string guitar, which sounds a lot fuller if you’re just strumming chords, and played that. In the summers after my junior and senior years, I was hired as a summer orientation RA, living and working in Wonders Hall. One of the activities that we had for the new students, who stayed in Wonders for several days while signing up for classes, taking tours of the campus, and generally just getting pre-adjusted to dorm life, was a hootenanny. If you’re too young to remember those, they were folk song sing-alongs that were very popular in the sixties and seventies. Each week, I would lead a hootenanny one of the evenings, playing the role of a “tuned-in, turned on, dropped out”-type Hippie. It was fun—I entered in a motorcycle helmet, a horrid black shirt with polka dots, cutoff shorts, and generally looked pretty strange. This was probably easier than just looking geeky, which would have been my alternative. I passed out sheets with words to many popular folk songs, and would play the 12-string and lead the singing. I’d usually get something like a hundred kids to come.

I didn’t do a lot with the guitar after those summers... played in a dorm coffee house a few times, but that’s about it. It wasn’t until about five years later, when I was entering my third and final year of Ph.D. study at Michigan, that I found my musical niche. I had taken a trip somewhere for a few days, without my wife, Denise, and she had gone to an Ann Arbor bar called “Mr. Flood’s Party” with some friends. There, she heard the house band, a group called the RFD Boys, playing bluegrass music, and she went back the next night, and when I got home, she dragged me there the next weekend to hear them. Well, I was practically struck dumb. Somehow, during my five years in North Carolina, and while loving folk music, I had never stumbled onto bluegrass music. And here it was, in Ann Arbor, Michigan! I instantly fell in love with it, and we attended Friday and Saturday evening performances nearly every weekend for the next several years. It was a five-piece band, with Charlie Roehrig singing lead and flat picking guitar, Dick Dieterle on fiddle and singing bass, Jim “Willard” Spencer on banjo and baritone, Paul Shapiro on bass fiddle, and Gary,
whose last name I’ve forgotten, on mandolin and singing tenor. Their harmonies were as impressive as their picking, and Charlie was also a good songwriter, so they some original songs, together with the standards. When Gary left Ann Arbor, they didn’t immediately add a mandolin player, and played as a four-man group for several years.

Soon after hearing the RFD Boys for the first time, I went out and bought myself a 5-string banjo. I bought the Earl Scruggs instruction book and started learning the so-called “licks” used in bluegrass. These are 8-note sequences (for 4/4 time) or six-note sequences for waltz time, and knowing how to string these licks together across chord changes allowed one to play an incredible number of notes in sequence at a rapid pace. So, during my final year at Michigan, I divided my time between my thesis research and learning to play banjo. In a story I loved to tell my senior capstone design classes in ECE, to teach them about making their talks memorable, I used to tell them how I learned to play banjo in the bathtub. Doesn’t that bring up a vivid and memorable picture in your mind? I would then explain how, after learning to play these licks and practicing with the tablature in the Scruggs book to play each particular song, I one day realized, while sitting in the bathtub, that I could string these licks together across arbitrary chord changes and play accompaniment to any song I wanted (well, any bluegrass song). I got out of the tub, dried off, got dressed, picked up the banjo, and started playing along with bluegrass songs I’d never tried to play, and realized that it all came together just fine.

From that time on, one of my favorite things to do was to go to bluegrass festivals, where there was always a show going on stage, but just as many people sitting around campfires or around the trunk of a car, usually until about 2am, playing and singing bluegrass songs, and they were very welcoming if you wanted to join and play along. If you indicated you were interested, they’d turn the lead over to you to play a “break,” usually a chorus- or verse-and-chorus-length passage when the other instruments played accompaniment and you played the lead part, showing off for all you were worth. Breaks went around—fiddle, mandolin, banjo, guitar if someone could flat-pick lead, dobro if one was present, and even sometimes bass. Denise and I would go to three or four bluegrass festivals per summer, always including the original one in Bean Blossom, Indiana, on the farm of Bill Monroe, the “Father of Bluegrass.” Bean Blossom was even more fun because the RFD Boys would be there, too, and I’d get to sing and play with them around the campfire.

In fall of 1971, I began as an instructor at MSU, having nearly completed my Ph.D. at Michigan. Denise and I began years of faithfully driving to Ann Arbor every Friday and Saturday night (or staying the weekend), to hear the RFD Boys. Yes, that sounds a little weird, but they had become like family. Eventually, I became the sound man for the band, running the board from out in the audience… it didn’t take a lot of “running”—just get is set properly and let them handle the
dynamics themselves, which they were quite used to.

Meantime, in East Lansing, I started to go to meetings of the MSU Folksong Society (which I think was the predecessor of the current Ten Pound Fiddle, but the get-together-and-play part, not the concert part). There, I met Ron Rosenberg, an assistant professor of mechanical engineering, who played rhythm guitar and sang. We hit it off, and he introduced me to Chuck MacCluer, an assistant professor of math, who had played bass fiddle his whole life. His father, Theron MacCluer, had been principal bassist of the Cleveland Symphony, so Chuck knew all about classical music, but had also played jazz bass, etc. But he was tired of playing accompaniment, so when we talked about forming a group, he decided he wanted to play fiddle, rather than bass. And I must say, he learned bluegrass fiddle very quickly, with his deep musical background. Then we needed a bass player, and recruited Jim Bateman, another assistant professor in math, who was really a pianist, but quickly learned bass. We added Marv Siegel, my colleague in electrical engineering and systems science, as a mandolin player, again learning it after moving from jazz guitar. So those were our original five musicians, and since we were all MSU faculty members, we decided that we were expanding the university's mission, and called ourselves the Bluegrass Extension Service. That name stuck for the band's twenty-five years of performing.

We practiced for a good part of the fall and across winter break, and decided to make our public debut in January, 1972. Coincidentally, that's also the month I defended my thesis in Ann Arbor, and I'm pretty sure I was much more worried about the first performance of the band than about the thesis defense. We played at a place called Synergy, on Grand River Avenue in East Lansing. That place should be should have a historical marker erected outside it, not because we started there, but because beside us there were two or three glass counters full of guitar picks, strings, capos, etc., under the name Elderly Instruments. That little operation went on to become the country's number one place to buy/sell/trade folk instruments, with a huge inventory in their store in Lansing and an even larger mail-order business.

The Bluegrass Extension Service was well received, but likely because most of the audience members were our friends, students, or families. It was a little rough in the beginning, but as we got more comfortable on our instruments, and more used to singing together, the musical quality definitely improved. We had a number of early changes in the band. Marv Siegel wasn't really into bluegrass, it turned out, so he dropped out after a few months, and we played without a mandolin. Eventually, we hired Jack Clarkson, an MSU osteopathic medical student, to play mandolin, and he was an excellent picker and singer, so our harmonies improved, too. Jim Bateman dropped out after a while, as we began performing more often, and we hired a bass player named Scott "Buck" Robinson, who was a school teacher. We had also added a second guitar to the group, an anthropology
grad student named Bob Mainfort, who did flat picking, so gave us another break instrument, while Ron continued to play rhythm guitar.

The band played at many local bars, usually one or two evenings during the week (since I was still spending weekends in Ann Arbor). We played for years at a German bar called Frank’n’Steins on Howard Street near Frandor Shopping Center (now housing AlAnon), and our fans filled the place every week. We had developed a continually developing patter on stage, imaginary histories for the band members, with just enough truth that they could make it plausible. Many in the audience knew that several of us were professors at MSU, as some of them had been our students, but over time, more and more people did not know us except from the bar. So we started “legends.” In particular, I would talk about Chuck, the fiddle player and a professor of mathematics, as though he were a pretty simple-minded farm boy named Farley, from Ohio (he WAS from Columbus), raised part of his life on a small island in Lake Erie (true—he lived in Put-In-Bay summers at his Dad’s OSU Music Camp), and now living on a farm in Laingsburg (true—he DID keep sheep, goats, ducks and chickens, and sometimes horses). I would urge the audience to be nice to him when talking with him during breaks, and he did a great job “playing the role.” So our show was mostly music, but was also filled with sometimes recurring and sometimes off-the-cuff stories about Farley and his adventures. An amazing moment happened one evening at Frank’n’Steins, when one of our pretty regular fans confronted me, saying he had learned that Farley was actually a math professor at MSU. He was quite upset, as I think he’d gotten to be pretty fond of the Farley character. So I had to admit to him that a lot of the stories we spun about Farley were just stories, and that, in fact, he was probably the smartest guy in the band, and knew not only more math, but also more engineering than I did, an engineering professor. The fan eventually recovered and could enjoy the stories as stories, but it gave us pause to think that our patter had been taken so seriously.

One high point in the band’s history was our long road trip, in 1977, I believe. We booked a gig at a bar in Fayetteville, Arkansas, and then several other gigs along the way. We piled the equipment and two people (including the roadie/sound man) into the band’s van (a well-known fixture in East Lansing, an orange Ford Econoline owned by Chuck that had the band name lettered on the sides). Then the rest of us jumped into my airplane, a 4-passenger Cessna Skyhawk (172), and we were on our way. I had just had my instrument rating for a few months, so the band was showing significant confidence in me. We made it just fine through some rain and bumps that probably had them worried, but were really nothing significant, and the whole trip was pretty uneventful. But I remember how much fun we had as we approached the airport in Fayetteville. Chuck, an amateur radio whiz, W8MQW, had brought along an FM transceiver, enabling him to make local phone calls through a nearby FM repeater, so when we were about 40
miles out, he placed a call to the bar manager, asking if he could send someone to the airport to meet us, as we’d be landing soon, and gave him the tail number of my plane. Well, we could hear the wheels going in the bar manager’s head... "My God, there must be some mistake... I’ve accidentally booked a band that thinks they’re going to get paid $300,000 dollars, not $300 dollars, and they’re landing in their corporate jet, complete with a phone!" Well, that misconception didn’t last for long, and it all worked out great!

The Bluegrass Extension Service played regularly at a lot of bars in the Lansing area, from 1972 to about 1997, including the Pretzel Bell (on Trowbridge), Peanut Barrel (on Grand River), Lums, later called Moon’s High Wheeler (now Rick’s American Café), Alley-Ey (Sunday nights, in basement of 100 block of MAC), Park Lake Tavern (by the golf course), Berkshire Inn (Williamston), Art's Bar (Kalamazoo Street in Lansing), and several others. We also played the Charlotte Bluegrass Festival for many years, and other festivals from time to time. We played a variety of music, too, from bluegrass “standards” to country-pop songs set to bluegrass (John Denver, John Prine, Emmylou Harris, etc.). We played for many square dances, doing endless Scottish fiddle tunes, of which Chuck knew dozens. We once did a whole gospel show on Sunday morning at the Charlotte Bluegrass Festival. Maybe our most fun gigs ever were one weekend a year for several years when we played a special show at the MSU Planetarium. They added pyrotechnics to the music, and we did several numbers with all but the blacklights out, and us wearing white gloves. Fingers flying in the dark—it was magical! And, of course, the audience was there to listen, not to clink glasses and converse, and in that big dome, the sound was just great.

The Bluegrass Extension Service cut its first record album (remember those?) in the late 70’s, calling it “First Time Out.” It had a lot of covers of bluegrass standards and some popular songs, plus a couple of originals written by Chuck. We printed 2000 copies of the record and sold them at bar gigs and festivals, and did sell them out within a couple of years. I still have some of the cuts up on my web pages, but behind a password because some of them are BMI or ASCAP copyrighted. The band then included Chuck, Jack Clarkson, Scott Anderson, Scott Robinson and myself. We recorded it at the studio belonging to Bob Baldori, in the Okemos area. I liked the songs, but the album was flawed by some “wow” introduced when it was printed slightly off-center, but caught too late for us to fix. Most of our fans didn’t care, but it sure bugged the heck out of me, and I’m sure Chuck wasn’t happy about it, either.

