Caernarfon Castle

Caernarfon was just as impressive. It was built with an hourglass shape that divides the inner grounds into two wards. It has only a single massive wall with ten towers spaced around its periphery. A lot of restoration work has gone into this castle because in addition to being a fortress it was built originally to be the official residence of the Prince of Wales. It no longer serves that function, but it was the site of the investiture of Prince Charles as Prince of Wales in 1969. The castle houses a museum, the Royal Welch Fusiliers Museum, an arms exhibit, and a 'Princes of Wales' exhibit.

None of the other castles we visited, excepting of course the Tower of London, were in as good a state of restoration of Caernarfon. Most were like Caerphilly or worse. The wooden floors and living quarters of these castles have long since rotted away and the great towers have only a big hole right down through the middle flanked with stonework on all sides. Still it was, naturally, irresistible to me to climb the long spiraling stone stairs of the towers to see the view from their very tops. Most now have rope banisters to hang on to during the climb, but in their day these stairways did not have this safety feature. The stone steps were small and it's hard to see how an armor clad man could bound up them all that quickly. By the time I would get to the top I'd be feeling pretty winded from the climb. At one stop I was huffing and puffing after climbing to the top of a sixty foot tower and wondering a bit if I was getting old or something. Just then a British family with a little boy, who was probably eleven or twelve, came up the stairway from behind me. On reaching the top, the boy turned to his 'mummy' and gasped out, *"I'm shattered!"* which is the Brits' slang for saying 'I'm exhausted.' I felt better after hearing this.

I really loved England and Wales, and the tiny piece of Scotland I had time to see, and my days in Great Britain passed all too quickly. I would have dearly loved to have seen Ireland as well, but there just wasn't time to go everywhere I wanted to go and see everything I wanted to see. Even after all these years I keep telling myself I have to go back there some day. But by mid-August I'd been away from home for a month and it was time to come back to Boise. So ended the greatest vacation I've ever had. □

In January of 1986 we were still putting the finishing touches on Eagle. On January 28th I was on my way back to my desk from one of our analytical laboratories when Mitch's secretary stopped me in the hallway. She was upset and distressed. "Did you hear about the space shuttle?" she asked. That was how I learned *Challenger* had exploded barely a minute after launch, killing all seven astronauts.

Like millions of people, I was mesmerized watching the news replays of the launch and the explosion. To this day I can't find adequate words to describe my feelings. Shock, yes. Depression, yes. A deep inner sadness, yes. A sense of anger that continued to grow in the weeks that followed as more details about the accident came to light, yes. But none of these words really do justice to how I felt inside. I could remember the overwhelming pride in my profession – engineering – and in my country I had felt when Craig and I watched *Columbia's* first landing in April of 1981. Even in the midst of all the many problems and troubles with which America has to come to grips, the grand and inspiring accomplishments of NASA and the space program had always served as a most splendid example of what America can do when we put our collective efforts as a free people together to work for a common goal.

Now in a devastating instant came the worst possible failure imaginable. When the Apollo 1 fire had claimed the lives of Gus Grissom, Ed White, and Roger Chaffee it had been an awful tragedy but it had,

after all, happened at a time when Apollo was little more than a very dangerous and experimental vehicle and it had been caused by a cascade of small, individual mistakes and errors that had avalanched in the worst way possible. When the oxygen tank had exploded during the moon flight of Apollo 13 the incredible and heroic efforts of all the NASA people in bringing the astronauts safely home seemed to me and to many others a confirmation of the skill, care, and professionalism of America's space program. It really made it seem to me and to many others that something like *Challenger* simply could not happen to us. Not this way. Not during a launch. Not in the way it had happened. Not from what was so obviously a fundamental design flaw and, as we all learned later, culpable negligence on the part of NASA and NASA contractor administrators and managers. When the latter came to light six months later after the report of the Rogers' Commission was published I was shocked and very, very angry.

I thought it was clear from the very beginning, in watching those news replays, that something in the solid rocket booster was the root cause of the disaster. You don't have to be Wernher von Braun to know flames aren't supposed to spurt out of the sides of a rocket engine. The pictures of this happening were particularly hard on my friend Jan. Her father – who was also my friend – worked at Morton Thiokol, the contractor who designed and built the solid rocket boosters. As everyone now knows, the accident was caused by the rubber O-rings placed in the rocket motor specifically to prevent flaming gas – 'blow by' as NASA euphemistically called it – from escaping through the joints. When Nobel laureate Richard Feynman staged his dramatic demonstration during the Commission hearings that the O-ring material would fail to do its job when it got cold, the physics of the failure was suddenly exposed to be something so fundamental and obvious that the magnitude of the design failure defied comprehension.

When it came to light that 'blow-by' had been observed on earlier shuttle flights, that the decision makers were aware of it, and that NASA and its contractors had been gambling all along with the lives of the shuttle astronauts, I was baffled and utterly furious. Why no one went to jail because of this is something I fail to understand right up to today. If a drunk gets behind the wheel of a car and kills somebody, he gets charged with vehicular homicide – murder. The people who knew about this design failure before January of 1986 weren't drunk. They knew the danger in the light of cold sobriety. Despite what the press claimed, there are no heroes in this tragedy other than the seven people who lost their lives. There was only ethical bankruptcy all down the line from the top officials at NASA to the engineers who knew about the danger and failed to act effectively to stop the inevitable from happening. Jobs and careers – no matter whose – are not more important than lives.

You see, there are *always* social consequences in the work engineers do. It isn't often the case that lives are on the line in what most engineers do, but the social consequences are always there. Consider the comparatively tame nature of my own work for HP. Disk drives like those we manufactured are not sold into marketplaces where a disk drive failure puts lives at risk. The possibility of financial loss, yes; the possibility of great inconvenience, yes. But not the possibility of loss of lives. *Those* applications are – or should be – very special and even more reliability assurance precautions to mitigate against a single disk drive failure are taken. But social consequences of what I did for a living were there nonetheless.

I was always keenly aware, for example, that the jobs and livelihoods of our production workers depended a great deal on the work my colleagues and I did. New products were the lifeblood of our company and if I failed to do my job with complete professionalism the people who would ultimately pay the biggest price would be the people who worked in the factory. I never once forgot what things had been like in Maquoketa when the Clinton Engines factory went bankrupt. I never once doubted the same thing could happen to *any* company. A company – especially a publicly-held stock corporation – doesn't *just* belong to the shareholders, despite the avaricious and self-serving slogans of those predators we call investment bankers. It belongs also to the people who work there, without whom no company can be successful or survive. That's what the word 'company' *means.* The word 'incorporated' means 'united in a body.' There is a social and moral contract implicit in every business organization and this contract is binding on everyone from owner to the guy who sweeps up at closing time. I know most business people today would deny this, but all such denials are self-serving and merely excuses. Bill Hewlett and Dave

Packard knew the truth of this fact keenly. That was why under them HP was the best managed company in the world. □

By spring of 1986 Eagle, now the HP 7937, was in full production and we were back in the R&D lab in Building 83 Upper once more. Our section was working simultaneously on two projects. One was the 'Eagle Cost Reduction' project. It was aimed at reducing the manufacturing cost of the HP 7937 by developing what are known as 'application specific integrated circuits' – ASICs – to replace the older and more conventional technology with which Eagle had been designed. New technology ICs would be used to perform a number of functions carried out by dozens of older chips. Some of the mechanical engineers were set to work reducing the costs of the actuator assembly. This project was never given a code name.

The other project was Eagle II, the next generation Eagle, and this is the one to which I was assigned. It was an interesting assignment in a number of ways. HP – or at least DMD – had gone away from the old title of 'project leader'; instead I was designated the 'architect' for the Eagle II electronics. In this role I was responsible for coming up with what is called the 'Engineering Reference Specification' or ERS, the lengthy document that defines all the technical specifications the heads, disks, and electronics were to be designed to meet. Dave, the mechanical engineer with whom I had worked on the resonance problem, had the same role for the mechanical ERS and the two of us jointly partnered to define what Eagle II would be. We also had responsibility for planning the technical schedule of the project, known as a PERT chart. PERT was a technical project management tool that had been developed by NASA for the space program and most US companies had adopted it as part of the process of doing development engineering.

'Doing the architecture' is a full-time job at the beginning of a project but once it is done and the ERS is published to the team it is not a job that takes very much time. Looking after the PERT, making tactical changes to the development plan, and occasionally revising the ERS is about all there is to it. Therefore both Dave and I had design responsibilities too once things got rolling. In my case I was responsible for doing the Eagle II servo system, the part of the disk drive that positions the heads over the data tracks. We planned to replace the older analog electronics method of designing the servo system by using digital signal processing technology. This was based on new microcomputer chips that had come out and had been specially designed for digital signal processing, commonly referred to as 'DSP.'

My friend Larry Ritchie on one of our hiking trips.

I wasn't the only engineer working on the servo. There were two other guys who had design responsibilities for it as well. But the DSP aspect was mine to do. It was kind of a coveted sub-assignment within the overall servo system design and one I was very eager to do, in part because the nature of this DSP design also dovetailed nicely with my own electronic brain research I did at home. You see, a digital signal processor – called a 'DSP chip' for short – is also capable of implementing what is known as an 'artificial neural network' or ANN, and neural networks are fundamental in mathematical theories of higher-level brain functions. Consequently, my day job and my after-hours electronic brain avocation complemented each other very nicely. By 1986 I wasn't the only guy with the technical training and experience to do the DSP part of our servo, but as 'architect' – which was basically just another name for 'project leader' – I was in a position to cherry pick this part of the job for myself and that's what I did. Rank has its privileges.

Our servo design objective was not to make the servo '100% digital'; that isn't possible. The design specs called for some very high-precision analog electronics right in the front end, and the design of this crucial element went to my very good friend Larry Ritchie. I had met Larry and his beautiful wife, Susan,

at one of the parties I attended not long after first moving to Boise. Larry has an 'Amiable' interpersonal style – the same classification as Rich Smith was in – and so our friendship always had a kind of 'odd couple' flavor to it inasmuch as I'm a 'Driver' style personality. But since he never actually worked for me and I never worked for him, we didn't have the kind of problems I had had with Rich. We both shared a love of music, especially for polkas. Larry played the accordion and he was the one who originally urged me to learn how to play a musical instrument. I'd never owned an instrument; we couldn't afford that when I was a kid, although Melody did try her hand at playing a clarinet when she was little. It was the only thing I ever saw her try that she wasn't very good at – and, of course, I didn't let the opportunity to tease her about a shortcoming go by since I always came out on the losing side compared to her on pretty much everything else.

But Larry suggested and urged me to give learning to play an instrument a try. He said he thought I could learn how to play an electronic keyboard and under his encouragement I agreed to give it a try. He even helped me pick one out, one that was well suited to a raw – and, admittedly, impatient – beginner like myself. He was right, too. I did manage to teach myself how to play it reasonably well in just the space of a few years. Now I could do more than just sing, and I owe that to Larry. I never did learn how to read sheet music 'in real time' the way Larry can, so all my playing has always been by ear. But he and I had a lot of fun playing together, he on his accordion and me on my keyboard. He's unquestionably the better musician and that gave me some extra incentive to practice and improve so I wouldn't mess us up when we played together.

High precision analog design takes great skill and Larry had it. This was no surprise to me; I'd seen what he'd accomplished over the years even though Eagle II was the first time we were actually paired up on the same project. I always thought Larry was greatly underappreciated at DMD. He's a gentle man, he really hates confrontations and he tended to give way to more aggressive personalities. When he had first come to DMD his boss was Mitch, who could easily serve as the poster boy for a rough, gruff, tough driving Driver personality style. Mitch loves to argue about technical matters and people who don't know him very well tend to overwhelmed by his blunt in-your-face style of arguing. I'm sure Larry didn't find working for Mitch an unalloyed pleasure. No, sir. I, on the other hand, tend to meet confrontation with confrontation and wouldn't ever back down from Mitch if I thought I was right and he was wrong. The first technical argument I ever had with Mitch was one of these high-volume, right-in-the-middle-of-the-lab confrontations, and when it turned out that my technical argument was the better of the two Mitch immediately conceded the issue, no hard feelings. That's how I knew Mitch didn't take these things personally. But not many people knew that about Mitch. Greg did. Maybe a few others. But not many.

I have no doubt that starting off by working for Mitch was probably the main reason why Larry's skills were always so underappreciated at DMD. Mitch is kind of a force of nature and I don't remember ever hearing him pay someone a compliment. But engineers aren't hired to argue; they're hired to solve problems and I've always held the opinion that this and the ability to work as part of a team are what count at the end of the day. Larry is a team player and he solved problems and he solved them so well and so quietly people just didn't give him the credit he deserved. The Eagle II design he did was perfect. Even Bill Hewlett would have said so if he'd still been around. I know Greg knew how good Larry's design was; I know because I told him how good it was. Larry never, ever tooted his own horn so I did it for him.

There was one idea I'd gotten from Larry that I wanted to explore for Eagle II. Larry already had his master's degree when he came to HP and he'd written his thesis on the topic of what is known as a 'variable structure control' system, abbreviated VSC. VSC is a highly nonlinear type of control system – vastly different from traditional disk drive servo approaches – but there were two reasons I wanted to look into it as a candidate method for Eagle II. The first, and most important, reason was that if it worked it would be highly immune to the kinds of parameter variations that ate into our servo margin. Servo margin had been a big issue for the HP 7937 during its development. The second reason, which was important to me but not to HP, was because I had made a hypothesis that various feedback systems in the brain, especially those involving motor control, might well turn out to be VSC types of neural network systems.

It looked like an opportunity to try to kill two birds with one stone.

The problem, though, was that a VSC system is mathematically very complex because of the non-linear mathematics it involves. It is only simple for relatively simple applications and Eagle II was not one of these. In point of fact, there were theoretical reasons for thinking that a practical VSC servo for Eagle II would not work at all. On the other hand, some of the conditions that led to this mathematical theorem weren't met by Eagle II and so there was some hope that a practical system could come of this approach. We had our model of the Eagle actuator, which was easily adapted to fit Eagle II, and at that point in the project there was room in our PERT schedule to try out the idea on our simulator. The amount of time available had a definite limit to it, of course. But it was enough time to explore the feasibility.

Unfortunately, this turned out to be a very bad idea so far as Eagle II was concerned. Chet had once remarked, "You know, nonlinear systems can do anything they want to." This turned out to be an excellent description of how the VSC behaved in our simulator. It exhibited a number of astonishing – and thoroughly unpleasant – behaviors and I never was able to figure out how to tame it. I did give it 'the old college try' to my best ability, but when it still wasn't even close to working when I ran out of available time I had to drop the idea and go with the conventional approach. So much for the Eagle II bird I was aiming at. As it turns out, my VSC hypothesis about brain systems is also still unproven to this day, so I didn't get any birds with this one stone in 1986. But I'm still working on the VSC idea for brain theory and maybe one of these days I'll get it figured out. If I do it will be an important finding and the original inspiration for it will be owed to Larry. □

Because the Eagle II servo system used such a different approach from previous servo designs its development involved coming up with a number of inventions. All in all I ended up filing about a half dozen invention disclosures with HP's legal department. Although HP did not directly pay any additional bonus money to its engineers for making new inventions, the company had begun doing a nice form of recognition for new inventions. When a patent was issued the inventor received a nice wooden plaque with a copy of the first page of the patent laser engraved on it. The plaque would be presented at a coffee talk in front of everyone. For a development engineer it really was a very gratifying form of recognition. Coming up with inventions was, of course, what we were paid to do in the first place but being honored in front of one's co-workers in this way still felt good.

But as it turned out, it was the committee that reviewed invention disclosures who decided whether or not a particular disclosure would actually be filed with the U.S. Patent Office. Some inventions were seen as too important to risk competitors learning about the technique or method, which is what a patent discloses to the world. In these cases the invention disclosure could be classified as a 'trade secret.' Trade secrets being secrets, there was no public recognition whatsoever that went with that kind of invention. This was a policy I didn't particularly understand, but it was the policy nonetheless. As it turned out, the invention disclosure committee at that time was chaired by the other lab manager, Doug Clifford. Doug and I for some reason didn't along too good – the most likely reason being that I had a sense of humor that Doug didn't exactly share. He was one of those terminally serious types of managers who never fraternized with the troops and rarely smiled at work. In all the years I knew him, I never once heard him laugh or even so much as chuckle at anything. Even Mitch laughed every once in awhile, so Doug was something of an oddball in this respect.

Well, you can probably guess how tempting it was for me to tease Doug a little bit just to see if I could get him to lighten up some. Life at DMD had enough serious, stressful moments just from the nature of the business we were in without having our top leaders constantly walking around looking like what we were doing was on par with storming the beaches at Normandy. I tend to tease just about everybody I know who is overly serious about everything and I didn't even try to resist the temptation to try to humanize Doug at least a little.

As it turned out, that was probably a mistake. As far as I can tell, Doug just simply didn't have any sense of humor at all. Not in the workplace at least. That's the reason most of the R&D staff didn't like

him very much. One day I was in the men's room relieving myself when I heard a voice coming from one of the stalls, "Can you hand some toilet paper to me?" It was Doug. "Sure," I said, chuckling a little bit. I went into one of the other stalls, liberated a roll of TP, and handed it over the wall to Doug. He came out a minute or so later snarling about the janitors not doing their job. "Well, Doug," I wisecracked, "you know the first rule of engineering. Always check your assumptions first." He just glared at me and stormed out of the men's room without a word.

I couldn't help but picture in my mind the contrast between this and something that had happened once at Delcon Division. Delcon's division manager, Brian Moore, was the shortest guy in the division and Bob Allen, the lab manager, was the tallest. I was in the men's room there one day when Bob came in. "Hello, Brian," Bob said to someone sitting in the stall there. Sure enough, a minute later Brian Moore came out. "How did you know that was me?" he asked Bob. Bob flashed his big toothy grin and replied, "You're the only guy in the division whose feet don't touch the floor." Brian was a little touchy about his height, but even so he laughed. A little. Not Doug though; I guess he was preoccupied with the problems of storming Omaha Beach.

I didn't crack wise with Doug all the time, of course, but I did it often enough that I guess he became convinced I was some kind of smart aleck. I'm not so sure Doug actually liked anyone he worked with, but I'm pretty sure he didn't like me very much. Mostly that didn't matter because I didn't work in his lab. But it seems like it did matter so far as all my invention disclosures were concerned. By some strange coincidence every single one of them became a 'trade secret.' It's a pity. There are several pretty good stories that could be told about the development of those inventions, but I can't tell them. They're 'secrets.' □

While we were working on Eagle II, the HP 7937 – Eagle – was making a big splash in the market-place. The old BFD, the HP 7933, hadn't exactly taken the disk drive market by storm and while we had been developing the ′37 a number of Japanese companies had entered what is known as the 'plug compatible' business, building disk drives that could plug into HP computer systems. The BFD itself had opened the door to this as a consequence of the original decision that had been made to try to stretch the old, and now obsolete, disk drive head technology one more generation. Our competitors' entry into this market had also been abetted by a disgruntled HP employee at one of the systems divisions who had leaked the details of our computer interface – known as Command Set ′80 – to our competitors. That information was what let them develop what are known as 'plug and play' peripherals.

Not many years earlier this sort of treason by an HP employee would have well nigh been unthinkable. But by 1986 the face of business management all across the country was changing and a little bit of this had already begun to slip into the HP management culture. The changing face of management invariably leads to changing attitudes on the part of the managed and the handing over of company confidential information by a low ranking jerk at another division was just a symptom of the changing times. By 1986 the old timers – the people who had known the Great Depression and World War II first hand – were mostly retired or on the edge of retirement. I thought then and I think now that the new generation of managers – I wouldn't call very many of them 'leaders' – just wasn't in the same league either in terms of knowing the business they ran, knowing the people who made that business run, or even in just plain old fashioned common sense. Under Bill and Dave we had what I call 'an owner's attitude' toward the company; there was no possible doubt the new generation had adopted a 'manager's attitude.'

I thought HP President and CEO John Young was mostly doing a pretty good job of running the company, although knowing he made more money in one week than I made in a year didn't exactly inspire me to glory. I didn't resent the fact but it seemed disproportionate compared to, say, what a production supervisor's paycheck looked like. Of course, that wasn't exactly a new phenomenon. Robert Townsend, the former CEO of Avis, had written about this sort of thing all the way back in 1970 in his book *Up The Organization.* Of the Mount Everest of 'management' books that have been published over the years, Townsend's was the only one about effective leadership. But by 1986 it wasn't on anyone's

reading list anymore and I think that fact was starting to show within HP and elsewhere across America. What would later come to be dubbed 'The Age of Greed' and 'The Me Generation' was already starting to become visible within HP during President Reagan's second term.

In 1986 HP's disk drive business was pretty important to the company's bottom line. We were still in what I like to call 'the Golden Age of the disk drive business' when there was a mountain of profit to be made. And, just like it says in freshman Econ, those profits were attracting new competitors into the business. HP had just recently entered the laserjet printer business – and in fact that part of HP's business was also located on the Boise site – and it would grow like a wild weed over the next few years. But in 1986 our disk drive business was still a huge moneymaker – even rivaling HP's computer system divisions in terms of how much profit was coming into the company's coffers. We took the entry of competitors into this business pretty seriously.

There was at that time a big annual users' group trade show, known as Interex, that disk drive makers attended to show off their wares. After Eagle's introduction I was one of several of us who got to fly down to San Francisco to attend Interex ′86. Interex wasn't a trade show HP set up and ran, although we were obviously always a big part of it since it *was* organized by an HP users' group. There would be a lot of competitors' products on display there and one of the reasons I was sent down to it was to check out what the competition was doing and see if there was something we needed to be doing differently in order to respond to it. My basic attitude was that DMD had a God-given right to 100% of our competitors' business, and I went to San Francisco with this as my guiding aim. Don Curtis, our division manager, must have had a similar attitude because sending me to San Francisco was part of Don's LOOT campaign – Liberate Our Occupied Territories – the central focus of which was to pound our competitors into the ground by every legal and ethical competitive means possible. As a one-time linebacker, LOOT appealed to me a lot. It was the kind of management slogan I could get behind all the way.

It turned out that the HP 7937 was the runaway star of the show. Our exhibit was packed with on-lookers from the time the doors opened until the time the doors closed. As I listened to what different customers said about Eagle it was like basking in warm sunshine. Their enthusiasm was unmistakable and I was filled with pride for what our section had accomplished. For me the crowning moment came when our biggest Japanese competitor came to our booth. They were the company giving BFD the toughest time in the marketplace and I guess they had presumed Eagle would be another BFD. They had brought their own latest disk drive to the show expecting to wow the customers with its obvious superiority to the HP 7937. Instead, they quietly took down their exhibit and left town the first day. I guess they figured a side-by-side comparison between their disk drive and the ′37 wasn't in their best business interests. After Interex ′86 there was no doubt in my mind: We had come out with a world-beater. □

One thing characteristic about the job of inventing new products is a tendency to lose track of what's going on outside one's immediate day-to-day surroundings. The simple fact is that design work is fun and easily can become all-absorbing. That might have something to do with the high divorce rate I noticed among my coworkers. Divorce often takes product development engineers more or less completely by surprise. One guy I knew was divorced by his wife on grounds which, translated from lawyer-speak, amounted to saying that he was boring. What tends to happen with a development engineer during the early part of a new design is that he carries the design problems he is working on in his head wherever he goes and thinks about them constantly. I used to keep a notepad on the nightstand beside my bed in case I'd wake up in the middle of the night with an idea for solving some design or research problem.

The Eagle II project was in this stage of intensive creativity in 1986 and 1987. Even so, outside there were events going on in the world that breached the walls of my concentration and couldn't be ignored. President Reagan's punitive air strike against Libya in April of '86, which was done in retaliation for Libya's terrorist role in the bombing of a West Berlin disco that had killed two Americans, was one of these events. I had mixed feelings about this event. Libya, like Iran, was a sponsor of terrorist activities and I certainly didn't feel the least bit sorry for Libya when our planes came in. Not one bit. In that sense

it was like the brief dogfight that had happened in March when Libyan planes attacked U.S. Navy fighters in the Gulf of Sidra and learned it wasn't a good idea to take on graduates of Top Gun. In my book Libya was an outlaw state and was just asking for a good old fashioned beating. I didn't have any problem with giving them one. I felt completely the same way about Iran.

What I didn't like was the idea of the President ordering this kind of military action without Congress being in the loop. Presumably there must have been at least some congressmen involved in the decision process through one or more of the 'oversight' committees that had been set up after Vietnam, but I don't think that is a sufficient safeguard for guaranteeing civilian control of the military. You see, the Armed Forces of the United States isn't a police force and the President of the United States isn't the Chief of Police. The President is the 'Commander-in-Chief of the Army and Navy of the United States, and of the militia of the several States when called into the actual service of the United States.' Today, of course, this responsibility also clearly takes in the Air Force, Marines, and Coast Guard. But what exactly does being 'Commander-in-Chief' empower a President to do? It's a gray area in the Constitution even if the Founding Fathers didn't think there could be any confusion about it. In *The Federalist* Alexander Hamilton had written,

> The President of the United States is to be "commander in chief of the army and navy of the United States, and of the militia of the several States *when called into the actual service* of the United States." The propriety of this provision is so evident in itself, and it is, at the same time, so consonant to the precedents of the State constitutions in general, that little need be said to explain or enforce it. . . Of all the cares or concerns of government, the direction of war most peculiarly demands those qualities which distinguish the exercise of power by a single hand. The direction of war implies the direction of the common strength; and the power of directing and employing the common strength forms a usual and essential part in the definition of the executive authority.

The key word here is 'war.' Nobody with any brains would argue the President shouldn't act immediately and on his own to defend the country if Lower Slobovia invaded Florida. 'To provide for the common defense' is one of the six tasks of our federal government.

The office of the Presidency was modeled after the conduct of just one man, George Washington, and I think Washington is still the right model for the job. This is what separates the idea of a President from the ideas of a King or a dictator. But the Constitution doesn't say one word about giving any branch of our government the power to conduct so-called police actions, and that's what the Libyan raid was. That's what Vietnam had been billed as in the beginning. That's what the Korean War was billed as. If there is any organization on earth that could plausibly claim to decide upon 'police actions' between sovereign nations – and, granted, it's a big 'if' – that organization would be the United Nations. That's what the U.N. was set up to do, first among other things, in the first place.

I don't think the President has or should have the power to decide we're going to be vigilantes, and that's what I didn't like about the Libyan raid. I think if America is going to go kick the crap out of somebody, Congress should be the one who stands up and says, "We're going to go kick the crap out of these guys." If Congress lacks the conviction to stand up and say that in a loud, clear, unmistakable voice, then we shouldn't do it. If they do stand up and say it, then we shouldn't pussyfoot around in administering the crap kicking. War isn't a game. It's the most awful and deadly serious thing in the world, and *no one man should ever* have the power to potentially commit our nation to it. Once we *are* committed to it, the *only* goal should be victory, achieved as fast and as completely as the application of overwhelming deadly force can accomplish. War isn't anything else than the massive application of deadly force, and if you don't like that reality it just means you don't like war. Neither do I.

You might wonder what I mean by Congress speaking in a 'loud, clear, unmistakable voice.' It's not hard to understand. President Roosevelt framed it for Congress after Pearl Harbor: *I ask that the Congress declare that since the unprovoked and dastardly attack by Japan on Sunday, December 7th, 1941, a state of war has existed between the United States and the Japanese empire.* It doesn't get much clearer than that.

For a short time it looked as if a national debate over President Reagan's decision to bomb Libya might develop. But less than two weeks later the world had something else to pay attention to: the nuclear accident at Chernobyl. As near to deadly a thing as Three Mile Island had been in 1979, Chernobyl was the nightmare come to life: a huge radioactive cloud spreading across Europe; the complete meltdown of the nuclear core eating its way into the earth, what the movies and press had years before dubbed 'the China syndrome'; thousands of square miles rendered uninhabitable by human beings for tens of thousands of years; unreported hundreds of deaths, some immediately and many more to come later from the radiation. It was a catastrophe without parallel since the beginning of the industrial revolution, even compared to other catastrophes such as the Union Carbide gas leak in Bhopal, India in 1984 that killed two thousand people and injured one hundred fifty thousand more. Only the bravery and self sacrifice of the heroes who fought to contain the disaster prevented worse from happening and prevented the casualties from rising to or beyond the level of Bhopal. I don't know if anyone ever erected a monument to these men, but if not there should be one somewhere for all the world to see. They knew going in there was probably going to cost them their lives, and they went in anyway. They were willing to pay with their lives for the immoral negligence of those who had designed Chernobyl, those who had administered it, and those in the Soviet government responsible for it.

Then on June 4th, 1986, another outrage made the headlines, this time in America. A man named Jonathan Jay Pollard, an ex-Navy analyst, was convicted of espionage. What made this an outrage rather than just another cold war incident was who Pollard was working for. Israel. Our so-called ally. Our so-called friend. I guess most of the country wasn't as outraged by the Pollard espionage as I was. On the other hand, the story dropped out of the headlines and the news so fast that I couldn't help but think there was something dirty and political going on somewhere – either in government, in corporate boardrooms, or both. Whatever the case may have been, it disappeared before much of a political ripple could happen. But I would not forget it. Israel had spied on my country. This was not the act of a friend. This was not the act of an ally. It was the act of an unfriendly nation pretending to be our friend. It was the act of an enemy. I ceased to trust Israel on that day. I have never trusted or supported them since that day.

Still worse was yet to come. On November 4th the Democrats swept the mid-term elections and recaptured control of the Senate. Because the liberal fringe of the party still controlled it, I wasn't at all happy about the outcome, but two days later I was no longer so sure about that. Two days later the Iran-Contra scandal broke. Officials in the Reagan administration had secretly traded military arms to Iran in return for a pledge by Iran to try to get American hostages in the Middle East released by their terrorist captors. The Reagan administration had been dealing secretly with an enemy nation, a sponsor of terrorism, like a blackmail victim paying off his blackmailer. And then these same officials used the money from this disgraceful episode to funnel secret support – in violation of U.S. law – to the Contras trying to overthrow the Sandinista government in Nicaragua. During July of 1987 I listened to and read in disbelief the reports of the testimony in Congress of Oliver North, John Poindexter, George Schultz, and Casper Weinberger. It was the testimony of people I saw and still see not as patriots but as incompetents and criminals. The right wing called Oliver North a hero. He's no hero. He's another G. Gordon Liddy.

For a decade I had trusted and supported Governor and then President Reagan. I had hoped and believed in what he said he stood for back in 1976. Iran-Contra meant and could mean only one thing: the Reagan revolution I had enlisted in had failed. It is the Constitutional Duty of the President of the United States to 'take care that the laws be faithfully executed' and now we found that the Executive branch of our government had taken care to break the law. On August 12th, 1987, after previous denial, President Reagan accepted responsibility for Iran-Contra. I agreed. Whether he knew as little as he claimed or not, he was responsible. That's the way it works. I cannot describe how bleak I felt over this betrayal. But I can describe what I thought about it: The party of Reagan was turning back to Nixon. If the Reagan revolution had ever really existed at all, if the Reagan 'big tent' had ever been anything other than a hoax, it was over now. America once again had criminals in the Executive branch of government. From the first of August, 1987, and up to this day, I never gave another dime to the Republican party. □

Reunion with my brothers at the Sigma Nu house in Ames. Front row left to right: Large Al Peterson, Tom Korpela, Lorne Wazny, Tom Donovan, Jerry Pribyl, Al Welch, me. Back row left to right: a younger guy I never really knew, Steve Krabbe, Randy Ewing, an older alum I didn't know.

The Eagle II period was such a busy time for me that those years tend to blur together in my memory. Despite this I did jump at a chance to see my brothers again when someone organized a reunion back in Ames. Except for me the guys were married now and I more than half expected their wives would exert something of a restraining influence on our behavior. That, as it turned out, wasn't exactly the case. Oh, things did begin that way. But before too long it was like the Friday nights of our college days and it turned out that we hadn't forgotten how to have one heck of a party. The next morning I had all the proof I'd ever need that I wasn't as young as I used to be. We retold all the old stories of our college days – some of which we saved for when the wives weren't in earshot – and we laughed like it had all happened only yesterday. For a few golden hours we were kids again and I found I couldn't remember why I had ever been eager to see the end of my college days. If I could be frozen in time forever, I know exactly what time I'd choose. Today with each swiftly passing year I understand better and more fully something Housman once wrote,

> With rue my heart is laden
> For golden friends I had,
> For many a rose-lipped maiden
> And many a lightfoot lad.

Back at DMD the R&D lab was beginning to age a bit, right along with me, and the number of people who had yet to pursue their Master's degrees was growing smaller and smaller. At this stage in their careers most of my colleagues were interested in short courses rather than traditional college courses for continuing their education, and the company formed a Site Engineering Education Committee to look into addressing this need. My old section manager, Ken, was chair of this committee and he asked me to serve on it. After doing what basically amounted to a market survey of the engineering staff on the site we identified two particular short course needs that I became directly involved with. One was a short course on servo system design. I got in touch with John Purviance and one of my old committee members, Joe Feeley, up at the U of I and they agreed to design this short course and offer it at our site in Boise. It was heavily attended. The other short course identified was called 'EE for the Non-EE' and was aimed at members of the mechanical and other engineering disciplines needing a better basic understanding of electrical engineering in their jobs. I asked another old friend up in Moscow, Bob Rinker, if he could come down and present such a course. Bob came down during the summer of '87 and spent that time talking with numerous people who wanted this short course, finding out precisely what their needs were and figuring out how to best meet them. Officially he was working for me that summer but in fact Bob didn't need any supervising. At the end of the summer he went back to Moscow and designed this new short course, and we began running it in 1988. It turned out to be one of the most successful short courses we ever had at the Boise site and Bob ended up offering it several times.

At about this same time there was a growing clamor in the Boise area for a local degree program in electrical engineering. A lot of this clamor was coming from Micron Technology, a company that designed and produced semiconductor RAM chips; today Micron is the sole U.S. manufacturer of these chips. Micron's shareholders included the two wealthiest men in Idaho, billionaire J.R. Simplot and multimillionaire Allen Noble, as well as some other wealthy local businessmen. These guys had and have enormous political clout in Idaho and what they basically wanted was a new engineering college at Boise State University. However, the Idaho State Board of Education (SBOE for short) wasn't eager to spread

Idaho's overly modest higher education budget too thin, and setting up an entire, brand new engineering college was opposed by executives at HP, who were concerned that this would lead to severe underfunding of the college in Moscow. At the time HP nationally was getting a lot of their new hires from the U of I College of Engineering and the company didn't want the quality of the U of I program to be compromised.

As a compromise, an agreement was reached between the U of I and BSU. BSU was already a feeder school for Idaho's engineering college, teaching courses in the first two years of the engineering program. Idaho agreed to supply faculty to teach the remaining two years and also some locally-offered graduate level courses in Boise on the BSU campus. The resulting program became known as the Engineering in Boise Program and its scope was expanded to include mechanical and civil engineering – to better serve the needs of other Boise engineering firms – in addition to electrical engineering. Because Bob Rinker was spending a lot of time in Boise anyway due to the 'EE for the Non-EE' short course, the Dean of the UI College of Engineering, Dick Jacobson, asked Bob to head the new Engineering in Boise Program and move down to Boise permanently. Bob agreed and began to organize a faculty for the program. He took advantage of the fact that there were a number of professionals already in Boise who were agreeable to serving as affiliate faculty members for the new program. I was already an Affiliate Professor of EE with the UI, and I agreed to join the new program. Because the basic justification for having this program in the first place was to serve 'place-bound, non-traditional students' who already had full time jobs but wanted to enter the engineering profession, classes were held in the evenings and I would drive across town to BSU after work to teach my classes. Initially the program was quite small but it eventually grew to having around twenty juniors and twenty seniors enrolled each year in EE or in Computer Engineering. Graduates received a Bachelor's degree from the University of Idaho. Affiliate faculty members each received around three thousand dollars per semester for their teaching services.

Also right around this time one of my co-workers, Ted Barnes, decided to take advantage of HP's Ph.D. educational program I had pioneered, and he joined our section while working on his research project. His research involved figuring out how to design adaptive servo systems for disk drives, which at that time still involved a number of knotty research questions that had to be answered if the technique was to become practical for high-volume disk drive production. Because this topic was within my own field of expertise and because I was an Affiliate Professor with UI, Greg asked me to be Ted's research supervisor in addition to my other responsibilities. I only knew Ted casually at that time, but I happily agreed to do this. Because I was only an Affiliate faculty member and not a member of UI's Graduate Faculty at this time, I couldn't serve as Ted's major professor. Joe Feeley up in Moscow took that role. But I could serve on Ted's committee and I could serve as his local academic advisor and mentor. Ted and I became pretty good friends during that period. Ted's research turned out to be very, very successful and he received his Ph.D. in 1991. He and I were also issued a patent for the adaptive servo system method that came out of the research work. By that time Doug wasn't chair of the committee that evaluated invention disclosures anymore. But by the time the patent was actually issued in 1993 I was no longer with HP so I didn't get one of those nice plaques for that one either. □

The Eagle II development was coming along quite nicely in 1988 and we were getting close to the end of the lab prototype stage when suddenly the roof fell in. Our marketing people and DMD's top management had been looking at where the division wanted to go in the increasingly competitive disk drive market, and they had concluded that they wanted to take us in the direction of becoming an OEM (Original Equipment Manufacturer) business supplying what would rapidly become commodity disk drive products for what was known as 'the box business.' The idea was to sell our disk drives to other companies besides HP. Up until that time DMD had been mainly a supplier of mass storage systems that were integrated into HP's lines of computer systems. But we also had a small but growing box business of our own within DMD and it did, in fact, purchase and use some OEM five-and-a-quarter-inch disk drives made by other companies. Coyote I, Vern's project, was already in production by then and his section was working toward introducing the follow-on product, Coyote II.