We also played quite a few wedding receptions, when former student couples that had been fans of the band got married. I know that some of the parents thought the bride and groom were crazy when they said they wanted to book a bluegrass band for the reception, but they always enjoyed it once they found out we could do something besides lightning-tempo bluegrass. We also could get people
dancing who wouldn’t normally do so, by teaching them to do the Virginia Reel, for example. We had a lot of laughs with that, too, as people collided with each other or froze in place, not knowing what to do, but we always got them through it just fine. At Cheryl’s and my wedding, we had a fabulous classical guitarist play at the ceremony in MSU’s Alumni Chapel, then Chuck MacCluer on jazz bass and Jim Bateman on piano playing soft jazz. Then the Bluegrass Extension Service came on, with Paul Nilsson substituting for me on guitar (to which I had moved by this time) and singing lead, and I came up and sang two or three songs with the band just for fun.

Until 1976, this Bluegrass Extension Service activity was going on while I was going back and forth to Ann Arbor almost every weekend to hear and run sound for the RFD Boys. Somewhere around 1974-5, they added mandolin player and tenor singer Freddy Harris, whose claim to fame was that he’d played mandolin with the Sunny Mountain Boys, the band of bluegrass legend Jimmy Martin. Freddy added a good tenor and fine mandolin picking to the RFD, but stayed with them for only about a year, I think. He later moved to East Lansing and joined the Bluegrass Extension Service after Jack Clarkson left, playing with us for several years, during what I regard as our “Golden Years.”

But big changes came for the Bluegrass Extension Service and for me in 1976. Paul Shapiro, the bass player for the RFD Boys, was soon finishing medical school and needed to decide whether to stay in Ann Arbor with the band or to move on. They approached me with the idea of starting to play with the band on rhythm guitar and singing primarily tenor. I jumped at the chance. The plan was for me to spend some time getting comfortable with the band, and to start learning bass on my own, then to move to bass, freeing up Paul. I started that with the best of intentions, and loved being part of the band. The harmonies with Charlie and the others were just wonderful! It was during this time, when the RFD played every weekend to a packed house at the Pretzel Bell in Ann Arbor, that I met Cheryl Barris, my bride-to-be. We were both unattached, I having been divorced from Denise a couple of years earlier, and she not yet having married. (I robbed the cradle—she was only 26, while I was 33.) The RFD banjo player, Jim (Willard) Spencer and his wife, Kathy Dekarsky, who was a friend of Cheryl’s, fixed us up. Cheryl thought I sounded a little weird—a banjo-playing engineering professor who was taking flying lessons every Saturday—but she agreed to check me out. They invited us to dinner at their house before a gig, then we were off to the Pretzel Bell for the evening. An unusual date, but we hit it off immediately, and in the next week, celebrated both of our birthdays together. She was living in Flint, working on establishment of Flint’s first HMO, and very soon after I got my flying license, our weekends would start with me flying to Flint to pick her up, fly to Ann Arbor, play a gig, stay over, spend a Saturday in Ann Arbor, play another gig, then fly her back to Flint. Before very long, she moved in with me in East Lansing, and that simplified our commutes a lot.
Now what for me was the bad news: as the year progressed, it turned out that I wasn’t able to spend the time to learn to play bass, as it was also my year for promotion to associate professor, I had just landed my own large grant from the Environmental Protection Agency, and I was still playing with the Bluegrass Extension Service during the week. I was crushed that I couldn’t do it all, but after a year with the RFD Boys, it was clear that I wasn’t going to be part of the long-term solution as a replacement for Paul, and we parted ways. I was very unhappy about that for a long time, because I loved being in that band, but I still had the Bluegrass Extension Service to go back to, and we were getting better and better, so I survived.

Bob Mainfort, the lead guitarist for the Bluegrass Extension Service, had already left, and Ron Rosenberg, our other guitarist, left around the time I started playing with the RFD Boys—I think he, like me, was too busy to do all the music he wanted to do. I changed to playing guitar in the BGES, as I was doing in the RFD Boys, which meant we needed a banjo player, and we hired a young guy named Scott Anderson. He was a good picker, but not as mature as the rest of us, so we had occasional friction, and later replaced him with Steve Ellis, an excellent banjo picker and more reliable band member.

After I stopped playing with the RFD Boys, we had more weekend slots available, and we played more often... often two or three times a week for the next five years or so. We recorded our first album during that timeframe, “First Time Out,” with the lineup of Chuck MacCluer on fiddle, Scott Anderson on banjo, Scott Robinson on bass, Jack Clarkson on mandolin, and me on guitar. There were more band transitions—when Jack Clarkson dropped out to form his own country band, we hired Freddy Harris, the former RFD Boy, and he played with us for several years.

We played a lot when Freddy was in the band, and laid down tracks for our second album in the studio, but never completed it. Steve Ellis replaced Scott Anderson on banjo, and we played in that configuration (Chuck, Steve, Scott Robinson, Freddy, and me) for several years—I think that was the best the band ever sounded, at least on the classical bluegrass standards. Sometime in the mid-80’s, Freddy moved away, and we replaced him on mandolin with Brenda Sayles. She was an excellent singer, and some of my fondest memories from the band are the duets and trios we would sing. When we got in a quiet place, like the occasional auditorium, it would sound absolutely wonderful, at least to me! She stayed with us until the very end. Eventually, Steve Ellis also moved away, and Paul Kirchner joined us on banjo. He was an excellent musician, but lived “up North,” where he also played with some other bands, so we performed much less regularly after that. In the last years, the lineup was Chuck, Brenda, Paul and me, a four-piece. The music scene in East Lansing had been changing gradually, partly because the drinking age had gone back to 21, making most MSU students unable (at least in theory) to go to the bars. Also, to some extent, the folk “craze” was waning a little, so it
became harder and harder to line up regular gigs in the local bars. Our last gig was more or less a reunion gig that we did to celebrate Gerry Park’s retirement from MSU, at the University Club. Gerry was a colleague and friend of mine in electrical engineering, and he and his wife Lois had come to hear the band many times, so we wanted to play that party for him. After that, we got together a few times over the years, just to pick and sing and remember old times, but never again performed in public. Today, I often think about getting my guitar out and trying to revive my playing, or about buying another banjo (I gave mine away in the 90’s), but haven’t yet found (or made) the time to do either.

My Discovery of Computing

Given my fascination with languages and with logic, I decided in winter quarter of 1965 that I should take a course in computer science (although no such department yet existed at MSU—it was called EE 101). At some schools, CS emerged from EE, while at others, it came from math. At MSU, it was a combination of both, with EE’s having built a vacuum-tube computer, MISTIC, under Lawrence (“Wayne”) Von Tersch, subsequently Chair of EE and Dean of Engineering. Several math faculty members, including J. Sutherland (“Sud”) Frame, had designed algorithms to run on it. MSU was fortunate to have bought serial number #2 of the Control Data 3600 computer, the top of the line for scientific computing at that time, which was 1963. We had a CDC 160-A before it arrived, which then became an I/O processor for the 3600. My first course was FORTRAN, taught by Dr. Glenn Keeney, and it was love at first sight. I devoured the course, finishing the book within a few weeks. I added the assembly language course as an audit that same quarter, and eagerly gobbled that up. We learned CDC’s COMPASS assembly language and did all the fun stuff that challenged programmers back then... for example, to write ultracompact, self-modifying code that was totally unreadable but unbelievably cool! Of course, that kind of programming is now virtually impossible, since our modern processors carve memory up into code space, data space, etc., and trying to execute code from the data space is blocked, but back then, it was all open to us—you could execute a “Halt” instruction, and the computer would stop, waiting for a human operator to restart it! Programs were submitted on punched cards at the input window, and results fetched (generally the next day) at the output window, with your cards coming back rubber-banded in your printed output. That put a high premium on catching mistakes before submission, but it normally took several tries to get the desired output. One of the best things, in my opinion, about CDC 3600 FORTRAN was that one could freely intersperse COMPASS assembly code in the middle of a FORTRAN program. That meant that if you knew how FORTRAN would compile your code for the 3600 architecture, you could speed up whatever parts of the code you wanted simply by putting in the assembly code to accomplish them most efficiently. That is, if you knew that a FORTRAN line would leave some value in the A register, you could just put in a STO XYZ to store that
register value in location XYZ. It’s too bad that this capability disappeared from later FORTRANs, but it would have prevented any reasonable porting of code among machines, so it had to go.

During this introduction to computing, I found my intellectual passion. It became clear to me that, whatever else I might study, computing would be at its core. It was a wonderful feeling, studying something because I couldn’t wait to learn how to do it, rather than because I was being a “good student.” What a difference that makes! I had been internally motivated to learn some other things, like German and Modern Algebra in high school, and my first philosophy courses at MSU, but those were never at this level of intensity. I only had one other concept that ever hit me with such force again—the notion of evolution—and that didn’t come until much later in my studies.

I was later hired as an undergrad teaching assistant (although no such formal position existed at the time) to serve as a “native informant” for the assembly language class. It was being taught by Dr. Laura Trout, who was a computational chemist who wrote FORTRAN code, but knew little about CDC COMPASS assembly language. So she would teach the programming concepts and architecture, but when questions came up about how to do some operation in assembly language, I’d be there in the back of the classroom to answer the question. That was pretty strange, but many strange things happened in the early days of computing.

My “Career” as a Pilot

There’s clearly a flying gene in our family. My Uncle Henry (Rust), after flying in WWII, started Rust Flying Service, which became the largest non-airline flying service in Alaska. With planes on pontoons, wheels, and skis in both Anchorage and Talkeetna, Alaska, he and later his sons, who took over the company after his death, have been flying tourists and fishermen, as well as Alaskan residents, all over the state ever since, today usually in DeHavilland Turbo Otter DHC-3T airplanes, a wonderful turboprop workhorse on floats, skis or wheels. I had a chance to ride in the right seat of one of those from Anchorage to Mt. Denali, landing on a glacier lake there, when visiting them around 2012. So this branch of the family has been all flying, all the time!

My Dad wanted to be a pilot from his teenage years, and took flying lessons until he ran out of money, when we lived in Red Oak, Iowa, when I was three. I must have been paying attention to that, as I loved the idea of flying, too, all the while I was growing up. When, in 1976, I was commuting back and forth between East Lansing and Ann Arbor twice each weekend to play in the RFD Boys bluegrass band, I decided that it would be much better to fly than to drive. I’d get done with a gig a little after 1am, and although I never drank, I would still be very tired, and would have trouble staying awake as I drove my VW Scirocco home to East Lansing, even though I was busy making calls on the CB radio. You remember? “Breaker one-nine, this is the Banjo Man, what’s Smokey
up to tonight, come back...” So I decided to take flying lessons. It worked out best for me to stay in Ann Arbor Friday night, then get up and take flying lessons at the Ann Arbor Airport on Saturday. After only a few lessons, I bought my first airplane to use to complete my training... a Cessna 172 Skyhawk, tail number N3742S. That’s the most popular 4-passenger airplane ever built, but it’s neither very fast nor very sexy, with its high-wing profile. It took me only a few months to complete my training, and soon, I was commuting back and forth between Ann Arbor and East Lansing by plane. I hangared the plane at Davis Airport, a field with three grass runways, on Chandler Road (the northern extension of Abbot Road), where a zillion student apartments are now located. When I flew back at night, I’d have to trigger the runway lights on by clicking a few times on the Unicom radio frequency, which turned them on for about 15 minutes. It was only about a 20-minute flight from Ann Arbor to East Lansing (on the straight-line diagonal), so I’d get home much earlier, and not the least bit sleepy—I think my adrenaline level from flying assured that! I bought a junker car (‘64 Plymouth Valiant, with the cool push-button automatic transmission on the dash) and kept it at the Ann Arbor Airport, so when I landed, I could jump in and drive to the Pretzel Bell, where we played, then drive back to the airport and fly home. It was fun getting home at 2am, too, because at that hour, there was absolutely no air traffic, and sometimes I would talk with the controller in Lansing. After a while, they certainly knew who it was when I checked in with them for radar tracking as I approached Lansing, and we could talk a little bit informally, as well as handling the pure business. I was flying VFR (visual flight rules) at that point, so didn’t need to talk with anyone at all, but I always did, for added safety. The nice thing about this commute, before I had my instrument rating, was that if the weather was bad, I could always just drive. So that removed any pressure to fly if the weather was at all questionable.