In this marketplace the eight-inch disk drive was not sought after and so Eagle II was not a 'fit' to this new strategy of entering the 'jelly bean' disk drive business. Consequently, our project was abruptly cancelled and we were re-directed to begin design work on HP's third generation five-and-a-quarter drive, code-named Coyote III. The Coyote family of products were never to receive an HP 79XX name of their own. They were now 'component products,' which HP regarded as a not-mainstream business segment, and would receive product designations that began with a 'C' designation. Once Vern's section finished with the introduction of Coyote II, they would be directed to begin work on a line of three-and-a-half-inch disk drives.

There was never to be an Eagle II or any other new eight-inch HP disk drive now. For a time morale in our section hit a very low point. The cancellation of Eagle II had been preceded by a change in our management chain as well. Scott Anderson, whom we all liked very much, was replaced as our lab manager by Mitch and Greg became our section manager. My old friend Keith Whitaker became the project manager and my boss. We liked Mitch, but a lot of us suspected that office politics had had everything to do with Scott leaving us. Whether that was true or not, we thought it was and didn't like the change one bit. Most of us blamed Doug Clifford for division manager Don Curtis' decision to replace Scott. Our general opinion was that Doug was a politico who had seen Scott as a rival. Neither I nor anyone else in the section knew whether that was really true, but Doug wasn't popular with us and we were willing to believe it was true. Otherwise nothing about the management change made sense to us. A lot of us, me included, also saw in the abrupt way the change was made an ominous sign that the old HP culture – called 'the HP Way' since the days of Bill and Dave – was starting to be infected by an entirely different kind of company culture of politicos and yes-men, the kind of culture characteristic of typical, unenlightened big companies few of us would want to work for. HP was still a special company, but it didn't feel quite as special anymore. Not to me anyway.

Greg softened the blow of the cancellation about as well as anyone could have. Most engineers take it pretty personally when the company cancels a project they're working on if that project is going well. Decisions like that made by upper management really aren't personal and aren't meant to send the message 'we don't want what you've done,' but to the guys on the bench it *feels* like that's what they're saying. We had a kind of Irish wake for Eagle II right after the cancellation and each engineer in the section received a little trophy, an engraved HP eight-inch thin film disk platter bearing our Eagle Section logo and the inscription, *No matter how well you perform your job, a superior will seek to modify the results.* I still have mine. It hangs on the wall in my study.

I wouldn't say the Eagle section was like a family, but I would say we were like a kind of tribe. The section logo was one mark of this. It was a pig with wings that we called 'the Peagle.' The way this logo came about in the first place was from a little sign Mitch used to hang on the wall of his cubicle. It featured a pig wallowing in the mud with the caption, "Never try to teach a pig to sing. It wastes your time and annoys the pig." Somebody had digitized that pig and added wings to it, and from that point on we'd been putting our logo on everything – design drawings, specification documents, you name it. We even had Peagle logos hiding inside the custom integrated circuits we had developed for the HP 7937. It was a symbol of our team's *esprit de corps.* Somebody on the production line was a part time artist and she made these marvelous little porcelain statues of a pig with wings and a unicorn's horn. They sold like hotcakes to a lot of us in the Eagle section. I have one of them in my living room today.

For some reason Don Curtis took a strong dislike to our logo after he became division manager and had ordered it removed from all Eagle documents. This was an order that had made him instantly very unpopular with all of us. We had to comply with Don's order, of course. He was in charge of the division and everybody's boss of all the bosses. But it left us with the feeling he didn't like us and we reciprocated the feeling. Don was the only division manager I ever worked for who I felt I couldn't talk to and who I really didn't want to talk to. I thought he treated me and everyone else like a 'resource' instead of a member of the team. He definitely was a spoilsport. Don never knew it, but we never removed the Peagle from inside our custom chips. It was our little underground way of saying, 'Hey, Don! *Nyah!*"

I probably took the Eagle II cancellation harder than most. A big part of it was the fairly typical frustration and depression that sets in when all your work comes to nothing. Most design engineers have this reaction when a project gets cancelled for anything other than purely technical reasons. A lot of soul gets poured into bringing a new product into the world and reactions like the one I felt do not come from, as I once heard a non-engineer manager say, 'having the fun taken away.' Strictly speaking, the most fun time on Eagle II was nearly over at the time it was cancelled. The lion's share of the invention and basic design work was already over or nearly so when the cancellation came. What would have come next would have been the long, hard slugging needed to bring a prototype design into the finished state needed for its manufacture. That part is a lot less fun and a lot more stressful. But, you see, a design engineer wants to see the fruits of his labor become real and that means releasing the product into manufacturing.

But this wasn't the only reason I took it so hard. A big part of it was a sense of alarm and a deep conviction our division's strategy for the future was a terrible, terrible mistake. Eagle and its predecessors were terrific money makers in large part because of the type of marketplace they served. The new direction was going to take us straight into a marketplace of a wholly different sort, the kind economists call the 'monopolistic competition model.' Everybody who knows anything about agriculture knows what the 'perfect competition model' of economics looks like. Whether a farmer produces corn or wheat, his produce is just like that of any other farmer and there are a lot of farmers. As a result, the profit any farmer makes on his corn or his wheat is very, very slim – just enough to keep him from getting out of farming altogether. His product is a commodity and he makes what economists call a 'zero economic profit.' The term 'economic profit' means the business is making more than it could make by putting its resources into some other use. Zero economic profit means you're right at the point where you could make just as good a return by merely putting your money in a savings account at a bank.

The monopolistic competition market is similar to that of perfect competition in many ways. The main difference is that companies in such a market produce products that can be distinguished from one another by putting in features – what engineers call 'bells and whistles' – that provide customers with an excuse for preferring Brand A over Brand B. This is called 'product differentiation.' When you go to the super-market one juicy red apple is pretty much exactly the same as another and you don't really care all that much about which one you pick. They are 'exact substitutes' for each other, and that's the perfect competition case. In monopolistic competition, any one disk drive maker's product is a 'close substitute' for any of those from other disk drive makers. The result is that short run economic profit is possible but in the long run the situation is the same as under perfect competition. It is, as the saying goes, a 'buyer's market.' Not too many years after DMD went off in this direction I started hearing managers at different levels in the company starting to refer to disk drive products as 'high tech commodities' and that's pretty accurate. I had been watching 'jelly bean' disk drive companies for years in my stock market investing and had seen them come and go. One thing that could be counted on was that every few years the companies in this business would engage in bloody, take-no-prisoners price wars that put a lot of them out of business altogether and would even almost destroy the 'winners.' There was never any recovery. Once a big part of the competition was driven out of the business and prices started going back up, new competitors would flood back in and the cycle would repeat. I never invested a dime in a commodity disk drive company.

And that's where Don and his staff wanted to take us. To me two things were obvious. First, it was obvious, at least to me, that this decision went directly against the third company objective: Field of Interest. The objective was 'to concentrate our efforts, continually seeking new opportunities for growth but limiting our involvement to fields in which we have capability and can make a contribution.' What contribution were *we* going to be able to make in a jelly bean market? Second, it was clear to me that we were an organization too bloated and fat to come out a long term winner in this business. During the Golden Age of the disk drive business, DMD had added more and more support departments – what both economists and accountants called 'overhead' departments – to take care of the thousands of bits of tiny things that have to be looked after in a large manufacturing business. These departments had sprung up in

reaction to perceived needs and not as a part of any coherent strategy for organizing the business. By this time we had six large buildings on the HP site in Boise and there were entire floors in them filled with people in 'supporting' roles, many of which I would characterize as business luxuries we could afford in the Golden Age but would never be able to afford in this new marketplace. I didn't need a calculator to know we had a top-heavy overhead cost structure. All I needed was a pair of eyes.

When talk of taking this direction had started a couple of years earlier I had loudly and repeatedly tried to sound this warning but it hadn't done any good. I was 'just a lab engineer, a technical guy' and what did I know about business? It was a convenient stereotype for promoting the peculiar form of deafness you often find in people who refuse to hear anything that goes against what they think or want to be true. When I was in college I probably had enough coursework in economics – especially microeconomics – to qualify for an economics minor if there had been any such thing as a minor in a college of engineering at that time. And I wasn't unfamiliar with the kind of market we were seeking to enter. Bakeries operate in just that same environment. Even if your town has only one bakery shop, it competes with all the super-markets. Over the years I was constantly astounded about how completely ignorant of economics most of our managers were. 'The Dismal Science' it may be, but it is a science none the less.

Now, as Caesar might have put it, the die was cast. 'We are going to get our head handed to us,' I thought. There were more than three thousand people working at HP's Boise site and over half of them worked for DMD. An awful lot of people were going to pay the price for this strategic blunder. I wasn't making myself very popular by openly opposing the strategy, but oppose it I did. It was a Duty because, as Charles Eliot Norton had written in 1898,

> The voice of protest, of warning, of appeal is never more needed than when the clamor of fife and drum, echoed by the press and too often by the pulpit, is bidding all men fall in and keep step and obey in silence the tyrannous word of command. Then, more than ever, it is the duty of the good citizen not to be silent.

I did have the option, of course, of walking away from it all and I did think about it. Over the years I was always receiving calls from 'head hunters' trying to recruit me to work for other companies, and there were also academic positions at different universities as a professor I could turn to. But I couldn't do that. These opportunities existed because HP – especially John Stedman – had paid for my graduate education and invested in my professional development and had been generous in rewarding me for my work. In my heart I knew I had an *obligation* to repay the company for everything it had done for me over the years. To cut and walk now would have been the act of a dastard. I had to do *something* but what this could be I did not know.

So it was that when Greg called me in to discuss my responsibilities in the new project my spirit was at one of the lowest ebbs I had known in my time with the company. In truth, I wasn't emotionally ready for our discussion and most of it was hazy to me then and now. That I would continue in my role as the 'architect' for Coyote III was a no-brainer. We agreed on that pretty much right away. Beyond that I wouldn't have any direct design responsibilities for the new product. I honestly don't remember if that was Greg's idea or mine. I wouldn't be surprised if it was mine. A spark had gone out inside me when Eagle II died. I'm sure a design assignment would have rekindled it, but I wasn't emotionally ready just then to, as the Irish melody goes, gird on my father's sword, sling my wild harp behind me, and go off again to the next disk drive war. This Minstrel Boy was in the mood to stay home.

As it turned out, I didn't work on Coyote III for very long. At least I don't remember working on it for very long. Near the end of 1988 an opportunity opened up to become the production engineering manager for the Eagle line. I interviewed for the job and they gave it to me. My new boss would be a guy named Jim Vashro. He had recently been promoted one step up from that job although he would be wearing two hats for a time – one as my boss and another as de facto production engineering manager for our 'box' product line. I had known Vashro in passing for several years but had never had any real dealings with him up to then. I neither liked him nor disliked him. He had been just a face in the crowd until now. As it

turned out, Vashro was an 'Amiable' interpersonal relations type but he wasn't nearly as obvious an Amiable as Rich Smith had been. I didn't recognize that at the time or I might have thought twice, then thought thrice, about going to work for him. In contrast, Greg was an 'Expressive' personality type and I've always gotten along well with Expressives. Vashro could pass himself off as one when he wanted to and that's what he did when we interviewed.

My motives for abandoning the bench and stepping over the line into management were complicated and probably not really all that well thought out. One factor was that it occurred to me that product development work had seriously interfered with my ability to make progress on my private research project. By now this work had been going on for well over a decade but had still not netted anything I saw as an important breakthrough. A mound of minute accomplishments, yes, but not the Enduring Big Idea that could bring it all together. As a manager at least I wouldn't have work on inventions going on in my head day and night after day and night and I could give my brain research more attention.

But the clinching motive was the thought that, as a manager, I'd probably have more of a voice and a more credible platform from which to try to get our division's direction changed. As an engineer nobody was listening to me. As a manager maybe I could get them to listen. As it turned out, that was a terribly naive supposition on my part. In the end I think I had less influence on strategy as a 'Level 62' manager than I had had as a top-ranked 'Level 61' technical contributor. But I couldn't have known at the time this was how it would turn out.

The news that I had accepted a manager job dumbfounded my coworkers in the lab. For the next couple of days after the announcement a regular parade of my colleagues kept asking me if it was true. I had a hard time explaining why I had done it, mostly because it wasn't something I'd thought through in my usual clinical way of making decisions. I was running on feelings at the time and my heart was ruling my head. One friend, though, asked me a different question. "I hear you're going to be working for Vashro. Is that true?" he asked. It was, I replied. He shook his head and I couldn't read the expression on his face. "You watch your back," he said. He wouldn't say more than that and he left me wondering what that meant. Eventually I would find out. □

VIII. The Elder Bush Years

The elections in 1988 had a chance to be interesting but they weren't. The Democrats ran Governor Dukakis from Massachusetts, which basically only demonstrated that the liberals still held the reins of power within the Democratic Party. Because it looked like a pretty safe bet the Democrats would hold control of the Congress, I didn't see much of any option except to support Vice President Bush. Although I was pretty disappointed by President Reagan's failure to support the things he had advocated all the way back in 1976 and deeply disillusioned by how powerful the extreme right wing of the Republican Party had become, the best I could hope for was a stalemate between Congress and the Executive Branch.

I wasn't entirely sure Vice President Bush was really not involved in Iran-Contra, but I didn't know if he had been involved either. I did remember the 1980 primaries, where he had come across to me as a rather moderate Republican. Certainly his characterization of 'Reaganomics' as 'voodoo economics' seemed to be on the money. The national debt had more than doubled under the huge deficits that had characterized President Reagan's two terms in office with no evidence at all of the 'trickle down' effect that was supposedly going to prevent this from happening. Although I had personally done well in my investments during the Reagan years, I did not at all feel comfortable with the ballooning debt or with the scandals, like the Ivan Boesky and Drexel Burnham Lambert affair, which I regarded as symptoms of something Dad had always claimed about the Republicans – namely, that they never met a millionaire they didn't like or a working man they did. Dad and I had had several arguments over that, but now I wasn't so sure he hadn't been right and I hadn't been wrong about the 'new' Republican Party.

One thing I fully agreed with my liberal-leaning friends about was Vice President Bush's incredible choice of his running mate. I pretty much assumed Dan Quayle was a nod to the conservative religious

right wing of the Republicans, but I still couldn't believe this choice. It was my opinion, right along with my liberal-leaning friends, that this guy was a total moron. God help America, I thought, if Bush wins and then dies in office.

During the run-up to the election there was quite a lot of negative campaigning, which I didn't like at all, and I couldn't agree with the widespread characterization of Vice President Bush as a 'wimp.' The guy had been a naval aviator in World War II. He had run the CIA. Wimp? Not by a long shot. And who was calling him that? The lace-panty wing of the Democrats. Until the liberals were unseated from power in the Democratic Party, I saw Vice President Bush as the only possible *practical* answer to both the conservatives and the liberals. He won 53% of the popular vote and carried forty states in the electoral college on November 8th. With January of 1989 came the beginning of the Elder Bush years. □

Vashro and I got along well enough as I began my new job. Of course, one reason might have been that he and I rarely saw each other in 1989. He kept busy with the box product line and whatever else it was he did, while I kept busy managing the Eagle production engineering group. One thing I had to give up when I took up my new responsibilities was teaching for the Engineering in Boise Program across town at BSU. As production engineering manager, I was on call twenty-four hours a day and as I saw it that meant I couldn't properly serve the engineering education program because I couldn't guarantee I would always be able to show up to teach. Any emergency at the factory had to take precedence. It would not have been fair to the students if their teacher had to subordinate their needs to the calls of his day job.

As a rookie manager, I found there were several management training courses I was now required to take, and so off and on that first year I'd be away from the operation from time to time. In fairly short order I had collected a nice little stack of tissue-paper certificates certifying I had been trained in 'Managing at HP', 'Performance Evaluation & Pay', 'Finance at HP', 'Project Management', and, my personal favorite, 'Process of Management' – POM as it was popularly called. My periodic absences didn't have any ill effects on the factory or my team. I had inherited a very good team of people and a production line that was already in pretty good shape.

Which was not to say the production line was wholly free of problems. The HP 7937 – Eagle – was the division's main revenue-producing breadwinner. We shipped products out the back door that brought one million dollars *a day* into HP's coffers. Anything that stopped that flow, no matter how briefly, was a pretty big deal. At the same time, Eagle had a well earned reputation for being a highly reliable disk drive, which is something of paramount importance to people who buy disk drives. My counterpart who managed production operations for Eagle – a very cool guy named Bob Claridge – and I were from the very start in complete agreement on one very important objective: Nothing would be allowed to degrade the quality or the reliability of the HP 7937. Anything that did was a sufficient cause for shutting down the production line until the problem was fixed. A decision like that is always a technical decision and, as such, it was always my call to make. Bob never once argued with me about a decision to shut down the line. He and I always had a united front on this. Mind you, I'm not saying we 'presented' a united front. We *had* a united front.

Any problem that stops the production line is called a 'line-stopper.' We ran three shifts in the factory and that meant line-stoppers could potentially cost the company eleven dollars and fifty-seven cents for every *second* the line was shut down if the production folks couldn't make up for it after the line started again. Allowing a bit for the division's growth over the years, Ken's old '$8 per second' signs in the lab back in the HP 7908 days no longer looked as ridiculous as I had thought they were back then. My team's job was fundamentally to get that line running again after a line-stopper as soon as possible. Bob's team's job was to make up for however much production had been lost because of the line-stopper. He, I, and the production line supervisors and managers worked very closely with each other any time one of these emergencies happened.

From time to time various managers up in the R&D lab still questioned the need for having a production engineering staff at all. The kinds of things my team was occupied with on a normal

production day tended to involve making small cost improvements here and there or testing cost reduction changes to Eagle itself that would come down from upstairs from time to time. Each station and each operation on the line had a production engineer who was responsible for it. The guys on my staff each generally had several of these under their charge. Visitors from upstairs didn't come by the production line very often, so when they did these were the kinds of activities they'd see us doing. Since these things aren't very high return-on-investment activities, it wasn't any real wonder they would think production engineering wasn't a good investment. But these little day-to-day jobs weren't really why we were there. We were there to deal with line-stoppers. I explained this to different R&D managers by using an analogy. In peace time there isn't any real use for an army. But if war breaks out and you don't have a standing army, by the time you could put one together it would probably be too late. The war would already be lost and over. Production engineering was DMD's standing army. Most of the lab guys could understand this analogy and would then agree that, yes, we had to have production engineering.

Any production worker on the line who thought there might be a problem was not only empowered but *expected* to bring this problem to the attention of her supervisor and her engineer immediately. If it really was a problem, or even looked like it *might* be a real problem, the supervisor and engineer would bring it straight to my attention. If the supervisor and the engineer both agreed, they could also temporarily stop the line before coming to me. These folks were real professionals, and I can't recall one single instance where I overruled a decision by them to shut down part of the operation. Whether or not the entire line had to be shut down was always my call. This wasn't micromanagement. It was my job to make this kind of decision because of the amount of money this decision involved. And because there was always the possibility that the problem hadn't been spotted immediately, and therefore we might have bad products further downstream in the production pipeline, it was also my job to decide if stopping the line would also be accompanied by stopping shipments as well. The worst case scenario was the decision about whether or not a product recall had to be made – bringing back products we had already shipped.

All these decisions required my team to really climb on top of the problem to understand its severity, extent, how long the problem had been going on before it was noticed, and how to fix it. Because our production workers were so dedicated and committed to their jobs, there wasn't one single instance where a problem had gone on long enough to require a recall of Eagles. That was something that made my job a lot easier because ordering a product recall is never any fun. No, sir.

Eagle line-stoppers weren't frequent, but one would happen about every couple of months. One of the things I soon learned was that line-stoppers weren't caused by the 'high tech' elements of the product. I never once saw a 'high tech' line-stopper. They were always caused by low tech things. We'd receive a shipment of dirty disk clamps. Somebody would put the wrong length screw in a part bin. Somebody would drop and break a motor magnet and contaminate the clean line with airborne magnet particles. It was always stuff like this that stopped the line.

We – that is, my team – would periodically pluck out Eagles coming off the end of the line and run them over to our test facility to carry out audit testing of their reliability and their regulatory compliance. Sometimes that was where a problem would be discovered, and these were generally the scariest ones because we'd know there was a problem but we wouldn't know the cause. Audit failures were always a ground for immediately shutting down the whole factory operation until we found the root cause and assayed how long it had been going on and how extensive its effect was in recent production.

A typical line-stopper would go something like this. Somebody would find something and a few minutes later the supervisor and one of my engineers would show up at my desk. They'd give me a brief description of what had happened. I'd order the line to shut down and have the supervisor and the engineer go notify the appropriate people there would be an emergency meeting in ten or fifteen minutes to figure out what needed to be done next. While they were spreading the word, I'd go see Bob and let him know I'd shut down the line. I'd tell him what I knew at that point and he'd handle notifying the manufacturing manager and the division manager that Eagle was down. Bob never sat in on my

engineering meetings; he left that part of the problem solving process to me. Neither would the upper managers come down to it or show up anywhere on the line during the line-stopper. They trusted and expected Bob and me to do the right thing to get the problem fixed.

That first meeting was to assess the situation and figure out what else we needed to know. The engineer would brief everyone on what had happened and we'd plan what we were going to do next. Usually the first step was to do a more thorough investigation to nail down the facts we were going to need to know. Everyone – engineers, supervisors – would be asked to present their points of view and we'd figure out who was going to do what and how we were going to coordinate our efforts. My job here was to see to it we *as a team* came up with a plan everyone agreed to. If I thought there was something the others had missed bringing up, I'd ask questions. That usually stimulated more discussion and improved the plan. I'd ask how long everyone needed to accomplish the actions we'd decided on and then set the time for our next meeting, where we'd see what the facts were and be able to get a clear handle on step two, which was actually fixing the problem.

The second meeting usually had two objectives. The first was to formulate the plan for fixing the problem. The second was to decide whether any shipments could go ahead – and if so which products were 'safe' to ship – and whether or not a product recall was necessary. Like at the first meeting, everyone left this one with action items to carry out and with the knowledge of when the third meeting was going to be. The third meeting was for evaluating if we had the problem fixed and, if not, what the next actions were going to be. If the solution had been found, the supervisors would take the helm in figuring out how to bring the line back up again. Here they'd tell us what help they'd require from the production engineering staff. A big part of this plan was rework. There would be Eagles downstream in the process 'infected' by whatever the problem had been and these would need to be fixed and put right. That was usually where my folks got involved in the re-start. Most of the time we'd have a resolution at this third meeting and shortly afterwards we'd be producing again. The total down time averaged about two shifts (sixteen hours), sometimes was as brief as an hour or so, and once in awhile might take two or three days to resolve, depending on what the problem had been.

I have always been extremely proud of the Eagle folks, both mine and Bob's. They were exceptionally dedicated and conscientious. I have also always been especially proud of Bob and the production folks, to whom always fell the task of making up for the time the line had been down. Eagle never once missed its monthly production goals, and that's saying a lot for how good the production operators on the line were and how well Bob and the supervisors managed production operations. I was working with the best. □

Jan Skurzynski (left) and Gayle Chapman (right), also known as Black Diamond.

One thing I hadn't counted on when I became a manager was becoming a kind of outcast. It didn't take very long before I noticed that a lot of people I'd been chumming around with for years stopped chumming around with me. Vern, Chic, and Steve didn't do this, but a lot of other folks did.

Once I did notice this and thought about it a little, I guess it wasn't too surprising. Management at HP discouraged fraternizing between managers and non-managers, and there is a good rationale behind this. When you become a manager you are responsible, among other things, for doing performance evaluations and administering pay for the people who work for you. If those people are your close friends this can create any number of frictions and problems. This doesn't have to happen, of course, but it does happen often enough that the no fraternization rule is fairly prudent. I knew this, of course, and went along with it where the people who

worked for me were concerned. But I hadn't expected a mere title change to be important in the case of my friends who did not work for me. Apparently, in many cases, it was.

It first showed up in little things like not being invited to join any HP League softball teams anymore. In past years when someone was putting a league team together it was sort of a casual matter of course that the organizer would come around and let me know. From 1989 on that didn't happen any more and I ended up only playing on City League teams after that; these were usually organized by guys who were also managers. Steve and Jack Smith, another pal who had recently become a manager over in our printer division, both organized these kinds of teams. I liked playing in City League, of course, but our teams in that league weren't co-ed and that did take some of the fun out of it. Steve had been a manager for as long as I had known him and he had the people skills and leadership skills to get away with a certain amount of fraternization. But he, too, had long noticed the invisible wall that can go up between friends when one of them puts on the manager hat. There was a stanza from an old rock song that went, *No one knows what it's like to be the bad man . . . to be the sad man . . . behind blue eyes. No one knows what it's like to be hated . . . to be fated . . . to telling only lies.* Steve called this 'The Manager's Song.'

Vern and I always remained as close as ever; we were brothers. But in '89 Vern was courting another friend of ours, Mary Carter, and they got married late in the year. Naturally I was happy for both of them; Steve, Chris, and I attended their wedding, which was a small civil ceremony performed by a local judge. But the courtship period did cost me my summer hiking partner until after the wedding. Steve was my other usual hiking partner, and we had been planning to take part of our vacations one of these summers and spend it hiking the Atlanta loop, which is a multiple day hiking and camping trip near the little town of Atlanta, Idaho in the Sawtooth wilderness area. Steve and Chris had returned from England in 1987 and we had been planning this trip for three years. In 1987 Steve had come down with the flu just before we were going to go, so we had to cancel. In '88 it had been my turn to come down with the flu and we had to cancel again. Then in '89 Steve broke his leg during a softball game just before we were going to go and we had to cancel a third time. Steve and I agreed after the third time that maybe the Atlanta loop was just plain bad luck for us.

So, all in all, I found myself a little short on friends in 1989. My friend Jan Skurzynski had left HP not long after the Challenger disaster and was working a day job as a bartender at the Red Lion Riverside and taking part in Boise's very active music scene at night. I missed seeing her around the site after she left so I'd often drop in at the Red Lion after work for a few drinks and some conversation with her. Jan used to pour my Beefeaters & tonic a little heavy, which I liked, but more importantly she introduced me to the insides of the local music scene. It didn't matter to her in the least when I became a manager.

Through Jan I met and got to know many of Boise's incredibly talented professional musicians. At the time Monday nights were 'jam session night' at Pengilly's saloon in downtown Boise. The jam sessions were organized by an amazing musician named John Hansen. John is, quite simply, the absolutely best guitar player I've ever heard bar none, and practically no one outside of Boise knows about him. Whenever I'd get to feeling cocky about my own ability as a musician, all I had to do was spend a night listening to John play. When his fingers went flying over the guitar strings, they'd just be a blur and I'd say to myself, *I know nothing about music. Nothing at all.*

Among the many musicians who were drawn to the jam sessions and became my friends were Billy Braun, who is one of three remarkable brothers from the town of Twin Falls, Gayle Chapman, who came from Minnesota and was the original keyboard player in the rock group Prince, and – once in awhile and not nearly often enough – Rosalie Sorrels, who was a nationally famous folk singer in the golden age of folk music in the 1960s. Jan also played in the jam sessions. A little time after I started coming down for them, Jan and Gayle partnered up to form a folk duo named Black Diamond. I love folk music and whenever Jan and Gayle had a gig anywhere in town, I always came down every night they were playing to listen and to lose myself in their music.

Through Billy I met his brother Muzzie, who lived with his wife and three boys in a cabin up in the

White Cloud mountains thirteen miles up the Yankee Fork. They lived up there with no electricity or other modern gadgetry. Muzzie's boys were talented little musicians in their own right, just as cute as buttons, and they even appeared once on The Tonight Show with Johnnie Carson. After that Muzzie's oldest boy actually got a main part in a movie – a western – and Muzzie himself appeared in one scene as an extra. Muzzie was sitting on the set one day during the shooting of the movie when the director asked him if he'd like to be in it. "Sure!" Muzzie replied, whereupon the director called one of the makeup people over. Pointing to Muzzie, he said, "Clean this guy up. Make him look like an outlaw."

At a jam session in Pengilly's (1989). With me is my friend Diane, who was a social worker. She ran a shelter house for women in Boise.

'Jam session' was an appropriate name in more ways than one. Pengilly's was usually packed on jam session night and we'd be jammed in there wherever a place to sit could be found. There were several women, mainly divorcees, who were regular attendees and who I got to know pretty well. One of them was Ruth Haefer, who owned and ran the Idaho School of Massage Therapy in Boise. Another, Adele Thomsen, was a commercial artist. A third, Diane, was a social worker who managed a women's shelter house in Boise. In addition, there was a group of interesting women who were very active in the National Organization of Women. All in all, I made more women friends than men friends on the music scene, although two new friends I made were Tom Simpson, who is an engineer at another Boise firm, and Scott Simplot, who is the son of J.R. Simplot, Idaho's billionaire potato king. As you can see, we were quite a diverse cross section of America, all jammed shoulder to shoulder together and united by our love of the music.

Enjoying a Saturday afternoon at the Ste Chapelle Winery with Adele and Ruth (1990).

My social life with my new friends wasn't entirely confined to the music scene in Boise. That was, naturally, our most central shared interest but by no means the only one. I was able to rediscover a part of life that all my years with HP had almost made me forget even existed. It was a wider sense of community untainted by business relationships. A big company like HP tends to homogenize people to a certain degree when one's friends and acquaintances all work there. From late '88 on, my circle of friends included the rich and the poor, the businessman and the artist, the conservative and the liberal. To that small circle of my brothers I now added something new and special: a small circle of good and special friends who were women. What we all really had in common was something very special but easily forgotten: we were Americans. I was back in America's melting pot again and it felt *great.* If it's been too long since the last time you were in it, I recommend it to you. It's a hot spring for the heart.

This new part of my life began after a Pengilly's jam session one Friday-night-to-Saturday-morning when John, Billy, Jan, and I adjourned to Jan's house afterwards. The three musicians – who by the nature of what they do tend to be true night owls – weren't even close to calling it a night yet and I was too 'up' from the evening to feel tired either. A sort of post-jam jam session broke out at Jan's. I didn't know how to play a guitar at that time, but I could still sing and I joined in as a vocalist in the songs I knew. Billy took a liking to my voice and he was scandalized when I confessed I didn't know how to play guitar.

Not too long after that, Billy and his partner were playing a gig at Angel's, an upscale restaurant and bar in downtown Boise. Billy likes the more old fashioned show tune style of music in addition to Beatles and other soft rock songs. They were about to do a Beatles number and he spotted me sitting there in the audience. He cajoled me – ordered me, really – to come up and join them on stage. I had had a couple of beers by then, which helped me ignore my nervousness about getting up there, and we did one of the songs we'd done before at Jan's house. I assume that's why Billy wanted me to get up there with them. He'd already 'auditioned' me for that number and had liked my harmony. I have a tenor voice and between the three of us the harmonization really sounded pretty good. The crowd liked that one, so Billy had me stay there for a couple more before they took their break and he let me sit back down again. A few people I knew from HP happened to be in the crowd that night and I guess they were pretty surprised to find out I could sing. I got several compliments afterwards and I'm afraid it kind of stirred the ham in me.

Not too long after that night, another guy I knew at HP, John Hodges, talked to me about maybe teaming up with him to do a few gigs every once in awhile. John's pretty talented as a musician, and I think it would be fair to say he's a musician working a day job as an engineer. I wasn't too bad on the keyboard by then and John was a pretty good guitar player as well as being good with other instruments. I didn't take too much persuading and eventually we did a few gigs together on special occasions like Saint Patrick's Day celebrations at some little bars in the town of Meridian, which was just a few miles down the road from Boise. I particularly liked playing St. Patrick's Day. A few folks even thought I was an Irish tenor. We didn't get paid for doing it other than getting all the free corned beef and cabbage and beer we wanted. And tips. John set out a tip jar and the patrons were fairly generous about stuffing twenty dollar bills into it. Everybody had a pretty good time at these gigs, none more than me.

Word got around at work about our doing this, and this led to kind of an interesting and unexpected thing about a year later. There's a fairly large Vietnamese community in Boise made up of people – and now their families – who had fled Vietnam when it fell to the North in 1975. One of the young engineers at work, a guy I had originally hired and who worked for me for his first couple of years, got married and he had hired a Vietnamese band from Seattle to play at his wedding reception. At the last minute their keyboard player couldn't make the trip. Apparently you can't have a real Vietnamese band without a keyboard player and Thang asked me if I'd sit in and substitute for him. "I don't know any Vietnamese music," I told him.

"It's easy," he assured me. "It's all cha-cha-cha music." Okay, that I can do. I agreed.

It turns out that Vietnamese music *is* a bit different. Western music tends to be written in eight, twelve, or sixteen bar arrangements. The Vietnamese music we played that night was ten bar. That took a little getting used to but I soon got the hang of it. I didn't know one single song they did, so I just improvised around what the others were playing. Apparently that's exactly what the keyboard player is supposed to do in a Vietnamese band because during breaks all these Vietnamese folks kept coming up to me and exclaiming how wonderful it was to meet 'an American who plays Vietnamese music.' I didn't have the heart to tell them I was just faking everything.

John Hansen and I became very good friends, and late in 1989 I was able to help him out with something. John wanted to put out a tape of his favorite songs but he didn't have enough money to produce it. He was coming up about three thousand dollars short. I don't have a tenth the musical talent he has, but I did have money. I told him I'd bankroll the production of his album. He was really happy to hear that, and he started to tell me what he thought would be a fair compensation in return for my 'investment.' I just waved my hand in front of my face until he stopped talking. "I just want a free copy of the tape after it comes out," I said. I wasn't making an 'investment.' It would have been a sin against the arts for John not to be able to make that tape just because of money. He made his tape and I still have my free copy of it. □

We were about halfway through 1989 when another startling event took place out at work. Word came down from above that DMD was splitting into two divisions, a big one and a little one. The little one was to be known as Data Storage Systems division or DSS and was going to be a division devoted to our box

products. The big one was to be known as Disc Mechanisms Division and would keep the acronym DMD. The Coyote product line and its manufacturing were to be part of the new DMD. Eagle, on the other hand, was going to DSS even though the HP 7937 was not a 'box' product except insofar as it was not an OEM mechanism product and didn't have a 'C' product designator. The DSS-DMD decision effectively set in stone the strategy I opposed, and that had led to the cancellation of Eagle II, because the new DMD was by definition going to be a division that concentrated exclusively on the OEM jelly bean disk drive market. To my somewhat-less-than-unalloyed-joy, the new DSS division manager was none other than my old pal Doug Clifford. Now all of a sudden I *was* working for him. But at least there were two layers of management between me and Doug. It didn't look like I'd be running into him on a day to day basis. However, any more friendly teasing was now *definitely* out. I don't tug the lion's whiskers.

I was surprised by the announcement, and as the details regarding the makeup of the two divisions were explained to us my surprise turned to stunned surprise. Most of the vast organizational overhead of the old DMD was staying with the new DMD. DSS was getting only tiny slices of it, which meant we were going to be a pretty lean and mean division so far as our cost structures were concerned. At the same time, our box products – which were standalone storage products that sold directly to end users and not at all into the OEM market – commanded fairly large profit levels. DSS was both getting the money-making products and shedding the crippling overhead costs. *Man,* I thought to myself, *DSS is going to be one rich division*.

DMD, on the other hand, was set up to produce high tech commodities with low profit margins and was being saddled with the existing high cost operating structure. From where I sat what was in store for them looked pretty obvious. Basically they were screwed. And they had given away Eagle, which was the most profitable product the old DMD had ever had. By the time the HP 7937 went into product obsolescence it had brought over *one billion dollars* in revenue into HP's coffers. This one product, all by itself, brought in as much money as *the entire company,* all of HP, had brought in the year that ended just before I joined the company in 1975. Its ratio of average selling price to factory cost was thirty percent higher than the typical HP product, which meant its profit margin was one of the highest in the company's history. The new DMD was giving away its biggest breadwinner. I remember thinking sarcastically at the time, *"I must not have what it takes to be a division manager. I'd have never come up with this plan."*

Of course it wouldn't be fair to lay the entire blame for this astounding move at the feet of Don Curtis. A division manager doesn't have the authority to create brand new divisions of the company. That kind of decision rests with one of the company's vice presidents – in this case with Dick Hackborn, the guy who had been division manager of DMD when it started up and when I first moved to Boise – and with the VP's staff of 'business unit managers.' DMD – and now DSS – belonged to what was known at the time as the computer peripherals business unit, a unit that included that hot new product line from next door, the Laserjet printer. The business unit managers were known by their acronym, the BUMs, and if ever there were a 'bum call' this one was it. I guess I wasn't cut out to be a corporate vice president either.

One of the main reasons I had decided to become a manager had been so I could try to influence our strategy and try to get us to not head off in the OEM direction. Well, that objective was pretty much rendered moot by the division split. Now it was too late for that and all I could do was worry about my friends and all those other people who were trapped in the new DMD. There wasn't one single thing I could do to help them. I had never expected my new job to be more fun than a barrelful of monkeys, but at least I'd had a sense of a larger *mission* in taking it. Now, without that sense of mission, my job *felt* like a job for the first time since I'd had to work in the bakery all those years before. What I *could* do now was work to make my new division as successful as possible. That, at least, would be something I could do for the production workers and all the others whose livelihoods depended on our mutual contributions as a company. And there was no better product to accomplish this with than Eagle.

Or so I thought. Later in the year, as we rolled toward that last quarter of calendar year 1989, another surprising decision came rolling down, this time from DSS's management chain of command. We were to

start preparing for the transfer of the HP 7937 into product obsolescence. What this meant was that we were to design a low volume production line that would be transferred to a third-party company HP used to support old products that were being taken out of our product catalog. The Eagle factory would be dismantled and my team would be reassigned to production engineering for our main 'box' product line.

Disk drive technology is a fast moving technology and the new five-and-a-quarter-inch and 3.5-inch disk drive products now in design and in the marketplace were, from a purely technical standpoint, superior to Eagle's technology. Everybody knew that and everybody, including me, knew it was only a matter of time before the HP 7937 would no longer be competitive. By the end of 1989 Eagle would be three years old, and that's quite an advanced old age in the mass storage business. What bothered me was the end-of-the-year timeframe set for shutting down Eagle. In my perhaps naive way of looking at things, the marketplace determines when a product is no longer competitive and I didn't see any sign in our production schedule that Eagle had reached that point yet. Probably Somebody Up There had access to some good market forecast data that clearly showed the timing was right for bringing Eagle to a close. But if so, no one ever shared this data with me. I don't know if Vashro was involved in the decision or not. I do know I wasn't. As far as I could tell, the decision could just as easily have been an arbitrary act of market anticipation. To put this another way, it could have been nothing more than a self-fulfilling prophecy. I hope it wasn't, but I don't *know* that it wasn't. I did know our division had never won any blue ribbons for its strategic planning process. Like in most of HP, strategy never really was our strong suit. Tactical execution and being able to rapidly respond to opportunities and problems was.

Whatever my private doubts were about the decision – and I did have them – it was my responsibility to carry out this decision. That's the way it worked at HP in those days. The objectives for my team were supposed to support and help to achieve the objectives set at the next level up in our organization. Some of my folks did openly question the decision to terminate the Eagle product, but as much as I agreed with the doubts they were expressing, I couldn't share my own doubts with my people. I couldn't change the decision but I could guarantee failure by leading a revolt. As Gene Kranz, NASA flight director for the Gemini and Apollo programs, has famously put it in the title of his autobiography, failure is not an option. Eagle was going to die, but after having given seven years of my life to it I was determined it would meet its end with head high and absolutely no decline in its quality or in its reliability. That was the goal I stated to my team and every single person, both in production engineering and out on the line, signed up for it without reservation and with determination to make it so. We were all proud of Eagle and we were going to see to it that we could always be proud of it right down to its last day. The Eagle folks made that happen, and I've always been proud of all of them for that accomplishment. □

While we were busy keeping Eagle shipping and, at the same time, preparing for its obsolescence, there were other things on my plate that needed to be done in order to get ready for our new job of supporting the box product line. The Eagle factory was going to be completely dismantled and given over to DMD for expanding our thin film disk fabrication facility. The box product line was located in Building 83 Lower, which also housed so many other various functions that it was a regular sardine can. One of the things we would need was adequate floor space to house production engineering, and I wanted that space to be right off the production line where communication between the line and us could be as nearly instantaneous as possible. We also needed space to accommodate R&D transition teams coming down from the lab as the planned suite of new DSS products entered the production prototype phase. I wanted the lab team right next to us and not off in the distance someplace where they couldn't see what problems needed to be fixed before their new product could be handed over to production operations.

Floor space was always a contentious issue. No group ever thought they had adequate floor space to do their job. Over the years there had come into being a special group, known as Site Facilities but more commonly called 'the space group,' who had been handed the unenviable task of planning and *deciding* who was going to get what floor space, where it would be, and how much anyone was going to get. They were part of that big overhead structure we had built at the Boise site.

No one was ever happy with this group's decisions because everyone always thought *their* group drew the short straw so far as space was concerned. The space group really had a thankless job and regularly had to put up with abuse from everyone else. It was natural and inevitable under these conditions that a kind of Fort Apache attitude developed within this group. Nobody likes to be unappreciated and it was certainly true that they were *very* unappreciated. How would *you* like the job of standing between two seven-year-olds with *one* ice cream cone? That pretty much describes the situation they were in.

I didn't have to be a rocket scientist to see the parallels between their situation and that of Lee Brooks back in my Delcon days. One of the people in my team was a bright, conscientious, and extremely dedicated woman named Ok Hee Chang. Ok Hee had been a top craft production operator who had been moved off the line to fill a kind of general production trouble-spotting role. I call it 'trouble-spotting' rather than 'trouble-shooting' because as part of the production line all that Ok Hee could do was bring problems to the attention of the line supervisors. By herself she couldn't make anyone fix the problem. This had been kind of frustrating for her and not long after I took over the production engineering group her line supervisor came to talk to me about Ok Hee. She felt, correctly, that the nature of Ok Hee's job was more aligned with the function of my group than with that of production operations. What would I think of taking Ok Hee into my group?

I already knew Ok Hee. My first day in my new job she had come to me before my chair even had a chance to get warm to tell me about some problem she had spotted. I think she expected to be disappointed in the outcome of this meeting because Vashro had previously made a habit of ignoring her. But the problem – I no longer remember exactly what it was – was a real problem and it was something that needed to be fixed. Nobody was more surprised than Ok Hee when I put one of my engineers on it. Over the next couple of months I came to respect Ok Hee's judgment and commitment to Eagle, and so I thought the supervisor's suggestion that she be transferred into my group was an outstandingly good suggestion. I had to arm wrestle with Vashro to get this approved. It wasn't something I had the authority to do on my own and, quite frankly, my boss couldn't see or didn't want to see the benefit of having someone who was not an engineer or technician in his organization in anything but a secretarial role. But I argued him into it and, being an Amiable, he reluctantly okayed it. Ok Hee turned out to be a treasure and she made a lot of important contributions to making Eagle fly high.

Now I gave her a different kind of problem to help me with. I asked her to look around for any kind of space problems I could take to the space group. I didn't care what kind of problems these were. I just wanted them to be plausible space problems I could go ask the space group to help me with. I wanted this *before* I had to go to them with the request for my floor space needs in the box factory. Ok Hee came through for me and soon I had a nice, minor little space problem I could take to the space group. I trotted over to their area with it.

I'll never forget the nice greeting I received when I walked into their cubicle. One of the folks was sitting at her desk and as I walked up to her she snapped, "What do *you* want?"

I humbly admitted that I had a space problem and I wasn't sure what to do about it. Could she help me? She listened suspiciously as I described the problem. After I finished she snapped, *Do this!* and told me what her decision was.

"Okay," I responded cheerfully. "Thanks!"

I treasure the look of surprise and puzzlement that spread across her face. Something wasn't right here. Where was my argument against her decision? Where was the abuse? I peeked back over my shoulder as I was walking away. She had stood up and was watching me go.

Over the next few weeks Ok Hee found some more space problems for me and I took each one over to the space group. Each time, whatever they said, I went away and did exactly as I was told. No argument. When the time came for me to bring my big space request over, they gave me almost the entire ground floor of Building 83 that wasn't already given to the box line. *Including their own space*. I actually ended

up getting more space than I had dared to hope for. The space group was a pretty good bunch of folks. □

Vashro made some other changes in our organization in preparation for the post-Eagle world. The production technicians were being moved from production operations to manufacturing engineering, a designation that included my group, a newly formed New Product Introduction or NPI group under an old friend of mine, Dave Prouty, and a software group that would be under a capable woman named Katie Kolstad, who I knew slightly from various encounters over the years. Dave, Katie, and I would be Vashro's staff, which finally made his job what it was supposed to be: a manager of managers. It was also decided that the group of admin people – clerks – who kept track of all our production documentation would be officially formed into a group – the documentation group – and placed under a supervisor. For reasons never explained to me, it was decided this group would become part of production engineering, my group. So now, in addition to my engineers, Ok Hee and my administrative assistant, Fred Barton, I would have two supervisors reporting to me, one for the production engineering technicians and one for the documentation group. Vashro didn't ask for my opinion on any of this. He just told me about it. I approved of the technician group; I had plans for them. I didn't see why the Documentation Group should be put under me, but I didn't have any particular objection to it. If I'd been asked, I'd have said this function was part of production operations. After all, they were the ones who built the products and needed the documentation. But nobody asked me.

The task of hiring the new supervisor for the documentation group then fell to me. Or rather I should say the formality of hiring this person fell to me. Bob already had someone in mind and there was only one applicant for the job, a slightly heavyset woman in her late twenties or so named Linda. I had never met her before the day we sat down for her interview. She came from the production operations side of our organization and for all I know Bob had encouraged her to apply for this job. Whether or not Vashro had anything to do with it I don't know, but I pretty much think he did not. Vashro didn't bother himself very much with getting to know individual production people below the supervisor level. In this he was a very strange kind of Amiable. Like a number of people I've met who fancy themselves to be liberal and enlightened, he tended to view people as abstract people rather than bothering to get to know them as real people. I've never met any abstract people for the simple reason that there aren't any.

The interview itself was nothing particularly special. Since Linda was not an engineer it was what is called a 'behavioral interview.' This consists of talking about what sorts of things the interviewee has had experience with in the past and how she dealt with various situations that bore some similarity to the sorts of things that could reasonably be expected to pop up in the new job. Linda had no previous experience with being a supervisor, so I knew I'd probably have a bit of a coaching job on my hands. But all I was looking for was someone who could lead a small team and see to it the documentation operation ran more or less smoothly. By the end of the interview my judgment was Linda could probably handle that. One thing did bother me a little bit, though. Throughout the interview she had a kind of deer-in-the-headlights look about her. It is very common for a person to be nervous during an interview, but something about her nervousness seemed a little excessive to me. It bothered me enough that I mentioned it to Bob afterwards. "She'll be fine," he reassured me. "Don't worry." I generally respected Bob's ability to judge people so with that reassurance I went ahead and hired Linda.

That, as it would turn out, was the worst mistake I ever made. □

As 1989 drew to a close we were busily engaged in taking down the Eagle line and verifying the tiny little 'obsolescence line' our third-party vendor would use to support Eagle for the next ten years after HP ceased to sell new ones. It was during this that my phone rang one morning. It was a call from an R&D project manager down in Cupertino who was working on one of HP's new computers being developed in Data Systems Division. He was in a panic. It turned out that all of his group's design data was stored on an HP 7937 and this drive had suddenly failed. Through an oversight DSD's central computer system that automatically backed up the data on the lab's disk drives hadn't been backing up this particular drive. Everything his group had done for the last six months was on that drive. Tens of millions of dollars were

at stake. Was there anything we could do to help him?

I asked him a few questions about the symptoms the failed drive was exhibiting, and from what he told me I had a pretty good guess what had happened. One of the things we'd started doing after I took over the production engineering team had been to analyze the data we got back on Eagle field failures, and we had identified a problem in our production process that was causing the kind of failure that exhibited the symptoms he was describing. The basic problem was an inadequate tool used on the production line to apply lubricating oil within the actuator. The tool didn't reliably meter out the proper amount of oil and every once in awhile too much would be applied. It would leak out from where it was supposed to be and get onto the surface of the disks. Friction between the heads and disks during turn-on and turn-off would eventually turn this oil into a kind of tar and make the heads stick to the disk. Once this happened, the next time the Eagle was turned on the spindle motor would wrench the heads loose, bending them out of alignment and sometimes tearing out small pieces of the disk surface. One of my guys had fixed this problem on the line early in 1989 but there were a lot of Eagles built before the problem was discovered. This one was one of them. If it was what I thought it was, there was a good chance we could recover most of the guy's data for him. But it wouldn't be simple and we'd need to get that drive back to do it.

"We'll see what we can do," I told him. "Send the drive back here." That very afternoon my colleague down in Cupertino sent his best technician up to Boise on the first available flight from San Francisco. In the seat next to him was the ailing Eagle, securely bundled up inside a sturdy shipping case. To the best of my knowledge, it was the only Eagle that ever flew business class. In the meantime my best EE, Eric Johnson, and the production technicians set up an 'emergency room' in one corner of what had been the production line and got ready to receive our 'patient.' Andy Rad, who took care of all the software for the various computers we used in production, was also part of this team and was preparing some diagnostic software tools. We would need his skills if we were to have any chance of getting DSD's data back.

As soon as the Cupertino guy arrived with the Eagle we wheeled it into our 'emergency room' and started some very careful testing. This was done very cautiously because we didn't want to cause any further damage to this already damaged disk drive. The damage was already so bad there was no realistic hope of ever completely fixing the drive. But the cause of the failure turned out to be what I had suspected it would be and there *was* still a chance we could save most of their data. As it happened, there was one man on the face of the earth who knew the intimate details of Eagle well enough to design a way to make that possible, and that man just happened to be none other than Eric.

Eric figured out right away what had to be done and in a few short hours he had designed and built some special electronics that would let us bring up the drive well enough so that it could talk to a computer and respond to commands. It was a very, very sick Eagle and its condition was extremely delicate, but Eric got it working well enough to start transferring data. The Eagle controller included a very, very powerful error-correcting code and we needed every ounce of this code's power to recover the data. Andy rigged up some special software to nurse the drive along and to copy its data off to another Eagle. It took most of a long, anxious day but in the afternoon Eric and Andy came to me in triumph. They had recovered *all* the data. Not one single bit was lost. Andy set up a phone link to Cupertino and transmitted all the recovered data to a computer down at DSD. They were in business again. Eric, Andy, and the techs had made an absolutely fabulous accomplishment. I had thought we could probably get most of the data back, but I hadn't dared to hope we could get it *all* back. But that's what the guys did.

Less than a half hour later my phone rang. It was the DSD project manager and he was gushing with thanks and gratitude. He thanked me over and over again. "I'm happy we were able to help," I told him, "but we were just doing our job." He didn't buy the modesty, although all the while I was thinking none of this would have ever happened in the first place if *we* hadn't had that oil problem to begin with. But I thought it best not to bring that little detail up.

Later that afternoon the lab manager at DSD called our manufacturing manager and repeated all this unvarnished and lavish praise for what a great team he had in us. Then the DSD division manager called

our division manager and did the same thing. “Your people embody everything that’s best in the spirit of the HP Way,” he said. So then I got a visit from Doug and a nice ‘attaboy’ which I passed on to the team. Aw shucks, Doug. Just doing our duty. But thanks.

Christmas scenes from 1988 and 89. Upper left: Nephew Bryon, Sherri, Darrel Hicks, one great-niece and one great-nephew. Upper right: Darrel, nephew Scott, Scott’s wife, Bonnie Hicks, nephew Aaron, one great-niece. Lower left: Bill’s family – Bill, nephew Nick, Maryann, niece Marnie. Lower right: My cousins from Aunt Sylvie’s family getting ready for dinner at the retirement home where Sylvie now lived.

Back in Iowa one generation was getting old, another generation was coming up from behind, and a brand new generation had begun to be born. My five nephews from Sherri and Ronnie – Bryon, Scott, Mark, Dwight, and Curt – were young men now. Bryon, Dwight, Curt and Scott were already married and had kids of their own. That made Sherri a grandma, and also made me a great-uncle – a status that felt a bit strange to me. Sherri didn’t seem to have had any difficulty in making the transition to being Grandma Sherri; she really loved her grandkids, who she called ‘the pumpkins.’ Bill and Maryann had two kids. My nephew Nick was just entering adolescence and my niece Marnie was still a little girl. Dan had adopted Melody’s first boy, my nephew Aaron, and they had had the first child of their own, my nephew Donald, in July of 1988. My niece Danielle would be born in January of 1990. Nick had been born in Austin in February of 1975, while I was living in the Lincoln Apartments, and Aaron had been born in March of 1977. The two of them were terrific boys who I deeply love, but put them together and they could be little terrors who could keep Melody and Maryann both hopping. Mom, of course, was now a great-grandma. The ‘pumpkins’ who were old enough to talk hadn’t quite gotten this right yet and called her ‘Grandma Great,’ which never failed to get a big smile out of Mom.

Living as far away as I did and getting back to Iowa only once a year, I missed seeing my nephews and nieces grow up and I would likewise miss seeing my great-nephews and great-nieces grow up. I would have dearly loved to have been around more when they were kids but that just wasn’t in the cards for me. It was especially difficult to even keep track of my great-nephews and great-nieces. When I did come back for a visit it was a lot like going to Aunt Sylvie’s when I was little only now I was one of the tall people and they were the short people. I did try to be a good uncle and a good great-uncle to them and

I hope I was. Of all the 'pumpkins' the only two I really got to know even slightly were Dwight's girl, Heather, and Scott's boy, Toby. Heather stood out because even when she was barely taller than knee high she was already a grand little lady. It always seemed to me she was born with a mind already grown up and her body just had to hurry to catch up. I got to know Toby because he lived in the family settlement in Reynerville, would come over to see his grandma and grandpa while I was home for a visit and we'd talk. He reminds me an awful lot of Scott when Scott was a boy and a teenager. As I write these words, only a short time has passed since Bryon's daughter Patty had my first great-great nephew, Trevor, and Heather gave birth to my first great-great niece, Ashlyn Carol. I hope to meet them one day soon.

I have only one true regret in my life, and that is that I never had a son or daughter of my own and now I never will. I would have dearly loved, perhaps more than anything else, to have had a son of my own. I'm not too sure how good a father I would have made, but I'm pretty sure I'd have made a terrific grandpa. As it is, I'm a bit like the character in the movie *Goodbye Mr. Chips.* My boys and girls are the hundreds of wonderful, wonderful young people who are and have been my students.

Gary's parents, Bonnie and Darrel, were always part of Iowa Christmas. Gary was their only child and I can't even begin to imagine how terrible his death was for them. But for as long as they both lived, they were part of our family and no one ever called them 'in-laws.' Christmas wasn't Christmas without them.

Aunt Sylvie was several years older than Mom and was now in her seventies. She was as wonderful and alive as ever, but now she had reached that time of life when she really couldn't live by herself anymore. She had moved into a very nice retirement community and I did have the chance to spend one Christmas dinner there with her and her kids, my cousins. I can never see my cousins without remembering the Teters' family reunions we used to have in the park in Maquoketa when I was very little. There would always be a big picnic spread and there would always be a baseball game. The games weren't exactly regulation; there were always a lot more than nine players on a side and we little kids always got to field and bat right along with the grownups and the older kids. I can still remember when one of my uncles got a base hit one time and ran to first base, where I was standing with my little glove. He got there all huffing and puffing from running, and I was amazed and wondered what was wrong with him. At that age I could run full-out all day long and never get tired. I couldn't understand why anybody would huff and puff just because they'd run ninety feet to first base. Another thing I always remember when I see them is the party they threw one time to celebrate Grandma's and Grandpa's wedding anniversary. They had a mock wedding ceremony and one of my uncles dressed up like a woman – he was the bride – and put great big wads of cloth under his blouse to imitate breasts. When he marched down the aisle the whole Teters clan broke out into a song, *Here comes the bride! Big, fat, and wide!* At the time I didn't have much of any idea what was going on, but I thought that was hilarious.

Mom and Dad (1989)

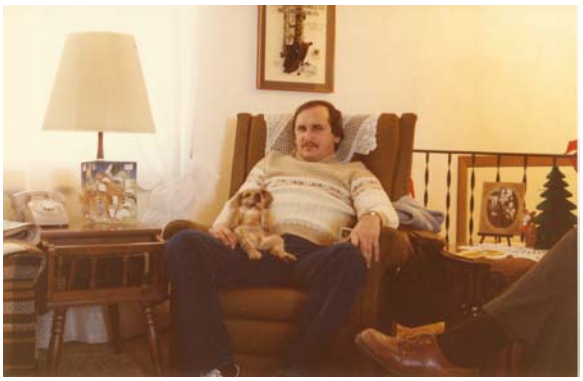
Dad was seventy-six years old the holiday season of 1989, and old age was starting to settle on him pretty heavily. The great physical strength that had been his source of pride his whole life had left him now and his eyesight had gotten so bad he really had no business driving a car – a fact that he lamented even while he continued to drive. He was starting to feel like he wasn't useful for anything any more, and this depressed him. Probably the brightest light in his life now was his grandson – my nephew Aaron. Aaron really loved his grandpa and Dad really needed to have someone who still looked up to him. One of the things I couldn't help but notice when I'd come for a visit was the way Dad often mistakenly called Aaron, "Rick." When I was a teenager working for him in the bakery he'd frequently slip up and call me, "Bill, ah, Rick." That

had really annoyed me back then but I had learned to put up with being "Bill-ah-Rick." I don't know what Aaron thought about being called "Rick," but I just joked that Dad was running one generation behind in his mind.

Dad had started keeping chickens on the settlement and they were sort of his pride and joy. Actually, I thought his chickens were pretty cool. During the winter the chickens would burrow out these little snow caves all around the house. They'd snuggle up in them next to the walls to keep warm. Unfortunately, the stray feral cats that roamed around all over the place also developed a liking for Dad's chickens. For a time he tried to defend his chickens using his old 22 caliber single-shot squirrel rifle. But by 1989 his eye sight had gotten so bad he couldn't see well enough to shoot any more. That year when I was back I noticed he had a lot fewer chickens than the year before and I asked him about it. He told me about the cats getting his chickens in the saddest voice I ever heard him use. There was one cat in particular, a big yellow-striped Tom, that was his worst nemesis. While most of the feral cats came around at night after the chickens were shut up in the chicken house – which afforded them some protection – this big Tom would come around in broad daylight to do his chicken hunting and Dad couldn't stop him.

A couple days later Dad and I were sitting in the dining area talking when I saw a big yellow Tom coming across the fields toward the chicken house. "Is that the cat you were telling me about?" I asked. I doubt if Dad could really see him all that well, but he said it was and started muttering in frustration. "Do you want me to shoot him for you?" I asked. Dad jumped up and scurried off to his bedroom, returning in a minute with his rifle. I loaded it and stepped out onto the back patio. The cat was still probably about sixty yards away when I took aim. I thought it was too easy a shot to get him in the body, so I took aim at his head instead. More of a challenge for me and the cat would never feel a thing. I touched off the shot.

Across the field every hair on the cat's body suddenly stood straight up. He'd become a furry beach ball and just as quickly vanished from sight. I walked across the field to make sure he was dead and fetch the carcass. When I got there, no cat. No blood trail. The bullet must have gone *whiz!* just past his ear and the cat vanished like a phantom. I couldn't understand how I'd missed at that range. I guess my eyesight wasn't what it had once been either. All I could do was hope the cat had taken the hint and would stop coming around anymore. Whether or not that turned out to be so, when I came back the next year all Dad's chickens were gone. The varmints had gotten every single one of them.



Brother-in-law Dan

Dan is an avid hunter and each deer season he'd go out to bag a deer or two. One time he got one and one of the boys – I don't remember if it was Aaron or if it was little Donald – was so excited about it he had to tell everybody he met. "My daddy shot a deer!" he'd exclaim. "He shot it forty-seven times!" That wasn't true, of course, but everybody for miles around started teasing Dan about it. "Gee, Dan," they'd say, "what did you do? Go deer hunting with a machine gun?" Or, "Hey, Dan! Bag any hamburger this year?" □

As 1990 began Eagle was history and my group took over production engineering for the box product line in Building 83 Lower. The box assembly line was far less high-tech than the Eagle line had been since essentially all that had to be done was put together various subsystems that were manufactured elsewhere and shipped to us. On the other hand, all the DSS products were assembled on that one line – now that Eagle was gone – and so the assembly line had to be flexible enough to deal with whatever mix of products the production schedule called for. In addition, the R&D lab continued to develop new box products and these, too, had to be introduced into the common production line.

When we arrived in Building 83L, it didn't take me very long to be shocked by how chaotically the production process was run. The original box line had been designed for the original box product and over

the years since then it had evolved by more or less the path of least resistance. There were problems in getting the material to flow to where it was needed on the line, problems with getting finished goods to the packaging area where they were boxed up for shipments, there were even problems with maintaining proper training and procedures for assembling the products. What should have been a relatively simple operation turned out to be running by the grace of extra efforts on the part of the production people, and in this environment mistakes were inevitable.

One symptom of this was change control. More accurately, the utter lack of it. Production operations are always supposed to be routine affairs, running like clockwork according to well-defined production procedures. We did have such procedures covering each one of the several products built on that line. But it is also necessary from time to time to do extraordinary procedures, usually in response to some line stopper problem that has popped up. At DMD and at DSS the vehicle for putting such an extraordinary procedure in place was known as the Temporary Change Document or TCD. Like the name implies, a TCD is supposed to be a short-term, temporary change in normal procedures. It is supposed to cease to be in effect after some relatively short period of time after the problem is corrected and, if necessary, the appropriate long-term change is made to the normal production procedures.

On the box line TCDs weren't too temporary. Over the years hundreds of them had been introduced to respond to various problems and had just been left in place. Under Vashro no effort had gone into fixing the long-term procedures and retiring TCDs. As a result, it was up to the shift supervisors and the trainers to carry in their heads the knowledge of what the *real* production process was because this real process was actually undocumented. If anyone had actually followed the official production procedures the result would have been disastrous. On top of this, engineers from both the lab and from manufacturing had long enjoyed the freedom to run experiments on the production line. The TCD allowed this. Sometimes they'd forget to withdraw the TCD after they finished running the experiment, and then the line would run for awhile building products in a way that had never actually been authorized. Vashro had let just about anybody who wanted to come out and play on what was now my production line.

Another symptom of how poor a shape the process was in was reflected in our pilot run success rate, or, again more accurately, our lack-of-pilot-run-success rate. From time to time changes in the design of a product and even entirely new products have to be introduced. A pilot run is kind of like the last dress rehearsal before the change is released permanently into the hands of production. By the time a new product or a permanent change to an old one reaches the stage of this dress rehearsal, *everything* should be right and pilot run should be nothing more than the final check before manufacturing release (known in our engineering jargon as 'MR'). In fact, production *plans* on being able to ship the units that are involved in a pilot run as soon as MR is authorized. The target goal for pilot run success rate has to be nothing less than a 100% success rate. I was handed a line where the pilot run success rate was 25%.

But at least the incidences of line stoppers was very low. That was because there was nothing in place to keep tabs on the quality and reliability of the products we were producing. It's easy to achieve a low rate of line stoppage if nobody ever looks for problems and just assumes that everything's fine. There was no real way to tell how much substandard product – 'crap' as a customer would call it – we'd been shipping off this line before my group took over the engineering, but I was determined to try to find out. If the number of line stoppers we had during 1990 is any indicator, it must have been a lot.

There *was* a group ultimately responsible for seeing to it that all these problems didn't happen in the first place, and there was one individual who was ultimately responsible for this group doing their job. The group was called production engineering, and the individual with the ultimate responsibility was called the production engineering manager. Me. You can't blame production operations for any of this. Production operations operate according to how engineering tells them to operate.

It took me about a week to fully realize how many serious problems we had. After that, I found myself in what you might call a delicate situation. The guy who had let this line get into such bad shape in the first place also happened to be my boss. I couldn't very well go tell him, "Jim, you really screwed up."

But he had. That's just the brutal truth of the matter.

Upstairs in the R&D lab there were several new products under development and scheduled to go into manufacturing, one after another, over the course of the coming months. As I saw things, the most urgent needs were for getting the production line back under control and for setting up audit and failure analysis procedures to first find and then deal with whatever problems were happening out on the line. To address the second need I turned to Eric and asked him to set up the kinds of operations we'd had on the Eagle line to maintain product quality. Eric also partnered up with Vern Dutton, my supervisor of our technician team, to set up a Failure Analysis Lab to investigate the root causes of yield problems on the line.

To address the first, I asked Ok Hee and Linda to work with the supervisors and trainers to get the line off the TCDs and bring the procedures up to date. I also told the production supervisors, and Bob, that we were going to set up a new change control system. Over time it had become habitual to overuse TCDs – which were supposed to be for one-time events – to introduce permanent changes. From now on there would be another document, which I called a Change Proposal Worksheet or CPW, that would be used as our positive control for every change intended to become permanent. The CPW had something in it a TCD did not, namely a long list of signoff authorizations that included *every* manufacturing function that was supposed to be involved in product changes. For example, the site had a safety and regulatory compliance group that was supposed to check every change made in the materials out of which something was built because these changes could potentially affect our Underwriter's Laboratory certification of a product. This group had been complaining loudly for quite some time that they weren't being notified of things, and on more than one occasion some fairly serious regulatory agency problems had arisen as a result. TCDs didn't require their okay; CPWs did.

I had no trouble at all getting Bob to sign up for the new change control system. He immediately saw it was necessary. The production supervisors were a different story. Every one of them opposed it at first. I think they saw it as something that would just add to their workday burdens and they were burdened enough already. I felt sympathy for their concerns but I was pretty certain they'd start to support it once they saw the benefits. And that, in fact, is what happened. It took about a month, but after that they were among its biggest boosters. In the interim, with Bob backing the plan I had all the support I needed to put it into operation immediately. Usually I prefer to work through a process of consensus building rather than just wield the power my job position conferred on me. But consensus building takes time and I saw the present state of the factory as being in a state of emergency. The supervisors didn't see it that way because they'd gotten used to the day-to-day chaos.

One group I knew wouldn't like the change control system was the engineers, both mine and those from the R&D lab. R&D engineers, of course, don't like forms of any kind – as my long-ago experience at Delcon had shown. Truth be told, I don't like them either. But I also didn't like getting vaccination shots at Dr. Swift's office. Sometimes you have to do things you don't like. I knew the engineers would never be very happy with having to work with CPW forms; but that's life. I was the manager and I had the authority to make the final decision to accept or not accept changes into production. That was a pretty powerful bit of authority and I used it. I had Fred make a huge banner sign that hung on the wall above my desk. It read: *All* permanent changes require a CPW.

I knew the best I could hope for from the engineers was an attitude of resignation about having to put up with the 'bureaucracy' the change control system involved. And that is in fact the attitude they came to develop. A typical conversation at my desk went something like this. An engineer would come to me and say something along the lines of "I want to make such-and-such a change. Do I need a CPW?"

"If it works, is it going to be a permanent change?" I'd ask.

He'd look at me like I was an idiot. "Well, yes," he'd reply. Then I'd point to that sign. He'd make a face and go away to start a CPW on its way through the system. That was how it went after awhile. Initially, as I had anticipated, some of them would argue with me to the effect that *his* change was so

special and urgent there wasn't time for a CPW. "What part of the word 'all' is giving you trouble?" I'd ask. The engineer, of course, was concerned with getting his own job done swiftly and efficiently. But *my* job was to see to it the entire factory and our connected business operations – like product regulations – worked swiftly and efficiently. 100% of the revenue of DSS came off that production line.

I didn't clear any of this with Vashro. Basically I knew I could never talk him into it without having to bring up the long list of things that were wrong with factory operations. That, of course, would have amounted to the same thing as telling him how badly things had gone to pot on his watch and *that* was a conversation I didn't want to have. Within the old HP culture this was my call and I didn't need his approval. I had decided to let the results speak for themselves once we'd had time to get some results. Then he could see it as an 'innovation' and not a censure. And that meant *he* could take credit for it with his own boss, the manufacturing functional manager. HP informally defined 'management' as 'getting results through the efforts of others'. When the new system succeeded he'd have done his job as *my* manager. If it failed – which wasn't going to happen – then I'd get to take the blame. Personnel departments – and Amiables – don't like to hear things put so bluntly, but the fact is that's the way industry works even in enlightened companies like HP.

Still, I knew he'd hear about it eventually. And probably not like it. I was just hoping he wouldn't hear about it until enough time had passed for me to have some positive results to showcase and to have won over the support of the supervisors. Unfortunately, I underestimated how fast the grapevine worked. We had barely begun to use the new system when he called me in to see him about it. As I had expected, he didn't like it. He accused me of fomenting a bureaucracy. *I* found his tone offensive and snapped, "An organized bureaucracy is better than a disorganized one."

That wasn't the smartest thing I could have said. But I don't always say smart things.

My point, which I explained to him, was that we already had a bureaucracy based on the TCD system and it had 'become complicated enough over time that it was no longer up to the task' of dealing with all the varieties of products the line was now expected to produce. And there were new products – 'NPIs' or 'new product introductions' – on the way that would only make the situation harder to control. He didn't look more than about a third convinced by my argument and things came to kind of a delicate point. He could have ordered me not to do what I'd done and I'd have had no choice but to follow that order. I'd have also had no choice but to find another job under a smarter boss somewhere else. I don't accept orders to fail or to tolerate mediocrity. That goes against *my* code. So, we had kind of a tense moment there. But he didn't issue that order. Among the many unwritten rules we had at HP, there was one that said a boss can't tell a subordinate *how* to do his job. He can tell him what the job *is* – that's what our system of objectives is for – but he can't tell him how he's supposed to achieve the objectives. Vashro 'stuck with the code' of the HP Way and didn't countermand my decision.

As we progressed through 1990 and the impact of the new system registered, production became its greatest booster. Far from making their jobs harder, it made them easier. Nobody is faster than a production person to recognize when that happens. The non-production areas of manufacturing also became supporters and for the same reason. My decision was vindicated, but Vashro never quite forgot our conversation. I never once heard him mention the new system – much less brag about it – to anyone. But Bob did. And, as it turned out, once our product audit and FA (failure analysis) operations got going, the change control system was what allowed us to manage our way through the blizzard of line stoppers that subsequently erupted. As I had feared, there had been a lot of problems hiding in our operation. And we fixed them. Eventually this started showing up in our warranty failure data from the field when our product field failure rates began to drop. Most manufacturing managers would be pretty happy with that result but I have my doubts whether Vashro ever even knew about this particular data. Certainly I never got an 'attaboy' from him on this. Or anything else for that matter. It looked to me like his system of managing a factory used an 'is anybody complaining about anything?' metric. He was an Amiable, just not with real people. He was an 'abstract' Amiable, something I think is kind of pathological.

Aside from shipping all of DSS's products, introducing new ones, and fixing a record number of line stoppers – we had over fifty of them in 1990, twenty-two in September alone – there was one other new big deal we had to deal with that year. It was called Building 22. The DSS production line occupied some pretty prime real estate – namely the ground floor of Building 83 – right in the heart of DMD and pretty far away from the shipping and receiving docks. Somebody Up There had decided to lease a new building in the industrial park that sat across the street on the west side of the HP campus and to put DSS production in that building. That building, which was designated Building 22, would be ready to occupy late in 1990 and we were slated to move there with the coming of 1991.

In point of fact there was a lot of sense to this. The box products line had over time become crowded and cramped to the point where people and material were almost piled on top of one another. The coming introduction of the new family of products would finally overflow the cramped space we had. Vashro had added another engineer to my group – an older, experienced guy named Arlan Saunders who really knew the box line well – to oversee the engineering details accompanying this move. Nobody, myself included, saw the upcoming move of the factory as being all that big a deal.

Nobody, that is, except Arlan. With his detailed understanding of the box line, Arlan could see full well all the myriad practical problems that had evolved over time and were now hampering the production operation. I knew the line had such problems but I hadn't realized yet just how many issues it really had. Initially I saw the upcoming move more as a relocation exercise than anything else. Arlan didn't. He wanted us to have a brand new factory designed from the very start to build an unlimited variety of different products, in whatever mix of quantities, all on the very same generalized assembly line. He wanted, in other words, a factory designed in accordance with our division's product strategy.

Arlan patiently set about educating his new boss, me, on the engineering issues of box product production. He explained to me in painstaking fashion the many, many fine details of assembly flow, material storage and flow to the line, and the numerous difficulties inherent in having even relatively small differences in assembly tools or procedures between our different products. Before too long I was sold. DSS needed a new factory. Not too surprisingly, Bob and the three line managers – each shift had its own line manager who worked for Bob; the line supervisors worked directly for them – weren't hard to sell on the idea. Nobody is more intimately acquainted with the details of production operation than the line managers. All our line managers were women, and they were all very, very sharp people.

The trick was going to be to sell upper management on the idea. Arlan's vision, which was taking shape in the form of detailed engineering design documents, wasn't going to come for free. There would have to be a capital investment, and it wasn't going to be a small one. This was one decision I didn't have the power to make. I could recommend; I couldn't authorize these kinds of expenditures. In the old DMD, new factories for building new disk drive models had always been co-designed right along with the R&D lab's new product development. Our situation was different. Pretty much nobody Upstairs thought the box line really amounted to much. Weren't we just screwing parts together in a box? Compared to the comparatively high tech nature of a disk drive production line, the box line was low tech and nobody in any management position in the old DMD was ever very interested in low tech production facilities. Our line wasn't glamorous. All it did was produce all the division's revenue, a mere $300 million per year.

In order to get Arlan's design funded we'd need to be able to show a significant return on investment. HP had long had a minimum ROI that any major new product had to show in order to be approved. But in our case, where was the 'return' going to come from? After all, customers don't buy factories. There was only one way we could show any financial return at all, and that was from major production cost reductions the new factory design would make possible. If we couldn't prove the financial case approval for Arlan's design would never get past Vashro's desk, and rightly so. We needed an ROI analysis.

I got in touch with Finance – officially known as 'Admin' since that functional area also included Personnel – and requested their help in this. They assigned one of the accountants to work with Arlan and me on this. The three of us sat down together and, over the course of about the next month, we slowly

pulled together all the data and projections needed for an ROI. Our current costs weren't hard to come by. That is, after all, something the accountants keep pretty good tabs on. The real trick was estimating what operating costs were going to look like with the new factory design. This, in turn, reduced to operational objectives for production rates, time-and-motion costs, inventory costs, and so on. Arlan supplied detailed guesses for all these factors based on his analysis. When the analysis was finally completed I was more than a little surprised. The ROI figure came back at 126%, more than enough return to justify the project. Armed with this analysis, getting approval up through the management chain proved to be no problem. Now all we'd have to do was deliver on all those operational objectives. The ROI analysis became the basis for setting measurable goals and objectives for the line in the new factory.

Arlan did an outstanding job and the new factory in Building 22 came on line right on schedule. The first shift that started building products for real in Building 22 was our second shift, known as the swing shift. On the very first day of operation, the swing shift set a new all-time single shift record for production. Bob wasn't the least bit shy in making sure they heard about this accomplishment all the way up to Doug Clifford's level. Jerry Flandro, our manufacturing manager, and Bob threw a party to celebrate the opening of Building 22 and to recognize the many people who contributed to this success. Among those receiving trophies at this celebration were Arlan and, to my surprise, myself. Both of us received very nice wooden wall plaques bearing the engraved inscription: *In recognition of a job exceptionally well done. The Building 22 Program.* Below this was inscribed our names, Arlan's name on his and my name on mine. Today my plaque hangs on the wall of my study just above my desk. □

Serving up burgers and dogs at the company picnic in 1990.