After I stopped playing with the RFD Boys, my flying continued full-tilt for quite a while, as I immediately started working on my instrument rating, then on my commercial license. I did the instrument rating out of General Aviation, a fixed-base operator (FBO) at the Lansing Airport. My instrument instructor was a woman named Doris, whose last name I’ve forgotten, and she was an excellent teacher, with many thousands of flight hours. I absolutely loved flying under the hood, a device used to keep you from looking outside the airplane when you are learning to fly by means of the instruments. I especially loved “unusual attitudes” training. That is where I, wearing a hood, had to look down at my lap (away from the instruments) while the instructor first did a bunch of random banks and climbs/dives to try to disorient me, then put the plane into a steep bank and either a steep climb or dive, at a speed that was unusual for that attitude, and then would say, “Your airplane.” My job would be to look up at the instruments and immediately start to get the airplane OUT of that unusual attitude and into straight-and-level flight as quickly and smoothly as possible, using only the
instruments for reference. Sometimes, one or more of the instruments would be covered with a suction cup, simulating instrument failure, which made the task even more challenging, but I loved doing it. And during my many years of flying in instrument conditions, I actually did suffer three instrument failures, so all of that training was not for a “what if” scenario, but for a “when” scenario. Once I had my instrument rating, it became easier (or more reliable) to keep the plane at the Lansing Capital City Airport than at Davis Airport, since Lansing had both ILS and VOR instrument approaches, and Davis had only an NDB approach that demanded much better weather conditions to complete. So I rented a tie-down spot for the Skyhawk at General Aviation in Lansing, and moved my junker Plymouth Valiant up there. After the Valiant sat there for many months unmoved and the tires went soft, someone eventually had it hauled away, and the retrieval cost exceeded the value of the car, so I just let the tow company junk it. That was the second car I'd let suffer that fate, the first being my lovely Rover 2000TC that I drove before I bought the Scirocco. I had left that parked at my apartment complex, Ville Montee in East Lansing, and one day it was just gone. It also was not worth paying to get back, at that point, as it needed lots of work and that work was very expensive for a Rover (same company as Land Rovers).

I did my commercial license training in East Lansing, out of Davis Field, with an instructor named Harold. A lot of the commercial license was about learning a massive set of rules and regulations, but the flying hours also demanded that you learn to do normal flying far more precisely, and to perform some maneuvers that demanded much more coordination of elevator, rudder, aileron and throttle controls. My favorites were the chandelle, a steep climb while turning 180 degrees, and eights along a road, in which all of the factors—speed, bank, pitch, torque—are changing constantly. Those are maneuvers I would continue practicing all during my flying days, whenever I was just flying to stay current, rather than on a trip.

My brother Greg heard from me all about my flying, and pretty soon used to have me fly him, and sometimes one of his associates, to his consulting jobs in Ohio, Indiana, or Pennsylvania. I'd get up around 4am, have breakfast at Theio’s Restaurant in Lansing, fly with Greg to Pontiac to pick up his associate, then fly them to Kokomo, for example. Then I’d fly me back to Lansing and show up for a full workday at MSU. Then, that evening or the next, I’d reverse the whole thing. The wonderful thing was that they reimbursed me for the cost of the flying, so I got to have all that fun for free! It was great as long as it lasted, but predictably, Greg decided he needed to get his license, and soon, he was also a pilot. The good news for me about that was that we could then together buy a better airplane, our beloved Mooney Super 21, a 1964 Mo20E, tail number N7844V. It was a lovely low-wing bird, with a more powerful 200HP engine, variable pitch propeller, retractable landing gear, and hydraulic hand-pumped flaps. It carried four people like the Skyhawk,
but was a sleek design, and its nominal cruise speed was 181 MPH, although we usually got more like 175 from it. But compared to the Skyhawk’s 130 MPH, we were flying! And it got 18 miles per gallon of avgas, so was quite economical to fly. We founded an S-corporation, Mid-Michigan Flight, Inc., to own and operate the plane. I was a director (hey, sounds good...) and Chief Pilot. I could also have declared my self CEO, Prime Mover, Head Wonk, or whatever else I wanted, I guess, but director sounded better. We took on two more partners, Rich Schomaker, a friend of Greg’s who was a chemist at GM, and Jeff Stetson, who was a beam tuner at MSU’s National Superconducting Cyclotron Lab. When my brother Greg moved to Kalamazoo, he sold his share in the plane, and Chuck Gendrich, a Ph.D. student in mechanical engineering, bought in. Greg then bought a V-tail Bonanza and had the tail reinforced when the mandatory tail mod came out. It’s a great plane... I flew in it with him recently to see my Mom and sister Cindy in Philly, and it is a very nice ride.

I truly loved that Mooney, and even today, dream about flying it, whether I’m awake or asleep. I remember the excitement of pushing the throttle to the firewall and enjoying the acceleration as it picked up takeoff speed, rotating, and becoming airborne. Another favorite recurring thought and dream is breaking out the top of a solid bank of clouds into bright sunshine. Dancing in and out of puffy clouds is another favorite memory—you really can fly such that for a while, one wing is in cloud and the rest of the plane is not. But I don’t recommend doing that when you have passengers... funny how what is fun for you is nerve-wracking for them!

Back in the ‘80’s, flying instruments carried a number of burdens. One was remaining “current,” which required flying at least six instrument approaches within the previous six months, either in “actual” instrument conditions, or under a hood with a check pilot. Greg and I also bought a second-hand flight simulator (not the computer kind, but actually an analog computer with an interface just like the instrument panel and controls of a real plane). It displayed only the instruments, just as if you were in zero visibility. That allowed you to practice approaches on the ground, as well. Flying with passengers at night required night currency, and carrying any passengers, even under VFR (visual flight rules) still required currency, so it was important to keep flying a fair amount. Otherwise, getting current became a hassle before any necessary flight.

Before every flight, the plane must be pre-flighted, which means checking all of the externally-checkable things to be sure none of the control surfaces is jammed, the oil level is good, the gas tanks are filled to the desired level and the gas is not contaminated (by draining a little fuel into a cup), the pitot tube is not plugged, the prop is not nicked, the tires look properly inflated, the chocks and tie-downs and pitot cover and any control locks are removed, etc. Before that, if the plane is to be he loaded anywhere near capacity, the weight and balance calculations must also be done. I said
the Mooney can carry four people, but you can’t load up four heavy people and full fuel and go anywhere—the balance of the airplane would be out of limits and make the plane difficult or impossible to control. Of course, for any of the “standard” loadings I used, like Cheryl, David, and me, or like myself, a 160-pound Russian in the back and a 220-pound Ukrainian up front with me, I had done the weight and balance many times, so I knew if I could also load up full fuel, or how much I could carry, both to stay under maximum gross weight and to maintain the center of gravity in the right area. But for a new situation, it meant calculating how much weight was loaded into each part of the airplane, including the fuel to be carried, and then determining where the center of gravity was at the beginning of the flight and where it would be at the end after the fuel had all been burned.

A nice thing about owning your own plane is that you can memorize the checklists so you don’t have to be shuffling around with the aircraft manual before taking off or landing. Since I’m a geek, and you may be, too, I’ll go through them with you here, but please feel free to skip the next couple of pages if you don’t care about flying!

With the Mooney, we had five checklists, which I still have absolutely no difficulty remembering. After engine start and turning on and tuning the radios to the right frequencies, which is done before taxiing, then if it’s an instrument flight, clearance must be requested, copied and read back. Then, after getting permission to taxi, or announcing your intentions on the radio, you taxi to the runup pad (usually right near the takeoff end of the runway). Then comes the first checklist: CIGARTIPPS (Controls, Instruments, Gas, Altimeter, Runup, Trim, Interior, Prop, Pump, Security). That means checking the freedom of movement of all the flight Controls, and that they all do the right things, and opening the cowl flaps, checking the Instruments to see that they are all in “the green” (or wherever they were supposed to be) and setting the gyro to agree with the compass or some known heading like a runway direction, Gas—including checking fuel quantity on the gauges, selecting the desired fuel tank for takeoff, and turning on the auxiliary fuel pump, setting the Altimeter to the correct barometric pressure, setting the brakes and Running up the engine to about 1800RPM and checking the oil pressure, then switching off each mag in turn to be sure both are working, setting the Trim wheel so the right amount of control pressure will be needed to move the elevator—not too much, not too little, centering the trim on the autopilot, and applying takeoff flaps by pumping the hydraulic flap lever, checking the Interior to be sure no one’s baggage or carry-ons will block the dual control or keep you from raising the landing gear (done with a big lever between the seats called a Johnson bar), “exercising” the Prop by feathering and unfeathering it to make sure it reacts appropriately, double-checking the auxiliary fuel Pump, and assuring that the door is Securely latched and all the passengers are belted and nothing is likely to fly around the cockpit in flight. That’s CIGARTIPPS.
Once all of that accomplished, it’s time to announce what you intend to do on the radio, if at an uncontrolled field, or to request permission to take off, if there’s someone in a control tower. Then you roll out onto the runway, and all three engine controls ago all the way to the firewall... throttle, mixture, and prop control. Then, as soon as you’re airborne, the next checklist kicks in: BUFTPMP. Brakes, Undercarriage, Flaps, Throttle, Prop, Mixture, Pump. That’s Brakes (to stop the spinning wheels before you tuck them away), Undercarriage (yup, tuck them away), Flaps gradually retracted from takeoff position, Throttle backed off from takeoff power to desired climb power, looking at the manifold pressure, Prop backed off to the desired propeller RPM for climb (or for cruise, if you are flying at low altitude), Mixture leaned to the desired cylinder head temperature, and auxiliary fuel Pump off. BUFTPMP!

Then, when approaching the desired cruise altitude, you set up the cruise power you want and trim the airplane so it isn’t climbing or turning when you take your hands off the controls. But there’s also another checklist: CMR. That means open the Cowl flaps, adjust the Mixture, and, if at a high enough altitude to make it useful, open the Ram air (which bypasses the air filter and gives about another inch of manifold pressure, for more power at altitude). Then the bird is set for cruise. While cruising, you have to mind the navigation, communicate with air traffic control (usually), and be sure to switch fuel tanks when appropriate, but that’s pretty easy. Of course, if you’re flying in a cloud, you are using your instrument scan and paying a lot more attention than if you’re flying around in the severe clear!

When getting ready to descend for landing, it’s CMR again, setting things for descent, then cutting back the power (or, rarely, just cranking the nose down and going up near Vne, the max indicated airspeed “never to exceed,” for a little bit of quick descent. But that’s not the usual way to descend, which just involves backing off on the power, trimming down, and descending at cruise speed or below. At some point, you have to slow down, because there are maximum speeds at which you can lower flaps or lower the landing gear—in the Mooney, its 120mph for the gear and 100mph for the flaps. Then when you get near the airport, it’s another checklist: GUMPPS. That’s Gas (proper tank, aux fuel pump on), Undercarriage down and locked (“3 in the green”), Mixture rich, Prop control all the way in, aux fuel Pump on (checking again), and Security (people again belted, nothing loose). I usually ended up running through that checklist several times before landing, and guess what: I never landed with the wheels up. That’s a very good thing not to do.