DSS was a small division and, despite the fact that all our different groups and departments were geographically scattered over numerous locations on the HP campus and Building 22, I think we were a fairly close knit division. With our low overhead costs and high profit margins, we were a very successful division right from the start. No business that pulls in three hundred million dollars a year in revenues is ever free of stress, but compared to what the folks at the new DMD were faced with we were as nearly a stress-free division as I'd ever seen, the only exception being little Delcon Division back in the seventies. People were proud of our success and proud of working for DSS. Even Doug Clifford seemed more human in those days, not quite the nail-biter I'd perceived him as back in our R&D labs days. We had fairly regular celebrations that helped promote morale and *esprit de corps.* These were never as wild as those DMD had in the early days – those days were gone forever – but they were fun and people from all levels rubbed elbows at them.

I particularly enjoyed serving up the food at those functions where we had food because inevitably I'd get to see a lot of folks I didn't have much of a chance to see at work due to how spread out we were and how busy my job managed to keep me. Serving hamburgers and hot dogs also held a strange kind of nostalgia for me. Back in the sixties when I was a kid Dad always had a watermelon patch and during the county fair we'd often set up a little food concession at the fairgrounds where I sold watermelons, cantaloupes (which Dad called 'mush melons') and soda pop. At the time I wasn't too thrilled to pull that duty, but now I found myself looking back on those days with quite some fondness. I found myself also remembering riding on the floats in the parade that marked the start of the fair, something I hadn't thought about in many, many years. Another memory I found coming back to me was Ridiculous Days. For several days each summer, the uptown Maquoketa merchants all got together for a big sales extravaganza called Ridiculous Days. Everybody who worked uptown would get dressed up in all kinds of outlandish costumes and people would come flooding into the main uptown area – which consisted of

about three city blocks – to enjoy the festivities and, of course, to buy things. Sometimes uptown would get so crowded traffic had a hard time moving. Now *that* was community. I don't know why serving up burgers and dogs at HP reminded me of that, but maybe it was because it felt like America.

Lunch time with friends during a whitewater rafting trip (1991).

On the average my job was pretty low stress despite its responsibilities, but sometimes the stress level really shot up during our not-that-infrequent emergency line stoppages. Even back on the Eagle line these irregular doses of high excitement tended to add up, especially since part of my job was to remain cool and unruffled looking during these events. Line stoppers are a normal part of life in production and we needed to handle them without panic and to just work the problem to its resolution. As the leader, how I acted set the tone.

I think the price tag for this showed up on the bathroom scales. I was starting to gain weight again and to combat this I increased the duration of my workouts at home. I've never liked jogging or running-for-the-sake-of-running. My preferred exercise was weight lifting and I preferred free weights to the weight machines found in gyms at that time. I had set up a weight lifting room at home and had designed a thorough exercise program that I followed. Three days a week I lifted for three hours a session, and on off days pedaled an exercise bike to keep my metabolism levels up. Jogging was the trendy form of exercise at that time and a few people thought it strange that I was a weight lifter. I guess they thought of weight lifters in unflattering intellectual terms. When I'd be asked about this from time to time, I'd just grin and say, "Do you know how a weight lifter says, 'Ouch! That hurts!'?" When they'd shake their heads I'd say, *Feels good! Feels good! Feels good!* I liked the 'burn' that came with a good workout.

But one day I got more burn than I bargained for. I was doing deep knee squats with the bar across my shoulders and the back of my neck. I didn't really have all that much weight on the bar at the time, only about one hundred fifty pounds. As I was coming back to the standing position, all of a sudden I felt a sharp burning pain in both knees. For the next month my left knee in particular ached all the time, enough so that I'd had to stop lifting. Something was obviously wrong and I tried to schedule an appointment with one of Boise's best knee doctors to find out what was wrong. As it happened, by the time I could get in to see him a month had passed, the ache had disappeared and things seemed to be back to normal. He couldn't find anything wrong from x-rays and his other external examinations and could only guess at what had happened. He knew something had because every once in awhile my knees made little clicking noises he could clearly hear. He told me the only way to find out what was wrong was for him to drill some holes in my knee and go in for a closer look. Even then he couldn't guarantee he'd find anything.

"Is that what you recommend?" I asked him. He shook his head. "Not if it doesn't hurt anymore." He was an honest doctor. I decided against having exploratory surgery.

But as it turned out, things really weren't healed up and back to normal. Both knees slowly deteriorated over the next couple of years until I had to give up playing softball. What eventually happened was I developed 'trick knees.' Every once in awhile, something painfully pinches in one or the other of them and leaves me unable to walk without the help of a cane for awhile. Well, it's too dangerous to go backpacking and camping way out in the back country if you can't depend on your legs to walk you out of there. The injury put an end to my hiking days and, as the condition worsened, put an end to my weight lifting program too. It pretty much left me with just whitewater rafting for outdoor activity, where you're never isolated from other people and emergency help, if needed, is always near by. □

1990 was the year I had my most direct and active experience in politics. It started while I was having

lunch in the cafeteria. Ted Barnes was with me and out of the clear blue he asked me if I would help his wife Marjorie run for the Idaho House of Representatives. Her opponent was none other than the majority leader of the Idaho House, Republican representative Gary Montgomery. It had been years since Mr. Montgomery had even faced an opponent in the elections. His seat was regarded as a 'safe' seat and even the Idaho Democratic Party considered him unbeatable. Ted and Marjorie had talked about it and wanted me to fill a slot on her campaign staff as 'campaign strategist.' They already had a campaign manager for taking care of recruiting volunteer campaign workers, finding and setting up opportunities for Marjorie to speak to the public, and so on. But they needed someone to help in turning mere individual issues into a unified political platform that would let the voters know who Marjorie Stuart was and what she stood for, and to help figure out how to counter the image of Marjorie Mr. Montgomery and his people would try to paint. Was I interested in helping out?

I didn't know Marjorie very well at that time, so I asked Ted to tell me briefly why she was running for office and what her core issues were. He gave me a quick rundown. Later Marjorie herself would tell me more. The things Marjorie stood for were things I stood for too, while, in contrast, most things Mr. Montgomery stood for were things I opposed right down to my core, and so I agreed to join the campaign.

The Idaho Legislature has a well-deserved reputation for being 'the most Republican legislature in the country.' But even this description doesn't really tell you about the Idaho Republican Party. The Party leadership here is the most extremist bunch of political dictators anyone could ever hope to not meet. Calling them 'conservatives' is rather like saying Napoleon was a tad ambitious. My support for Ronald Reagan and for George Bush never extended one single inch to the Idaho Republicans. They have been the majority party in Idaho for as long as I have lived here, but in the 1980s the Idaho Democratic Party was still a fairly strong minority party and over the years I found myself on their side of the issues almost all the time. The leadership of the Idaho Republicans consistently leads that party to undermine and hurt public education, to underfund and even try to privatize the state universities, to pass every religious law dreamed up by so-called Christian fundamentalist political organizations – usually referred to anymore as the 'base' of the Republican Party – and to remove every ounce of any exercise of judicial discretion from the hands of state court judges. They regularly defy rulings of the state courts and carry out the business of legislation by means of closed party caucuses in open violation of state law. Their social radicalism is defined by and takes money and orders from the national organizations of the so-called 'religious right.' I think 'The Moral Majority' and similar radical groups are basically a political front in a movement that would overturn of our system of government and replace it with an authoritarian theocracy similar to the one in Iran. The Idaho Republican leadership never met a religious law they didn't like or a teacher they did. Mr. Montgomery stood at the apex of the Idaho Republican leadership. Would I enlist in an effort to remove him from office? You bet I would. In a New York minute.

One of the very few good things to follow as a result of the Nixon years had been the repeal of the blue laws. These were a hotchpotch of various religious laws designed to force Protestant religious conformity on everyone through the power of government. One blue law example was the one making it a crime for grocery stores to sell beer or wine on Sunday. There used to be a lot of these kinds of laws and all of them had been taken off the books in most places in the seventies after Nixon's resignation, Kansas and Utah being the most noticeable exceptions. They were part and parcel of the same prejudicial persecution that through the history of our country has found a fundamentalist justification for oppressing Catholics, Jews, and anyone else who didn't dance to the tune of the dominant fundamentalist cults. It isn't necessary to set up an official state church to restrict people's rights to the free exercise of their religious views or to *not* conform to others' religious views. All you have to do is codify the dogmas of the sect you would make state-sanctioned in the form of laws. That's what the blue laws were for. When they were repealed I had thought 'good riddance' and never expected to see them come back. But in the eighties with the rise of the so-called 'Moral Majority' and other radical elements of the religion-based political party, the move was on to bring back state-sanctioned fundamentalist doctrines.

I had not forgotten the way the so-called-Christian right had called the AIDS epidemic 'God's

punishment' of people of whom they did not approve and how they had opposed government steps to fight AIDS. I had not forgotten how they had refused to condemn murderers of doctors. I had not forgotten how their crowds of activists had surrounded clinics to heap abuse and psychological sadism on desperate young girls as they sought to enter these clinics. The name Falwell's fundamentalist political party chose for itself stated as clearly as possible one of their tenets. If they saw themselves as the 'moral' people, then they clearly would have to hold that *I* was one of their 'immoral' enemies because I utterly reject as un-American their ignorant and unholy dogma of intolerance, hate, and persecution.

One thing I have always respected about Billy Graham has been his uncompromising stance that religion must stay out of politics altogether. In this he has been alone among our nation's national religious leaders and stood out from all the posturing fakes who make their living being TV evangelists. The latter seem to me to be 'Old Testament Christians' who take it on themselves to define 'moral' as meaning belonging to their cult and 'immoral' as disagreeing with their doctrine in any way, no matter how ignorant of God and barbaric that doctrine becomes. No religious group that bases itself on fearing God and telling its members they must toe the line in order to avoid hell or win a blissful place in the afterlife is 'moral' in the slightest degree. No morality can ever be based on self-love and self-interest. If you do a good deed *because* you want to avoid punishment or 'win favor in the sight of God,' you're doing that deed for your own sake and nothing else. That isn't acting from moral law. You can only act from moral law if the reason for your action is because either, in your very best judgment and in the depths of your heart, your deed is categorically the right thing to do or because not taking that action would be categorically wrong. When any church or religious cult seeks political power, the reason can be nothing else than to gain the power to violate the social contract, force other people to conform to the dogma of that cult, and to take away other people's religious and political liberty. And to do that is categorically wrong. To do that is immoral. It is to me no source of wonder that Billy Graham has never belonged to the so-called 'Moral Majority' because I think they are the most immoral political party in America and their leaders know *nothing* about God. 'Take heed you are not led astray, for many will come in my name,' Jesus is supposed to have said. If he really said that, he got it right.

Ever since the 1988 elections, Idaho's Republican-dominated legislature had been in the hip pocket of this national religion party and had been pressing to pass religious laws that at root were and are aimed at persecuting and criminalizing people for acts contrary to the dogmas of ignorance that define the national agenda of this un-Christian and un-American religion party. If there was something I could do about it, here was a chance and a *duty* to do it. To not do what I could to try to wrest power from the hands of this religion party that masquerades as Republican would have been morally wrong and a betrayal of my Promise. And that, more than anything else, was why I volunteered to take an active part in the 1990 election campaign. You could say my activism was 'faith based' too, but with one big difference. I wasn't active in order to force other people into following my faith; I was active to oppose those who were trying to force me and the rest of us to knuckle under to their dogma. As I see it, if the tenets of a religion are so flimsy that the sanction of law and the power of the police are necessary to hold the 'flock' together, there's something essentially missing in that creed: It has forgotten God and substituted an idol. I don't worship a book. I don't believe all new-born babies automatically come into the world as sinners.

And so began the campaign for the Idaho House. Marjorie and Ted lived in rural Star, a tiny town west of Boise with fifteen thousand registered voters in the district. Politically, we were raw amateurs. None of us had ever run a political campaign for office before, none of us had ever been a candidate for political office before. The state Democratic Party thought Mr. Montgomery was unbeatable and gave us almost no support or guidance or advice at all. They wrote us off from the very start and we were on our own. But we had a small and dedicated group of campaign volunteers and we learned as we went. The very first rule, laid down by Marjorie herself at the outset, was we would have a clean, honest campaign based on issues. And that's the kind of campaign we had. I will also say this for Mr. Montgomery: He, too, ran a clean campaign without smear tactics or any dirty tricks. Naturally, the Republican campaign machine tried to paint Marjorie as a 'tax-and-spend liberal,' but that's standard fare for the Republican Party. They

characterize all Democrats that way in every election.

Marjorie worked tirelessly, appearing at pretty much every little fair, event, and gathering where there were people to talk with. Our volunteers planted Marjorie Stuart posters all over the district, everywhere property owners would give us permission. Funding for the campaign came in from small donations and, if I remember correctly, we also got a modest amount from one or two Democratic PACs after we began to start showing unexpectedly good numbers in the polls. Volunteers wrote campaign letters to the editor for the local newspapers. You know the kind; you see them in every election and almost all of them are written by campaign volunteers and vetted through the campaign staff – me in this case. We did have one case where an overzealous supporter sent in a letter that unfairly and personally attacked Mr. Montgomery. We saw that letter only after it was printed, and Marjorie wrote a letter of her own, apologizing to Mr. Montgomery and letting everyone know that kind of tactic was not acceptable to her or her campaign.

By election day the race was unbelievably close. For election night we rented a room in a downtown Boise hotel where our supporters could gather and we could watch the election returns come in. Hour after hour the voting results trickled in and still the race was too close to call. There was a heavy voter turnout in the district, and the night came and went without a clear victor. It wasn't until late the next morning when all the precinct results were in and the absentee ballots had been opened and counted that the election was decided. We had lost by one of the narrowest margins imaginable. If a trifle over one hundred votes – out of nearly fifteen thousand – had gone the other way, Marjorie would have been elected, defeating the most powerful man in the Idaho House. We actually were ahead in the ballot count for a fair time on election day; it was the absentee ballot count that tipped the scales the wrong way.

It was a disappointment to lose, but we had come so very close to victory that all of us could stand tall and take pride in how well we really had done. There wasn't any doubt the message was heard that year. Idaho Democrats actually did very well that election, although of course they remained the minority party. The 1990 election was a close one and it did at least put an end, for a few years, to the tide of religious laws coming out of the Idaho legislature. Not a permanent end, unfortunately, but for awhile at least the religion party radicals had to duck and cover.

In addition to being an election year, 1990 was also a census year, and this led to the most contemptible act of gerrymandering I've ever personally witnessed. In 1991, as required by law, the voting district boundaries were redrawn to reflect the results of the 1990 census. The Republicans, being in the majority, dictated the new boundaries and the lines were drawn to ensure Democratic voters were parceled up into minorities in every district in Idaho. The most brazen act in this gerrymandering happened in Marjorie's district. The boundary line between districts fourteen and fifteen ran through a farm field a few hundred feet away from Marjorie's house. This line was altered by adding a little loop, only a couple of feet wide for most of its length, that swooped down and surrounded Marjorie's house. They moved her into the other district so she couldn't challenge Gary Montgomery again in the next election. The Republican gerrymandering worked, too. The Idaho Democratic Party has never yet again been able to elect more than a tiny handful of people to the legislature. They effectively turned Idaho into a one-party state. I think there was something awfully Communist about that. □

With our move over to Building 22, 1991 started off as a very good year. The new factory operated perfectly and the flood of line stoppers had now passed, just in time for the parade of new product introductions to get fully underway. Located in one section of the factory was a brand new NPI line facility where Dave's team and the R&D folks could experiment to their hearts' delight with the assembly and test processes co-developed along with the new products themselves. The lab guys liked this in part because the NPI line, not being part of normal production, did not have to worry about CPWs or other forms of production control. Lab engineers like to innovate and try new things, and that was what the NPI line was for. I liked the NPI line because now I didn't have lab engineers out there playing on my production line. Everybody got what they wanted. Pilot run failures were relegated to ancient history.

With the line now running smoothly and producing good products, we could now turn to another goal that Vern Dutton, the technician supervisor, and I wanted to accomplish. We could put our staff of bright, skilled technicians to better use. Technicians, I am sorry to say, had long been a very underappreciated and underutilized group at DMD. Most of them had been relegated to carrying out very routine testing and troubleshooting procedures that were aimed more at making a sick box well so it could be shipped. In this role, failure analysis – the actual discovery and long-term fixing of problems – then fell to engineers. One lesson I had learned years before on the HP 7908 line was just how much good technicians could contribute to FA. What Vern and I wanted to do was set up a new system. The day-to-day routine and procedure-driven tasks most of the technicians had been performing would be turned over to specially trained production operators, people without the two-year Associates' degree technicians have. Our technicians would then be moved to the FA lab or to the NPI line, where their training and skilled craftsmanship could have a much higher impact. The techs would in effect be working under the direction of the engineers, either mine or Dave's, and this would, in turn, leverage up how much our staff of engineers could accomplish. The operators, the technicians, and the engineers would all have jobs that were much more inherently interesting and at the same time would have a much higher positive impact. It was a system in which everybody won.

When I proposed the plan there were skeptics. How could production operators do a technician's job? Wouldn't this run the risk of hurting product reliability? Etc. Etc. I was able to point to the old FA operation from the HP7908 as a past success story, and could point out that 90% of what we had our techs doing right now really wasn't all that highly technical. I'm pretty sure Vashro had his doubts about the plan, but I had noticed he tended to undervalue and underrate how good the operators and the techs really were. Bob and his line managers didn't share this concern; they knew how good their people were. Dave, too, was in my corner on this because he could clearly see how the new system would help with new product production development and improve the transition team process. In point of fact, Dave and I shared the longer term goal of trying to eliminate the need for transition teams from R&D or, at the very least, reduce the amount of transition time needed. R&D lab engineers are at their best when they're inventing new products, and new products were always the lifeblood of our business.

So, while there was some skepticism there was also a lot of support for the plan and we got the go-ahead to try it. Ok Hee worked on establishing the written procedures the production operators would follow and with training the corps of top-flight operators the line managers and supervisors identified. Eric and Vern supervised the overall technical details of designing the new system, testing it, and running the pilot run when we were ready to introduce it into the production process. The team did a great job and whole thing worked like a champ. It was a quantum leap in improved factory operations and it noticeably raised morale for the line people, the technicians, and the engineers. Vern and I were pretty proud of this accomplishment. □

As it turned out, this was the high water mark of my time as production engineering manager. There was even some talk at this time to the effect of my becoming a 'section manager,' officially known as a Level 63 manager, one number up from my job as production engineering manager. Even Vashro, who was a Level 63 himself, was paying lip service to the idea. The future was looking pretty bright.

What I didn't know was that all of this was about to come to an abrupt end. There was a cancer quietly growing within my team, and her name was Linda.

Linda's documentation group performed an important if completely routine function. They kept track of our production documentation and kept this documentation up to date. She had been working for me now for a little over a year and had been a good if not outstanding supervisor up to this point. It wouldn't be an exaggeration to say that the less anyone heard from the documentation group, the better they were doing their jobs, and up to that time there had been only two incidents involving the documentation group that had required my attention.

The first had been a minor personal spat that had broken out between two of the women in Linda's

group in mid-1990. It didn't have a single thing to do with work; they just didn't like each other. From my point of view this was something Linda should have been able to take care of all by herself, but for whatever reason she was having trouble resolving it and finally brought it to my attention.

I've mentioned before that HP was a company that never did earn a very good grade for strategic planning. The success of the company really turned on the ability of its people to respond to situations with a very high degree of tactical excellence in the execution of everyone's individual jobs. The thing that was the bedrock of this ability was teamwork. Everyone at all levels of the supervisory and management chains knew this was the foundation of our success and, consequently, teamwork was the most highly valued commodity in the company. Linda had five women in her group and two of them were not working and playing nicely together. That's very bad for teamwork.

When Linda first brought this up with me, I chalked it up to her inexperience as a supervisor. After all, she hadn't been in her job for all that long yet and problems like these are among the most difficult for a supervisor to deal with. In a lot of companies supervisors take a meat ax approach and 'solve' the problem by firing one or both of the people involved, but this was wholly contrary to the HP Way and we weren't going to do that. There is an old saying in management: When you have an employee who is not adequately doing his or her job there are only two choices – fire the person or develop the person. In the HP I worked for, we *always* tried the latter first. Sometimes, rarely, that didn't work, and only if it didn't would we resort to the former. There were very, very few instances where people got fired in HP.

Every supervisor and manager in the company knew this. At least they were supposed to. It's part of the normal training supervisors and managers receive when they become a supervisor or a manager. This training, admittedly, falls a bit short when it comes to practical ways to deal with problems like the one in Linda's group. That's where a degree of leadership ability comes into it. The supervisor or the manager is expected to be able to figure out how to deal with it without resorting to the meat ax. So when Linda first brought this to my desk, we had a conversation about how important teamwork was and how it was part of her job to find a way to achieve it in her group. There weren't many practical tips I could give her in this particular situation. If Linda's people had been men there would have been any number of locker room speeches or coaching maxims that would have been sufficient. But in this case, the whole thing was the kind of silly cat fight men usually find incomprehensible. I don't think it was a coincidence that all the production line managers and supervisors were women; the production line was overwhelmingly made up of women and to lead effectively a leader has to understand his or her people. That's something a person tends to learn as part of growing up, and the gender differences in communication style that develop during childhood and adolescence are never to be underestimated. I figured Linda was in a far better position to know how to talk to her people than I was about this. All I could suggest was that she try explaining to her two battlers why teamwork was so important and why open squabbling like this was not acceptable in the workplace. I asked her to give that approach a try.

In retrospect I'm not so sure Linda knew what 'teamwork' means. Whether she did or did not, she came back a few days later and told me she wasn't getting anywhere with them. "What do you want me to do?" I asked her. She wanted *me* to talk to them. Okay, that happens sometimes. I don't like it when it does, but it happens sometimes and it's just one of the things a manager has to do once in awhile. I asked her to set up a little meeting of the four of us. We held it outside in HP's park-like campus, away from the other folks in Linda's group and in as private a spot as we could find.

Linda said not one word during this meeting. Her two people started in by bad mouthing each other but I cut that off pretty abruptly. "There's something I want both of you to understand," I said. "The only way this company works is through everybody's ability to work *as a team*. I don't know how or why the two of you aren't getting along, but what you're doing is hurting the team and I won't allow that. I don't care if you don't like each other, and I don't care what you do outside of work. But *at work* you *will* get along with each other. Your feud ends now. Do you understand?"

Oh, yeah. They understood. Before we were done they were even both wearing sheepish-looking

grins. I'm pretty sure there was no more trouble after that. Certainly I never heard of any trouble between them at work after that. In HP management parlance, what I had done was called a 'verbal warning.' It doesn't go into an employee's personal file, but it is the first step in what we called 'the corrective action process.' Was it a threat? Yes, of course it was. If you strip off all the double-speak, *any* disciplinary warning from a supervisor or manager to an employee is a threat. I didn't have to say 'get along or else.' A manager doesn't have to be cruel or heavy handed in disciplining an employee. There aren't that many people who aren't smart enough to understand a message like this so long as the unacceptable behavior is clearly identified and the specific expectation for future behavior is communicated. These two women were good workers and good employees; they just forgot for awhile that they were co-workers.

I'm not sure Linda understood, though. I mentioned before that deer-in-the-headlights look of hers. She wore that look all throughout that meeting. It made me wonder what exactly she had been saying to them before getting me involved.

The second incident involving the documentation group also happened in 1990 and this one came from entirely outside production engineering. It came in the form of a memo from the group that looked after site computing resources. This group wasn't my favorite part of the Boise site. In early 1989 I had received a memo from them telling me the company was going to 'standardize' on a particular brand of HP computer across all the areas. Every group was supposed to 'modernize' its computing resources by buying this particular computer system for every employee in the group who used a computer. It would be the 'standard computer' going forward into the future. As it happened, the computers in Eagle production engineering were kind of long in the tooth anyway, so I spent a big wad of money re-outfitting the team. Less than a year later, I got another memo saying basically the same thing except that now the 'standard' computer going forward into the future was an entirely different model. I guess the site computer group just assumed all the managers on site had unlimited budgets to blow on computers. There wasn't anything wrong with the still-new machines we had, so I said to myself, *Oh, screw this,* and filed that memo in my wastebasket.

Now I had yet another memo from them. For years the mainstay business computer used in HP had been the HP 3000 Series II, one of the most successful computer systems HP had up to that time. But now the old HP 3000 was awfully long in the tooth as well and was being replaced by the new line of "HP-PA" computers, collectively known within HP by the project code name 'Spectrum.' One of the old HP 3000 systems on the site was the one that held all our production documentation, and the memo announced that this system was going to be phased out effective on such-and-such a date. What *I* had to do, it went on to say, was (1) buy a new HP-PA system for my group; (2) hire a computer administrator to run it; and (3) have my group move all of our documentation to the new computer system. And, oh, by the way, the software systems used by the two computers weren't compatible. We'd also have to translate our documentation from the old software packages to new ones.

Yeah, right. I didn't have any trouble imagining the kind of warm reception this would get from Bob and from Vashro. I was supposed to just meekly spend a few hundred thousand dollars on a computer system plus get a hiring requisition for a new high-priced computer guy? I picked up the phone, called the memo's author, and we arranged a face to face meeting to talk about this.

I must say, the young woman who came down to see me bubbled with enthusiasm over the whole thing. "This has the support of Top Management," she said gaily. I could even hear the capitalization of the words 'Top Management' in her voice.

"It's not in my targets," I replied. 'Targets' are spending targets, upon which budgets are based. Once a year every manager had to undergo a ritual known as 'targeting' in which he or she tries to guess how much budget The People Up There had already decided upon for each area, and these targets then became the group's budget for the next fiscal year. Typically the manager would do a bunch of work to figure out how much money he'd *like* to have in the operating budget, turn in this 'forecast' to his boss – Vashro in my case – and then the boss would return it to him with the comment that the forecast was too much

money and would have to be cut. Then the second round would begin. This went on until the manager either guessed the secret amount or went under it. The official idea behind this process of looking for the foregone conclusion was so all the managers could 'participate' in the budget-setting process. Some guys never caught on to the fact that the budgets were already set from Up Above. In my case, the process was made even more fun by the fact that Vashro wouldn't settle for a target from me that came up to the secret number on the back of the card. Instead he'd require that I turn in a too-low target and he'd put the rest of the actual targeted dollars in a 'slush fund' – as he called it – of his own. That way I'd always run out of operating money before the end of the year and have to come to him for a handout. Ah, well. If that's the way he wanted to run his operation, that's the way we'd run.

But this computer thing went way beyond normal circumstances. "I can't do this," I told her. "It's not in the targets and I just don't have the money or the hiring requisition."

"But this has the support of Top Management," she repeated.

"No, it doesn't," I said. "Not if it isn't in the targets. What this is telling me to do," and here I held up the memo, "is impossible. I can't do it."

"Well, you'll have to find a way to do it," she said. She really thought her group had the support of Top Management. "On such-and-such," she continued, naming the looming deadline, "the 3000 is going away."

"There isn't any way to do it," I repeated. "Your group is just going to have to find a way to take care of this without requiring me to spend money I don't have."

"This has the support of Top Management," she said again.

"Tell me something," I said calmly. "When your group takes down the 3000, all the production documentation of this factory disappears, and I have to shut down production on every single one of the DSS products because of it, how much top management support do you think your group is going to get?"

This wasn't a bluff. I meant it.

Lo and behold, it turned out the computer group decided to change the plan. They bought the new computer system – they were buying one for their group anyway – and they used the expertise they had, and I didn't, to take care of all the work involved in the software changeovers and in porting our documentation to the new system. Linda kept an eye on what they were doing and her group helped out a bit. The group that created this problem ended up solving it too, and that's the way it should be.

Those were the only two problems involving the documentation group that ever made it to my desk. The rest of the time they just quietly did their job and I didn't worry about them. Linda and I had monthly meetings to review her group's objectives and to establish them for the upcoming month. This was purely routine and a normal part of HP's system of management by objectives. Compared to everything else, there was nothing requiring much of my attention to be paid to Linda's team at all, and that's the way it was supposed to be. Now it was 1991 and everything in the factory seemed to be going very, very well. There were only two things that happened I didn't particularly like. The first was a personnel problem in Vern's technician group that ended badly, the second was a reduction in my technician staff ordered from Up Above.

For quite some time we'd had one guy in Vern's group who basically wasn't doing his job. I'd known this guy for a very long time, dating all the way back to the 7908 days, and I knew he had been a very good technician back then. But something had changed over the years and for a long time now he was failing to accomplish his monthly objectives, failing to be able to stick to his own work plan, and he had generally become a burden to his work group. Vern, his supervisor, had been trying hard for months to try to get him turned around, but nothing worked and Vern was getting frustrated. I did what I was supposed to, which was to let Vern try to handle it, but even I was getting concerned because in my occasional conversations with this guy I could tell he was a very different man from the one I'd worked with years

before. His attitude was one I found incomprehensible in an HP employee. I didn't know if he had just ceased to care very much about doing his job, or if he had developed some kind of a drug problem, or if maybe he had some kind of mental illness problem. He knew he wasn't getting his work done and that didn't seem to bother him, although he acknowledged that fact on some high Platonic level.

Vern had no better idea of what was going on than I did, but it finally reached the point where resolving this issue had made it on to Vern's monthly objectives. Nothing worked and at one of our meetings, Vern said in frustration, "What are we going to do about this?"

"Well, it looks to me like you've tried just about everything else," I said. "I hate to do this, but I'm not seeing any other choice but written warning. What do you think?" Written warning is the next to last phase of the corrective action process, and it's pretty serious. It means the employee either comes up to an acceptable performance level or he gets fired. It is the step of last resort for managers and supervisors.

"I agree," said Vern.

In HP at that time the company bent over backwards to try every means of salvaging an employee. We got a representative of the Personnel Department to sit down with Vern and myself to carefully, carefully draft the written warning statement for the performance evaluation Vern would give this guy. It spelled out, line by line, what the unacceptable work performance problems were, how progress toward improvement would be evaluated, a general timeline over which this improvement was expected and required – everything that could possibly be done in a last attempt to salvage the guy's job. It took us about a week to do this, and we thoroughly scrutinized every single word so that the expectations were objective and reasonable, and so the evaluation itself stuck to work and didn't in any way attack the employee's character. It was by the book.

The day for Vern to administer the written warning finally came. He and his guy went off to one of the private conference rooms in Building 22 to hold the evaluation session. A short time later, Vern came to me with a shocked look of disbelief on his face. "He tore it up," he said in a dazed voice.

"He tore what up?" I asked.

"The performance evaluation."

I was astounded. "Why? Were you guys having a big argument?" Tearing up a performance evaluation is an act of insubordination and insubordination was one of the few ways to 'crash land' – immediately get fired – there was at HP. If it had happened in the heat of a moment I was prepared to overlook it with nothing more than what we called a one-time warning: If you ever do this again, you'll be fired.

But Vern shook his head. "He just read it and then tore it up," he said. "I said, 'Whoa! Don't do that!' and he just said it (the evaluation) wasn't correct." Vern went on to tell me he had been completely matter of fact about it, just flat calm, as if Vern wasn't even his boss and the evaluation was just an opinion.

I asked one more question. "Was this insubordination? In your judgment, was he being insubordinate to you?" Vern nodded. That settled it. "Fire him," I said. Vern turned a little pale; I didn't feel good about it either. But I didn't see any other choice. I wasn't going to carry somebody who wasn't going to do his job. Nothing else is more deadly to teamwork and to the morale of members of a team. The team is first.

This kind of thing is a serious matter and my decision had to be approved by Vashro, Personnel, and the division manager, Doug Clifford. First I let Vashro know what had happened and he agreed. Then I drove over to the main site and made the rounds, explaining what had happened and that my recommendation was to terminate employment. Our Personnel guy, the same guy who had worked with us on the written warning statement, okayed my decision. Then I had to go explain it to Doug, and he approved the action. I came back to Building 22 and gave Vern the go-ahead. I had one last face to face meeting with the guy. It was very weird. He claimed he didn't really know why he was being fired, but what was absolutely strange was that he didn't particularly care either. No hostility at all. He acted like it was no bigger deal than having to gas up the car. The interview made me feel chilly. *This guy's cheese*

has slid off the cracker, I thought to myself. I didn't at all like firing him, but I don't have any doubt at all it was the right decision.

As soon as the new way of organizing the production technician team was in place, Vashro called me into his office and told me that now we didn't need so many production technicians any more. There were a number of other groups, both in DSS and DMD, that were screaming for additional technician support and I was going to give it to them. He was cutting my technician staff in half. The guys were to be informed of the available jobs over on the main site and any that wanted to transfer were to be allowed to transfer, up to the quota he had set. It was a move that would cripple our failure analysis plans.

I didn't like it. "You know what's going to happen, right?" I told him. "We're going to lose our very best guys." The best techs always preferred lab jobs to production jobs. That didn't bother Vashro.

Well, he was my boss and the decision was made. He hadn't called me in to discuss it; he'd called me in to inform me of it. The matter was completely out of my hands except for damage control. I asked Vern to come over to my cubicle and I told him what was going to happen.

"We're going to lose our best guys," was the first thing he said. I know, Vern. I know. Vern didn't like it. I didn't like it. Just like we predicted, our best guys lost no time at all taking advantage of the opportunity to land more prestigious positions over in the various R&D labs. The only thing we could do about it was make adjustments and carry on. And that's what we did. □

It was shortly after this that I started having some very strange conversations with Vashro. He would quietly take me off to one side and start speaking in abstractions about management. I couldn't tell at first if he just wanted to make conversation or if there was something on his mind. He spoke in Amiable-speak and I still didn't own a secret decoder ring. It was all vague and hypothetical and after each of these seemingly casual conversations I'd always think the same thing: *What in heck was that all about?* I had a very uncomfortable feeling about these conversations. In the two previous years I'd worked for him, he had never once had the least interest in just the two of us having a chat. Suddenly he wants to talk about management philosophy? I was pretty sure something was going on, and I was pretty sure whatever it was I wasn't going to like. But I could never get him to just come out and tell me what was on his mind.

It was Linda. I don't know when it started, but she'd apparently begun going to Vashro and complaining about working for me. What her complaints were I was never told. She never told me; Vashro wouldn't tell me. It's kind of hard to fix a problem if nobody will tell you what it is. Maybe where Vashro had gone to school they had a course in mind reading; they didn't have one at any of the schools I'd gone to. We had three or four of these conversations – pointless from where I stood; rich in meanings I would imagine from Vashro's standpoint. You know, if he had just come out and said, "Linda doesn't like working for you," we could have settled the problem immediately. The documentation group wasn't part of production engineering and I'd have been just as happy if he wanted to transfer that group to somebody else. To operations, say, or to the NPI group – which is really where most of their work flowed from in the first place. Maybe Vashro was angling to try to get *me* to suggest this. Thinking back on our conversations, that is possible. But he hadn't asked me before putting that group under me in the first place. Why would he think it would occur to me – on grounds of management philosophy of all things – to raise the suggestion now? He had never once asked for my opinion on any matter having to do with how he organized his organization, nor had he ever taken any suggestion I did offer.

Anyway, there finally came a day when he all of a sudden decided to make himself clear. Why? I have no idea. It happened not long after the firing of that technician in Vern's group; maybe Linda thought she was next or something and fled to Vashro with some new wild tale. What I do know is Vashro summoned me to a conference room, where he proceeded to criticize my personality, my mannerisms, my personal style, my leadership style, and pretty much everything else except my personal hygiene and grooming. There had been serious complaints about me, he told me. "From who?" I asked. I was deep in astonishment. From Linda, he informed me. Then he went on to tell me he had personally conducted a

poll of the people who worked for me to see if the charges – whatever they were – were substantiated. They were. "Who did you talk to?" I asked again. He named Vern, the technician supervisor, and one of my engineers. That was all. There were thirty-five people in my group, but he had learned all he needed to know by talking to two of them.

Apparently compared to me Captain Bligh was a model of Amiable civility. I was going to attend a class on anger management. I was going to become a smiling, happy guy everybody loved. I was going to exorcise my inner demons. I was going to become the sort of exemplary leader he was.

HP had a euphemism for criticism. 'Constructive feedback.' I guess that's what Vashro thought he was supplying. It didn't sound too 'constructive' to me. Telling somebody he's the worst tyrant since Attila the Hun seemed a little bit personal to me. Especially coming from Vashro.

I felt like I was being personally attacked, so I tried to defend myself. "You know," I pointed out, "we've gotten a lot of pretty good results since I took this job. Don't you think that counts for something?"

No. It didn't. What counted was how I got along with people. All people. Actually doing the job was somewhere far down on the list, among the unimportant things. Spoken like an Amiable.

So, anyway, after that rather stormy meeting the next thing I knew was I was sitting in a room in a downtown hotel learning all about 'anger management.' It wasn't a worthless class. They actually did have a few handy tips. If Vashro had asked me if I was willing to go to this class, I probably would have said I was. But, again, he didn't ask me. He told me I was going.

When I finally got back to work, I thought the best thing might be to have a chat with the three folks who Vashro had 'polled' in his famous psychological investigation of my character flaws. I spoke first with Vern, then with the engineer. Quite frankly, neither of them seemed to be harboring any big problem and they were both surprised to learn Vashro had taken their comments the way he did. Then it was time to talk to Linda. We had our chat in my cubicle, out in the open with people working all around us. I didn't want to take the chance of having this meeting in some remote conference room somewhere because I had no idea what she might go tell Vashro afterwards. She was a woman, I was a man, and I sure didn't want to take the chance of finding myself facing any accusations of harassment. To tell you the truth, I didn't know what to expect from Linda at this point. I wanted witnesses just in case.