That’s the basics of what it was like to fly my airplane when not in instrument conditions, which is, of course, most of the time. There were also a ton of regulations, procedures, etc., needed to talk with air traffic control, but I don’t think I’ll describe those here—if you want to learn about those, take flying lessons! I also had to keep my instrument charts up to date,
which meant replacing 50-100 pages in the Jeppesen 3-hole-punched books twice a month. No one very serious about flying used the U.S. Government’s charts, which were replaced in toto on a regular schedule, but not nearly as frequently as the Jepps were updated. But that busy work was always a labor of love... a little contact with flying even when you weren’t flying!

My Dad, who had started taking flying lessons when about 21 years old, in Red Oak, Iowa, finally was driven to go back to flying lessons when Greg and I were both pilots. He got his private license when in his 60’s, and an instrument rating when in his later 60’s, which I see as quite an accomplishment. He bought a Cessna Skyhawk like I had had, only newer and much prettier—might have been N4788D, but I’m not certain. Anyway, he flew for quite a few years, and my Mom was a good sport about it, since it meant she could go from North Carolina to Philadelphia or Michigan to see her kids, but it did scare her, and Dad eventually gave it up and sold the plane, at which point we all heaved a sigh of relief. But he, like Greg and I, really loved to fly!

My co-owner Rich flew one very long trip to Arizona in the Mooney, but then didn’t use the plane much locally. Chuck, Jeff and I all flew similar amounts, and ran the plane through two engines and 900 or so hours into the third one before we sold it. I always flew in the IFR system (instrument flight rules), which was easy, at first. If I hadn’t filed a flight plan before taking off, I just contacted departure control or center and asked for an IFR clearance direct to wherever I was going, and they would say, “44V, stand by one,” then issue me the clearance. But after Reagan had his showdown with the air traffic controllers and fired most of them, the system became much less hospitable, and for a while, clearances required ground filing or talking from the air with a Flight Service Station to file a full clearance, then waiting until it got into the system, then calling center to activate it. That was a pain, but after a few years, things got to where I could once again sometimes get a clearance from the air if the weather was worse than expected, although I mostly filed my trips in advance from the ground and had a clearance the whole way.

I had some adventures while flying—I always stuck to the rules, but sometimes stuff happens that gets the adrenaline pumping, even so. For example, I used to fly to Put-In-Bay, Ohio, in the summers, for Bluegrass Extension Service gigs there on South Bass Island, in Lake Erie. Once, while there with some band members, we were preparing to take to the runway and depart the island, sitting on a runup pad beside the runway. Now Put-In-Bay has an unusual runway: the only one I knew of that has a “dogleg” in the middle—the runway actually turns about 10 degrees right near the middle. So you had to plan to land well before that or well after that, or you were going to be executing a high-speed turn just after landing. Well, as I sat there running through my pre-departure checklist (CIGARTIPPS: Controls, Instruments, Gas, Altimeter, Runup, Trim, Interior, Prop, Pump, Security), a V-tailed Bonanza approached the runway from
the OTHER end (i.e., landing downwind, a major booboo). He sounded inebriated on the radio, and landed long. Soon, I realized he wouldn’t be stopping before he got to me near the end of the runway, so I gunned the engine and turned around and taxied off the runup pad, which is where he ended up stopping his plane. It was a drunk doctor—you know, the guys who can do anything. There’s a reason the nickname for the V-tail Bonanza is the “fork-tailed doctor killer”—they are expensive, so doctors are the most likely buyers, and docs tend to be overconfident pilots, so I think a disproportionate number of them end up dead. As pilots say, “There are old pilots and there are bold pilots, but there are no old, bold pilots.” None of us really believes that, as the military and test pilots tend to be bold and to survive, but that may be more true of pilots who don’t fly for a living.

Another adventure was when Cheryl and I were flying with another couple to see the play “Nicholas Nickleby” in Manhattan. It was such a long play that they gave you a dinner break in the middle. On the morning of the play, we were flying into Newark Airport, so we could take the train from there into Manhattan very conveniently. Newark is a busy airport, but I’d flown into many big airports by then (Midway, Dulles, Detroit Metro frequently), and was flying a lot, so I didn’t worry about it. However, as soon as we touched down, I could feel the plane pulling strongly to the left, and realized that I must have a flat tire on the left main gear. So I kept the plane going as straight as I could until I was slowed down, then pulled onto a taxiway and called Ground Control. “Newark Ground, Mooney November 7844V is clear of [whatever runway it was], and I have a flat tire.” The response: “You have a WHAT?” I guess they’re not very used to flat tires there, since airliners have a bazillion wheels and would hardly notice a flat in one tire. Anyway, they sent a tractor out and put the left main gear up on one of those little dollies a mechanic uses to roll under a car, attached with bungee cords. They pulled us in to the FBO and by the time we got back from the play, the plane had a brand new tire. It was all free, too! (Okay, that’s a BIG lie—I think that tire cost me several hundred dollars.)

A fun happening was one day when Cheryl and I landed at Dulles Airport, outside Washington, DC, and as I taxied off the runway I had used, Cheryl said, “Look, there’s a Concorde landing right behind us.” I didn’t believe her until I turned and saw that it was right there! That was very exciting!

Winter snow and ice pose other perils. It takes some skill to land a light plane in a crosswind on a snow-covered runway, but I have done that a few times, particularly at Michigan City, Indiana, in the “snow belt” along the east coast of Lake Michigan. That takes checking with folks on the ground to be sure there is some traction, but mostly, you just keep flying the bird with the flight controls after you’ve landed, until it slows down. An interesting snow/ice experience was one Christmas Eve, when my sister Cindy, from Philadelphia, was to come to our
house in Michigan, to spend Christmas with us and my parents. A blizzard descended on Ohio and Pennsylvania, and she couldn’t drive any further than Youngstown, Ohio. I checked the weather and it looked flyable to there, so off we went. We were between layers much of the way, with no ice, but getting thrown around a little—Dad and I were in the Mooney. After an instrument approach, we managed to collect our passengers and get them back to Lansing. On the way home from the airport, the car quit in the middle of the street, amidst the snow and ice. So we ended up getting out and pushing it to get it started, and had more weather trouble on the ground than in the air.

I made many trips in the ‘90’s flying my Russian and Ukrainian visitors around on MSU business, consulting for manufacturers of automotive gears—GM, Chrysler, and New Venture Gear, in particular, under the Case Center’s Industrial Technology Incubator. That took us frequently to Kokomo (IN), Peru (IN), and Syracuse. In all cases, we could fly in, do a day’s work, and fly home, rather than waste a day in an airliner, stay overnight, and fly back on the second or third day. The university reimbursed me for my costs as if I were driving, and in the Mooney, that was enough to cover most of my actual costs, and meantime, I got to fly instead of driving or changing planes and waiting in the airline system. I loved it. But by the late ‘90’s, that activity concluded, and my reasons for flying got fewer and fewer. I was going to conferences, but they were usually too far away for me to fly, and by that time, the West Ramp at the Lansing Airport had been closed, and I had to move the plane to Mason Airport. It took long enough to get to Mason that it wasn’t worth it for a short trip, so my flying hours started dropping off. By that time, I had also had to buy out all of my partners except Rich, and he wasn’t really flying any more, so I became afraid that if I didn’t start the engine more often than every few weeks, I’d start getting rust in the cylinders and would have to overhaul the engine before I could sell the plane. So, with a very heavy heart, I put the plane on the market, and it sold quickly, for $24,000, about $3,000 more than I had bought it for 20 years earlier. Of course, I had put in two engines and 20+ annual inspections and new radios and routine maintenance and a paint job and a new interior, so it’s not like I made money on the plane; nonetheless, he airframe certainly retained its value well. I had flown a total of about 2,000 hours, of which several hundred were at night and several hundred were in instrument conditions.

Of course, all of my international travel also meant I logged a lot of hours on airlines, especially Delta (and Northwest, before that was bought by Delta). I recently passed a million miles on Delta, and I figure that, together with about 250,000 miles flown in my own planes, plus miles on other airlines, I’ve probably flown far enough to circle the earth about 60 times at the equator!
Teaching Telephone Engineers

For three years, while I was in my master’s and Ph.D. programs, I was hired each year to teach a course on computer programming and telephone traffic simulation to telephone engineers belonging to USITA, the US Independent Telephone Association. This consisted of the non-Bell phone companies (at the time, Bell was completely dominant in the U.S.) like General Telephone, United Telephone, and lots of “mom-and-pop” local phone companies like Stockbridge Telephone Company, not far from East Lansing. The courses were coordinated by John U. Jeffries, a member of the College of Engineering faculty for whom this was his main job. He did not have a Ph.D., and didn’t teach or do research, but did this job as part of MSU Extension Service, I think. The trainings were three weeks long, full-time, and both the engineers and teachers lived in the Kellogg Center for that time. I absolutely loved this, my first real teaching experience. I taught them the BASIC programming language, using teletype terminals with paper tape readers/punches, talking to the Dartmouth Timesharing System at Dartmouth College, using 110-baud modems that you fitted the phone receiver into, and I think later, 300-baud modems. This timesharing stuff was pretty heady at the time! You got your answers right away, rather than waiting for a deck of cards and a printout to come back. I lectured to them several hours a day, and they had some other lectures and then time with the computers. We ate breakfasts, lunches and dinners together, and thoroughly enjoyed each others’ company. They had another instructor, too, for non-computer material, and while I can’t remember what he taught them, I do remember that he ate a chocolate sundae with every meal, which, of course, was a subject of great attention. He was skinny as a rail, so must have been hosting a whole colony of tapeworms.

Once the students got the hang of programming, I taught them how to simulate telephone traffic arriving at a switching center, so they could use that to simulate their own switching centers and size the various kinds of equipment appropriately. That meant they learned about Poisson distributions, exponential distributions, normal distributions, and how to generate them all from a uniform random number generator in BASIC. Most of the engineers got the hang of it pretty well.

We also had a lot of fun together in the evenings, since we were all living there together. One year I remember I spent some time writing a program on the timesharing system that resembled the "Eliza" program. I assume I had heard of that somewhere and just decided to clone it. When they ran the program, it would begin by asking them a few questions, interacting with them conversationally. After each response, it would sort through looking for keywords, and begin acting like a psychotherapist, triggering on family words, work words, emotion words, etc. I think I only had forty or fifty words or phrases that the program actually understood, but it did pretty
well in sounding like a person was on the other end... given its very restricted domain of discourse. Anyway, we all had fun with that.

Another year, I started playing a game with them in the evenings that was based on a kid's game. Books are arranged in a 3x3 array, and while a confederate is taken out of the room, someone chooses a book to be “it.” The confederate returns, and the person with ESP uses a broom handle to point to books, seemingly at random, and the confederate always correctly identifies the right book. The entire trick is contained in where on the first book pointed to the person with ESP touches the book. If he touches the book in the lower right corner, then the correct book is the lower right book. Well, that became the basis for the trick, but my confederate and I made it more and more subtle, by not using a pointer at all, but simply touching or leaning on or drawing attention to the correct portion of something vaguely rectangular. In the end, the students were literally sitting on me as I lay on the floor, while still managing to communicate the needed information. Well, this trick finally backfired on me... some of the students confessed to me that they had been sure it was a trick, but that after all they'd seen, they were now convinced that it really was ESP. I was appalled! So I quickly assured them that, no, it was just a trick, and showed them how it was done. We had several evenings of great fun with that, as those who had caught on could join in and begin “picking up” the ESP signals and identifying the right book. I still smile when I think about my time with the telephone engineers.