It was one of the strangest and most unproductive meetings I've ever had. She came into it with that deer-in-the-headlights look of hers and I could barely get her to say anything at all. I asked her what I could do to make her more comfortable in her job. She had two themes she kept repeating over and over. The first was I had to win her trust. Win her trust? She'd been working for me for over a year and nothing bad had ever happened to her in all that time. What wasn't to trust? "Perception is reality," she kept repeating. Now we were having a philosophy conversation. 'Perception is reality' is one theme the philosophers bat around every now and again. They have some pretty deep, high-brow arguments and counterarguments concerning it. But I knew Linda didn't know a thing about any of that. It was a phrase she'd picked up from somewhere and hung her own interpretation on. I didn't think it would do any good to try to talk about the difference between perception and cognizance. 'Untrustworthiness' isn't an object of perception anyway; it's an object of thinking. I did try to point out there wasn't much I could do about *her* perceptions. These were subjective and belonged to her. "Perception is reality," she repeated again.

Okay. Back to the issue of trust. "Don't you think trust runs both ways?" I asked.

No, she replied. It was entirely up to me to win her trust.

We got absolutely nowhere. Finally I said, "Well, there's a lot for both of us to think about here. Give me a little time to think about what you've told me and we can get back together again in a few days to see what we can work out." To tell the truth, I wasn't sure what to do about the situation. I had just had a conversation with a person who acted like she was living in her own universe and I didn't have any

experience in dealing with a neurotic person.

It turned out I wasn't going to have a few days. I wasn't going to have a few hours. Linda left our meeting and ran straight back to Vashro. He, in turn, summoned me back into that conference room again. This time there was no trace of amiability whatsoever. He glared at me from across the table and the first thing he said was, "You've retaliated against the Open Door."

HP had what was known as the Open Door policy. Any employee who felt they weren't getting along with his or her boss could take his or her concern to the next manager up the chain. The basic idea is for that manager to act as a kind of ombudsman to help get whatever the problem two people were having straightened out in the most amicable way possible. It's supposed to be a non-judgmental process. To 'retaliate' against the Open Door means the manager or supervisor has inflicted some kind of punishment or retribution against the employee for availing him- or herself of the Open Door. It is one of the most serious charges that can possibly be leveled at a manager. It constitutes misconduct and it's an offense that can get you fired on the spot. Linda had run to Vashro and told him I'd retaliated against her.

Talking to an employee isn't retaliation. It's what you're supposed to do when you learn about a problem. I hadn't threatened her, I hadn't done anything that could even remotely be construed as being a threat. Not, at least, by anyone who was playing with all her marbles. I tried to get Vashro to tell me specifically how I was supposed to have 'retaliated' but all he did was keep repeating that Linda had informed him that I'd 'retaliated.' I doubt if he'd even bothered to ask Linda what form this 'retaliation' had taken. He wasn't interested in hearing my side of what had happened at all. Vashro as much as told me he thought I was lying about what had taken place. I guess that's one of the conveniences about living in a world of abstract people instead of a world of real people: You never have to bother yourself with facts. All you need to do is have 'virtual' conversations with the 'virtual' people in your universe, all inside your own head. Then you can get as mad at the real person as you want since obviously he'd have said the same things your 'virtual' person said to you. Yep, perception is reality: virtual reality.

This accusation was so unfair and so fantastic I finally really did lose my temper, and I denied the accusation with some warmth. Probably this wasn't the best thing I could have done, seeing as how I was just back from an anger management class, but I'm not used to being called a liar and I wasn't in the mood to just sit back and take all this. You see, it wasn't until that meeting when I realized two things: Linda was trying to get me fired and my boss was ready to do it. I was already guilty in his mind.

I was in serious trouble here so before things could get any worse I played the one card left to me. "I want Personnel in here," I told him. "I think you've already made up your mind and I want a mediator present for everything we have to say to each other from this point on." Vashro glared at me when I said this, but I was within my rights to demand this and he didn't have any choice in the matter. He was going to have to wait a few days before he could fire me.

I am convinced calling in Personnel is the only thing that saved my job. It turned out the Personnel guy was the same guy we'd worked with earlier on the written warning procedure. He was completely fair minded about the whole thing; he beat up Vashro just as much as he beat me up. In the end, I was offered a choice. I could remain as production engineering manager but be in corrective action under a written warning. Or I could quietly accept a transfer to some other management job somewhere else on the site. For me that choice was a no-brainer. I didn't have any doubt in my mind at all that no matter what I did Vashro was going to evaluate me as 'not meeting' whatever requirements were going to be set down in that written warning evaluation. If I tried to hang on to this job I was going to be fired. My boss had turned on me like a rabid dog and it was all over between us as far as I was concerned.

"I'll take the transfer," I said to the Personnel guy. Then I looked Vashro right in the eye. "After this, I wouldn't spend one more minute working for you," I said.

Practically the next thing I knew, I found myself back in Building 82 Upper sitting across the table from my old boss, Greg. His section was starting work on a new project, Coyote IV, and he had an

opening for an R&D project manager for the part of the development involving design of the new factory that would build Coyote IV.

How much of the whole story he had been told I don't know, nor do I know who did the telling. He gave me a puzzled look, though, and he said, "I thought things had been going very well over there."

"So did I," I replied. Greg had known me for a long time and he trusted me. And I trusted him. I knew he was one guy who understood why our jobs existed, which wasn't to spread virtual peace and love across a virtual world. At the end of a fairly short conversation we shook hands and I was working for him again. Back in the lab. Back in DMD.

There was only one thing left to do over at Building 22. The announcement that I was leaving had to be made to the team. I had to be there for it, but Vashro insisted that he would do all the talking. He called everybody together and gave them the news I was taking an R&D project manager job back over at DMD. He never said anything about why this was; it's normal practice to pretend to the team that nothing was wrong and this was just a normal 'taking advantage of an opportunity' situation. But I'm pretty sure every single person in the group knew full well I'd been removed from my position. People aren't stupid.

The reaction from the group was one of stunned amazement. With the exception of Linda, nobody looked happy about it. Ok Hee actually broke into tears. While I was cleaning out my desk, a lot of the folks came over to wish me good luck and have a quiet word or two. A few of them did ask why I was leaving, and I didn't lie about it. "Basically I was fired," I told them. When they asked why, I just said, "I really don't know." That was the truth. I didn't share any details at all about how events had played out; there was no good to be served by that. Arlan, though, had an interesting theory about Vashro's motivation. "He's jealous of you," he said. I've thought about that a lot since that day, and I'm not so sure Arlan wasn't right. After all, we'd just spent a little over a year cleaning up the mess Vashro had left from his days as production engineering manager of the box line. Was he jealous? I can't say because my judgment isn't altogether objective on this question. I think he's just a swine.

There are two interesting postscripts to the story. Very soon after I left, Vashro transferred Linda and her group out from under him to the dayshift line manager of production. I've often wondered if this wasn't to prevent Linda from doing to him what she'd done to me. Shortly before I left HP for good I heard Linda had been removed from her supervisor position. It wasn't a promotion. I'm human enough that I felt pretty happy upon hearing about that. If you're wondering, I didn't have anything to do with it.

The second interesting thing also came quite a bit later but before I left HP. One day out of the clear blue the announcement was made that DMD and DSS were merging again. They had put the old Disc Memory Division back together. Nobody ever said so out loud, but I've always assumed Somebody Up There happened to notice that without the box product line DMD was bleeding red ink. Merging the divisions was one way to postpone the inevitable day of economic reckoning. After DSS was disbanded, I heard some time much later that Vashro had been shipped off to handle some backwater management job at a small and unimportant overseas location. 'Time wounds all heels,' I thought when I heard that. I had long come to understand what my friend had meant about watching my back around Vashro. □

It would turn out Coyote IV would be the last product I worked on for HP and next to last commercial product I would ever work on. The Coyote IV team was a mix of some of the old Eagle R&D people plus a lot of 'new' faces – new in the sense of being new to the section since the last time I'd worked for Greg; many of the folks were people I'd known for quite awhile but hadn't worked with on the same project. After two plus years of working in production engineering, Coyote IV started out being almost like a vacation for me. This wouldn't last, but it did start that way. There were two project managers, myself and an old pal named Jeff Allen, who I hadn't worked with before on the same project but had known for a long time. Jeff was managing the actual product development and because of this he was *de facto* the senior manager under Greg because at DMD everything in an R&D project was driven by the product design team. My team and I were there to design the factory that would produce what Jeff's team

designed. Among other things, this meant most of the pressure rested squarely on Jeff's shoulders.

DSS had been organized along a fairly traditional line hierarchy, the kind you see depicted in pretty much any organization chart. We had a fairly simple business and it only required a simple management structure. DMD, on the other hand, practiced an HP form of 'matrix management.' Matrix management was one of those management ideas that originally came out of the space program in response to the enormous complexities of projects Mercury, Gemini, and Apollo. Naturally, nothing we were doing even came close to the complexity of Apollo, but a watered-down version of it did make sense given how big the division was and the more or less accidental way its various departments had sprung into being over the years. One way to describe DMD's matrix structure is to say it consisted of a lot of parallel 'traditional org chart' functions and departments with a lot of 'dotted line' connections running back and forth between them. Most of these dotted lines led straight to the R&D project managers, and of these most of them led straight to Jeff. My main 'dotted line' connected to the production manager, a very good, capable guy, also named Bob, and our relationship was very much like the one I'd had with Bob Claridge on Eagle. My other main dotted line, of course, was with Jeff. Jeff's universe was a lot more interconnected. To put things in perspective, when I was managing the whole R&D team for Coyote IV in 1992, I counted up one time how many 'lines' I found myself connected to. Including the lab engineers, there were fifty and over half of these were dotted lines between the lab and other departments.

Coyote IV was what is called a 'leveraged' product, which means it was fundamentally based on its predecessor, Coyote III. It was still a 'next generation' five-and-a-quarter disk drive mechanism, and so there was considerable design work involved in inventing it. But there wasn't as much absolutely new design as there had been in Coyote III, and so comparatively speaking the development time was shorter for both the product and the factory. The lab team was comprised of smart, top-notch engineers and so for the first year or so things went very smoothly, smoother in fact than any other DMD project I'd been involved with.

The biggest difference I noticed was the much greater role played by marketing throughout the project, and this was due to the much different marketplace into which Coyote IV would be sold. DMD was now an 'OEM business' selling disk drive mechanisms as components to other companies (and, of course, to HP's computer system divisions). The way this business works is driven entirely by the customer companies. These companies are generally designing their next products at the same time we were designing the disk drives we wanted to sell to them. What this means is that these companies demand, and get, 'pre-release' prototypes of disk drives so they can evaluate them and make their selection of which one of several competing disk drives will be the one that gets designed into their products. There is what is called a 'market window,' during which if you can't supply them with prototypes, you're out. It is essentially a winner-take-all process. If you hit the market window *and* your prototypes evaluate out as better than your competitors, you win 100% of that customer's business. If you miss the market window, you sell nothing. It's win or die.

The customers know they're receiving prototypes and so they don't expect them to be perfect prior to manufacturing release. They *do* expect them to be perfect *after* manufacturing release, and they expected us to be Johnny-on-the-spot about responding to any and all problems their testing and evaluation process turned up. They evaluate their potential disk drive suppliers just as much on prototype delivery and responsiveness to their problems as they do on the disk drives themselves. That's not hard to understand. All disk drives in this kind of economic market are close substitutes and it's pretty easy for a customer to switch from one company's product to another's. The most mission-critical responsibility that fell to Bob and me early in the project was seeing to it we supplied prototype Coyotes on demand to all the customers whose business we needed to win. That was very, very different from the old market model of the Eagle days and it affected everything.

The Golden Age of the disk drive business was over now and would never come back. The new reality was we were in a low-margin market of high tech products, much higher technology in fact than goes into

the central processing unit (CPU) of a computer system. By the time of Coyote IV disk drives had gotten so small and required such high mechanical precision to build that literally we could no longer assemble disk drives by manual processes. The production line had to be highly automated and used a lot of robots to carry out this precision assembly work. It is a capital-intensive business and you live or die by what the economists call 'economy of scale.' What this means is you make only a tiny, tiny amount of profit on each unit sold and you make your money from sheer volume of sales. One thing I noticed was that most of the HP people who glibly talked about 'economies of scale' had a pretty primitive idea of what this meant. There were a lot of folks who simply equated it with high production volumes. That's part of it, of course. The other part is that nothing but direct material costs can be allowed to go up as volume increases. If you add to your overhead or labor costs as volume goes up, pretty soon you find yourself in the position of, as the joke went, 'losing a little on every sale but making it up in volume.' That was the part of economies of scale a lot of people had trouble getting their hand around.

I know our marketing people didn't quite get that part of it. They understood well enough that the fixed costs – that is, the capital equipment part of factory cost – depended on volume and it wasn't a good idea to have a factory capacity that enormously exceeded sales volumes. Consequently, in the early days of the project they tended to be pretty conservative about projecting how many Coyotes the factory would need to produce. Their initial estimates were made just prior to targeting for fiscal year 1991 and our capital equipment targets for the factory were based on these estimates. This happened before I came back to DMD and Jeff (or Greg, I'm not sure which of them), very wisely multiplied up the early forecast numbers on the assumption that marketing was underestimating things. This wasn't as reckless a decision as it might sound. The division could never survive on low volumes. We'd have to hit the higher volumes or it was all over. Given DMD's bloated overhead structure, we would in fact have to hit *very* high volumes or it would be all over.

As you can probably tell, new product development at DMD had become a very complicated thing during the time I was away at DSS. It required a great deal of coordination in order to succeed. Once a week, every Tuesday morning at ten o'clock come rain or shine, there was a meeting of what was known as the Tactical Planning Team. Present were representatives from every area of the division who were involved in any way with Coyote IV. It was a pretty big group. Jeff chaired this meeting and it ran by a set agenda. The purpose of this meeting was to review events of the past week and, if necessary, change the tactical plan to respond to events. As it turned out, we changed the tactical plan pretty much every single week throughout 1991 and into 1992. As I've said already, the secret of HP's success was always tactical execution and nimbleness in responding to events, not grand strategic thinking.

Most of what went on at the tactical planning meetings is a blur to me now – just a sequence of one tiny but important thing after another – but four consecutive TPT meetings in 1991 still stand out in my memory. At the first one the marketing guy announced with great joy that the latest sales forecasts for Coyote IV had doubled. Everyone smiled broadly. I silently blessed Jeff's and Greg's foresight in targeting for a bigger factory; the new projection was still well within the capacity we were designing for.

The next week, the marketing guy joyfully announced that sales forecasts had doubled again. More good news and we still had plenty of factory capacity to deal with it.

The third week, the forecast doubled again. More good news. But this time I was a little edgy because now the forecasts were right at the capacity we had targeted and were designing for.

The fourth week, it doubled again. Really, really good news except that now our planned factory was too small. What we were planning for could no longer meet the forecast. After the meeting I asked the marketing guy for a quiet word. How much more did he think the forecast was going to grow? It had grown sixteen-fold in one month. Was it going to be thirty-two-fold next week? He explained that they – the marketing department – wanted to be conservative in their estimations. I explained that it took a long time to build a factory and if the capacity wasn't built in on Day One it couldn't meet the sales demand. That seemed like kind of a new thought to my marketing colleague. He promised to get me a more

forward looking, ‘acceptable risk’ sales number, and a couple of days later he delivered on it. It turned out to be a pretty accurate number, too. Our marketing people knew what they were doing.

I sat down with my guys and we talked about what this new number meant for what we were doing. To nobody’s surprise, it was going to take a much bigger capital investment for the factory. I took this number to Greg and explained the situation. I was asking for fifteen million dollars over and above what had been targeted. In business parlance, this is known as a ‘cost overrun.’ It was the biggest one I ever had. However, because it was caused by an extremely good thing, higher sales volumes, it turned out to be a pretty easy sell when we had to take it way up the management chain to the BUMs. Expenditures of this level needed the approval of an HP vice president, and we got it. So far as my team and I were concerned, the rest of 1991 went pretty smoothly after this. 1992 was going to be a different story. □

As the summer of 1991 arrived I was still living in the same little eleven-hundred-square-foot, three bedroom starter home I’d bought in 1979. When I first bought it, this was plenty of room but over the course of a dozen years I’d accumulated a lot of things. Most pronounced had been the growth of my personal library, which had just reached about one thousand books and was still growing. But I now owned other things as well such as a lot of musical equipment, camping gear, and the little free-weight ‘gym’ I’d set up. Basically, things were getting piled up on top of each other and I needed some elbow room. It was time to buy a bigger house.

Over the years I had been awarded stock options on HP stock several times. These options were good for ten years and some of them were coming up on expiration and showing a very nice profit to boot. I did a little figuring and decided that between them and my stock market account I’d be able to buy a new place free and clear while still holding on to most of my investments. Then when I sold my old house that would get rid of its mortgage. I got in touch with a realtor, gave him my specifications for what I was looking for, and told him the price range I had in mind. He got to work and found the perfect place. It was a three thousand square foot, five bedroom house, brick construction, with a fully finished basement. It was located on McKinney Street in an older neighborhood on the west side of Boise and had been built during the Kennedy administration. Its owner was a banker and the house itself was in mint condition.

I guess the housing market wasn’t in too great a shape just then or something because when the banker found out I was making a cash offer he became very reasonable in our price negotiations. We closed in June and the next thing I knew I was living in my ‘new’ house. It had a large family room in the basement and that was where I set up my music studio. One of the downstairs bedrooms became the gym and a second downstairs room – technically not a bedroom because it didn’t have any windows – became my library and study. The third downstairs bedroom I made into a ‘miscellaneous’ room. The master bedroom and guest bedroom were upstairs, along with the kitchen, a large living room, and a TV/dining area room. I now had all the elbow room I could possibly want. Anything bigger would have just been showing off. I figured at the time this was the house I’d retire in.

The next job was selling the old house on Linstock Street. I told my realtor I wasn’t interested in any kind of fancy wheeling and dealing here. I wouldn’t carry any part of the new owner’s costs, I wouldn’t loan the buyer any money; when the deal was closed I wanted no further involvement with him of any kind. I wanted to put the money in my pocket and walk away with it.

It took until the end of July before he found a buyer who would meet these conditions. It was kind of amazing how creative a lot of the first offers I received were – creative, that is, in terms of the schemes some of them had cooked up to try to buy my house without actually paying for it. One guy from California was particularly amusing. He was basically out to buy property in Boise and play the real estate market game. I’m pretty sure he did not plan to live in my house himself. Whatever was on his mind, he’d concocted some complicated and grandiose scheme whereby, in effect, he was offering to buy my house without having to pay for it himself. His basic idea was that I’d loan him the money to buy my house. I guess he thought Idahoans were either hicks or idiots. “Don’t bring me any more of these,” I told my guy.

We finally found a real buyer. He was a young married guy from Utah with something like three very young children. He had just gotten a job in Boise working for the state. Like all state jobs, it didn't pay very much and he was really strapped for money. How he was going to cram all those kids into that little bitty house I didn't know, but I figured that was his problem to work out. The only catch was that he couldn't come up with the money until September. It was part of his offer that he'd rent the house for a month – he had to move to Boise and start work – and we'd close in September. The rent amount he offered was reasonable so, although generally I have no interest at all in being a landlord, I agreed to these terms.

One thing I'll say for this guy is he really knew how to be a renter. This was their first house and when they moved in he didn't even own a lawnmower. I had my lawn mowing done by a company that took care of people's lawns so I loaned him my lawnmower free of charge. During August there were a few times when a small rock would get stuck in one of the sprinkler heads and it wouldn't pop up. He'd get on the phone and give his 'landlord' a call, and I'd drive over there with my toolbox. I kind of had some fun with that, putting on a pair of overalls, a tee-shirt, and a baseball cap. I looked like something half way between Uncle Wayne and the landlord at the Lincoln Apartments in Ames. I'd come rolling up in my little VW pickup truck – which I'd bought from Steve when he and Chris were moving to Bristol; I used it for camping and for hauling musical gear to the gigs John and I were playing – and he'd show me which sprinkler head wasn't working. I'd bend over with a screwdriver, flip the rock out, and that would be that. One thing I will say about my 'tenant'; he sure was helpless around the yard. But his kids were pretty cute. When September came we closed on the house and I was out of the landlord business for good. After paying off what was left on the principal of my old mortgage, I was free of debt – finally – for the first time since I'd taken out that first student loan to pay for college.

It was pretty obvious even from the front yard that the Linstock house really wasn't big enough for a family the size of the one he had. I didn't expect they'd live there for too many years, especially after the older kids got old enough to start wanting their own rooms. Sure enough, in '93 I happened to drive by the old place one day and saw it had been sold to somebody else. The young family from Utah was gone.

It irritated me that they'd run off with my lawnmower.

Scott, my stock broker, and a few of my colleagues out at HP professed surprise that I'd paid cash for my new house instead of borrowing more money from a bank. Their basic question was why I'd want to give up the income tax deduction you get for mortgage interest payments. I thought that was a pretty silly question. "Suppose my interest payment is three thousand dollars a year," I'd tell them. "How is it a win for me to pay a bank three thousand dollars so I can pay the government one thousand dollars less?" I guess they must have looked no farther than the amount of the deduction rather than looking at the actual amount of money they spent. People really are ignorant of basic economics. It didn't escape my notice that most of the guys who asked me about this drove a BMW or a Porsche. Kind of expensive toys, I've always thought. I drive a boxy little Toyota Corolla FX-16 (a 'rice rocket') I bought in 1987 for cash. I'm still driving that car today, although it won't be too much longer before it will be time to buy a new car. Again for cash. That one will probably be the last one I'll ever own. □

Maybe it was because I was spending so much time hanging out with all my musician friends, but in autumn of 1991 I got the idea for a very special kind of Christmas present for my family. I thought they'd get a big kick out of it if I made a cassette tape album of some original songs I'd been writing. As a song writer I'm never going to win any prizes, but since my musician friends didn't hold their noses when they heard one of my songs, I figured they were good enough to please friends and family. The music studio I'd set up in my new house included some fairly nice recording equipment, so I got to work on the album.

Over time I'd written twelve songs – not quite country songs, but not quite rock songs. Maybe 'folk country' would be a good description for them. Whatever anyone wants to call them, I knew they were in a style of music Mom and Dad especially liked. The lyrics to one of these, *Mending Fences,* were written by my friend Ruth. Most of them were love songs but a couple were comedy numbers.


Christmas 1991 and 1992. Left: Me, Dad, and Bill (1992). Right: Mom and me (1991).

By now I'd learned how to play the guitar a little, but I'm basically just a strummer and no more. It was like one of my musician friends – the one who gave me guitar lessons – said: The guitar is the easiest instrument to learn how to play and the hardest to learn how to play well. I'm better at bass guitar. I wanted the guitar parts of the arrangements to sound a lot better than I could produce, so I asked some of my professional friends for a little help. They were happy to oblige me. Gayle contributed her talents on the keyboard, bass, and lead guitar on some of the numbers. Jan contributed some really good guitar on some of the others, as did my friend Tom Simpson. I supplied most of the keyboard parts, some of the bass parts, a little bit of rhythm electric guitar, and, of course, the lead vocals. My friend Adele contributed her artistic talents and designed the cardboard 'jacket' insert that went into each cassette holder. I called the album *Habits of the Day,* which came from a line in one of the songs. Production was very, very limited. This was something special, just for my family. Bob Dylan has nothing to fear from me.

As I'd hoped, *Habits of the Day* was a big hit at Christmas time back in Iowa. Mom actually got just a little bit teary eyed about it, which was pretty unusual for her. I was really surprised at what a hit it was with my little nephew and niece, who thought it was pretty cool that Uncle Ricky was a musician. Of course, they were little kids and not too hard to impress. Yet. Of the songs on the album, the most popular one with the folks back home was one of the comedy ones, *Big Dumb Guys.* That one, as it happens, was also pretty popular with female audiences in Boise, too. Somehow – and I've honestly never been sure how – a couple of radio stations (KMAQ in Maquoketa and another station in Davenport) each got hold of one of the albums and played *Big Dumb Guys* on the air a few times. I've always assumed one of my relatives loaned them their copy. It was a little embarrassing, but the kind of embarrassment that had me grinning from ear to ear. Paul Simon I'm not. Hank Williams' legend is safe. But it still gave me a kick.

It was a pretty great Christmas except for one thing. It was impossible not to see how heavily age was wearing on Dad. Mom was still a very spry senior citizen, but Dad wasn't looking too good at all. Gone was the physical strength he had always been so proud of and from which he had always drawn a lot of his self image. His weight had dropped a lot – by an alarming amount I thought – since Christmas the year before. On top of this he was suffering from macular degeneration – a disease that destroys cells in the retina and can't be corrected by glasses or any other kind of treatment – and so he wasn't able to read anything that wasn't in very, very large print or see well enough to drive a car any more. His big hands, which had always been so strong, were now enfolded in loose-fitting skin and had lost their strength. His

arms weren't tree trunks any more. He even lacked the endurance to stand or walk for very long or very far. All this added up to leave him in a constant state of depression. Uncle Foryst, Dad's brother and the eldest of Grandma's and Grandpa's four children, had died a few years earlier, and I think Dad was feeling his own mortality. That Christmas Bill took me quietly to the side and said, "I think we're going to start seeing a lot of funerals in this family the next few years." I nodded; there wasn't really anything to say. But neither of us knew just how right he was about that.

Dad was seventy-eight years old that Christmas. We didn't know it yet – and the local tribe of witchdoctors who call themselves medical men wouldn't figure it out for a couple more years – but Dad was suffering from cirrhosis of the liver and his condition was terminal. No one knows what caused this. Dad's doctor said it was 'genetic' – which is pretty much the term they use these days when they don't have the faintest idea of what's going on. I know one thing for a stone cold fact: it wasn't caused by alcohol. Dad was a teetotaler his whole life. Back when he was just a teenager he'd gone drinking once, had a hangover, and that was that. It wasn't a religious thing. Dad just thought drinking was the stupidest thing a man could do – an opinion he'd always share with me whenever I'd go out for a beer. When Melody and Dan had gotten married, I'd gone over to Dad during the wedding celebration with a glass of Champaign in my hand and said, "Dad, I want to thank you." He asked what for. I held up my glass and said, "This is the first time in your life you ever bought me a drink."

Dad had just scowled. "I didn't buy you that," he growled. □

Back in Boise a section manager position had opened up and my partner Jeff landed it. At the time our project looked like it was in pretty great shape and would be finished before too much more time had gone by. Consequently, Greg thought – and I agreed – that rather than replace Jeff with a new project manager we'd finish off the project with just one project manager. Me. We even began to transfer a few of the development engineers on Jeff's team to start work on other projects. That's how good things were looking right then. That was before we met John from EMC Corporation.

EMC – popularly called 'EMC-squared' – was projected to be our biggest customer for Coyote IV. At the time they were still a relatively new company based in Worchester, Massachusetts, and were pioneering what was known as the RAID business. The acronym stands for 'redundant array of independent disks.' A RAID is a large-capacity mass storage system built up out of many disk drive mechanisms so arranged that some of these disk drives stored coded information that would allow the system to keep running even if one of the constituent disk drives failed. At the time this was a fairly new concept in the mass storage business. They hold enormous volumes of data and are used by companies such as the airlines in applications like airline reservations systems. They are the very top of the line of 'box' products, enormously profitable, and just exactly the kind of business I had thought we should have gone after rather than choosing to enter the no-profit killer marketplace of commodity disk drives. Today EMC is a large company and, the last time I looked, one of the most successful in the business. A single EMC RAID product could use a dozen or more Coyote IV drives. John was the manager at EMC in charge of qualifying disk drive mechanisms for use in their products. He was the guy who would decide if we sold thousands and thousands of Coyote IV drives to EMC or none at all.

I had always thought HP was a company with the highest possible commitment to product reliability. Well, that turned out to be wrong. Compared to EMC, we were pikers. I'd never seen another company with a more complete, total, and almost fanatical devotion to reliability than EMC. At the time they were still a young, small company and they were scared green that one day one of their products would crash, take down somebody's airline reservations system, and that then EMC would get sued out of existence. Ideally they wanted disk drive mechanisms that would last longer than Stonehenge but they knew this kind of reliability goal was unreasonable. They would settle for disk drive mechanisms that could demonstrate a reliability level of one million hours mean-time-between-failures (MTBF). In 1992 disk drive mechanisms typically were capable of from about one hundred fifty thousand to three hundred thousand hours MTBF.

John, as it turned out, was the perfect guy for the job of dragging the disk drive industry kicking and screaming into the world of ultra-high reliability. I've never been a big guy, but even next to me John was an itty bitty guy, a short, intense Italian with pure east coast manners – the kind of manners westerners regard as unpardonably rude and which, not all that many decades earlier in the history of the west, had been pretty likely to lead to a gunfight. When it came to reliability issues, he was an absolute lunatic. If he thought I was being the least bit lax or uncooperative in meeting his demands, he'd scream and yell and cuss at me, and he'd accuse me of lying to him about where Coyote IV was and what we were doing to make it better. If we were having a face-to-face meeting, he'd see my face turning red and see my muscles tensing up in anger, and then he'd abruptly say, "Hey! Don't take it so personally!" Lunatic.

John and I had face to face meetings only a few times a year, but we had telephone meetings practically every week. The only difference was that over the telephone he couldn't see me swelling up with anger over being called dirty names. At first our marketing folks would sit in on these teleconferences, but after only a couple of times they quit coming and left dealing with John to me. The specific technical issues would vary from one phone meeting to the next but the agenda of the meeting was pretty much always the same. Figuratively speaking, John would ram an umbrella up my hind end, open it, and then pull it back out. I would fantasize about taking him out into the parking lot and pounding him into a greasy spot on the concrete.

Every single meeting I'd come within an inch of losing my temper and telling him how the cow ate the cabbage, but I always managed to keep control of myself. EMC was our biggest customer and I had a pretty good idea that Bruce Spenner, who had taken over as division manager from Don Curtis while I was still in DSS, would take a dim view of one of his project managers telling off the guy who could make or break our success. I'd known Bruce for a long time, since his days with HP down in the Bay Area, and we liked each other. But, as the old saying goes, business is business. We needed a happy John in order to succeed and the only way to get a happy John was for me to sit there and take it and then go do whatever it took to solve the problems he and his team were uncovering. So I'd take a tight grip on myself and after every meeting go outside and walk around the HP complex, chain smoking one cigarette after another until my rage subsided and I calmed down enough that I was safe to be near again. This went on all throughout 1992 and into 1993.

The heck of it was John was right. I hated the way he expressed his righteousness, but he was right. I'll never forget the first time I met him – this was a face to face meeting in Boise – and the very first words he said to me: "What are you doing to achieve one million hours MTBF?" I was dumbfounded by the question. Our spec goal for Coyote IV reliability had been set for three hundred thousand hours MTBF, which was a goal consistent with where the industry was at that time. We were, in fact, the reliability leaders. Nobody then, except the Japanese, was even dreaming about a million hours. Frankly, I didn't think it was possible. But it was.

There is a kind of reliability urban legend in engineering called 'the random failure.' It's such a well established legend that it gets written into engineering textbooks as if it was a fact. The impression it leaves with most people is that 'stuff happens' – failures in this case – for basically no reason at all, that there is always some base level of failure rate caused by mere random chance and once a product reaches this level there isn't anything more you can do to improve its reliability. This isn't true. By 1992 I'd been involved with failure analysis work for over a decade, ever since setting up DMD's first FA lab during the days of the 7908. Every failure *always* has a physical root cause. Sometimes the root cause is something introduced in the production process, but more often it is a mechanism inadvertently designed into the product from the very beginning. There are no random failures. It's only a question of what base level of failure rate a company is willing to tolerate from its products. Every company on earth will tell you 'we do everything possible to meet a zero-failure goal' but really this isn't true. The legend of the random failure is what lets well-meaning people *think* it's true. The reality is that what a company decides to accept as its 'base' failure rate level is usually decided upon in terms of warranty failure costs. John wouldn't let us get away with that kind of decision making for Coyote IV. Either we met *his* goal or HP

didn't sell disk drives to his company. It was as simple as that.

Somewhere in the back of my mind, I knew this about failure mechanisms and failure rates. But there was a lot of pressure from other project and section managers for us to get done with Coyote IV so the people on the Coyote IV team could be moved to other new product developments. Neither my colleagues nor their bosses had yet had the opportunity and unforgettable experience of dealing with John, and they suspected me of just being stubborn and 'perfectionist' about finishing up our project. I wasn't after perfection. I just wanted a million hours MTBF. Really what I wanted was John off my back. I did tell them a few stories about what it was like dealing with EMC – a company that would be a key customer for them as well – but they didn't really believe me. I couldn't blame them for that. *I* could barely believe it and I was the guy with the umbrella sticking out his behind.

The plain and simple truth of the matter is that if John hadn't been a lunatic, if he'd been a reasonable guy, we wouldn't have even tried to hit one million hours MTBF. And a few years down the road our Japanese competitors would have blown right past us on reliability because the goal *was* achievable. I wasn't the only guy on earth John was making miserable. He had even forced Texas Instruments, the giant semiconductor company, to change the way they manufactured integrated computer chips to make them more reliable; that was something HP had been trying to accomplish for years with absolutely zero success. Coyote IV turned out to be the world's first disk drive that *did* achieve the million hours goal. I know because the guy at EMC who measured product reliability in the field told me he'd clocked Coyote IV at better than a million hours after we'd finally won the business and EMC started shipping products in volume with our disk drives in them.

I had the chance one time to see the production process at EMC up close. The chance came when John called me one day – I *never* called him; it hurt too much – and basically ordered me and the product development team to fly out to Worchester and have our noses rubbed in the reliability problems his team was uncovering. It was a completely unpleasant trip – for me at least – but it turned out to be a very important and productive trip. The guys had the chance and the experience to see for themselves, in one on one dealings with John's people, exactly what the challenges were we had to successfully meet. Those challenges were something nobody could really appreciate with actually having the experience. It's the kind of thing you can't just tell somebody about that he'll understand down in the gut. It's the kind of thing a person has to actually encounter up close and personal. I don't think there was a person on my team who didn't come back to Boise energized to meet and beat these challenges after seeing what they were. Of course, it helped that none of John's people we met were anywhere near as unpleasant to deal with as he was. The un-pleasure of dealing with John was reserved for me.

I was very, very impressed with the factory at EMC and their production process. In fact, we ended up incorporating certain key elements of it into our own production process in Boise. That wasn't a popular decision back home. Bob and the entire production staff absolutely hated it. Mitch didn't like it either. But it was something we had to do to meet John's goal, and if we didn't meet John's goal the product would fail. Without EMC there was no chance of making any profit in the teeth of DMD's bloated overhead costs structure.

Aside from the Worchester factory, there were three other things that stuck in my mind from that trip. One was how hot, humid, and oppressive the weather was in Massachusetts. Boise is in the desert and the humidity is extremely low. Over the years I'd gotten used to being baked in our heat. In Worchester I was boiled and the humidity almost made me sick. The second thing that stuck was the maniac traffic in Boston. How Boston avoids having a large scale demolition derby each and every day of the week is completely beyond my comprehension. One of my guys was from the Boston area and he did all the driving for us. I didn't want any part of Boston's *bansaiii!* motoring. The third thing was Plymouth Rock. After our meeting with EMC we took a little side trip to go see it. Frankly, it isn't much to see. It's just a rock and not a very impressive one at that. But there was a clam chowder place right next to it and *that* was worth the trip. There aren't too many things I like better than clam chowder and they really know

how to make it in Massachusetts. Manhattan clam chowder? Forget about it. Feed it to the pigs.

All this hard work on reliability really started to pay off. I kept a spreadsheet detailing each and every failure being uncovered either at EMC or on our own line in Boise. It was quite a long list and the failure rate associated with each and every item was very, very low. But they had to be driven lower in order for Coyote IV as a whole to hit a million hours. John and I would go down this list every week during our phone conferences. It took a long, long time to accomplish, but we were getting close to the goal.

Apparently, though, it was taking too long in the eyes of some engineer back at EMC. I never found out who it was, but some guy there let his frustration boil over one day in early 1993 and he sent a letter to NCR. NCR was a giant computer company and they were one of EMC's most important customers. As it happened, they were also, after EMC, one of our biggest Coyote IV customers. The letter they received pretty much denounced Coyote IV as an unreliable piece of crap; it turned out NCR had been pushing EMC to use our drive, and this guy didn't like it. The letter more or less set a fox loose in the henhouse and the next thing anyone knew, we had a three-way teleconference call going between the manager at NCR, John, and me. NCR was very much in charge of this meeting. It was a memorable day.

John was amazingly quiet and well mannered all through our meeting. The NCR folks had basically taken the position that Coyote IV was a wonderful disk drive and if there was a reliability problem EMC must be causing it. Over and over and over, the NCR guy kept offering me the chance to say there was nothing wrong with our disk drive and EMC was the culprit for any reliability problem there might be. He kept serving this chance up using different words, and every time he did I took pleasure in picturing in my mind an image of John sitting there in Worchester biting his fingernails off and sweating. That made it the most fun meeting I ever had in which he was involved.

But the truth was there was nothing wrong with EMC's process and the reliability problems really did exist in Coyote IV. They were our problems. So that's what I kept replying over and over again. I used the opportunity to review the top items on my spreadsheet list of problems, what we were doing about them, and when I was projecting they would be fixed once and for all. "There's nothing wrong with the EMC process," I kept saying. "Coyote IV should be able to go through that process just fine and that's what we're going to make it do. These problems are almost fixed now and it won't be long before they're completely taken care of." I praised EMC for their commitment to reliability. By the end of the meeting NCR was happy, they were signed up for what we – and EMC – were doing, and the crisis was ended.