**Skiing**

I had never been skiing, as far as I can remember, before the age of about 35, although it had always looked like fun. Our friends Michael and Stephanie Shanblatt and we booked a Boyne Mountain Condo Weekend—you know, free lodging so long as you go to a 2-hour sales pitch about their condos. Anyway, we had a great time, taking our first ski lessons, hot tubbing, eating good food, and enjoying the getaway. Michael was a brand new Ph.D. and recruit to EE at MSU, and Stephanie was a Ph.D. biologist teaching as Lansing Community College. We became very good friends, supporting each other through some of the tough times that both couples experienced. But only one of the four of us got bitten by the ski bug—me. I discovered that the Lansing area was home to the Lansing Ski Club, and they had their own “hill” (an old landfill) out by Park Lake Road, in what is now converted into luxury homes. I went out and started taking skiing lessons there, where they had a single chair lift, a T-bar, and a couple of rope tows. I loved it, and started hanging out with some of the people who skied there regularly. It turns out that most of them had been expert skiers—on the East Lansing High School or Okemos or MSU ski teams. Some of them had even tried out for the U.S. Ski Team. Well, these nice people explained to me that the only thing to do at Lansing’s teeny-tiny hill was to learn to race, as one simply couldn’t go there to “cruise.” I explained that I was not particularly
athletically inclined, but they said I’d be fine, so I joined the Lansing Ski Team, a member team in the Metro Detroit Ski Council, and started learning to race. At Lansing Ski Club, that meant a slalom course or a very short giant slalom… you couldn’t set three gates for a downhill there. They coached me on form and gear (I had 185’s and 206’s—way longer than anyone uses today). They gave me lots of tips, and soon, I was competing in Class D, in race weekends up at Boyne Mountain. We had a great time... I’d ride up to Boyne on Friday afternoon, usually with Howard Grider, who was MSU’s Director of Contract and Grant Administration. Both he and his adult kids raced, and there were several others that would travel with us in his station wagon, with the skis all loaded up on top. We had a great time, not only on the hill, but also at meals and relaxing in between. Because of my computer skills, I was quickly recruited to work on the software for recording race times, tabulating results, etc. We transitioned from a very arcane bit of BASIC code to using a spreadsheet during my years there. We had electronic timing gear, and the people at the bottom of the hill would call in the racer number and race time, and we’d record it. Improving the software system gave me something I could contribute to the team, and earned me a place, given that my skiing wasn’t all that great. One week each winter, all of the MDSC teams would head out West, often to Colorado, to compete for a week with teams from all over the country, in what was called the USSA Citizens’ Championships. What a thrill it was, to ski at legendary places like the Back Bowls at Vail, Sun Valley, Aspen, Park City, and the rest! You could actually cruise out there! The USSA competitions, like those at Boyne Mountain, were divided into classes: Elite, A, B, C, and D. I started out in D, of course, and worked my way up to coming in second in a couple of Class C races, then finally made it to Class B in my last year at the Nationals. I practiced about one or two nights a week, first at Lansing, then at “Mount Brighton,” after Lansing Ski Club was closed and the hill plowed down, until 1990. The birth of my son, David, put an end to the weekend trips up north, and I think I’ve only skied once since then. The skis are now entirely different—much shorter and with a curve cut into the ski profile, so I wouldn’t know what to do with a modern pair of skis. But I sure had fun for the decade or so I was racing.

Tennis

I had started playing tennis a little bit as a kid living on the MSU campus when I was in fifth or sixth grade. MSU ran a summer tennis program for kids, and I got some group lessons from Stan Drobac, MSU’s legendary varsity tennis coach. But I didn’t play much outside of that until I moved to North Carolina. There, in the summers, my friend Paul Licker and I used to play in Hanes Park, the city park adjacent to Reynolds High School and Wiley School. The courts were clay, and they kept them well limed. I remember wondering why they didn’t just pave them and make them nice, not appreciating the great privilege it really was to play on clay courts—something I’ve rarely been able to do since then. When Dick Smith and I lived in Fowlerville, Michigan, in an
apartment in an old, remodeled funeral home, we had school tennis courts right across the street, and we used to play quite a bit. I played some paddleball at MSU during grad school, and also during my Ph.D. program at Michigan, but gave that up after receiving the classic injury—a paddle edge putting a tooth through my lower lip after brushing a wall. But I played no tennis after that until the early 80’s, when I joined the Thursday night men’s doubles league at Court One East, in Okemos, run by Prof. Vik Shah. I have played in that league for 35 years, now. I also joined a Monday night doubles league, a Saturday morning doubles league, and for a few years, a Tuesday morning men’s singles league. I generally played somewhere near the middle of those leagues—neither the best nor the worst. I occasionally won a trophy, while they were still giving those out, but more often finished “out of the money.” For most of the 34 years, I’ve played three times a week, which has constituted my major aerobic exercise, and which I hope I can get re-established in the future, after two of the leagues have shut down for lack of steady membership.

For a long time, my game has been limited by my slow reaction times... my net play has never been very good, as a result. My foot speed was (and still is) excellent, but I have to recognize early where I need to get to, or that speed does me no good. The troubles I’ve had with my eyes means that sometimes I have gone a whole season with lousy vision, which also doesn’t improve my reaction times. Nowadays, the loss of visual field from glaucoma in my left eye means that I’m not able to use my left eye to track the ball, so my depth perception is bad. But practice is actually letting that improve over time, and I have no plans to quit playing tennis. Nowadays, I wear goggles to protect my good eye, but those are my only tennis prosthetics—compared to a lot of my fellow players who have braces on knees, elbows, wrists, ankles, etc. In the evening doubles leagues, we always have dinner at the tennis club afterward, sharing pizza or Mexican or Indian food, mostly. There’s beer and pop, too, and people sit around for an hour or so and talk, so I’ve made quite a few friends like that over the years, and not all are professors. There are state government folks, real estate guys, business owners, doctors, lawyers, and the gamut (that is, of folks who can afford to pay to play in an indoor tennis facility). At times, I’ve felt like the only Democrat in a room full of Republicans, but that’s never actually been true. When the atmosphere becomes unpleasant for me, I can either inject my views, or shut up, or leave. It’s a tossup as to which I’ll do on a given night—I guess it depends on how the rest of my day has gone and whether I sense the possibility of any allies in the discussion. But at this point, most of us know who lines up on which team, and that no one will convince anyone of anything different, so we often talk about things other than politics or economics.

**SCUBA Diving**

My brother Greg started SCUBA diving in the 80’s, when it was a fairly new sport. I’m really sad that I didn’t start then, too, but at that point, I was
flying, playing tennis, ski racing, directing the Case Center, and did not have time for another recreational activity. I had dived once with a friend, Gene Nickerson, at his cabin on a lake up north, in 1967, when I was a graduate advisor in Hubbard Hall. Gene was one of the RA’s, and we went up to his family’s cabin to let me try his SCUBA gear. He set up the equipment and we waded in. He’d just talked me through the process at that point, and when I donned the mask and put the regulator in my mouth and stuck my head in the water, I popped back up and said I couldn’t breathe. He said not to worry, that was natural at first, and I kept trying, with no luck. I finally gave him the reg, and we then learned that the tank he’d given me was empty. Oops, fine introduction to SCUBA. Happily, it wasn’t a boat dive. We got another tank, and then I could breathe just fine! But I didn’t do any more SCUBA for about forty years. Gene enlisted in the Air Force after graduation to avoid the draft (Vietnam War), and was trained as a fighter pilot. Unfortunately, he was shot down and killed in Vietnam. I was quite moved when I saw his name on the monument in Washington, DC, many years later.

I began SCUBA diving in earnest with a resort dive during a “free condo visit” in Cozumel, Mexico, around 2007. I loved it, and soon scheduled another trip to get my Open Water certification, which I completed that same year. Then I added Nitrox (enriched air) certification and Advanced Open Water certification in short order. In 2009, I earned my Rescue Diver certification, which was not easy for me, at the age of 65. I don’t know how many times I had to rescue my instructor, hauling him to safety while administering rescue breaths, over and over… it was many times before I satisfied him that I could do it. Then I did other specialties—Night Diver, Deep Diver, Underwater Navigation, Equipment Specialist—until I qualified for my Master SCUBA Diver certification, in 2010. Cozumel was my “dive home,” and I got back there at least 7-8 times in my first ten years of diving.

I also loved diving the cenotes (underwater caves) of nearby Playa del Carmen. In 2014, I decided to get serious about that, and completed the training for certification as a Cavern Diver. That was also strenuous, but fun. For one thing, the equipment weighs a ton—for cavern diving, you’re wearing twin tanks with a crossover mechanism, so you start with twice as much air, and if there’s a flay with one tank, you still have the other to work from. Lots of other things are different, too—the kind of light you carry, the kind of buoyance gear, the precise way everything is situated, etc. I had to learn how to lay a line underwater from rock to rock—the knots to use, the rock shapes to choose, and the markers to place, and many other fine points that change cavern/ cave diving from being very dangerous to being only a little dangerous. I loved these lessons, although walking up and down moderate grades to get to the cenote entrances was a challenge with all that gear on. Students have to experience all sorts of potential emergencies—for example, having no visibility and following your line back out of the
cave. I remember the first time I had to follow a line with my mask off and eyes closed—it was in the open part of the cenote, shallow and not at all dangerous. I took the line in one hand and started following, feeling for the rock tie-offs to find the new direction. As I went, I felt absolutely no fear, but rather a sense of elation—it wasn’t from nitrogen narcosis, at that shallow depth, but just from feeling perfectly at home in this very strange environment. I’m not the least bit claustrophobic, which is also a good attribute for cave diving. I have a little acrophobia, which never bothered me inside an airplane, but no claustrophobia at all.

The “final exam” for the Cavern Diving certification was really amazing. You lay out a line for a few hundred yards into the cavern, marking it periodically with plastic arrows so you know the way out even if you managed to get disoriented. Then, without warning, the instructor takes you off the line, motions you to take off your mask and close your eyes, then turns you around several times while changing your depth and moving you away from the line. Then your job is to find the line again and get yourself out of the cavern, all without any vision—remember, in a real situation, failure of your many lights or lots of sediment in the water could create zero visibility in a real situation! You are taught to try to remember the general direction of the line, but the first thing you do is to use your extra safety line to mark your current location—the nearest thing on the bottom or to your side to which you can tie your safety line. That way, if you swim off in the wrong direction, you can at least get back to wherever it was you started your search. Well, when I did this test, the first thing I was supposed to do was to reach down and detach the safety reel from the D-ring down by the crotch where it is attached by a clip that has a little slider to open the clip. But when I felt around for the slider to open the clip, it had broken off—it’s metal, but clearly not tool steel! After a minute of trying to dislodge the reel without using the clip, I gave up, turned my light on and put my mask back on, and showed the instructor what had happened. He gave me another safety reel with a working slider, and off we went again—mask off, lights out, spins, and then I’m on my own. This time, I got the safety reel out without incident and tied off my safety line at my current position. Then the idea is to start off in the direction you think is most likely the way to your line, and at a depth likely to be at or below the line. You swing your hand up and down in front of you, trying to feel for the line and maintaining your depth as best you can (ears help with that). Then either you find the line, or when you are sure you’ve gone too far without finding it, you decrease your depth (go upward) and turn around, still trailing your new safety line behind you, and go back along the safety line. If you picked the right direction, then your safety line should now catch on your original line, as you are now above and beyond it. In my case, the instructor told me that my hand came within inches of the line on my way joutward, but didn’t quite touch it. But on the way back, I quickly found it when my safety line engaged with it, and I was soon on my way back out of the cavern. It was
unbelievably fun, doing all of that in pitch darkness, but knowing that I had a mask and an instructor if needed, so I was not at all fearful. For a diver who’s not claustrophobic, I thoroughly recommend the beautiful cenotes of the Yucatan!

I’ve dived many other places, now, with a total of over 170 dives. I love night diving because of the critters that come out on the bottom, particularly the octopods. They are truly amazing to watch, as they change shapes and colors and squeeze through impossibly small holes in the reef. Lobsters are just strolling about at night, too. Many of my dive trips have been with my brother Greg, who has well over 400 dives and, though much bigger than I am, uses a lot less air—I still haven’t learned all of the tricks, although I keep working on it. Cheryl and I also go on trips alone sometimes, and although she’s snorkeled a few times, that’s not really her favorite thing, so she often reads and walks around town while I dive. I can usually arrange to be home by 1:00 or 2:00 in the afternoon, so we have the rest of the day together. In addition to Cozumel and the Riviera Maya, I’ve dived at Grand Cayman, Los Cabos, Puerto Vallarta (two trips), Punta Cana (Dominican Republic), Roatan (an island off the coast of Honduras), the Peloponnesus (Greece), Key Largo, and Guanacaste (Pacific coast of Costa Rica). I don’t like any of those places as well as Cozumel and Playa, however, and since Cozumel and Playa are also the cheapest places to get to and stay, my diving is skewed pretty strongly toward them. But Cheryl and I, sometimes with Greg and Karla, will continue to explore new places, too, I expect.

My Fascination with Trains

When I was a kid, I loved trains. My first was a wind-up train that I discovered one morning under the Christmas tree, I think when I was two or three years old. Then when I was a little older, I got a Lionel O-gauge electric train—a steam locomotive and half a dozen cars on an oval layout, in the beginning. Then it got expanded to include a figure-eight crossover instead of the oval. At some point, a second engine appeared, but I’m not sure whether it belonged to me or to a friend, but I remember that we carefully insulated the left and right tracks and the wheels on one side of one locomotive and on the other side of the other locomotive (and they shared the center rail), so we could control them independently and have train wrecks.

When I was maybe six through eight years old, I had the pleasure of taking an annual trip in the summer for a week or two with my Aunt Cora and Uncle Art, who lived in Enderlin, North Dakota. The name should give you a clue... it was at one point the end-of-line for the Soo Line Railroad. There was a big maintenance roundhouse there, and my Uncle Art had come up through the railroad workers union, made his way into politics, and was once the Democratic nominee for Governor of North Dakota. Of course, as a Democrat, he had no chance of winning, even back then. But I remember fondly taking the train, all by myself, from
Minneapolis to Enderlin. It was a “milk train,” stopping at every small town along the way, and in my early years, was pulled by a steam locomotive. I remember how thrilled I was when that was replaced by a shiny new diesel! And now, how much I’d give to take that ride again behind a steam locomotive, with the stops at the water towers and all that. I used to have a great time in Enderlin, as I had some second cousins living right across the street, and Enderlin was a nice small town with a soda fountain and movie theater right “downtown” a few blocks away. I remember that one year I got a toy submarine as a prize in a cereal box, and it was powered up and down by baking powder. I would put it in a galvanized washtub in the back yard and spend an amazing amount of time watching it go up and down as the bubbles formed and broke—how interesting can that have been? Interesting enough, I guess! Maybe I had some other boats there, too... but I can’t remember them.

Anyway, I went from my childhood trains to my first N gauge layout when I first married. I kept it on a 4-by-8-foot sheet of plywood under the bed, as is, of course, traditional. I had a few crossing signals and the like, but never did any serious layout construction, and I don’t even know where that train ended up.

But when David was about four, he became my excuse for building a train layout in the basement. Wow, did he ever NOT buy into that as a shared activity! After I got him down there at various points in the construction process, it became very clear that he had absolutely no interest in building trains or in running them. SO, I had to revise my personal justification for working on the trains—I had to admit to myself that it was now just because it was something that I enjoyed very much doing. And do it I did, typically spending 2-3 hours in the basement after dinner three or four times a week, and sometimes also some Saturday or Sunday time, too. And Cheryl was very supportive, as she could see how much I enjoyed it, and at least she always knew where I was! I did it for a couple of years, took a long break, and went back to it for a while when David was in his teens.

I emptied out half of the basement, mounted Masonite countertop inside-out (rough side facing the room), covering the windows completely, and began the layout. First I built a 4x8 table, then added a second table to make an L shape. Then I moved the whole thing up against one wall (after first painting the whole sky on the Masonite, while I could still get at it). I replaced the first 4x8 with new benchwork attached to the wall. Then I added a second, higher level, with a hidden loop underneath on the first level. I then did a higher table at the far end of the room and joined the two levels with a long grade along the long wall, rising about 18”. Then I completed the scenery on the two-level end, with rock walls and bridges and lots of fun buildings, roads, etc. I then installed a large mesa in the middle of the central part of the layout, to provide visual separation when the train went around a loop there, so you couldn’t see where it went. I wanted to keep the challenge in running multiple trains, so I wired the layout in electrically isolated
blocks, with microswitches controlling the track which was getting power from which transformer distributed (and sometimes duplicated) among two control panels in different parts of the layout.

Then, as David's sports stuff became more and more time consuming, I had less and less time for the trains. I never did find anyone interested in running them with me, but I did master some of the maneuvers I had always dreamed about, like the “saw-by” maneuver whereby two trains, both too long to fit on a siding, could pass each other. But once I abandoned the construction, I hardly ever even went down there, as it would take me too long to catch up with what needed doing next, and I would have to clean the rails before I could even get the trains to run properly. The one person who would gladly have run the trains with me was the son, Grant, of my friend and colleague Rob Pennock, who lives just down the street. Unfortunately, although we ran them around the tracks a few times, there was enough maintenance needed, and I had so little time, that we never got that going, which is too bad. Grant loved trains from his earliest days, and would have made a great train buddy.

Come to think of it, I did run the trains once with my friend Dick Smith. He is an excellent nature photographer (in his retirement from teaching sociology), but also loves to “doctor” photographs to show me alien-aided evolution, sometimes with little plastic figures that he arranges to act out some drama (vaguely reminiscent of “Oh, no, Mr. Bill” on Saturday Night Live). On one of his visits to East Lansing, we took movies of trains colliding with school buses, and it turned out to be fairly difficult to get the train to actually knock the bus off the tracks (and maybe over a cliff) without the train just stopping unrealistically. And tough to get good footage of the whole thing! But we passed a few hours indulging in this spectacularly black humor.

Languages—Another “Hobby”

At various points, I have studied Latin, German, French, Russian, Chinese and Swahili. I studied them because I like to study languages. In my leisure time, sometimes I would pick up a science fiction novel for reading pleasure. But sometimes I’ve foresworn that pleasure reading completely for extended periods. Instead, I would pick up a language textbook to study—at various times, Chinese, Swahili, or earlier, Russian. One of my greatest pleasures is that I’ve been able to use those languages in Russia, China and Tanzania many times. I studied Russian during my first three years of college, then hardly ever used it for 25 years. But, in the early 90’s, I began going to Russia every year for a few weeks, so brought my Russian back and was able to use it a lot in the 90’s. After I started studying Chinese in 1987, I made many trips to China, even living there with my family for six months, so again got to use it. And now that I’ve been living in Tanzania for a month every year for ten years, my study of Swahili has really paid off, too.
My Latin vocabulary is gone, but the impact of the grammar has stuck with me through all my other languages. My German and French I haven’t used in 50+ years, so they are gone in terms of any fluency, but the grammar and some of the common words are still hanging around, together with songs, poems, and the like.

It is troublesome that when I’m trying to put together a sentence in one language, some corresponding words from another language often pop into my head. Once I’ve been somewhere for a week, that stops happening with the pronouns, conjunctions, and other common words, but when I think of how to express something that I’ve come to recognize as idiomatic in one of the languages, that idiom often intrudes regarding the same expression in another language, especially when Swahili and Chinese are concerned. When that happens, I just shrug to myself and dismiss the false recall, and go back to looking for what I need in the language I’m trying to speak. But it’s sometimes actually kind of funny, and I laugh to myself.

**Thirty-some Years of Stratford with Friends**

Cheryl and I started going to Stratford, Ontario, to see plays at the Shakespeare Festival, soon after we married. It was an annual event. We’d usually fly in, land at the small Stratford Airport, and grab a taxi to town. The trip was made more cumbersome by having to go through Canadian Customs on the way in and U.S. Customs on the way home. We usually landed at Windsor or London to do Canadian Customs, and going home, always landed at Port Huron, after notifying Customs in advance of our expected arrival time. They would charge me $25 for the service, sending an agent over to the airport from the bridge. I’m not sure I would do that any more today, if I were still flying, because of the risk that they’d tear the airplane down to bare metal looking for drugs. But it wasn’t much of a worry back then.

We’d usually go in from Wednesday to Sunday, seeing four or five plays. We always saw at least one musical, which I love, and usually one Shakespeare, and then whatever else was playing. We stayed at lots of different places, mostly hotels or B&B’s in downtown Stratford, since we didn’t have a car there.

Sometime in the early 80’s, we began going with a group of people I knew from the Case Center or from committees at MSU’s Computer Laboratory. Tom Atkinson, a chemist and computer networking guy, usually bought the tickets for the group in the beginning, and the others in the group included Mike McPherson, from the Case Center’s Computer Services Division, Maggie Wilke, also from Case, her husband, Jay Siegel, a professor of forensic chemistry, and John and Andy Funkhouser. John was another forensic chemist and a frequent co-author with Jay, and Andy worked in the College of Social Sciences with their Study Abroad programs. They moved to Ajijiq, Mexico, near Guadalajara, some years ago, so now combine their annual doctor visit to East Lansing with our Stratford trip. We visited them in their
two Mexican homes (one is a “beach house” that can house several families at once), and we can now understand how an American can have a good life as an ex-pat in Mexico. A few other chemistry faculty and their wives sometimes came to Stratford, too. Eventually, the group grew to as many as 20 people, and for a couple of years, included my high school friend, Paul Licker, and his wife Susannah.

For a few years in the 80's, we went annually instead to the Shaw Festival Theatre, in Niagara-on-the-Lake, Ontario. We enjoyed the different type of plays, but after a while, the Shaw plays began to seem a lot like each other, and we switched back to Stratford. But all of us were just as interested in the people in our group and in sharing good meals together as we were in the plays. Breakfasts were in carefully selected places, and dinners were often reserved six months in advance. Lunches were always catch-as-catch-can. For over twenty years, Jay Siegel took care of getting play tickets and hotel and restaurant reservations, under his banner “Miracle Travel—If We Get You There, It's a Miracle!” He did an amazing job, polling people regarding which plays they were interested in, which restaurants they wanted to go to again, etc. Eventually, Mike and his wife Carolyn moved away, and then the Atkinsons retired to Traverse City, so some of our original stalwarts were gone. Because the group was still large and unwieldy to seat at a restaurant, we eventually cut back to the remainder of the original crew. We've added a few since then—including our good friend Ron Rosenberg, who used to attend with his wife, Judy, before she passed away, and has now rejoined the group and taken on a role at the euchre table, too! This year, we were only eight—the MacCluers, Funkhousers, Goodmans, Maggie Wilke and Ron Rosenberg, since, to the great sorrow of all of us, we lost Jay right after our Stratford trip of last September. He had had heart troubles for years, but we certainly hadn't expected to lose him so soon.