I think John was grateful that I didn't use this chance to pay him back for all the fun he'd put me through. In our weekly phone conferences after that he'd still ram the umbrella up my behind but he stopped opening it before pulling it back out. □

For me the job of manager never was very much fun, especially compared to actually doing product design. It had its moments of great personal satisfaction, but most of the time it felt like a job and nothing more. There are people who love it; Greg is one of them I think. But I never loved it. It was just something somebody had to do and when that somebody turned out to be me it was a duty to do it as well as possible. Part of it – and to my way of thinking, the most important part of it – was to get the job done and achieve the results the company needed to achieve. That is the essence of the social contract every single person implicitly enters into when they go to work for any organization. The other part of it was doing this in such a way that you never lost sight of the fact that your people *were* people with lives, ambitions, and dreams of their own. Kant wrote that it is a moral categorical imperative to always treat people as ends in themselves and never as merely the means to an end. I believe that. It is the essence of moral leadership. But it's often hard to do well and I know I wasn't always as successful at it as I should have been. I did try very hard. But it's a tough obligation to meet consistently. Maybe *the* toughest.

There is a tendency anymore for management systems to treat people as 'human resources' rather than as people. Managers, especially higher level ones, read management magazines and mimic trendy theories of management they find there. Calling people 'human resources' was something that began at HP not too

long after Bill and Dave retired and John Young took over as president and CEO. I hated being called a human resource and I never knew anybody who liked it when the term was applied to them personally. It was a term I avoided using because from that term it is only a short step to falling into the habit of thinking about people in the same way as you think of desks or production robots. It's popular among managers to say management is a science but it isn't. It's a pseudo science. The essence of management is leadership, and leadership – moral or otherwise – isn't something they teach in business schools nor in any of the various management courses HP had. Budgeting, scheduling, recruitment, and the other things they do teach are only a small fraction of the job, important but not the most important things a manager does day to day. American business has a awful lot to learn about moral leadership.

One particular case in point of the 'scientific' management that was slowly changing the HP culture, and that I hated, was the employee ranking system that came into place in the 1980s. We never told our people how this system actually worked and for a pretty good reason. Somebody had tried to make a 'science' of this process by reducing it to a formal procedure. It was a very de-humanized process.

In the old days if an employee did something heroic that bailed a project out of trouble, he or she could reasonably expect to be rewarded for doing it. That couldn't happen anymore. The new mantra was 'sustained long term performance' and under this way of looking at things heroic acts no longer counted. Instead, all of us Level 62 managers periodically had to participate in an all day affair known as 'relative ranking.' We would gather in a big conference room and, one by one, compile a list of all our employees at a given job level – Level 58 for engineers with three years experience or less, Level 60 for the great majority of our engineers, and Level 62 Technical Contributor for the small fraction of people promoted to this next 'rung' on the 'technical career ladder.' The starting point for each list was the list that had been put together at the last meeting. Employee performance was divided into five categories: unacceptable (U); good (G); very good (VG); excellent (EX); and exceptional (XP). Except for the U category, each of these levels was 'defined' by one specific person. That meant there were four people who, all unknowingly, had suffered the misfortune of having been identified as the 'prototype' performer in each category. If Joe Blow had been tagged as the prototypical VG performer, that meant he was always going to be regarded as a VG performer no matter what. He'd be in the middle of that part of the list where 'VG people' were listed and he could not move up in the rankings no matter what he did. He could move down, of course; all he had to do in order to move down was quit doing a very good job. I never saw that happen in my time as a manager, but if it had somebody else – either the name just above his or just below his on our list – would then have become 'the prototype performer' in that category. But unless that happened, poor old Joe Blow was going to be a 'VG performer' until the day he quit, retired, or died. In effect, his job performance was no longer evaluated unless it happened to go bad.

The 'prototypes' were the anchor points for the rest of the list. Other people could move up or down within their category but it was a zero sum game. If one person moved up a notch on the list, somebody else moved down. This was because the number of people in each category, category U again being the exception, was forced to correspond roughly to a bell-shaped curve. We artificially forced a distribution. Of course, the Personnel department issued strict instructions that we weren't supposed to force a distribution. But if the final rankings turned out to violate the bell shape then the chairmen of the ranking session had to appear before the division manager and justify why the distribution had been violated. No one ever wanted to do that. So, while 'in principle' we didn't have to force a performance distribution, in practice we always did. Every single time. One consequence of this was it was very difficult for any of our people to change performance band, e.g. to move from a G performer to a VG performer, etc. If someone from the G band moved up to the VG band, someone in the VG band had to move down into the G band.

No manager liked to have this happen to one of his people because then he had the unpleasant task of explaining to his person why he or she had dropped into a lower performance category. It *was* possible for a person to climb into a higher category; I was able to secure this for a few of my people over the years. But it always started a nasty cat fight in the ranking meeting between two managers and it usually only

worked if the 'bottom' category person – say the bottom guy in the VG band – wasn't too highly regarded by his boss, who then didn't mind so much if his guy slipped down to G to make room for somebody to move up into VG. It was easier for a person to move within a category, although in practice nobody ever moved more than one or two places on the list during any one ranking session. It was easy because if you moved one notch in the VG category you were still VG and your boss didn't have any uncomfortable explanations to make. The only people who couldn't move were the prototypes.

You can see why we kept this process secret from our people. If what we were required to do had gotten to be common knowledge it would have totally destroyed all the teamwork on which the success of the division depended. Our people wouldn't have liked the fact that their job performance was secondary to the skill their manager brought to 'gaming' the other managers during ranking sessions. How do I know this? Because we Level 62 managers knew the Level 63 managers ranked *us* by the very same system and *we* didn't like it. When I'd first become a Level 62 manager, I'd entered the list at the VG level, most likely because I was entering it from the EX category of Level 61 (the level that immediately predated the introduction of the technical ladder; when the new system was introduced Level 61 was abolished), and if they'd put me in at the G level it would have meant a pay cut for me. They'd have had a hard time explaining to me why being promoted was accompanied by less pay. After I was initiated into the relative ranking rite, I knew right away I was going to be in the VG category for the rest of my days at HP. And I was. Not too surprisingly, there was next to no teamwork between Level 62 project managers in our lab except within a single project team.

I suppose this system was as fair as any unfair system could probably be. But it was just one of the many things that came into being once our people ceased to be people and became 'human resources.'

All around me I could see any number of signs that the new management culture at DMD was evolving away from the HP Way philosophy and with an Alzheimer-like pace was forgetting what the word 'company' actually means. In 1991, in response to a downturn in business, DMD had cancelled the annual company picnic in order to save money. The picnic had been a tradition at HP for decades and was one of the many largely symbolic but still extremely important ways of demonstrating that we were all part of something bigger than any one of us. When they reinstated the picnic in 1992, a lot of the higher managers were surprised that attendance at the picnic dropped to a fraction of what it had always been. Mitch understood. "You can't cancel a tradition," he remarked to me shortly afterwards. "It isn't a tradition anymore if you do." Mitch was right, of course. We had gotten the message the year before: *you people don't count as much any more.* That wasn't the message higher management had meant to send. But they didn't understand leadership or that leadership is the soul of management so it really wasn't too surprising to me that they didn't know how to lead. HP wasn't alone in this decay. In fact, my opinion is we were holding out against the trend better than most big companies across America. But the rotting of the social contract and the disappearance of moral leadership had infected us too.

Well before the end of 1992 my own morale was starting to sag pretty badly. It resulted from what I was seeing all around me as the company's very personality was becoming more dehumanized, the mounting economic consequences of that stupid decision to enter the commodity disk drive market, and the unrelenting stress of having to pacify John from EMC *and* fend off the efforts of my fellow managers to get the de-staffing of Coyote IV back under way again before the project was finished enough to succeed. It was a rare morning I could even make it to my desk without somebody running me down in the hallway to bring to my attention whatever the crisis of the day was going to be that day. I developed a painful eye condition in which the natural moisture that lubricates the surface of the eyeball dried out. Often what would awaken me in the morning was the sensation of being poked in the eye with a sharp stick as the inside of my eyelid would stick to my eyeball and thin layers of skin would be ripped off. I was having to lubricate my eyes artificially using Celluvisc® eye drops every few hours. The eye condition was caused by stress. How do I know? It went away completely after I left HP.

The Epicurean philosophers of ancient Greece had defined 'pleasure' as 'the absence of pain.' I was

on my way to lunch one day when all of a sudden it occurred to me that I had begun defining pleasure this very same way. My job was making an Epicurean of me. I certainly wasn't having any fun at work, so in the fall of '92 I started teaching again in the evenings for the Engineering in Boise Program. The difference between my day job and my teaching job was like the difference between sour and sweet. In my teaching job I was in continual contact with bright, fresh, eager young people who were a pure joy to be around and who really appreciated what I and my colleagues were providing to them. The classes were still evening classes, and afterwards I could drop in to one of Boise's downtown restaurants for a late supper and to listen to my musician friends perform if they happened to have a gig that night. All this was possible because I was no longer on call 24-7 the way I had been as production engineering manager. I continued teaching in the spring '93 semester, and at the end of the '92-93 school year I was surprised, honored, and very, very touched when the students voted to give me an Outstanding Teacher award. During all of 1992 and 1993, this was the only thing anyone said to me that meant, 'we appreciate you' right up until my very last day with HP.

My decision that after eighteen years it was time to leave the company happened in kind of an unexpected way. From time to time division managers and other higher level managers at HP would take management short courses. Occasionally the division manager – Bruce in this particular case – would decide it had been such a good class that he'd want to share it with all the managers in the division. When this happened, he'd order Personnel to see to it that every manager in the division would be scheduled and enrolled to take this class. We'd find out about it when the memo from Personnel came.

So it was that one crisis-filled afternoon I got a memo in the interoffice mail notifying me that I was scheduled to take the '7 Habits of Highly Effective People' class on such-and-such days at such-and-such time at such-and-such place. This sort of thing always had an uncanny knack for happening at the worst possible times during a project, so as you can guess I greeted it with something less than unrestrained joy. But it was something there was no possible way to get out of doing. The division manager had ordered it and that meant I was going, like it or not.

A couple days later I found myself sitting, early in the morning, coffee cup in hand, at a table at an off-site location so they could teach me how to be a highly effective person. Like Melody, I'm not a morning person but HP likes to start its training classes early. I was barely awake enough to know if I knew any of my fellow classmates. After some introductions and some preliminary talk, the instructor told us all to take out a sheet of paper and 'write down your goals in life.' She gave us about fifteen minutes to do this, but a second cup of coffee helped and at the end of the allotted time I had my list. Then it was *yak, yak, yak, yak* for the rest of the day.

The second morning, which came just as early as the first had, there was some more preliminary talk and then we were told to make another list, this one 'your job description.' I was tempted to describe how my job looked to me, but I played along and wrote down the job description for an R&D project manager instead. Then it was *yak, yak, yak, yak* again for the rest of the day. "Be proactive. Begin with the end in mind. Put first things first. Think win/win. Seek first to understand, then to be understood. Synergize. Sharpen the saw." I didn't think these 'seven habits' were exactly front page news, although it did occur to me Vashro could probably benefit from trying some of these for a change. Except the last one. He already knew about sharp saws. And sharp knives.

The third morning we were told to take our lists from the first two days, set them down side by side, and make a third list describing how our jobs supported our goals in life. I looked back and forth between the two lists over and over again. After fifteen minutes my third sheet of paper was still blank. I couldn't find one single thing in my job description list that supported one single thing in my goals list. Hmm. I proactively put first things first and thought *Rick, you have forgotten your aim.* Somewhere, somehow, sometime between 1989 and 1992 I had become one of George Santayana's fanatics.

I thought about this the rest of that day while the class droned on around me. Was anything I was now doing something working to fulfill my Promise, made so long ago in my special place that awful weekend

when President Kennedy had died? It was still true that the outcomes of my labors provided jobs for all those people who worked in production. For now, anyway. Tomorrow? That was a different question altogether. I knew those jobs were becoming less secure with each passing year as DMD struggled to survive in a marketplace we were ill-equipped to compete in, and the economic forces at work in that marketplace were things there was nothing at all I could do anything about. Greg had already started to have little private chats with me about the low profit margins picture beginning to take shape for Coyote IV. I could tell he was worried. And if Coyote IV margins were in trouble, I knew the story was going to be even worse for the three-and-a-half inch products planned to come along afterwards.

And the products themselves with each passing year had shorter and shorter useful lifetimes. Quite literally, the last product I worked on would disappear from HP's product catalog before the next one came out. The teamwork, the community, the *soul* of the company I had worked for all my adult life was disappearing like Lewis Carroll's Cheshire Cat right in front of my eyes. Worst of all, I had even let myself become a willing co-conspirator in an employee ranking ritual that put administrative process and procedure before people and which reduced them to being cogs in a machine. I looked into myself that day and I didn't like what I saw.

By the end of that third day I had made a decision. I would never forget my aim again. I would not be a fanatic anymore. By the end of the third day, I knew HP and I had come at last to a parting of the ways. It had been eight years since I had received my doctorate degree and I felt I had long discharged the obligation of gratitude to the company for all the support it had given me in the old days that had made that accomplishment possible. Now the time had come to move on.

I had good reason to think the Engineering in Boise Program would very soon have some full time openings for permanent professors despite the Idaho Republican landslide in the 1992 elections that followed after the gerrymandering of our electoral districts. Micron Technology, which was then on its way to becoming Boise's largest employer and whose shareholders included the two wealthiest businessmen in the state, was pushing for the establishment of a more 'permanent' program in Boise – one not so dependent on the use of affiliate professors and that would be staffed by professors who worked for the state. Even though Idaho's Republican legislature can usually be counted on to be education's worst enemy, the politicians could not and would not ignore the special interests pressure Micron's owners could bring to bear on them.

The 1992 election itself had been a disturbing one even on the national level. On the whole I thought President Bush had done a pretty good job but not one without its disturbing elements. Like everyone else I had celebrated the fall of Communism when the Soviet Union finally collapsed early in his term, but I was deeply disturbed by the unfettered free market capitalism that had been urged upon the new Russian Republic by the political ideologues of the national Republican Party. These people can always be counted on to see this nineteenth century model as the answer to everything, but it isn't. The rise of the robber barons in America in the nineteenth century and the violent countermovement in the rise of unions at the turn of the century proved the flaw in this way of thinking. Unfettered free market capitalism is a good thing if you happen to be John D. Rockefeller or Andrew Carnegie. It's not such a good thing if your name is Molly McGuire. President Roosevelt – Teddy Roosevelt – had known that and had fought back successfully against the rising tide of feudalism in America that had become pervasive in his day. I believed then, and I believe now, that if unions were all abolished tomorrow we would need them again by Monday of the following week. Unfettered capitalism is not and has never been the secret to America's success. Free enterprise, yes. Unfettered, uncontrolled capitalism, no. But the latter was what had been presented to the Russians. They tried it and conditions for their people soon worsened. A still-nuclear-armed Russia sliding into economic chaos was the most dangerous thing I could imagine.

I had nothing but praise for President Bush's leadership in the First Gulf War. Quite frankly, I had been very worried when that conflict first began. Iraq had a huge army equipped with Soviet hardware and before the war began few of us outside the military knew how amazingly effective America's military

technology would prove to be. Crushing Granada or Panama was one thing. Iraq looked very much like it was going to be a different story altogether. But America had new and competent military leaders now in Generals Powell and Schwarzkopf and a capable Commander in Chief in President Bush. Two decades and the lessons learned from the quagmire of Vietnam had made all the difference in the world. I had been amazed, inspired, and awed by the professional way America's new leaders dealt with the threat. Like a lot of people, I was initially disappointed we stopped where we did, but it didn't take me long to see that this was precisely what had had to be done. President Bush had clearly articulated the war objectives from the very start and he had stuck to them. The only thing I hadn't liked about it was the way Congress had once again failed in its duty and refused to *declare* we were going to war as part of the U.N.

On the other hand, America had slid into a deepening economic downturn after the war and I hadn't seen any effective steps being proposed by President Bush to do something about it. Congress, of course, wasn't doing anything about it either, but it is the President's job to step up and lead and I thought President Bush should have been doing more than he was. Still, if this had been all there was to it, I would have again supported him for re-election. But that wasn't all there was to it.

In the summer before the election, my phone rang one evening. It was a fund raising call from the Republican National Committee fund raising people. I hadn't been giving any money to them for quite a while by then, but my name was still on their rolls. When these calls come in, the caller basically just reads from a prepared script that outlines the party's basic campaign themes for the election. I could always tell just exactly what the Republican campaign was going to look like after one of these calls. This time there was only one item on the agenda.

"We have to get the word out," the caller told me, "about what a sleaze bag Bill Clinton is." I was just stunned. She actually called Mr. Clinton a 'sleaze bag'; those were the exact words. In over fifteen years of involvement in Republican national politics, I had never heard anything even remotely like this before. There was no other theme. Bill Clinton was a sleaze bag and he had to be stopped. That was it. As she continued to read, it didn't take long for a chilling fact to emerge. The fundamentalists had taken over the Republican Party. The old Reagan coalition – the real one that had brought me into it in the first place – was gone and the new one was something I wanted no part of. I declined to give them any money.

But that phone call was a wakeup call and a reminder to me that a change for the worse was taking place across the culture of America. Important things – attitudes and folkways – I had always taken for granted were changing now. I could even see signs of this in the workplace at HP. One of these, believe it or not, was what was happening to Doug Clifford. When DSS was re-absorbed, Doug was out of a division manager's job. You can't be a division manager without a division. Doug was still an employee. But he had no power and no position that I could see. Neither could any of my friends. I didn't know what his job now was, and neither did any of the rest of my colleagues from the project manager level on down. In a kind of cruel jest, somebody had hung a sign on the outside wall of his cubicle: *Will manage for food.* Doug and I had never been, and never would be, boon companions. But I still didn't like the looks of how the company appeared to be treating him. I thought about this during that third day of the '7 Habits' class and an old limerick Mom liked to recite every now and then for some reason came to my mind. It went

Here's to me and here's to you
And here's to love and laughter.
I'll be true as long as you
And not one second after.

A company has a right to expect loyalty from its employees as long as that company is honest, is a good corporate citizen of our country, and treats its people with dignity, respect, and a sense of ethics. But loyalty cuts both ways. When a company even starts appearing to lack loyalty to its people, it no longer has any right or even any reason to expect its people to be loyal to it. The social contract is broken. This, too, was in my mind that day and another reason I knew HP and I were done with each other.

That evening I did something I hadn't done in a long, long time. I began putting my resume together.

IX. The Clinton Years

As 1992 turned into 1993 a bolt from the blue fell. My long time friends, Steve and Chris, were getting divorced. To say the news surprised me would be like saying summers in Phoenix can get mildly toasty. I'm not at all going to go into the details of what happened between them. The only reason I knew the story was because I offered to let Steve stay at my house while he looked for a new place of his own. Both he and Chris thanked me for this; their divorce wasn't going to be friendly. If not for this, the story wouldn't have been any of my business and it sure isn't any of yours. Both Steve and Chris were and are my friends and I didn't take sides in the matter. But I did feel just awful about it.

Because Steve was living with me he knew I was planning to leave HP soon. As the Idaho Legislature began holding its sessions, every evening after work – after, that is, I got home from teaching – I turned on the TV and watched the *Idaho Reports* show on Boise's public television station. Back then this show came on nightly when the legislature was in session and reported on the major events that had taken place in that day's happenings. I was watching the progress of the bill to establish the appropriation for the Engineering in Boise Program, the purpose of which was to fund the staffing of the program with a permanent faculty. Steve couldn't help but notice I was watching this closely, he asked me about it, and I told him what I was planning to do if the appropriation passed. I didn't have to ask him to keep this to himself. He was my friend and he didn't breath a word of it to anyone.

The Engineering in Boise Program wasn't my only possible option, of course. With my resume there were a lot of places, both in academia and in industry, where I could land a job. But I no longer wanted to stay in the private sector and I did not at all want to leave Boise. In fourteen years it had become my home and my roots – aside from my family – were here. For me becoming a professor with the Boise Program was perfect. The day the Legislature finally passed the appropriation, I let out a whoop of joy. Steve congratulated me. The very next day I gave my resume to Bob Rinker and became the first applicant for the new positions that had just been created by an act of the Legislature.

The new professor positions belonged to the Boise Program but were part of the University of Idaho. I felt pretty confident about getting the job. After all, I knew most of the UI faculty personally, except for seven brand new professors on the Moscow campus, and they knew me. Nonetheless, there were something like one hundred sixty applications for the three available positions and I went through the same process everyone else did. There are very strict procedures and rules that governed the University's hiring process and representatives from the UI's Human Resources department – yeah, this management mind set infected the academic world, too – sat on the search committee to see to it all these rules and procedures were scrupulously followed. Nonetheless, I made the short list of finalist and took a couple of days of vacation in order to travel up to Moscow, three hundred miles north of Boise, for final interviews. These went well and I anticipated the job offer would come around March or so. There were no guarantees, of course, but I had no serious doubt but that I'd be offered one of the positions.

This timeframe looked like it would pretty closely match the end of the Coyote IV project. We weren't quite done yet, but the project schedule was projecting this timeframe for completion and by this time there were few uncertainties left that could seriously jeopardize the schedule. That left me with one more important thing I had to do for HP. I had to let Greg know I would be stepping down as a project manager at the end of Coyote IV. I wasn't prepared to tell anyone out there yet that I was leaving. I thought it was foolish to quit one job before landing another one. But I had to make sure they wouldn't be planning to put me in charge of another new product development. The division had enough huge problems surviving in that marketplace as it was, and I didn't want to chance hurting the launch of the next major new project by having its manager quit just as it was getting started. I was taking a risk by doing this; it was still very possible I was overestimating my chances of being offered a job by the UI, and if I didn't get the job I'd be demoting myself out at HP. But I didn't think it was too likely I wouldn't be receiving the offer, if I did receive it I knew I'd accept it, and I certainly didn't have the right to protect my own interests at the

expense of those of my friends and colleagues at HP. I had to step down, and I had to do it before I'd know if the deal with the UI would be finalized.

The time came not long before the end of the project when Greg called me into his cubicle to discuss my post-Coyote IV assignment. As it happened, the strategic decision had already been made that Coyote IV would be our last five-and-a-quarter inch disk drive. From now on the new product developments were going to all be three-and-a-half inch drives and it also looked like Greg's section would most likely be split up and a lot of the R&D lab reorganized. I imagine this was probably a difficult time for Greg since major reorganizations like this are usually a tough time for Level 63 section managers. He had barely opened our discussion when I told him I did not wish to be a project manager after Coyote IV. I think in one way he was a little surprised by this, but in another way not too surprised. He knew Coyote IV had not been fun for me. Whatever his thoughts and feelings really were, he accepted my decision and said he'd arrange for me to return to the bench after the project ended.

March came and went without any word about the job from the UI folks. That did start to worry me a little. They were taking an unusually long time about making up their minds and that could mean almost anything. It might mean, for example, that they had some exceptionally strong candidates in their pool of finalists and I wasn't as good as I thought I was. Coyote IV did take just a little longer to finish up than I had expected, but it, too, finally came to an end and no word about the job. I had hoped to make a clean break immediately after the project ended, but now it was turning out that I'd actually be starting work, as a development engineer again, on the next project.

As it turned out, the delay at the UI's end of things had happened because they were wrestling with a tough decision. I had been interviewed with the idea in mind that I would teach electronics, and they did have another strong candidate for the electronics position. He was a young, newly graduated Ph.D. named Jake Baker. All the extra time apparently was being spent wrestling with the decision whether to hire me or Jake. You see, academic departments have specialties within the field and what they wanted to do was to set up a different specialist in each of the available positions. But at the same time they wanted to hire both Jake and me. It was a dilemma for them. They were eventually able to resolve it by realizing that electronics is kind of a big deal in electrical engineering and it wouldn't hurt in the least to have extra manpower in that area in a program for which the biggest Boise area advocate was a company that made its money in electronics. They also remembered that I was a system theorist and could therefore handle the academic equivalent of a 'utility infielder' position, and therefore they could justify hiring us both. And that is what they eventually did.

But they weren't able to reach this decision until the end of May. By then I was part of a new team and had started working on a fairly minor and routine assignment. My new assignment had come about in a kind of curious way. At least it was curious to my way of thinking. After Coyote IV ended I found myself being sent around for little chats with different R&D project managers, and in the course of this I ran into something I hadn't expected. All these guys had known me and known my reputation as an R&D engineer for many years. But I had spent the past four and a half years as a manager and most of them seemed to take it for granted that meant I'd somehow forgotten how to be an engineer. My guess is that all of them had spent enough time away from the bench to lose confidence in their own abilities to design and invent, and they just assumed their situations were no different than mine. Anyone who really knew me would have known better than to assume this, but that's what they seemed to assume.

The main consequence to come out of all this was they decided to reclassify me as a Level 60 engineer rather than, as I had expected, move me over to a Level 62 Technical Contributor position. The latter was the 'dual ladder' equivalent to the management position of project manager, but it was a job classification for which less than ten percent of the engineer workforce was classified. Because they doubted the fact I was still up-to-date on technology, they didn't want to 'risk' putting me into a category that by definition was reserved for the best engineers. A good, old fashioned HP technical interview could have answered their doubts in quick order, but they chose not to subject me to any technical interviews. I've always

assumed they were afraid of embarrassing me, and if that's what they were thinking then I suppose it was meant to be a kindness. Or maybe the idea might have been that once I'd proven myself again in the Level 60 position they'd be able to 'promote' me back to my previous level. (Level 62 TC was a category that hadn't yet been in existence when I first became a project manager; I was a Level 61 at that time. But all the Level 61 folks had been 'grandfathered' into Level 62 TC spots when the new system started). Whatever the thinking might have actually been, demoting me to Level 60 meant I wouldn't be seeing any pay raises for as long as I remained in that classification. They weren't going to actually cut my salary – at least not right away – but the fact was I was making more money than any other Level 60.

I didn't think they handled this transition with a great deal of people skill, but I didn't actually resent it. It was part of the risk that came with stepping down and however events played out I was willing to accept the consequences. I knew I wasn't going to be around all that long, one way or another, anyway. And in truth my new assignment was pretty unimportant, not that interesting, and I didn't have a great deal of enthusiasm for it anyway. After all those years of front line duty in what I had come to think of as 'the disk drive wars,' I was just pretty tired of it all. I guess you could say I had a bad case of combat fatigue.

In any event, the situation didn't last longer than a couple of weeks before the letter offering me a faculty position came in the mail. The letter, dated June 1st, was from Dick Jacobsen, who was then Dean of the College of Engineering. I'd be reporting to Joe Feeley in the EE department. A university distinguishes between a 'program' and a 'department.' The faculty members in a 'program' officially 'belong' to an academic department. The Engineering in Boise Program was a program and that meant my official boss – the guy who would do my performance evaluations and decide on matters like pay raises – wasn't Bob Rinker in Boise but rather Joe up in Moscow. Bob was my 'dotted line' boss.

I called Joe on the phone that night and accepted the offer. Beginning August 15th of '93, I would start work as a tenure-track assistant professor of electrical engineering with the University of Idaho. By accepting this offer, I was taking a pretty big pay cut. My new job had a salary about forty percent less than what I was making with HP. But that was unimportant to me. What was important was that now I would be working to keep my Promise again, something I resolved never to lose sight of ever again.

Now that the deal was closed, it was time to let them know out at HP. The first thing the next morning I asked my new boss for a one on one meeting. I'd known Ken casually for quite a few years, but not really all that well. (He wasn't Ken Jochim; he was a different Ken). I liked him well enough, but we'd never worked together before. At that meeting I told him I was leaving HP. His reaction surprised me. His eyes got very wide and the first thing he said was, "This isn't because of *me* is it?" It had never occurred to me he might think there was something personal in this. No, I reassured him, my decision didn't have anything to do with him. I explained that I had decided to go into teaching and would be starting with the Engineering in Boise Program as an assistant professor come fall. That seemed to come as a relief to him and he congratulated me on my new job and even had the grace to say I'd be missed. In turn, I said I was going to miss all the people here at HP, and I really meant that. I didn't say I was going to miss *working* with them; I wasn't going to miss working at HP at all. But I was going to miss *them* and I knew I wouldn't be seeing some of them very much any more and most of them ever again.

We shook hands warmly and my days with Hewlett Packard were unofficially over. My official last day would come a few days later, but for all practical purposes my meeting with Ken was my last real act as an HP employee. It was eighteen years to the day since that now long-ago and far-away time when I had first arrived in Mountain View as a brash twenty-one-year-old kid who was two hundred dollars in debt to the company.

The speed of the employee grapevine at HP had long been an object of awe and wonder to every one of the managers. But news of my resignation swept through the division via the grapevine faster than any other bit of news I had ever seen. I didn't even have time to get back to my desk before Greg heard about it. We bumped into each other in the hallway as I was heading back and Greg gave me a kind of bitter

sweet smile but with no trace of surprise whatsoever showing in his expression. “I always thought you’d do this a long time ago,” he said. I couldn’t do much more than nod. I was glad somehow that it had turned out so I’d made my resignation to Ken. It just wouldn’t have felt right if I’d had to turn in my resignation to Greg. He is my friend and, really, the best boss I’ve ever had or ever will have.

The afternoon of my official last day a bunch of the guys I’d worked with for so many years threw a farewell party for me at the local pub we used to hit on Friday nights after work. Mostly they were guys who had worked for me on Coyote IV, but other old comrades also joined in. I was very, very touched by this. I was going to miss each and every one of them very, very much. I was happy to be moving on, but I would never, ever forget all those years and all the times – the good and the bad – we had been through together. We were *comrades,* and we always will be. Mingled in with my good feelings was a palpable kind of melancholy as well. A song my friend John Hansen had written kept going through my mind over and over. It seemed to speak to the heart of my long career with HP:

Though you might have lasted a lifetime
All good things must end.
I’ll say goodbye. This is a nice time
To say you were my friend.

You kept me warm in the cold.
You gave me strength.
You took me in.
I watched you grow.
Now you’re running over length.

And though you might have lasted a lifetime
All good things must end.
I’ll say goodbye. This is the right time
To say you were my friend.

I was now between jobs and it was a strange feeling. This was the first time since I was ten years old that I didn’t have a job to go do or full time school to attend to. It was a kind of emotional punctuation mark. An important chapter of my life had ended and a new one was beginning. □

Assistant professor (1993-4 school year)

There was a two month hiatus between the time I left HP and the start of the 1993-94 school year. Because I wouldn’t have a paycheck during that time I didn’t plan on any expensive vacation trips and I generally watched my spending. As it turned out, though, I only had to go a month without a salary income (my investments were bringing in money, but I always kept that money dedicated to my stock and bond market accounts except in case of emergency, and this wasn’t an emergency). Although my employment contract with the Idaho State Board of Education, who were also the regents of the University of Idaho, only ran for nine months – the latter part of August through the first part of May – and I was only paid for these nine months, the SBOE had a policy that university professors were paid across the entire state fiscal year, which ran from July 1 to June 30. That meant each paycheck was only about seventy-five percent of the earned amount but it also meant I started receiving pay from the university a month before I actually did any work for them. I found this out in mid-July when my first UI paycheck came. I initially thought it was a mistake and I asked Bob Rinker about it. That’s how I found out about the state’s stretched out pay system.

What I did instead was hang around the house during the day catching up on my reading and hang around the downtown music scene with my non-HP friends at night. When our regular poker game, the same one that had started way back my first year in Boise, came around, I'd drive out to my brother Vern's house and take my usual seat at the poker table. This was the only semi-regular contact I had with my old comrades from HP. Our poker game wasn't a high-roller affair. It was twenty dollar buy-in, nickel ante, table stakes, and pot limit. Occasionally someone could manage to lose as much as a hundred dollars at one of these, but he had to be a pretty bad poker player to lose that much money at one of our games and I'm not a bad poker player. All in all it was a very pleasant two months and I hadn't realized just how much I needed a break. Physically I felt better than I had in a long time; I just hadn't realized how stressful my last few years at HP had been. Now I was living with no stress at all. There must have been some kind of healing that went on during this break because that problem with my dry eyes slowly went away for good. I stopped needing all those regular applications of moisturizing eye drops. I stopped needing *any* of that.

Although I hadn't turned forty yet, my beard had started showing streaks of white over the past few years and its original dark reddish-brown color had faded to a light reddish-brown. I guess I must have looked quite a bit older than the calendar said I was. I came to realize this on my last day at HP when I was talking to one of the women who worked as a skilled operator in DMD's magnetic head lab. Somehow the subject of age had come up and I'd invited her to guess how old I was. "You're not too old," she said. "I'd say you're in your early fifties." She was mortified when I told her I was thirty-nine. For my fortieth birthday that September, Ruth gave me a tube of Just For Men® beard, mustache, and side burn gel. As with any gift, it's the thought that counts. But I didn't use it. I don't think I'm immortal and it goes against my grain to try to make people think I'm something that I'm not. Like twenty.

When I found out I actually did have an income in July I took one trip. I went back to Iowa to see my family and to see Glen, my brother and college roommate, who was by then living in Davenport and working for the City Engineering department there. Aunt Hazel's health had gotten pretty frail by then and she was now on an oxygen tank that went with her everywhere. Iowa had legalized riverboat gambling and both Mom and Aunt Hazel loved to go to the riverboats. We, the three of us, had some very fun outings there. I'd do the driving and we'd spend the day in the riverboat casinos. Mom and Aunt Hazel liked to play the slot machines and I got a big kick out of watching them. And, of course, I played the slots myself a bit. Dad and Uncle Wayne disapproved of gambling and would sort of glower at us when we got home. I think Dad also hated to be left alone while we were down in Davenport or up in Dubuque. His body was practically melting off his bones by then and he looked terrible. He'd gotten into the habit of saying some pretty morbid things. I hated watching him decline like that, hated the way his age and disease were slowly robbing him of his dignity and of any real joy of life. He had become a frail little man almost wholly dependent on others. His fire was out. Dad would turn eighty that September.

I've always been very glad I made that trip. Aunt Hazel died the following year. When she did I lost my second mom. I carry her with me now in that special, sacred place in my heart. □

With the start of the school year in August I began this new chapter in my life. It had been twenty years since that day I had resolved to have the same job as my old advisor, Dr. Triska. Now I did. As I like to put it, I had 'gone public.' I was finally really and truly Professor Wells. Randy's sneering old nickname from our sixth grade days had become a fact rather than an epithet. I wondered my first day if he'd learned how to pronounce 'Einstein' yet. I doubted it. 'Parole board' maybe. But I don't know whatever became of him and I don't care.

Our new faculty was a small and closely knit group. Bob was the administrator of the Program and there were a total of five of us teaching in the program. Our senior guy was Jim Peterson, who was a tenured full professor from the EE department up in Moscow and had volunteered to move down to Boise and join the program. Jim had been on my doctoral committee eight years earlier and had been the EE department chair at that time. The rest of us were tenure track assistant professors. Richard Wall had been

hired by the Moscow campus three years earlier and had been assigned to the Boise program. Young Jake Baker, an ex-Marine Corps officer was there, as was Herb Hess, a former Army officer who was now a major in the Army Reserves. Axel Krings, a young computer science professor from Germany who had gone to school in Nebraska, would join us to teach computer engineering the following year.

With my brothers Glen and Al at Al's house in Wisconsin (January, 1994).

My midlife change of careers startled my family and my other brothers, just as it had startled my friends and colleagues at HP, but I don't think it surprised them very much. It was still unusual at that time for a person to deliberately choose to make less money, but in the years to come more and more people of my generation came to make the same kind of choice as I had. During Christmas break in '93-94 Glen and I took a little trip up to Wisconsin to visit Al and his wife Kathy, and Al just chuckled when he found out what I had done. Al was running a pharmacy and he understood from first hand experience the 'joys' of managing any kind of enterprise.

We had about twenty seniors and twenty juniors in the program that year, and this number stayed pretty constant for as long as the program lasted. It was a small, intimate setting – all housed on a single floor of BSU's Technology Building – and I knew every single student personally. We had just two resident graduate students in the program that first year, but a few of the seniors would go on for graduate studies with us the following year.

I call that first academic year my One Perfect Year, mainly because it was. The Program had been set up to provide a college education in engineering for non-traditional, place-bound students, and part of this was that all our classes were evening classes. Each of us taught two classes, with the first class period starting at five-thirty and the second starting at seven o'clock. Classes ran for an hour and a half each from Monday through Thursday with no classes on Friday evenings. I'm something of a night owl by nature and not having to start work until late in the morning felt like a real luxury. Friday was research day for me. In the late afternoon before classes started, students would often show up early and come into my office to ask questions and get help on homework. Most of them were still pretty young, in their early twenties on the average.

I loved working for those young people. I loved helping them understand the new things they were learning, I loved advising them, I loved just talking with them. I discovered something about myself in the course of this. I discovered that even if I was in a bad mood about something, that bad mood would melt away into the nothingness just as soon as I saw one of the students and be replaced by a feeling of contentment that lasted for the rest of the day. I was in the business of helping people make their lives better, helping them prepare for a long and successful future, and I don't think there's a better feeling than that to be found anywhere in the world. For the first time in my life, I *knew* without any doubts or reservations that I was keeping my long-ago Promise. Young people are the future of our country and there is no possible doubt that *this* was what I could best do for my country and for God. My life had become a life of direct, personal service to real people and not to any abstract entity or ideal. How could anyone hope for anything better than that? What could *be* better than that? For me the answer is: nothing.

The students were bright, dedicated, honest, hard working, and, yes, a bit naive. They were still in the full vigor and bloom of the high summer of their lives, untainted as of yet by the wearing grind of years of toil that so often beats down so many older people as they pass through life. Their freshness, vigor, and youth is contagious, and working with and for them made *me* feel fresher and younger than I had in years. Emerson had seen a pristine truth when he had written

So nigh is grandeur to our dust,
So near is God to man,
When Duty whispers low, Thou must,
The Youth replies, I can.