Our favorite breakfast place was Madeleine’s, a diner about a mile from the center of town. But the finishing touch to each visit, Saturday evening, was always at the Waterlot Restaurant in nearby New Hamburg. At first, our host there was a retired Mounty, Gordo, and later, after his death, his daughter, Leslie. We knew the waiters (our favorite was Greg—in fact, when he moved to a restaurant in a nearby town, we went there in search of him). The rack of lamb there was absolutely superb. We would sometimes just tell them that we had two fish lovers and the rest beef or lamb, and ask them to bring us something delicious, which they unfailingly did. We were crushed a couple of years ago when the Waterlot closed. We've tried a couple of places for Saturday night, including The (Old) Prune, which had been an early favorite of Cheryl's and mine, but I think we all miss the Waterlot. And we certainly miss Jay.

I took on the booking of plays, hotel, and restaurants this year—Miracle Travel is reincarnated, but a shadow of its former self. We missed other things, too... in the last four or five years, at least, Jay, Maggie, Cheryl and I had used most of our spare moments
in Stratford to play euchre. It’s a simple game, so it’s possible to talk politics, poke fun, discuss plays, and so on, all while keeping the game running just fine. We really looked forward to that part of the Stratford visits together. This year, we played three-handed euchre with Maggie, but it sure wasn’t the same—Jay’s absence was quite palpable in the room. Later, Ron Rosenberg joined us, and that made it more fun, but Jay was still much missed.

My Fights with Bladder Cancer

I had never had any serious illnesses other than appendicitis until about 2010. That year, I mentioned at my regular annual physical that I had seen a little blood in my urine a few days previously, and wondered what might be the cause. My doc, Dr. Jack Strandmark, said it was probably nothing to be concerned about, but he wanted me to check it out with a urologist. He referred me to a Dr. Lee in Okemos (who has since left the area). Lee’s testing showed evidence of bladder cancer, which he assured me was very treatable, but needed to be treated right away. I went in for a procedure by Dr. Lee called TURBT—Trans-Urethral Resection of Bladder Tumor. Basically, they use a cystoscope to invade the bladder, visualize the tumor, cut out the tumorous parts, and then “buzz” the nearby interior (burning the tissue with electricity). That is followed by infusion of BCG (Bacillus Caume-Guerain), a weakened form of the bacillus that causes tuberculosis. This bacillus is supposed to stimulate the immune system to respond to it and, in the process, also attack any remaining tumor cells. (My friend Marty Hetherington had the same procedure done somewhat later, but the bacillus got into his bloodstream and gave him tuberculosis, which was very hard to get rid of.) Needless to say, the recovery from this procedure is not fun, as performing “routine bodily functions” becomes very painful for a few days. But, happily, there is a drug that is an anaesthetic specifically for the bladder, and once I discovered that, I could use it instead of any of the usual opiate pain relievers, so I didn’t need them beyond the day of the surgery.

The procedure was said to be successful, and no evidence of cancer was found in a check a few months later, or at the one-year or eighteen-month marks. The tumor had been in the superficial layer of the bladder, not invading the muscle tissue. Dr. Lee left town and I began having my 6-month followups at the University of Michigan Cancer Center, with Dr. Hollenbeck. At the two-year mark, the cancer was back, and the procedure was repeated—TURBT followed by BCG. More fun. Once again, the bladder looked good (well, as good as a bladder that’s been pretty well hacked up can look) at the initial followups, but at the two-year mark, the cancer had returned again.

Happily, at that time, Dr. Hollenbeck was a participant in a clinical trial studying the usefulness of a drug previously approved for kidney cancer, Sutent (sunitinib malate) for treating non-invasive bladder cancer. Dr. Alon Weiser, who looked old
enough to be graduating from high school, was the PI on the project. As with most chemotherapies, this was designed not to kill you, but almost. The arrangements for monitoring and support while I was on the drug (one pill a day for a month) were excellent. I knew exactly what side effects to watch for. The drug was designed to attack mucous tissues such as found in the interior wall of the bladder, and guess what else it attacks—the mucous membranes of the mouth! It wasn’t a surprise, and I had yummy liquid diet solutions to drink through a straw when I could no longer tolerate solid food, but when the pain and sloughing of tissues got too severe, they stopped the drug for a week. That was about three weeks into the treatment, and I did the final week after the one-week pause. It wasn’t a fun experience, but didn’t keep me from working most days, anyway, because working beat sitting at home and feeling sorry for myself. But there was one totally unexpected positive side effect of the chemo. Along with attacking my mouth, the drug also caused me to slough off tissue from the bottoms of my feet, and completely cured the athlete’s foot fungus that I had been treating repeatedly for years with no completely curative effect. It took the layers of callous tissue that had been protecting the fungus from the fungicide right off, and I was fungus-free for the first time in decades! However, I would definitely not recommend this as the cure for athlete’s foot. But as a cure for bladder cancer? Yes!!!

I had checkups first every three months, then every six, and now once a year, and I have been cancer free for six years as of 2018. So that is definitely a very different outcome from the first two bouts of cancer. I feel very fortunate to have been able to participate in the clinical trial, and in the high quality care I’ve gotten from UM’s Cancer Center.

The Academy for Critical Incident Analysis (ACIA)

One of my long-time tennis-playing buddies is Dr. Frank Ochberg, a psychiatrist who lives in Okemos. Earlier in his career, Frank was involved in state government, at one point directing Michigan’s Department of Mental Health. He was active in overseeing the closing of many of the states mental health hospitals, which was in theory a good idea, but since the outpatient programs that were to replace the hospitals were never adequately funded, has resulted in many mentally ill people being homeless on the streets. In my not very well informed opinion, it’s a tough call as to which is worse—people warehoused like cord wood in mental health facilities, or people able to conduct more normal lives if properly medicated and supervised, but often, not actually receiving either adequate medication or supervision.

While Frank has practiced psychiatry for many years, his clientele is somewhat outside the ordinary, consisting primarily of patients who have suffered some sort of loss that has resulted in the diagnosis of PTST—post-traumatic stress disorder. Because of this specialization, he’s done a lot of work with various
government agencies, including the FBI and the Secret Service. I think this interest caused him to propose to the Dart family, of paper cup fame, establishing a foundation to seek to help victims of traumatic events (natural or man-made), and to try to understand and hopefully mitigate the effects of such crises. This led him to found, with support of the Dart Foundation, a series of organizations aimed at this target. He organized the Dart Center for Journalism and Trauma, which appointed journalists as fellows and encouraged their study of the effects of trauma, including on the journalists seeing and reporting about critical incidents. Another was created at the University of Virginia, and named the Critical Incident Analysis Group. That group held meetings for several years and eventually, I believe, morphed into the National Center for Critical Incident Analysis, at the National Defense University, where prospective senior military officers are trained. Frank had also met informally in Okemos with others interested in analyzing critical incidents—a group that I eventually joined. The definition of a critical incident is not simply an incident in which many people are killed or much property is damaged. Rather, the criticality stems from how the incident was handled, by both first responders and media. Did it have the long-term effect of causing people to lose confidence and faith in the governmental or other responses, as the response to Hurricane Katrina did, or was it able to be viewed as a disaster that ultimately affected only those immediately affected by it. The question is quite clear when one considers, for example, police shootings of unarmed minority youths. The long-term effects on a community, and even more broadly, may be substantial—far different than if a youth had been killed by a bolt of lightning.

On Saturday mornings after we finished playing tennis, a few of us, including Frank and myself, often sat and talked for an hour or more. Frank’s stories about critical incidents were a frequent topic, and I particularly enjoyed hearing about them. We started discussing how we might cast these incidents into a framework that could help to shape appropriate responses by first responders, since those responses often proved to be poorly chosen. We started getting together with a group of others in the area who shared this interest, and my role became to try to guide the creation of a model, using my experience with other sorts of modeling. My formal training in modeling and simulation became very useful, as without some imposed discipline, the form of the model could rapidly become unwieldy.

Eventually, Frank and I and a few others went to John Jay College (of Criminal Justice) in New York City, a part of the City University of New York. This is a school that has educated many of New York’s “finest”—police and firefighters who have risen to become leaders in NYC and elsewhere. They were interested in setting up a center to study critical incidents, and the Academy for Critical Incident Analysis was born. We initially held several meetings per year, and began establishing databases, organizing workshops,
creating curriculum, and publishing. The Academy initially received financial support for several years from the Dart Foundation. I was elected to the Board of Directors, and participated regularly in the meetings. The group visited New Orleans after Hurricane Katrina, Virginia Tech after the shootings there, and other well-known sites of critical incidents. We used our “model” to try to understand more about the actions and motivations of the various players, and to seek to derive lessons from them that could be used in better training first responders and heightening the sensitivities of journalists.

Because several of the recent incidents studied by the academy have involved visits to the scene while I was away in Tanzania, I have missed out on enough of the work that I have now resigned from the Board of Directors. But I will miss some of the excellent people who are involved in the Academy.

**More about Tanzania**

In 2008, Dean Satish Udpa of the College of Engineering asked me to meet with him about an offer one of the members of our Alumni Advisory Board had made. He (NAME) was a corporate officer in Lenovo, the company that had recently bought IBM’s PC division. Lenovo had made a pledge that a certain percentage of its earnings would be devoted to charitable projects, and they had a whole staff set up to administer that. The alumnus had suggested that MSU might apply for funding to test Lenovo’s equipment in a school in Africa, and Satish thought I might be interested in doing that, especially since I was teaching the ECE capstone engineering course with teams of students having industrially sponsored projects. I jumped at the chance, and we were able to land a grant of $50,000 from Lenovo to initiate the project.

The next question was where in Africa to go. We needed a place that was rugged, to give the equipment a good test, and safe for a group of students, and with reasonable accommodations available, so the students could work on the project rather than spending all their time setting up tents, cooking meals, etc. To our great good fortune, we learned of Dr. Jennifer Olson, in the Department of Telecommunications (now Media and Information), who was an Africanist. She knew of a village in Tanzania that was surrounded by Maasai people but that had an excellent place for students to stay. We also contacted Dr. Kurt DeMaagd, an expert in computer networking, also in Telecomm. He agreed to come to Africa with us when we had decided on a school to work in and had a group of students ready.

Jenny and I made a trip to Mto wa Mbu ("Mosquito River"), Tanzania in 2008 to meet with people from the Ministry of Economic Development, Ministry of Education, and with the head teachers of several schools. We visited two schools in the Losirwa subvillage and one in the nearby town of Naitolia. The head teacher at Naitolia showed little interest, so we eliminated that from the list, and the ministry people thought that Baraka Primary School, in the Losirwa subvillage, would be
the better of the two schools there. We arranged a meeting with the Maasai elders of Losirwa, the Village Executive Officer (appointed by the government), and the head teacher to ask whether this would be viewed as something useful for the school, since the parents are very much involved in supporting almost all aspects of the school except for the government-paid teachers’ salaries.

The elders were amazingly supportive. They were painfully aware of how difficult it would be for the next generation to continue to earn their livings by herding cattle, goats and sheep. The land on which they traditionally moved from place to place with their cattle was increasingly being turned into farmland by the government, because of the higher economic yield per acre. They understood that if they adopted a more static lifestyle, and their children could therefore go to school, many of the children would eventually leave the Maasai community to become doctors, teachers, lawyers, businessmen, etc. They had already made that decision, and were building more permanent settlements around Losirwa village. They were sending not only their boys, but also their girls, to school, as the Tanzanian government had required. So they looked at our project as making Baraka school better connected to the outside world, which was compatible with their hopes for their children. I was very impressed with the vision and selflessness these elders demonstrated. We agreed to work with Baraka School, with the approval of the Ministry of Economic Development, represented by Ms. Rose Mhina. We wanted to involve Tanzanians in the project, so we recruited two professors from the University of Dar es Salaam to work with us during our visit, and they brought along two engineering students to join our students on the team. We also contracted with a satellite Internet provider in Tanzania to come to install a satellite antenna and modem during our visit.