Then there was the research. The University of Idaho is Idaho's land grant university and is charged with the mission of conducting research. It was expected and required of every professor that he or she engage in scholarly research and publish the results through the venue appropriate to his or her field. For me that meant refereed journal and conference papers. My principal research was, of course, the old question of how to make an electronic brain. But I also realized this was very basic and very speculative research work and I couldn't count on this alone to yield enough results soon enough to satisfy the criteria for publications I would have to meet to win tenure in six years. The consequences of failing to win tenure at a research university are a bit on the Draconian side. Denial of tenure means you're fired. To be denied tenure at one university also means it is next to impossible to land a position as a professor at any other research university. To be denied tenure is the academic equivalent to being excommunicated.

Most people outside the academic world do not understand what tenure means. I have met many people who think tenure means you cannot be fired. This is not true. A professor, even a tenured one, can be fired for failing to satisfactorily do his job. He can be fired for misconduct. He can be fired for stealing or for committing any felony. A tenured professor can be fired for most of the same reasons you can be except for these: He cannot be fired because of his opinions, because of voicing his opinions, because his discoveries present truths people do not want to hear, or because someone in authority just doesn't like him. For example, like all professors at all state universities, I work for the state. Ultimately that means I work for the Governor of Idaho and, less directly, for the Idaho Legislature via a chain that runs from the Governor through the State Board of Education (SBOE), the President of the University, the Provost, the Dean of my College, and the Chair of my Department. But because I am tenured, the Governor cannot fire me, nor can anyone else in that chain, without a hearing that establishes that I have committed a firing offense. And that hearing is conducted by an academic board of my peers. In its own unique way, HP also had a kind of tenure system in the years that I worked there, although certainly one much less formal. Take my problem with Vashro for example. I know full well he wanted to fire me but HP's system wouldn't let him. Tenure removes caprice and petty vindictiveness from the process, it protects the academic freedom necessary for the pursuit of truth in a world often implacably hostile to truth, and it *ensures justice.* Would you work for a bunch of politicians without some kind of safeguard? Neither would I. Can the tenure system be abused? Yes. What can't? But abuse of it doesn't happen very often.

Tenure isn't automatic and it isn't just a matter of putting in six – or some other number of – years on the job. First, going up for tenure isn't optional. If you're a tenure track professor you're going to go through that process when the University says you are, ready or not. Next, before a tenure track professor can be awarded tenure, his performance and track record is reviewed by three different committees – one at the department level and followed by a vote of all the department's tenured faculty members, then again by a committee at the college level, then another one at the university level – then by the Provost, and then by the University's President. Even after that, the SBOE has the final word on whether or not tenure is granted. But once it is, none of them can take it away again without due process and just cause. Politicians hate that, which is why so many of them would like to abolish the tenure system.

So, for at least the first six years there would have to be enough breadth in my research to yield publishable results. 'Publish or perish' isn't a slogan at a university; it's a reality. Fortunately, almost all of the basic theoretical elements of the electronic brain project also had applications to more traditional and 'main stream' areas of engineering research. The publications requirement would slow down my principal research, but it wouldn't stop it. And the bulk of this more traditional research work would be carried out by graduate students under my direction. I would be closely involved with it, naturally, but the really time consuming parts of it were done by my graduate student research assistants. Private sector industry people call this 'leverage.' Graduate school really is the last remnant of the old apprentice system

set up by the European guilds of the Middle Ages.

It requires external funding – grants or contracts – to support graduate students so I got in touch with my old friend John Stedman. John had returned to Boise after completing the start up of the Bristol division in England and was now a vice president in charge of HP's network products business unit. John had always been one of the best supporters and advocates of engineering education in Idaho, and he arranged for me to meet with some of the folks on the printer side of the HP site. As it turned out, these guys were interested in neural network research and I was able to negotiate a nice grant to study this. It was a philanthropic grant, which basically meant there were no strings attached other than that the research involve neural networks and that once a year I report to them what I had done with their money and what we had found out. That particular grant ended up lasting for four years and three graduate students were able to get their degrees because of it.

I came within a hair's breadth of landing a very prestigious contract that first year with the National Science Foundation as well. The Engineering in Boise Program was in the main an undergraduate education program and NSF had a program called Research Experience for Undergraduates, or REU, that was funded out of NSF's directorate that supports scholarly activities for the development of human resources (yes, there's that term again). The principal objective of NSF's REU program is to encourage more of America's best and brightest undergraduate students to go on to graduate school and take up careers in research. The program particularly aims at doing this by providing funds to make it possible for students from small colleges and universities, where opportunities to engage in research are limited, to gain experience in the world of research. Because we were located on the Boise State campus, our undergraduate students fit this description like a hand in a glove.

I wrote up an REU proposal and sent it in to NSF. In January of 1994 I received a phone call from the NSF program officer in charge of engineering-related REU contracts. If I would make a couple of minor changes in my proposed budget, she told me, she'd recommend my proposed REU site be funded. The changes were very minor and I happily made them. Everybody in the program was very excited about this because REU sites are very prestigious and the idea we were going to become one seemed almost too good to be true.

Unfortunately, it turned out it *was* too good to be true. In August of '93 President Clinton had signed into law the Omnibus Budget Reconciliation Act which, among other things, mandated a balanced federal budget be achieved through 'implementation of spending restraints.' One of these 'restraints' turned out to be cutbacks to NSF's budget. They had planned to fund thirteen REU sites that year but with the new 'restraints' ended up only being able to fund twelve of them. Mine was unlucky number thirteen, the one that got the federal ax. Needless to say, all of us were very disappointed when we received the news.

Still, in spite of this disappointment, my new career had started off very, very well. After classes ended in the evening if any of the students wanted to talk with me about something, I'd hang around and we'd talk. Sometimes it was about homework, sometimes it was about something that had been said in class, sometimes he or she would just want to talk. It didn't matter to me. I was happy to stay around as late as they wanted. Other nights, if the students didn't need anything, I'd go downtown for a late supper and catch the gig if any of my musician friends happened to be playing. It was my One Perfect Year. □

Maryann, my third sister.

My One Perfect Year had just barely ended when the most tragic of news came from Iowa. My sister-in-law Maryann, Bill's wife, had been killed in an auto accident. In a heartbeat in time, a

warm, loving, vibrant member of my family had been taken from us. Maryann and my niece Marnie had been on their way to someplace in Cedar Rapids and Maryann hadn't noticed the stop sign at an intersection. She ran the stop sign and her car was hit broadside by a truck on the driver's side. She died a short time later in the hospital from her injuries. Thank God, my niece Marnie, who I'm told was riding in the front seat, wasn't hurt.

I had been sixteen when Maryann and Bill got married and their wedding had been the first time I'd seen a Catholic mass. Maryann's brother was a priest and he had performed the wedding ceremony. Her family lived in Chippewa Falls, Wisconsin, and her mother, Marvel, really was a marvel. I had liked her and her family from the very first time I'd met them, and it isn't usual for me to take to strangers so fast. Maryann had been working as an airline stewardess –nowadays called 'flight attendants' – when Bill met her, and Bill had become Catholic in order to marry her. From the very start Maryann had always treated me like I was her own kid brother, had learned how to get away with teasing me like Sherri did, and I had come to love her very much. Now I flew back to Iowa to attend a much sadder mass. 1994 was the first of four black-wreathed years. □

The Wells Laboratory in Boise. Left to right: Gary Bartles (RA), me, Ken Blair (the computer administrator for the Boise program), Steve McCarthy (RA), Mark Laverty (RA). RA stands for Research Assistant. An RA is a graduate student.

The 1994-95 school year started off as well as the '93-94 academic year and for the most part was almost as good a year as the first had been. I was able that year to draw enough external funding to establish my own research laboratory within the program to support my first graduate student research assistants (RAs), and I was also appointed to the Graduate Faculty, which meant I could now serve as major professor on graduate students' graduate committees. A major professor is a graduate student's principal academic and research advisor and this is always a very close relationship not too much unlike the master-apprentice relationship handed down from the old guilds of medieval Europe.

The first new contract began with the ringing of my telephone in my office late one morning. The caller was none other than my old boss, Greg. It turned out Greg had also moved out of DMD and was now running an R&D section on the Laserjet printer side of the HP site. His section was responsible for advanced technology development for HP's Laserjet printers and his people carried out applied research rather than direct product development. This was in itself a bit unusual for HP; most such research work is carried out by HP Laboratories down in the Bay Area. From time to time a product division of HP might set up an operation of this sort, but line managers at these divisions tend to be unable to resist the temptation to raid these operations when a product development project gets into trouble. It is one of the main symptoms of American corporate management's inability to stick to a strategic outlook.

It would turn out that Greg's group would be more successful than most within HP. A year later his operation was a full-fledged R&D lab and Greg became a lab manager – a significant promotion. He had called me that day because one of his engineers, an experienced old-timer named Tom Camis, had made a successful case that they needed a highly accurate and sophisticated computer model of the physical processes involved in laser electrophotography. The main selling point of this idea was that if such a computer model was 'user friendly' enough, they could use it as a computer-aided-design (CAD) tool to reduce the costs involved in new printer development. Greg didn't have the staffing to carry out this work but he had remembered my modeling work from the Eagle days. Would I be interested in doing this work? Would I? You bet. In a New York minute. When he found out a university partner could do a job like this at a fraction of what it would cost HP to do it internally, that sealed the deal. He was originally

thinking in terms of a relatively short term project, but as it would turn out the model would meet their needs so well that our research partnership ended up lasting for ten years. Greg and I still bump into each other every once in awhile, and when we do he always teases me about how long-term the relationship coming out of this phone call ended up. "I should have known that once you let a camel get its nose in the tent," he said to me one time, "pretty soon you've got the whole blasted camel inside." Our research partnership went so well that a few years later HP honored me by officially designating me as an "HP Master Researcher." At the time, I am told, I was one of only six university professors world wide to be honored with this designation by HP. That is something I will always be pretty proud of.

Gary Bartles was the first in a line of half a dozen graduate students to benefit from this contract. Gary had graduated the year before with his bachelor's degree in electrical engineering from the Boise program. He was the kind of non-traditional student I call a 'second-timer.' He lived with his wife and children in the little town of Parma near the Idaho-Oregon border. As a kid fresh out of high school, he had attended the UI in Moscow, officially majoring in business but factually majoring in beer and girls. After flunking out he had gone to work in a bank and a few years later, after the Engineering in Boise Program started, he had taken advantage of the opportunity it presented and went back to school. This time he had the maturity and judgment needed to succeed and he was an excellent student. During his last undergraduate year he had decided he wanted to continue on and study at the Master's level.

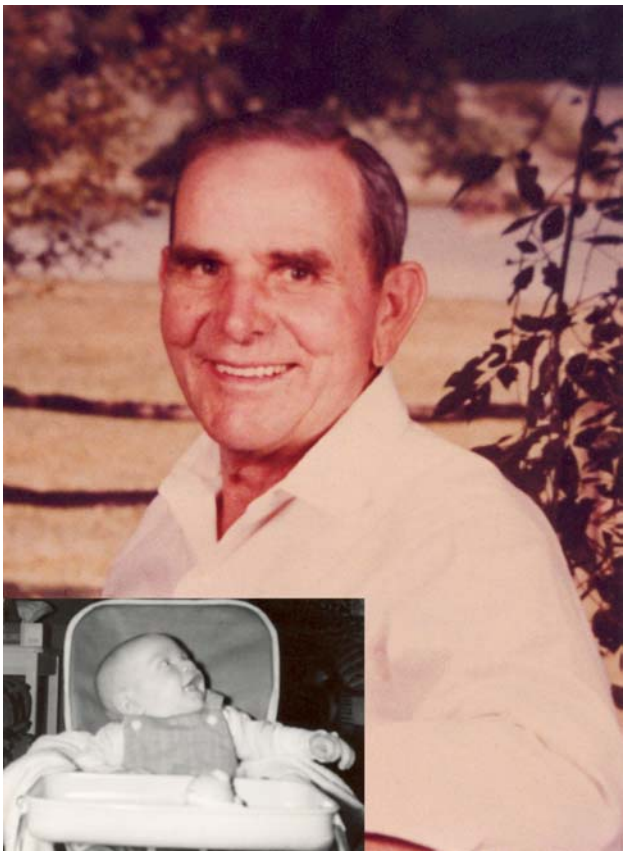
What most young kids fresh out of high school aren't too aware of is that your college record follows you forever. Gary's grades in the engineering program were good enough to get into all but the most exclusive graduate schools in the country, but these were weighed down by the abysmal grades he had earned his first time in college. As a result, his lifetime grade point average (GPA) fell below the minimum required by the UI for admission to graduate school. But there wasn't any doubt he had the mind and the dedication to succeed at the graduate level, so I went to bat for him and petitioned the UI to admit him despite his GPA. The University granted this and Gary succeeded marvelously, as I knew he would. He carried out excellent research, wrote his thesis, and successfully defended it in the fall of '96. The only thing he didn't do was turn in final copies of his thesis to the Graduate College. Gary told me all his papers, notebooks, etc. for his thesis had gotten lost somehow in moving and that was why he never turned in his final thesis draft. He is the kind of person who doesn't really care about having a diploma to hang on the wall; he wanted the knowledge needed to have a successful career. Having gotten that, actually getting his degree officially didn't matter to him, and so he is today what is known in academia as an 'ABT' – all but thesis. He works for HP now and I'm told they think he is an excellent R&D engineer. But I sure wish he'd taken that last trivial step needed to actually graduate. It's the sort of thing that makes a professor roll his eyes and shake his head. I'm sure parents know of a similar feeling.

The second new contract that year was also mainly a matter of networking. I knew a guy who was at that time a vice president with Maxtor Corporation, a leading disk drive manufacturer located in Longmont, Colorado. Kevin and I knew each other from the early days at DMD when he had been in the marketing department. As it happened, I also knew Kevin's wife, who was then an engineer at one of HP's Colorado divisions, from when she worked in the R&D lab at DMD. To add to this, Kevin's wife is also Bob's sister and that family relationship was what had brought them back to Boise for a family visit. Kevin got in touch with me while they were back, just to chat, and I told him about some of the research I was doing – for the electronic brain project – that happened to also be applicable to disk drives. He got interested in what I was doing and set up a meeting in Longmont with some of their R&D people. They also thought the idea was interesting and gave me a research contract to apply it to what they were doing.

The RA for this project was a bright young engineer named Steve McCarthy. Steve was a recent graduate from Gonzaga University, a private Catholic university in Spokane, Washington and he had moved to Boise to go to work for Micron Technology. I met him when he volunteered to teach some of the laboratory courses attached to the electronics courses I was teaching. It turned out Steve's job with Micron wasn't exactly what he'd had in mind and he became very interested in the topics I was then teaching in my courses on communication theory. He decided he wanted to get his Master's degree in this

area and I was able to hire him away from Micron because of the Maxtor contract. This was despite the fact that his salary at Micron was over three times what an RA stipend pays. This project also turned out extremely well and Steve presented one of our papers on it at a major conference in Seattle, where he became known to several of the 'big names' in the magnetic recording field. I like to send my students to conferences and have them present our papers for two reasons. First, I don't like business travel all that much; my years at HP had cured me of that liking. Second, these young people need the exposure far more than I do. When Steve graduated he got several job offers from companies that knew him from this conference and he finally elected to go to work for Maxtor in Longmont, where he was very successful.

You've probably noticed that these contracts, and the neural network grant, too, came about because I knew people who were in the right place at the right time. This has come to be called 'networking' these days. It's the kind of thing that young people – who haven't had the chance to meet and know very many people yet – tend to think is kind of unfair. You've heard the saying: *It's not what you know, it's who you know.* Generally this is said by people who don't know anybody. Older people, like me, have a different view of it. Even in federally funded contracts, winning a contract depends a lot on the reputation of the researcher. I don't see that it makes much difference how a researcher gets a reputation, and the older I get the more I like 'networking.' The fact is, it's *both* what you know and who you know – or, at least, who knows you. It turns out the sheer beauty and brilliance of your idea often isn't enough all by itself to get your idea funded, especially when funding agencies have tight budgets. □



Dad.

1995 brought from Iowa the news I had been long dreading and long expecting. Late at night in a hospital bed in the Jackson County Hospital, William E. Wells, Sr., passed away after a long illness. My dad was dead. Mom was with him when he died.

A son expects to bury his father. I had a long time and too much practice in preparing for this day. How many deaths had I seen by now over the long march of years? How many close relatives, brothers, friends, and colleagues? Two dozen? No. More than this. Three dozen? Almost. Death and I knew each other well by now and I knew how to stand in its face unflinching. Even this time. Back in Iowa there were people to comfort and words of condolence to listen to from others who I barely knew or knew not at all. I think only Mom knew how I felt inside. Again and again she came over to me and asked me quietly, "Are you all right?" I would nod and smile a little for reassurance and put my arm around her each time.

At the funeral home the visitors came in a steady stream all day. Fifty. A hundred. A hundred and fifty. Then more still. A hundred faces I had never seen before, to whom Dad had been no stranger but a living part of their world for decades, dating back for many of them years before I had been born. Uncle Wayne came, looking very lonely. He was the patriarch of our family, now the last of the brothers.

We buried Dad in the little country cemetery near Fulton where my family from Mom's side are laid to rest. The day was chilly and rainy, the grass soaked and slick, and the wind rustled the canopy placed over the gravesite. Mom and my sisters wept briefly during the service and then they played taps and the

honor guard fired the rifle salute due every one of the American heroes who fought for our country against the enemies of liberty and justice after Pearl Harbor. They folded the American flag that draped Dad's coffin and gave it to Mom. She in turn passed its safe keeping to Bill. I would have liked that honor for myself, but Bill is the eldest son and it was his right, not mine, to receive the flag from our mother.

Bill and I spent much of the next day walking and talking with each other, little Marnie with us for a good part of that time. My brother had many more stories about Dad to share with me than I had to share with him. When he was Daddy he was my hero and the biggest man in the world. Then for a score and more years while I was estranged from him, he was never estranged from me. Then finally after a long healing we became father and son and son and father again.

When in later years they opened the World War II Memorial, I watched the ceremonies on television. I wanted to be my father's eyes as our country finally said thank you to the veterans of World War II. And I wished with melancholy the Memorial would have been built many years sooner. I would have taken Dad to see it, and I think he would have liked that very much. □

The Engineering in Boise Program further expanded in the '94-95 school year by adding three more faculty in mechanical engineering plus one in civil engineering and, of course, Axel. It was when these new professors arrived that we began to really see the first clear signs of a developing problem with our so-called partners in Boise State. BSU flatly refused to allow us any additional office space for the new people even though the entire third floor of the Technology Building was vacant. BSU officials claimed they were moving some of their own people – from a discipline having nothing to do with either engineering or technology – into that space. As it happened, this plan of theirs materialized like magic only after Jake Baker wrote an angry letter to Governor Batt protesting BSU's lack of cooperation in this cooperative program. Jake showed me a copy of the letter he had written. It blazed with a young man's zeal and a Marine's diplomacy. After I read it I told him, "I wouldn't send this if I were you." He just grinned at me. "Too late," he said. He'd already sent it. Jake's letter brought an unfriendly visit from SBOE member Tom Dillon, one of the new Governor's appointees to the State Board, and Jake came pretty close to getting into some pretty deep trouble over it. In the end, the UI had to build a large trailer complex next to the building to house our new people.

Under Idaho's Democratic governors the people appointed to the SBOE had been largely apolitical so far as their administration of the state's system of education was concerned. They tended to focus on higher education, leaving the day to day details of the K-12 public schools to the elected State Superintendent of Public Instruction, who was an *ex officio* member of the SBOE. Idaho's population is fairly small and the SBOE had always been pretty conscientious about making Idaho's limited tax dollars for education stretch as far as possible. One way they did this was to assign to each of the state's public universities largely non-overlapping 'roles and missions.' Under this very sound system, responsibility for engineering education fell to the University of Idaho, and that was the main reason the Boise program had been set up the way it was. Engineering education had begun in Idaho when the UI was first founded, and in fact this mission was written into the state's constitution, albeit in pretty vague terms. The "UI clause" is Article IX, section 10:

> The location of the University of Idaho, as established by existing laws, is hereby confirmed. All the rights, immunities, franchises, and endowments, heretofore granted thereto by the territory of Idaho are hereby perpetuated unto the said university. The regents shall have the general supervision of the university, and the control and direction of funds of, and appropriations to, the university, under such regulations as may be prescribed by law. No university lands shall be sold for less than ten dollars per acre, and in subdivisions not to exceed one hundred and sixty acres, to any one person, company, or corporation.

It probably seems a little strange that something like this should be written into a state's constitution, but to understand this one has to know a little about the history of Idaho. You see, Idaho is more like three different states: heavily Mormon east Idaho, southwest Idaho, and north Idaho. The three regions have never gotten along very well. In the territory days, southwest Idaho was largely mining country and the

Republican politicians in that region were then very anti-Mormon. In order to make sure the Mormon population in east Idaho would constitute a political minority after statehood, the southerners wanted to persuade the people up in what would become Idaho's panhandle to join themselves to their proposed Idaho territory. Their problem was the northerners weren't inclined to be part of Idaho at all. About half the northern population favored becoming part of Washington state, the other half wanted to join Montana. The southern politicians offered a deal: Join with them as part of the Idaho territory and the state capital would be placed in Lewiston, which is thirty miles south of present day Moscow and the UI.

After this deal was made, a session of the Idaho territorial legislature, meeting in the brand new capital of Lewiston, then voted to move the capital to Boise. Then as now, the main population center was in southwest Idaho and the representatives from this region had the votes needed. Well, that sparked a very angry reaction from the northerners, leading to the Lewiston militia surrounding the capital building and refusing to allow any government records or anything else to be taken out of Lewiston. At the same time, a lawsuit was filed seeking to overturn the legislature's vote. Idaho's territorial governor conveniently disappeared on a nine month 'duck hunting trip' into the wilds of Oregon in order to avoid being served with the injunction against moving the capital.

In response, federal troops were dispatched from Fort Boise to Lewiston, where they forced the local militia to stand aside. The capital was moved at gunpoint down to Boise in Ada county. At this point, north Idaho tried to break away from Idaho and take the panhandle into either Washington or Montana. The agreement to locate the state's land grant university in what became Moscow was a peace offering made as part of the effort to keep the panhandle from breaking away.

North Idaho has never forgiven "Adaho" for this betrayal of the original deal. I have always wondered if that might not have a lot to do with the fact that the dividing line between the Pacific and Mountain time zones takes an abrupt eastward jog just north of the small town of Riggins, which is where the unofficial 'border' between north and south Idaho lies. The north Idaho politicians did not trust the southerners to keep their word on the university deal after statehood and so they forced this deal to be written into the state's constitution, and that's why it's in there. Going even further, the representatives from north Idaho to the U.S. Congress also sought to make the university agreement even more ironclad, and that's the reason why Latah County, where the UI is located, is the only state county in the United States to have been created by a special act of Congress and Moscow is the only city in America that was made a county seat by act of Congress. Idaho has from its beginning been, politically, a colorful state.

So this is the backdrop behind the 'role and mission' for the UI set up by the SBOE. However, there is nothing in all this that legally forbids establishing engineering colleges at the other state universities, and BSU wanted one of its own very badly. In this desire they had the backing of some very wealthy Boise area businessmen, including some who were large shareholders in Micron Technology and had a lot of political clout. The November elections of 1994 gave them their chance.

Everyone knows the '94 election turned both houses of Congress over to the ultra-right-wing of the Republican Party. In Idaho a right-wing and fairly goofy extremist named Anne Fox was elected as the Superintendent of Public Instruction. After taking office, Dr. Fox actually told me to my face that the lobby for a BSU college of engineering had contributed to her campaign and so she was going to vote to end our program and set up BSU with its own college. I was more than a little stunned to hear such a frank admission of bribe taking from an elected official. *Only in Idaho,* I thought. Cecil Andrus, Idaho's governor in the years prior to the '94 elections, had previously appointed Joe Parkinson, Micron's founder and CEO, to the SBOE and everyone knew he was also supporting the move to get rid of us and form a new engineering college for BSU. Later BSU's engineering college would come to be called "Micron Tech" by many of us. But up to that point, our enemies on the SBOE were still in the minority and the President and the Provost of BSU were still at least paying lip service to support for the program.

But the election also brought us a Republican governor, Phil Batt. Some of the SBOE members' terms were up and rumors were circulating widely that Governor Batt had a litmus test for his new board

appointees: Support for a BSU college of engineering. The Governor denied those rumors, but I wasn't too convinced. Governor Batt is a good man and he has a long record of reasonably moderate-leaning public service to Idaho, but he had never been particularly known for paying much attention to higher education. Whether there was really a litmus test or not, he did in fact choose people who publicly supported BSU when he made his board appointments after taking office. Adding to all the fun, Micron Technology announced they would give a gift of five million dollars to the engineering program in Boise, but only if this program were given to BSU. From that moment on, the President and the Provost of BSU stopped pretending they didn't want us out. Both of them told me to my face they were going to get rid of the UI presence on their campus, and both of them did it with 'and-you-can't-do-anything-to-stop-us' smiles on their faces. I thought to myself, *Well, a guy doesn't very often see greed and corruption as openly flaunted as this.* Only in Idaho. Things weren't looking too good for us.

In the spring semester Mr. Parkinson brought a motion before the SBOE to do away with our program and give BSU what it wanted. Things might have gone very badly for us at that meeting, but I think the shadowy money men pulling the strings must have made a mistake. Just prior to that meeting, Boise was rocked by the news that Mr. Parkinson was being ousted as president and CEO of Micron. He would soon be leaving the state. I figured that had to be the work of Micron's board of directors, the most active member of which was multi-millionaire Allen Noble, the second richest man in Idaho after J.R. Simplot. What led to this sudden change of top management at Micron was and is a total mystery to me.

Whatever was behind it, this turned out to be a setback for BSU's political allies. I went to that meeting of the SBOE to observe first hand what they were going to do to us, and it just happened that I rode the elevator up to the meeting with Mr. Parkinson. Mr. Parkinson, who is a lawyer, was relaxed and smiling and looking in altogether too cheerful a mood for someone who had just had the company he had founded taken away from him. *What the heck is going on here?* I wondered.

I soon found out. The second Mr. Parkinson took his seat at the board table, the relaxed, smiling, cheerful man disappeared and a scowling, strident, rabid nut-case appeared. I had to admire the way the man could change his outward appearance like that in the blink of an eye. He introduced his motion and went on a rant against the University of Idaho, including a David Letterman-like routine of 'the top ten reasons we hate the University of Idaho.' His antics infuriated the other Board members and the entire audience watching the proceedings. Except for me. Now the elevator ride was making sense. Some of the audience started shouting at the Board, and I had to physically hold Bob, who was sitting next to me, in his seat. Bob's face was stop sign red and I've never seen him so agitated, before or since. Governor Batt was in attendance, sitting in the first row, and he kept shaking his head and putting his hand on his forehead. Not too surprisingly, the Board rejected Mr. Parkinson's motion. After the meeting, he left the building wearing a big cat-ate-the-canary grin. He had just pulled off a big *screw you* on the men who had ousted him. At least, that's the way I see it. I am convinced he deliberately torpedoed the BSU attempt to get rid of us. And nobody in that room except me saw what he was really doing. □

We saw an awful lot of our Dean of Engineering down in Boise that year as the political pressure to get rid of us mounted. Dean Jacobsen was a big man, known to one and all as Big Jake. His frequent presence among us down in Boise led quite naturally to Jake Baker becoming known as Little Jake. I liked Big Jake, but I'm not entirely sure he was the finest diplomat UI President Elizabeth Zinser could have chosen to work on our behalf with Boise's crop of politicians. Basically, Big Jake is a blunt-talking man who pretty much says what he thinks. Probably his most famous remark during this period came when one of the legislators asked him what his job was. "Prostitute," Big Jake replied.

I'm not too sure President Zinser helped our cause a lot either. Liz always struck me as a thin, nervous person and she definitely had a pronounced tendency to try to micromanage things. The more the political pressure mounted, the more she micromanaged. I know she was pretty much driving Big Jake crazy with constant phone calls, instructions, and so forth. Liz had an uncanny ability to annoy people, including governors, legislators, State Board members, and the wealthy 'local businessmen' who seemed to exert a

lot of influence on Idaho politicians and BSU presidents. I wasn't too surprised when she abruptly "stepped down" as UI President in '95, to be replaced in the '95-96 school year by an interim President and, later, by a new guy named Bob Hoover.

We had a few other changes in administration come in during that second year. Up in Moscow, Joe Feeley's term as department chair had expired and we had hired a new guy, David Egolf, to come in and take the helm in the EE department. In relatively short order, David and Big Jake developed the kind of warm and cozy relationship with each other reserved for such famous pairs as Chairman Mao and Chiang Kai-shek or Winston Churchill and Joseph Stalin. This tended to make life interesting for us; interesting, that is, in the sense of the old Chinese curse, 'May you live in interesting times.' Topping it all off, Bob was going through a rather messy divorce at this time. He understandably developed a pretty good case of the blues and Big Jake allowed him to take an educational leave. Bob went off to Colorado to work on getting his doctorate and we got a new program administrator, Larry Stauffer. I can't say I was too fond of all this turbulence, but it beat having weekly telephone conferences with John from EMC. I concentrated on my students and tried to ignore as much of the rest of this stuff as possible. □

Near the end of spring semester, David Egolf called me on the phone. Would I be interested in representing the department at a workshop on engineering education in Sweden? The workshop was scheduled to take place just after the end of the school year so it wouldn't interfere with my teaching, and since I'd never been to Sweden I was happy to do it. The workshop was being held at Växjö University in the city of Växjö in southern Sweden. I learned that the University of Idaho and Växjö University had a formal agreement for a Study Abroad program whereby undergraduates from the two universities could go to each other's schools and take courses that would count toward their degrees. This was why we had been invited to participate in the workshop. It turned out I was the only American who went.

So it was that in mid-May I took a flight to Copenhagen and from there boarded a little puddle hopper for the jaunt over to Sweden. Back home it was already summer but a light snow was falling when I arrived at the airport in Växjö. Ever since I'd had to give up skiing I haven't had much use for snow and after living in the heat of the Idaho desert the weather in Sweden felt pretty chilly. Basically Sweden is too close to the north pole for me, but it only snowed on the day I arrived and after that we had the kind of lovely weather that is called spring-like back in the States. It was already a bit late in the day when my flight touched down so I took a taxi to the hotel and made myself get some sleep when night came to the city despite the jet lag that had my body telling me it was still the middle of the day. This turned out to be easier to do than I'd expected because the bed was very comfortable and came with nice, thick quilt blankets that kept me warm and comfortable against the chilly night air.

The next morning my Swedish host, a superb gentleman named Thör who was the chair of their EE department, met me at the hotel and took me over to the university. I was a little worried about jet lag causing me to nod off during our meetings but my hosts had just the remedy for that: good Swedish coffee. Thör did warn me that their coffee wasn't American coffee – and I thought I detected just the merest hint of contempt for American coffee on the part of my new Swedish friends – but I loaded it up with cream and sugar and discovered they were right. Their coffee had a very different taste from American brands, almost a mild chocolate-like flavor, and it was just excellent. It was pretty strong stuff, the kind of coffee that nails your eyelids open, and jet lag was never once an issue all that week.

The workshop had attendees from all over Europe, especially from the Netherlands, Germany, and Poland. Notable by their absence were the French. There was one Brit there and he and I were the only native English speakers. That wasn't a problem, though, because the workshop was entirely in English and all the folks attending spoke English very well. The Polish guy was a little hard to understand at times, but his English was infinitely better than my Polish, which is non-existent. I found out that all the Swedes except their senior citizens spoke English very fluently, after allowing for that famous Swedish accent that gives their words such a charming musical lilt.

I like to pronounce things correctly, so I tried pretty hard to learn the correct way to pronounce the

Swedish names and places. I think this sort of amused my Swedish hosts. But they were tolerant of my American accent and gently encouraging. Thör told me at one point, with a little smile on his face, that if I were to spend a month in Sweden I'd soon be able to speak Swedish like a German. The others chuckled when he said that. I sort of got the impression that week that the Germans were the butt of a lot of jokes among the other Europeans. Especially among the Dutch.

One thing I learned that week was that all the different countries represented at that workshop had slightly different educational systems from one another, and all were very different from the American system. In most of them the students take only a couple of different classes at any one time but take them five days a week, as compared to the American system where most classes are only three days a week. A lot of their classes don't run for a full semester; instead they'll concentrate on two classes for half the semester and then concentrate on two (usually) different classes the second half of the semester. In the American system a student typically takes five classes at one time over the entire semester. Most of the Europeans were amazed that our system worked. They referred to it as a system of 'parallel' classes and marveled that our students could learn all those different subjects all at once.

Another big difference between the European systems and ours was exams. The Europeans have a system in which their students take all their examinations at the end of the year. In our system, of course, we have frequent examinations spaced throughout the semester with final exams at the end of each semester. Basically our system forces the students to keep up as we go, whereas the European systems tend to take the view that how fast a student learns the material is less important than how well he or she knows it at the end. Its sort of the difference between an assembly line education mindset vs. education as a work of craftsmanship. Personally, I think the American system is more effective but my European friends didn't like it very much at all. I am of the opinion that our system of frequent, periodic exams is probably the reason our 'parallel' system of classes works even if, figuratively speaking, it chains our students to an oar bench in comparison to their European peers.

Another thing the Europeans do differently is place much more emphasis on laboratory courses than we do. We have labs in our engineering curricula, of course, but these tend to be regarded as a supplement to the lecture courses. In contrast, my Swedish friends put a tremendous amount of time and effort into what they call 'practical' courses, 'practical' being what they call their lab courses. I toured the student laboratories at Växjö and was very, very impressed. There is a lot we could learn from them when it comes to laboratory courses I think. Their lab equipment was very modern, very up to date, in contrast to a lot of the equipment one typically finds in undergraduate laboratories in the States. I am under the impression that the Europeans invest quite a bit more heavily in education than we do. I think in the long run this is going to pay off handsomely for them; it is already the case that most of the best innovations in communication systems – cellular telephony for instance – are already coming out of European countries, especially Scandinavia. I came away from that workshop with the uncomfortable feeling that we are too complacent about our technological prowess in the States. America is disinvesting in higher education while the Europeans are doing the opposite. It should give us all something to think about.

While we were there our hosts gave of a tour of Växjö and the surrounding area. Växjö is located in the heart of what is known as The Kingdom of Crystal. It is famous for its many glass blowing factories, most of which have been in operation for three hundred or more years. Some of those factories have been standing since before the Pilgrims landed at Plymouth Rock and are still doing a brisk business today. The sight of modern process control charts – now a staple in factories throughout the States – hanging on those ancient walls seemed incongruous to me. I was treated to an exhibition of glass blowing at one of the works and saw a beautiful crystal goblet take form from pure molten glass. Before leaving for home I picked up several crystal goblets, plates, and statuettes which I later gave as Christmas presents to the folks back home.

Glass and crystal are to Växjö what automobiles are to Detroit. One of the interesting places I visited was the Glass Research Institute. This wasn't part of the university proper. It was a research institute

devoted to the study of anything that has to do with glass. They had a very big list of clients, each of whom paid something like a fifty thousand dollars per year retainer fee to the Institute. In return, the Institute would research anything they wanted so long as it had something to do with glass. The day I visited they had just finished researching what kind of dishwashing soap did the best job of cleaning glass. It wasn't an American brand.

The country around Växjö is beautiful almost beyond description. One of my new friends took me on a canoeing trip one fine afternoon on Lake Helgasjön. We must have paddled every inch of that very big lake, including paddling right up to Kronoberg Castle, a fifteenth century ruined fortress on the lakeshore originally built by the Bishop of Växjö. My friend gave me a rundown on some of the history that had taken place there, especially from the days when the Danes and the Swedes warred over that territory. If you ever visit Sweden, here's a bit of useful advice: Never get into a canoe race with anyone whose ancestors were Vikings. I was mighty stiff and sore the next day.

The young students of Växjö were a pure delight. Young people are pretty much the same all over the world, and the Växjö students were eager, polite, curious, a bit naive, and just darling. I liked them very, very much. I was the first American many of them had ever met, and so I was something of an object of curiosity for them. Some were shy, some were bold, all were charming. Immanuel Kant, the great German philosopher, said old people have the qualities of the sublime but the young are beautiful, and I think there is much truth in this. □

All through the summer and into the fall of '95 the political attacks on us continued without letup. The *Idaho Statesman,* Boise's main newspaper, started taking an active part in it. They seemed willing and eager to print anything and everything our opponents had to say about us, but not too interested in anything we might have to say. It was an outright smear campaign and the *Statesman* happily reported all kinds of false accusations leveled against the program without bothering to find out if they were true or not. The professors on BSU's faculty began to take part in the attacks; one of them told me the BSU administration had promised them raises if BSU was allowed to set up its own engineering college. The storyline that developed out of that was that it was somehow the UI's fault that BSU didn't pay its faculty very much. I don't know how anybody could buy that malarkey, but people did. Another story said that we had only one student laboratory in our program. That was a lie, too. A gaggle of Boise construction contractors complained we weren't teaching anything about computers or microchips. This bunch of jerks wouldn't have known a computer from a typewriter, but in any case that was also a lie.