So, during the Fall semester, 2008, I assigned one team of students in the senior capstone design class in Electrical and Computer Engineering the task of designing a solar-powered computer system with off-the-shelf components, based around a single large Lenovo PC. The system was designed to support 6 seats (monitors, keyboards and mice) and act as if each were its own separate PC. To do that, they used a time-sharing system from Ubuntu, a version of Linux. They selected the solar panels, charge controller, marine batteries, inverter, etc. We worked with a company in Arusha, Power Providers, to arrange for delivery of the power components we ordered. They also prepared a large steel box to hold all of the power components and the computer in a safe enclosure.

Jenny Olson arranged a place for us to stay that was very familiar to her: Twiga Campsite and Lodge. The proprietors were very kind to us, and we have continued to stay there during every subsequent visit. We like the people, the facilities are good and steadily improving, and the food is good and also safe. (Since about 2016, they have had air conditioning and
nice TV’s in each room, although I have never turned on either one.)

We arrived at Baraka Primary School for a three-and-a-half-week stay and began installing the power system, computer, and terminals (screen, mouse and keyboard). The power system installation went very well, and we soon had very reliable AC power in the new, very small computer room. The satellite Internet company showed up on time and installed the Internet link without particular incident, and the school constructed a secure fence around the antenna to protect it against accidental damage. The big problem we had was with the computer system. The configuration of the system was extremely fragile: unplugging a single mouse from one USB port and plugging it into another could cause the whole system to fail to boot up properly, and one mouse might become associated with some other keyboard and screen, for example. So while we used this system for a year, we sought alternatives to replace it as soon as possible. Once we got the system working, we scheduled several sessions to train the teachers on how to use the systems. Most were completely inexperienced with computers of any sort, so had to learn how to use a mouse, how to find things on the keyboard, etc. We spent much of the time training them on how to use Microsoft Word and Excel.

On Sundays, we take the students to national parks to look at the fabulous wildlife. It is not unusual to see, in one trip to Ngorongoro Crater, many lions 2-100 feet from the Land Rover (sometimes they use it for shade), many elephants, giraffes, zebra, wildebeests, hyenas, rhinos, hippopotamuses, and a fabulous array of African birds. Sometimes we even see a cheetah or leopard in one of the parks. In two of the parks, we often encounter lions sleeping in trees—that’s unusual, but not for Lake Manyara or Tarangire National Parks.

In May of 2009, we returned with another team of MSU students and a new student from the University of Dar es Salaam to make improvements on the system and to add a second school to our system. We selected a...
secondary school for the next experiment, Manyara Secondary School, only a few kilometers from Baraka. There, we had first to fight a colony of bees living in the attic and using the computer room for entry and exit. This time, we chose to install individual laptop computers, because the secondary schools have access to the country’s electric power utility, Tanesco, which the primary schools were barred from using. But we soon learned that the electric utility provided power that included frequent brief outages, spikes, and other anomalies, as well as occasional outages lasting from hours to days. So we decided we needed to install UPS (uninterruptable power systems) to protect the electronics and provide a more reliable resource. As we soon learned, these UPS systems also burned out at a high rate, under the conditions they were subjected to in Mto wa Mbu.

The secondary school teachers and students were much better prepared to begin to learn about computing. Much of our training focused on using Excel for purposes ranging from physics calculations to recording student grades. We began to organize computer clubs for students in the schools, since there were not nearly enough computers to have any regularly scheduled times for every student.

Now that we were working with two schools, we needed to figure out how to share our satellite Internet link with both schools. We had 55-foot pipe towers built and installed at both schools, and topped them with WiFi transceivers/antennas, which allowed the sharing to proceed. Kurt DeMaagd was instrumental in knowing how to configure everything so it worked well.

At this point, we had exhausted the initial grant from Lenovo, and the PC crash caused Lenovo to close down their whole charitable division, so we looked to MSU for funding, and they gave us a much larger grant to establish our program as a Study Abroad program and also a minor or specialization in ICT4D (Information and Communication Technology for Development), available to students in both Electrical and Computer Engineering and Telecommunications (College of Communication Arts and Sciences).

During the first five years of the program, we were able to use our Lenovo grant or funding from the university to pay most of the expenses of the students going on the trip to Tanzania. Most of the students were still from the ECE capstone design course, and each team had a project of its own to add technology or update older technology. One year, we had 17 students from three teams who went on the trip, which turned out to be a lot for Jenny and I to manage. Between 2010 and 2012, we added three more schools to our network: Rift Valley Secondary School, Mto wa Mbu Primary School, and Jangwani Primary School. Each school typically started with six or eight computers, which was about capacity for the small rooms initially dedicated to the computers. Then around 2013, schools began dedicating larger rooms, so we moved the computers (and sometimes solar power systems)
and added more computers. We also began adding videoprojectors to some classrooms in the secondary schools and in Baraka Primary school. In fact, in 2014, we videoconferenced a classroom in Manyara Secondary School with one in Rift Valley Secondary School, so one teacher could teach in both schools simultaneously. Although both head teachers had assured us that they would use such a linked facility, in fact, scheduling differences between the schools have resulted in no joint classes being taught, so we haven’t spent any further time improving the system.

While we had lots of help from other faculty members in the beginning—Kurt DeMaagd, Lalita Udpa, Aloys Mvuma (University of Dodoma), the program evolved to be supported only by Jenny and myself. We have worked it out so that she handles most of the communications with the teachers, scheduling training, etc. Her extensive experience in Africa equips her uniquely to understand what is appropriate to do, and how it should be scheduled. I’m learning, but always refer such questions to Jenny. I worry about bringing or buying there and installing and maintaining the hardware for the schools and contracting for the services we need, and paying most of the bills. We both work with the students at nearly every meal about who is going to do what, and having us both there helps to assure also that we don’t miss out on early signs of problems—of medical, psychological, social, or whatever sort. We both end up making runs each year with students to the local medical clinics, but have, so far, never had to fly a student out in an emergency.

Not surprisingly, my exposure to Swahili in the 10-day orientation for our students each year at MS-TCDC (the Danish government’s Training Center for Development and Cooperation) got me interested in learning Swahili, so I bought what turned out to be a GREAT textbook by Peter Wilson, and went through it several times from cover to cover. Then, in 2011-12, I took the Advanced Swahili course sequence at MSU, taught by Prof. Deo Ngonyani, who was originally from Tanzania. I only missed classes when I was traveling out of town. I actually enrolled in the classes (as a visitor) in order that the department and instructor get credit for teaching me, since the class was very small and therefore threatened with elimination. It’s interesting—all faculty members at MSU are entitled to enroll for any course in the university free of charge, although they cannot be used to earn another degree. But nobody seems to do that… I had the same trouble when I did it in Chinese and in Swahili… Staff benefits said they’d have to check into it, because no one ever did it. But in both cases, I was successfully enrolled.

I now start refreshing Swahili every year in March or April, before leaving for Tanzania in May, but it still takes me a few weeks there each year before I can just start a sentence without worrying about whether I know how to finish it. The trouble I have now, in both Chinese and Swahili, is that I can say things that get me a response that I don’t understand, at least the first time. So I often ask for
repetitions, and then people usually slow down a little, too, which also helps. Since today I frequently have to ask people to repeat things even when they're speaking English, I don't expect this aspect of my Swahili or Chinese comprehension to improve a great deal. I wear tiny hearing aids all the time, and they help, but my hearing is still not what it was twenty years ago.

In one of our schools, there has been trouble with misuse of the facilities, largely keeping teachers and students out and essentially renting out the use of the computers and projectors. We have now enlisted the assistance of government officers (the people responsible for inspecting primary schools) of the Monduli District to try to contain that problem when we're away. We have found no evidence of that at other schools, where teachers and students both are becoming more knowledgeable about the computers each time we visit. In fact, some are now at a level where they have "hacked" some of our systems, finding ways to get around restrictions we have imposed to try to avoid the systems being infected by computer viruses, etc.

In 2017, we abandoned the satellite link to the Internet, replacing it with WiMax links from the Halotel telephone tower, which is served by fiber. That gives our schools much improved Internet bandwidth, and although it is still slow by American standards, they are able to access the Internet and get reasonable performance except at the busiest times. The cost for this link is about 40 times as expensive as the comparable bandwidth in the U.S., but we expect that to improve as competition becomes stronger.

We now have about 80 computers distributed among the five schools, and have probably replaced a similar number in total over the last ten years. The schools are now required by the government to turn in the grades for all students in a large Excel spreadsheet, so teachers from schools in the Monduli District which do not have computers must visit one that does. There are only four primary schools in the district that have them, and three of them are our schools. So our schools become very popular at the end of each school term.

And Now, Kenya!

It turns out that there are a lot of things that are interesting for someone who knows about Africa and someone who knows about engineering can do to help with development in Africa. Jenny Olson has worked on dozens of projects there, and of late, has involved me in some of them, for which I am grateful. Other than our joint schools project, the first is a project to work with female farmers in Kenya to develop and locally produce hand tools, and later some more mechanized tools, to reduce the pains they suffer when using the traditional tools designed primarily for men. It turns out that today in Africa, much of the smallholder farming is done by women, and "waist sickness" induced by bending over more than ninety degrees is very common. Working with Susan Wyche, another faculty member in Media and Information
who has experience in Africa and in client-centered design methods, we are involving female farmers with the “jua kali” (metalworking craftsmen) in their villages to design, build, test, modify, and maintain tools with which the women can suffer fewer injuries. For example, for some weeding tasks, a smaller, lighter-weight “jembe” or hoe, perhaps with tines on the other side, can require much less work to use than the heavier hoes designed for initial ground preparation. The women also came up with a design for what resembles a wheel hoe, used heavily in the U.S. a century ago and still used by some garden-scale farmers here. Their craftsmen have now built wheel hoes for the women to test, and in June, we had meetings with the farmers and craftsmen in “Western,” (western Kenya), to get feedback on the first round of tools and to suggest improvements for the next round.

In the same (lightly funded) project, we are also working with an engineer who was part of our study abroad program for several years, first as a student, then as our assistant—Eric Tarkleson. After getting his M.S. in Electrical Engineering, specializing in power systems, he went to work for a few years in Cincinnati, then decided to relocate to Arusha, Tanzania, to start his own solar power company, which he has now done. He and his company, EndaSolar, continue to work with us on the electric power needs for our five schools in Mto wa Mbu, but he also collaborates with us in design of small-scale mechanized tools, typically solar-powered, for use in these small farms. One such tool being built in 2018 is a four-wheeled cart, with two powered wheels, that can be used to haul water, run a portable water pump, provide portable electric power via an inverter, and other such tasks.

In a second (again, lightly funded) project just beginning, we will extend this assistance to small farmers in the village of Naitolia, one of two served by a large, donor-funded program called the Tanzania Partnership Program. We met with farmers there during June, 2018, to open the doors for our coming collaboration, and because it is only about 50 km from Mto wa Mbu, we can easily commute to Naitolia during the time we are in Mto wa Mbu at very little extra expense. Of course, members of our team including Eric Tarkleson may be going there much more frequently.

In hopes of creating a third related project, Jenny applied for and was awarded travel funding to allow us to spend a couple of extra days in Nairobi meeting with health professionals to establish a team for tracking of the health impacts of our other projects on the women farmers involved. There was also interest in involving Ghanaian farmers in this work, so Connie Currier and Linda Gordon, both of whom have done extensive work in Ghana, also attended the meeting, together with an agricultural engineering professor from Ghana. We were awarded only travel money to assemble a team to write a more comprehensive proposal, and we plan to work on that during the coming year.