The biggest and most effective swindle was pulled off by Micron Technology. Micron announced it had plans to build a gigantic, new, modern fabrication facility that would employ thousands of people. They were going to have what basically amounted to a nationwide competition to see what city would be selected for this new site, and they hinted that over time this new site would gradually become the center for their corporation. One criterion: the location had to have a good local engineering program. If Boise expected to be in the running, they'd have to address this 'problem.' The fact that Boise already *had* a good engineering program – we were right then winning stand-alone accreditation for the EE program from ABET, the national organization that accredits engineering and technology programs – was something the *Statesman* managed to miss in their reporting. But this was all a smoke screen anyway. They didn't really mean *Boise* had to have a good engineering program; they meant *BSU* had to have their own engineering program. This campaign seems to have had the desired effect on public opinion and on the politicians, who were desperate not to 'lose' Micron to another city. But it was all a hoax. I knew a guy out at Micron who showed me a report – I think it was put together by a local Boise company named CH2M Hill, although I don't remember this for certain – that said the Treasure Valley, where Boise is located, simply didn't have enough water to serve the gigantic integrated circuit fabrication facility Micron was planning. There was never the slightest chance that plant was going to be built in Boise. MIT could have opened a campus in Boise and it wouldn't have made the slightest difference. Somehow that report never made it into the *Statesman* either. But when Micron announced the 'winning' site – and it wasn't Boise – *that* fact made it into the paper, along with a read-between-the-lines accusation all this was

our fault.

The SBOE, now packed with Governor Batt's appointees, was busy too. They hired an outside consulting firm to come in and assess the Engineering in Boise Program for them and make recommendations. The consultant came in, went over us pretty thoroughly, and reported back to the Board that they had a pretty good program going here. That must not have been what the Board – who are also, by law, the Regents of the University of Idaho – wanted to hear because they brought in a second consultant. I guess they must have given this guy a little better briefing because his report said the Board should set up a new engineering college at BSU. That was the report that made the paper.

Another little item that happened during all this came at an SBOE meeting. One of our strongest factual arguments in favor of the program was that we had received extremely high marks from the ABET team that had come to evaluate our standing for accreditation. The official report and the granting of the accreditation wouldn't come until the summer of '96, but there was no doubt at all we were going to be accredited. The BSU administrators told the Board that if a BSU engineering college was established, the ABET accreditation would transfer to their program. That simply wasn't true. Either these guys were really and truly ignorant of how college accreditation works in the United States or else they were just telling the Board an outright lie. There isn't any third possibility. Big Jake then pointed out that ABET accreditation doesn't 'transfer' and a BSU program would have to start all over again from scratch. At that point, one of the new Board members asked who ABET's "competitors" were. I guess he must have thought college accreditation was a free-market enterprise in the United States and if ABET was a problem they could just do business with somebody else. I never heard a member of a board of education ever ask a dumber question. But Batt's appointees weren't exactly the brightest bulbs in the chandelier.

In the face of this malicious and despicable smear campaign our fate was a foregone conclusion. Nobody ended up being all that surprised when the Board voted that fall to end the cooperative program – which by then wasn't very cooperative anymore – and give BSU what it wanted: it's own college. To do so, they had to repeal the 'roles and missions' statement that had governed the administration of higher education in Idaho for decades. Their new 'roles and missions' were defined along regional lines. The UI would take care of north Idaho, BSU would take care of southwest Idaho, and Idaho State University would take care of east Idaho. To do so, the universities could set up duplicate programs to their hearts' delight. The fact that this would end up costing more money – tax dollars, to be precise – didn't seem to be a concern to them. But somehow the legislature managed not to go along with any ideas about raising taxes. If a university wanted to set up a new program, they'd have to pay for it by taking money away from one or more of their other programs.

The most childishly naive presupposition made by the BSU administrators was that we, the UI faculty, would be more than happy to simply become BSU faculty members. After all, wouldn't hanging on to a job be the most important thing to us? Charles Ruch – BSU's president, who we had taken to calling Fat Charley, which was a more polite epithet than we had for BSU's provost – called a faculty meeting after the decision that we were 'invited' to attend. The future was bright, we could all put the past behind us, yak, yak, yak. One thing he said really stuck in my mind. He said that BSU was really "a hundred million dollar a year entertainment business." That was the only thing he said I agreed with.

I had a mole on the BSU faculty from who I'd learn what they had been saying in their faculty meetings (at which *we* were never welcome). The prevailing view they had was there would be no problem and no objection on our part to simply staying on after BSU took over in the fall of '96. Somehow they managed to convince themselves that all the despicable attacks on 'the University of Idaho' were somehow or other not attacks on us personally and we wouldn't take it personally. That was one big cultural difference between Boise State and the University of Idaho. BSU is run by the administrators and the faculty just do what they're told. The academic programs in the UI are run by the faculty. It's called 'faculty governance.' The difference this makes is this: if you say the program is crap, you're saying the faculty is crap. Well, each and every one of us *did* take this campaign of lies and slander

very, very personally and we were furious. Our enemies had proven themselves to be men without honor, without ethics, and without honesty. Not one of us would stay on at BSU. We would have nothing more to do with these greedy and craven dastards. They were morally unfit to teach young people.

All our futures were very uncertain at that point except for Jim Peterson. Jim was already a tenured professor at the UI and his continued employment with the university was guaranteed. He could simply return to Moscow. That wasn't the case with the rest of us. I didn't know what I'd be doing except that whatever it was wasn't going to be at BSU. That was my one certainty in the midst of all this. We had been hearing rumors that the interim President up in Moscow, Tom Bell, was all for just cutting us loose. So long and good luck. I know for a fact the EE department in Moscow wasn't united in the idea about bringing any of us, let alone all of us, up to Moscow. For that matter, I wasn't so sure I *wanted* to move to Moscow. Boise was my home.

The one bright spot, at least for me, during this period was Bob Hoover. Bob was going to be the next President of the UI, and he came down and paid us a visit. Bob was a thoroughly likeable guy and would prove to be a very popular university president with the Board, the Governor, and the legislature. While he was meeting with us, he put his feet up on the table at one point and I noticed there was a hole in the bottom of his shoe. Right then I thought to myself, *this guy and I could be drinking buddies*. He was just that likeable. He didn't make any promises, but I came away from the meeting with a very strong feeling the University was going to do everything it could to keep us on the faculty. It was a good feeling.

But that meant I needed to start thinking very seriously about what my answer would be if they offered me a position on the Moscow campus. Would I go or not? In favor of going was the fact that I loved my job, loved working with the students, and what I was doing was in fulfillment of my Promise. On the other side of the question was what it meant to leave Boise. At the start of '96 Boise had been my home for seventeen years. I had roots here. I had friends here. I had a brother here. I didn't want to give all that up. But I knew I wouldn't go back to work for HP either. Those days were over for me. That I would have to find another job was certain; my personal finances were in pretty fair shape, but not nearly in good enough shape to let me simply 'retire' at the ripe old age of forty-two. So it looked like no matter what I did, the odds were very stacked against my being able to do it in Boise. So what would I do? I thought about something Emerson had written: *For everything you have missed, you have gained something else; and for everything you gain, you lose something.* Life is a series of tradeoffs. I'd been around long enough by now to know that was true, and I'd been around long enough to know there was a great deal of truth in what Emerson had said. I decided that whatever was to come, I'd just trust God and my faith it would work out for the best. If they offered me a job in Moscow, I'd take it.

One thing I will say: they didn't leave us hanging in the breeze very long. Just as the spring semester was about to begin, Big Jake called me into Larry's office (Bob's former office) and handed me a sealed envelope. In it, he said, was an offer to become a faculty member on the main campus in Moscow. I could have some time to think it over.

I trusted Big Jake and I didn't even open the envelope to look inside. Instead I stuck my hand out and simply said, "I accept." We shook on it. They found positions for each and every one of us. □

The UI stood by our students as well. Our previous graduating classes, including the class of '96, received accredited degrees because they were part of the accredited UI program in electrical or computer engineering. That year's juniors, on the other hand, now found themselves without an accredited program in Boise from which they could graduate. With just one more year to go to complete their education, the rug had been yanked out from under them. Even if BSU was able to put together something that resembled an EE program in time for the next school year, it would have been an unaccredited program and their degrees would be worthless. Accreditation requires the university's program demonstrate its competency over a multi-year period before the first accredited degrees can be issued. Our students, you will remember, were place bound students, financially rooted down in Boise. That was why they were attending the Engineering in Boise Program rather than going to school in Moscow.

The UI's administration really stepped up here. They dug up the money from somewhere and provided all our juniors with financial aid assistance that made it possible for them to take their final year in Moscow and graduate with a diploma from an accredited program. Every single one of our students took advantage of this, and they all graduated in the spring of '97. From the Moscow campus. With accredited degrees.

BSU hadn't given a damn about these students. Not the administrators. Not the BSU faculty. Neither had the SBOE. Or Governor Batt. Or Micron. Or *The Idaho Statesman.* Every single one of them was prepared to throw these helpless students to the wolves for their own selfish gain, and that's exactly what they did. The whole greedy, rotten bunch of them should be ashamed of themselves. But they weren't. And they aren't. The University of Idaho and its faculty and its staff were the only ones to stand by the students throughout this entire disgraceful, shameful, dishonorable affair. We were the only ones who were on their side.

During the smear campaign most people I talked to believed the villain behind the scenes in all this had to be J.R. Simplot. But you know, I don't think so. I wouldn't faint from the shock if some of his business cronies were. In fact, I'd be more likely to faint if somebody proved *none* of them were. But Mr. Simplot himself? I don't think so. He surfaced only once during the entire affair, after the *Statesman* had been running their stories about what an inadequate failure our program was and before the SBOE finally dropped its ax on our necks. And I must say, when he surfaced it was with style.

Mr. Simplot sent a message over to the Idaho Legislature telling them he wanted to talk to them. Our fearless Republican legislators called a joint meeting of the Idaho House and the Idaho Senate to hear what J.R. Simplot had to say. In a way, I suppose it could be said that Mr. Simplot, private citizen, called a joint session of the Idaho Legislature. Hey, only in Idaho.

At that session, he lectured the politicians on the importance of high quality engineering education to the growth of business – especially Micron's business; he was the biggest shareholder in that company. He basically gave them a pretty good tongue lashing. And then he said the words I most treasured. "It doesn't matter whose name is on the door," he said. Later that day I heard some of the BSU people complaining bitterly about that line, and I smiled. Those words are the reason I think J.R. Simplot didn't have a thing to do with our being run out of town covered with tar and feathers. □

The 1990 census placed the population of the city of Moscow at just over eighteen thousand, which was more than ten times smaller than Boise and about three times larger than Maquoketa. It was and is a fairly typical college town and I've never been sure what fraction of this eighteen thousand counted the students who live there. It's a question no one in Moscow seems to be able to answer. One of the first things I learned about my new town was that everything there except auto insurance cost more than the same thing did in Boise. That included houses. I had some trouble finding a house in Moscow that I liked well enough to buy. I finally did find a place almost the same size as the McKinney house in terms of square footage. My general impression was and is that in Moscow people pay more money for less house than they would in Boise. That was certainly the case for the house I bought on Ponderosa Drive in the northeast part of town. I really hated to sell my McKinney house in Boise, so much so that for awhile I tried to figure out if there was any way I could keep that house – sort of keep a foot in Boise as it were – and still buy one in Moscow. In the end, though, I had to admit that was a stupid idea so now someone else lives in the house I had planned to retire in and I live in one that I don't.

The move to Moscow ended up costing me about fifty thousand dollars net after buying the Ponderosa house and selling the McKinney house. I closed on the Ponderosa house in February of 1996 even though I didn't actually move to Moscow until May after the last school year of the Boise program ended. I'd have preferred to stretch the timing of that deal out, but the seller couldn't wait. I found out he was moving to Boise in order to receive better treatment for cancer than was available in north Idaho, and since acceptable houses – acceptable to me, that is – were hard to come by in Moscow, I reluctantly closed the deal earlier than I would have liked. The stock market had been fairly hot in 1995 and it wasn't

a good time to disinvest just in order to buy a house, so I did take out a loan to buy the new place. After the deal for the McKinney house closed in early summer I paid off the mortgage on the Ponderosa house and went back to making money from banks rather than giving money to them. □

With my brother our last summer.

In the midst of all the turmoil of 1996 down in Boise more bad news came out of Iowa. Aunt Sylvie had died. Now of all of Grandma and Grandpa Teters' children, only Mom remained. For some reason I didn't hear about it until it was too late to arrange to go back for the funeral. It was hard for me to accept the idea of a world without Aunt Sylvie in it and that I would see this kind and wonderful lady no more. When I was a little boy I learned so much about God from my Aunt Sylvie and I had learned how to be strong in the face of life's hardships by watching the way she faced adversity and hardships when they made their unwelcome intrusions. My Aunt Sylvie was a saint.

But there was still more awful news to come. I had barely moved into my new house in Moscow when Mom called to tell me. My brother Bill had been having headaches and the doctors had found he had a brain tumor. It was growing in the deep subcortical region of the brain where surgery was impossible. My big brother was going to die.

I was stunned by the news and after hanging up the phone a helpless rage swept through me. I paced back and forth in the basement family room of the house, fist clenched so tightly my fingernails cut into the skin of my palms, and I shouted at God for letting this happen on top of all the terrible things that had already come to pass one after another. This was the deepest challenge to my faith in all the days of my life and here in this strange town, where I myself was a stranger, I had no special place to which I could retreat. I was seized by an almost uncontrollable urge to smash and break everything I could lay my hands on, and I made myself sit down on the couch and I held my shaking fists between my knees until the violence of my feelings passed.

How long I sat there I cannot say because I was a man out of time, alone and ripped by misery. At first I demanded of God to know why this was happening, but even while I was doing this I knew deep inside there is no why. There is never a why. And in that same deep place of the soul I knew God would not answer this question. There is never a why. There is only what was, and what is, and what is to come. It is not the tragedies and the trials he faces that makes the character of a man. It is how he chooses to face them by which a man makes his own character. Slowly, slowly I remembered this and I asked myself, *What kind of man will you be?* and as I did I almost felt as if God had reminded me to ask this of myself.

In *Confessions* Saint Augustine wrote *Narrow is the mansion of my soul; enlarge Thou it, that Thou may enter in. It is ruinous! repair Thou it.* But Augustine was wrong to say this. God does not enlarge us, and God does not repair us. God leaves this for each of us to do for ourselves, and if anything at all is expected of us in life, it is this. And that we each can do this, that each of us is granted the power within to do this, is, I think, the greatest gift God gives us. Whether a man makes of himself a mansion or a hovel or a ruin is his own choice and his alone. What kind of man would I be? I would be a man who would face what life brings and find the strength to stand. I would be a man who could know rage but not strike out in rage. I would be a man for whom the grieves of life could be ruinous, but who would not make of himself a ruin. I would be a man who would not let shadows of evil make him blind to the just and the right and the good. This, I think, is what a man should demand of himself, and this, I think, is what God wishes for each of us to achieve.

I think somewhere deep inside I had felt these things since I was a boy, but before that day and night I had never articulated them for myself. As I did so now, I felt the calming of my spirit and although the sadness did not leave me, the misery slowly did. I learned that night of another special place God had made, and this one I would never need to be away from. It is the special place in my own heart.

I called Bill that night and we talked for a long time. He told me what the doctors had told him. After he had explained what they knew of the tumor, he said in a calm voice devoid of fear or self pity, "Basically, I'm screwed," and I was amazed to hear him even chuckle a little bit. My brother's courage filled me with pride that he was my brother and I was his. Later that summer I flew back to Iowa and went to stay with him for awhile in Cedar Rapids. Mom came with me and I spent as much time with him as I could.

The doctors had given up on his case, but Sherri had not. She learned of a clinic in Texas where they were trying an experimental treatment for cancer, and she took Bill down there. When I got back to Iowa he was taking the drug and his son, my nephew Nick, was taking care of him. Nick was twenty-one and a man, and he looked after both his dad and his sister, my niece Marnie who was then in high school. The medication had caused Bill to become swollen with fluids, and I think this bothered him more than the cancer did. My brother had always been vain about his looks. They said at the clinic that Bill should receive a lot of supervision from his doctor back in CR, but this bastard had refused to be involved in any way in Bill's treatment program. Nick had to shoulder the day to day burden by himself. For a time we had hopes the treatment would work, but the side effects of the medication ate away at Bill's dignity and self respect and one day he just refused to take the drug any more. He died in 1997 and we buried him in Cedar Rapids next to Maryann. I miss my big brother very, very much. □

Ning Choy at work in my laboratory in the MRC Institute. Ning worked as an undergraduate Research Intern (RI) in the electrophotography program for several years and his position was funded by the contract with HP. He became a U.S. citizen during the time he worked for me.

My first order of business after getting to Moscow and getting settled into my new home was to get my research laboratory set up and to rebuild my funded research program. Gary, Steve, and Mark had all finished their degree work, although Gary and Steve had to come to Moscow for their thesis defenses, and the Maxtor contract had been successfully concluded. The HP contract for the electrophotography research was still going, as was the neural networks grant, and I had some re-staffing to do. I had accepted an invitation to set up shop in the UI's Microelectronics Research Center (MRC) rather than to set up inside the EE department itself. This meant that in addition to being administratively 'under' David Egolf, the EE chair, I was also part of Touraj Assefi's research center.

The MRC had been founded in 1983 as a research center for inventing advanced microelectronics chips. HP had used an MRC-designed chip in Eagle but the bulk of MRC's research was under contract to NASA through Jet Propulsion Laboratory. Quite a few MRC chips have been used over the years on various space missions. Not long before I joined the UI, the founder and original director of MRC had taken a new job with the University of New Mexico and this had been a severe blow to the MRC. We had hired Touraj to come in and take over the Center in 1995. Touraj is a pretty interesting guy. Early in his career he had been part of the Viking missions to Mars and later a laboratory director at JPL. His resume also included stints as an executive at Lockheed and Boeing. His years with the space program and with the aerospace industry left him extremely well connected – Touraj is a super-networker – to the point

where I joke that he knows everyone on earth except for three guys in the middle of the Congo.

Like me, he had eventually tired of the Mickey Mouse that goes on in the private sector and, being by that time financially well off, he had also decided to 'go public' by entering the academic setting. Since coming aboard, he has breathed new life into the MRC by broadly expanding its research mission into other arenas and rebuilding its core of associated researchers. Thus, while NASA and JPL continue to be important partners for us, our clientele is now much broader and today, as the MRC Institute, we are the largest research institute at the UI with annual research contracts approaching ten million dollars. In 1996 this rebuilding process was just getting started and Touraj had wanted me and my lab in his organization. We have gotten along very well right from the start when I met him in 1995, and just as the fall '96 semester was getting underway he asked me to assume the post of associate director of the MRC. Since this didn't require me to give up any of my teaching or my own researches, I accepted and I've been his associate director ever since. It's a post I'm comfortable with and I have no aspirations to one day become the Director of the Institute. Nowadays I tell Touraj that he isn't allowed to retire until I do, and I'm not entirely joking about this. I didn't come to Moscow to be an administrator. Besides, I couldn't even begin to fill his shoes. He's the best.

My most urgent first order of business was to staff the electrophotography project since Gary had finished his degree work. Luckily I had just the man for the job, a brilliant young Master's student named Aaron Brennan. Aaron, too, had been part of my laboratory in Boise. He worked for a company down there – I don't offhand remember which one – and had come to me as a 'walk-on' – a graduate student who volunteers to work on research as part of getting his degree without holding an assistantship. I've always figured that if a university head football coach can have walk-on athletes, there's no reason I couldn't have walk-on Research Assistants. In Boise he and I had been working on a new kind of artificial neural network system based on a somewhat exotic type of computer circuit known as a 'content addressable parallel processor' (CAPP for short). The microcomputer chip Mark had designed for his Master's thesis project was based on the work Aaron and I did on the CAPP system.

When they ran us out of Boise, Aaron was still a little over a year away from finishing up his studies. Now I hired him as a paid Research Assistant in the electrophotography program, and he and his young family moved to Moscow so he could work full time on his degree. Aaron was one of the best young scholars I've had the pleasure of working with – smart, curious, eager, and enthusiastic. Adding to the fun of having him around, it turns out that his grandfather was Walter Brennan, the actor, who was always one of my favorites. Every now and again I could get Aaron to tell me a few stories about his granddad.

Aaron and his wife had a young son, a toddler at the time he was in my lab, and even with his RA stipend they were finding it pretty hard to make ends meet after Aaron quit his Boise job. I've rarely met a student of his high caliber and outstanding citizenship, and so I helped them out a little by creating a special private scholarship of one thousand dollars in memory of my dad. I don't give this out very often – a student has to be really, really exceptional both in scholarship and citizenship for me to consider doing this – but Aaron is and he was the first student to whom I awarded this scholarship. When he graduated I tried pretty hard to talk him into continuing on to get his Ph.D. – he's exactly the kind of person America needs very badly in our colleges and universities – but he saw it as his duty to get back into the private sector workforce and support his family. Today he works for a semiconductor company. I still get to see him once in awhile and we have remained good friends. □

The brouhaha down in Boise had seriously disrupted my work on electronic brains, and now that I was in the considerably more peaceful environs of Moscow I wanted to get that project back on track. It still wasn't funded – never has been, in fact – and during the tenure-winning years it necessarily had to take a back seat to funded work. But I wasn't getting any younger and I was determined to push this project forward. Over the many, many years I'd been doing this research I'd figured out how to build a lot of things, but I hadn't hit on anything I was willing to call a 'brain.' The problem wasn't really 'how to build it'; the problem was what to build. If I could figure out what to build, how to build it would be relatively a

lot more simple. That's typically the way it is in engineering. In all those years, the key missing ingredient, as I finally came to accept, was a little thing called 'mind.'

It's pretty much axiomatic in engineering that you can't build something if you don't know what it is, and I had reluctantly come to accept the fact that the key 'what' elements in anything I think could really be called an electronic brain weren't brain concepts. They were issues and questions of philosophy. In particular, they were what the philosophers call 'metaphysical' questions. By this I don't mean the kind of trash you see in a bookstore shelved in the so-called 'new age metaphysics' section. Scientifically, that stuff is pure, useless garbage and it's the sort of thing that gives philosophy a bad name. Like almost all engineers, my training had left me with a very dim view of philosophy in general and metaphysics in particular. But after thirty years of hitting one dead end after another, I finally had to grit my teeth and admit I'd largely been asking the wrong questions. What were the right questions? They were things like *What is 'mind'? What is 'thinking'? What is 'intelligence'?* and *What is 'reasoning'?* At root, these were the sort of questions that, instinctively, had been underlying my amazement that day I first heard Walter Cronkite call computers 'electronic brains.' These are pretty deep-weeds philosophy questions but without answers to these questions my quest for real electronic brains wasn't going to go forward one single inch. The problem with philosophy, as I saw it, was that it had long ago stopped regarding itself as a science and had come to wholly regard itself as a 'humanity' topic. This change in its self image goes back a long way – all the way to the first half of the nineteenth century.

To be of any practical use to me, philosophy would have to answer these questions *as a science would*. What I needed was philosophy-as-a-science and in all the different works of all the different philosophers I'd read over the years, I hadn't seen anything that came up to this mark. Perhaps, I thought to myself, some headway could be made if I could take somebody's philosophical 'theory' and make it mathematically rigorous. As it turned out, this was kind of naive in one way and not so naive in another. But that raised the issue: Whose philosophy? I had a long and illustrious list of philosophers and philosophies I already regarded as inadequate. Basically this list takes in all of them from the beginning of the nineteenth century forward. It also included Aristotle. And Plato. And a lot of other names, too.

But that still left one guy, generally acknowledged by philosophers to be on the 'big three' list of the all time greatest philosophers. Two of the names on this list, Plato and Aristotle, I had already ruled out. But I hadn't checked out the third guy. His name was Immanuel Kant. His most famous work was a book entitled *Critique of Pure Reason,* which sounded like it was at least topically the sort of theory I was looking for. I'd never read that work, but I decided now to give it a whirl. If it, too, turned out to be crap that would just confirm my pragmatic suspicions about philosophy and philosophers in general. If it wasn't crap, then maybe it could help me. Such was my attitude in the summer of 1996.

If I had realized how much work this was going to eventually involve when I started, I probably would have never even started. Fortunately, I was too naive to know what I was getting into. It took a long time for me to get through Kant's *Critique of Pure Reason* the first time I read it, and when I'd gotten through it there was just a whole lot of stuff in it I knew I didn't understand nearly well enough. I did come to appreciate the book's widely used nickname in philosopher circles: Kant's Opaque Masterpiece. Still, it wasn't one hundred percent opaque and from reading it I *felt* deep down in my gut that the old man was on to something here.

When I read numerous commentaries on Kant's work, I soon found out the world of philosophy isn't anywhere close to being united in what philosophers think Kant was saying. One big problem, I discovered, was that the English translations of Kant's works are very badly distorted. Translating from one language to another isn't just a matter of replacing a foreign word with an English word. The translator has to translate the author's thoughts out of his native language into a different language. It helps to understand what the author is saying in order to do this, but since nobody could agree on one understanding of what Kant was saying, how could anyone do this? That was the first serious 'uh-oh' I ran into. I couldn't completely trust the English versions of Kant's works; I was going to have to read

them in the German and the Latin he had written in. I was awfully rusty in both languages after all these years, but there was nothing else for it but to clear the cobwebs out and get to work. If I have one character trait all my friends and relatives would probably agree about, it's that I'm stubborn. No old German geezer who had been dead for almost two centuries was going to beat *me*. Kant was always talking about his 'system' and I'm a trained system theorist. I decided to take him at his word and figure out what that 'system' was. Either I'd find it or he wasn't the genius the world of philosophers said he was.

To make a long story short, it turned out my instincts had been right. It took me ten full years to put together a coherent picture of Kant's system – yes, he did have one – and before I was through I'd had to go through the whole twenty-nine volumes of Kant's collected works (in German and Latin). But what finally came out of all this research work was a model that answered *all* those questions I'd been asking plus a whole lot more of them it hadn't even occurred to me to ask. I had never intended to become a Kant scholar, but it turned out that's what I had to do. Probably the highlight of my career to this point came the day that I published what I had figured out. It had ended up being an incredibly massive tome – twenty four chapters and over twenty-four hundred pages – but it was all there: The architect's blueprint for what it is for any system to be entitled to be called a 'brain' in the sense of what 'electronic brain' meant to me when I heard Walter say it while I was still just a boy. I called my work *The Critical Philosophy and the Phenomenon of Mind,* and I published it as an E-book available free of charge over the Internet to anyone who wants to read it. It just happened to go on line on my birthday in 2006, and ever since then people have been accessing it at an average rate of a few hundred times every month.

By publishing my book in this way, I knew I was in serious violation of accepted academic practices for publishing research findings. In research work the most holy of holy rituals is called 'the peer review process' and my book isn't peer reviewed. The problem though, as I saw it, was "Who's going to peer review this?" It is a brand new science and there is no one I acknowledge as having the competency to really review this work. I'm getting on in years and I just didn't feel like I had the time to spend arguing with 'referees' who acted more like censors than scientists. I still have electronic brains to build. The work is a work of science; its ultimate proving ground is going to be in different scientists' laboratories, not on some journal editor's desk. There are people who are aghast at what they regard as my arrogance in this. To them I ask, "Tell me. Who peer reviewed Isaac Newton's *Principia?"* I don't claim to be in the same league with Newton, but I do claim the right to publish my work just as he did. If there's a mistake hiding in there somewhere, if some part of the theory isn't correct, then eventually someone will discover this *and prove it*. If that happens then it just means I was wrong about something, everybody will know it, and the science will be advanced. But I don't think that's too likely to happen any time soon. The *system* just fits together too neat and tidy. In the meantime, I'm not going to spend the time remaining to me arguing with people over mere matters of opinion. Let science be done. □

It was in the summer of 1996 that I had the interesting experience of being kicked out of the Republican Party. My expulsion came in the form of a letter from the Republican national organization. It started off, *Dear Mr. Wells: Are you still a Republican?* It went on to say that if I was then I would want to send them some money to support the Republican agenda for the fall elections. There followed a list of the Party's agenda items that would be passed after Bill Clinton (they never called him President Clinton) was defeated and a Republican was in the White House again. As I read down the list, I found that every single item on it was something that I not only did not support but actually opposed. That meant I wasn't a Republican anymore. Couldn't mean anything else.

There is an acronym that had been around for quite a while but had really become widely known after the Republican capture of both houses of Congress in the '94 midterm elections. It is RINO, which stands for "Republican in name only." The term had been started by the ideologues on the extreme right of the party who were out to purge the ranks of the party of moderates and its few "social liberals." The letter I received made it perfectly clear the RINO hunters were firmly in control of the national organization, and it made it equally clear that my views exposed me as a RINO. I crumpled up that letter in my fist and

threw it in the garbage can. I've never heard another word from the Republican National Committee.

Did this mean I was a Democrat? I wasn't entirely sure. The years of President Carter's administration and the years of the Vietnam War left me uncertain about this. If the liberals still controlled the party, the way the conservatives controlled the Republicans, I couldn't see myself as a Democrat. President Clinton was proving himself to be a moderate in deeds, although whether this was merely political expediency or not was something I couldn't really tell. Under his administration the federal deficit had been coming down each year, which I thought was a very good sign. Fiscal responsibility on the part of the federal government had always been something very important in my political views. Fiscal irresponsibility was something I firmly associated with the liberals and, prior to President Reagan's administration, something I thought the Republicans opposed. That the deficit had continued to balloon under President Bush even after the end of the cold war had disabused me of the notion I could look to the Republicans for this.

The other highlights of President Clinton's first term were things I viewed as kind of a mixed bag. I had mixed feelings about NAFTA, the North American Free Trade Agreement. If there ever could be such a thing as 'free trade' I was fine with the idea, but the free trade playing field has never been all that level a field and there are considerations other than economic that are important. One of them is war.

In *The Wealth of Nations* Adam Smith had written his whole hearted support of free trade. *To give the monopoly of the home market to the produce of the domestic industry, in any particular art or manufacture, is in some measure to direct private people in what manner they ought to employ their capitals, and must, in almost all cases, be either a useless or a hateful regulation. . . It is the maxim of every prudent master of a family never to attempt to make at home what it will cost him more to make than to buy. . . What is prudence in the conduct of every private family can scarcely be folly in that of a great kingdom. . . A trade which is forced by means of bounties and monopolies may be and commonly is disadvantageous to the country in whose favor it is meant to be established, as I shall endeavor to show hereafter. But that trade which is without force or constraint, is naturally and regularly carried out between any two places is always advantageous, though not always equally so, to both.* But one thing Smith did not consider in those days of sailing ships, muskets, and muzzle-loading cannons was the idea that the 'domestic monopoly' as represented by stock companies might altogether abandon its country in favor of setting up its production in a foreign country. Any prudent businessman can be expected to try to carve out a monopoly if he can; the monopoly is the most profitable of all markets and absolutely unrestrained free trade makes it possible to more closely approach achievement of a monopoly when the 'master' of a business can concentrate his operations in those places in the world where labor costs are most advantageous to him. In Smith's world he envisioned the loss of an uncompetitive domestic industry as an opportunity to employ the country's capital in other and more productive and beneficial enterprises. The fate and security of a nation was not seen then as being in any way dependent on what types of business enterprises were at home in that nation.

But times change and the world isn't in the eighteenth century anymore. Nationalism did not yet exist in Smith's day. Nor did the security of any country depend on its capacity for manufacturing. That is not the case today. The Civil War was perhaps the first illustration of this. Ultimately it was the industrial capacity of the North that overwhelmed the agrarian society of the South and decided the outcome. When America was plunged into World War II by the sneak attack on Pearl Harbor, it was America's industrial might and nothing else that let us prevail in that war. By 1996 the signs of American corporations abandoning their country and stripping us of our technological and industrial power were already visible. Whose side are these 'multinationals' on? Certainly not ours. I thought then and I think now that free trade wholly divorced from all but purely business considerations is folly and a recipe for grim national disaster in the future. A service economy is a third-world economy unable to protect our liberty.

I think anyone who discounts or ignores the patriotism of foreigners for their homeland just doesn't know very much about real people. As production engineering manager, my job frequently brought me into dealings with Japan. Japan was a notoriously closed market to U.S. companies, regardless of what the

politicians and the economics professors might say. HP had long had a subsidiary located in Japan, called Yokogawa Hewlett Packard (YHP), that was established to let us penetrate the Japanese marketplace. Even with YHP, I saw a number of instances of slick tricks by which Japanese organizations tried to keep our products out of Japan's home market. The one that sticks out most vividly in my mind started with a fax from YHP that angrily claimed we had sent an entire shipment of defective products through them to one of their important customers. Every single disk drive in every single one of the shipments was defective. I had those products shipped back to us so I could have my Failure Analysis team look at them. Sure enough, every single disk drive was bad.

Somebody in Japan had opened up the boxes and very carefully smashed the top of each disk drive with a hammer. It was sabotage, pure and simple. Do you think the Japanese are free traders? Think again.

The reality is that nationalism is alive and vigorous in every country on earth and all countries in the world look out for themselves first and anyone else not at all. I think the unregulated, unrestrained outsourcing of America's industrial capacity and technological expertise to foreign countries is dangerous to both providing for our common defense and to promoting our general welfare. I think this corporate outsourcing to foreign countries is an act of treason, intentional or not, in everything but the most narrow legal sense of that word. I don't think the United States is likely to ever go to war with Britain or Canada or Australia or Mexico in the future, but I wouldn't make the same bet when it comes to any other country on earth. It's not popular among either the conservatives or the liberals to say so, but in the final analysis I am an American. I care about *us* over and above any other nation, and I pledged my allegiance to America alone. So I was and am not very comfortable with NAFTA. But it doesn't seem to be an issue that one party or the other can be blamed for. As ignorant of economics and history as most corporate managers are, politicians are even more ignorant.

Then there was the health care reform plan. I never saw what that bill actually contained. I did see the vigorous advertising campaign mounted against it. It had been opposed by an alliance of conservatives, the American Medical Association, and the insurance companies. It wasn't hard to understand why the conservatives opposed it. The fiscal –as opposed to the religious – conservatives have always been on the side of what is usually called 'management' and against the side of what is usually called 'labor' – two labels that were fairly accurate in the nineteenth century days of the robber barons and a lot fuzzier today. Most companies don't like having to provide health benefits to the employees and only do it because their competitors do it. HP under Bill and Dave had been one of the few companies in America who introduced health care benefits for the employees for the sole reason that Bill and Dave thought it was the *right* thing to do, that it was part of what the *community* of a company meant. That had been in the 1940s. In the summer of '96 I had been working professionally for twenty-one years and in all that time the only changes to an employee's health benefits I had seen had been in the direction of reducing them. That's still the case today.

It wasn't hard to understand why the AMA and the insurance companies opposed the health care bill either. Many doctors and pretty much all hospitals love to suck every dollar out of a patient's wallet they can and insurance companies don't like to pay off on their policies if there is any way possible to get out of doing so. I knew the AMA and the insurance companies weren't on *my* side. To them I'm just a money tree from which they like to try to pluck a bushel basket full of leaves whenever they can. I didn't know if the health care bill had been a good bill or not, but I did know I'd welcome having somebody on my side for a change.

Then there had been the brouhaha of 'gays in the military' that culminated in the 'don't ask, don't tell' policy. My view about homosexuals has changed a lot over my lifetime. When I was a boy growing up in Maquoketa and in Bellevue I didn't even know what a homosexual was. "Homo" was among the names we boys sometimes called each other as part of the name-calling stage of having a fight, but I thought it meant the same thing as 'sissy.' Another name we used was "queer" but I thought that just meant

'different' in a bad and insulting way. The idea that a man would want to have sex with another man or a woman with another woman never even entered my mind. The places in the Old Testament where it said a man shall not 'lie with' another man and doing so was an 'abomination' had no meaning for me at all. I just thought the ancient Jews had some mighty strange ideas about sleeping arrangements.

It wasn't until college that I finally learned what a homosexual was. There was a small 'gay liberation front' group on the Iowa State campus and by then I knew enough about sex to understand what 'homo-sexual' really meant. And I was appalled. The very thought of anal sex disgusted me right down to the core. It still does. I spent a lot of time in locker rooms and the main bathrooms at the fraternity house weren't too different from locker rooms. The idea of being naked in a shower room in the company of some guy who liked to have sex with other guys was just the creepiest thing imaginable. As far as I was concerned, I thought there had to be something really wrong – unnatural – about guys who chose to be 'gay' or gals who chose to be lesbians. I even resented the appropriation of the word 'gay' by these people. It felt to me like they were stealing the word and making it dirty. There was something hedonistic about the whole 'gay liberation' thing so far as I was concerned. And I sure didn't want people like that anywhere around *me.* I wasn't afraid of homosexuals, and I didn't hate them in any 'hang the dirty queer' sense. But I didn't want them in any part of *my* life. I didn't even want to *know* there were such people. I felt nothing but disgust and contempt for them.

The day I flew out to San Francisco for my interview with HP, the first sight that greeted me as I came out of the walkway tunnel leading from the plane into the terminal was two men embracing and kissing each other full on the lips. I was ten feet away from them and I just cringed in disgust. *San Francisco,* I thought contemptuously as I hurried on past them. I mentioned it to my HP host who picked me up at the airport. He just shrugged.

I came to find out later that HP had a policy of nondiscrimination on the basis of sexual orientation. I wasn't too sure how I felt about that policy. It pretty much guaranteed that some of the people I worked with were probably homosexuals. But as time went by, I found out I couldn't tell whether a coworker was 'normal' or 'homosexual.' In the workplace there just wasn't any occasion for anything to come up where this mattered. I did come to find out that one guy in the finance department was 'gay.' He was a young man about my age named Dean and the way I found out was outside of work. My pals, Rich and Dick, and I used to go out on Friday nights for a few beers and then adjourn to Rich's apartment to grill some steaks and, usually, talk shop. One night Rich invited Dean to come along with us for some reason, and later when we at Rich's chowing down on steaks I was dumbfounded to hear Dean proposition Rich in what to me were the most obvious terms imaginable. Rich didn't get it; it all sailed right over his head. But Dick and I exchanged glances. I didn't say anything. I just sat there feeling very, very uncomfortable and disgusted. Dean never went with us again.

Two years later when I was working in Cupertino, I'd gotten used to the fact that homosexuals existed and that some of my coworkers – who I had no way of knowing – were probably homosexuals. It had never intruded on me in the workplace in any way and I no longer gave the matter any thought. Then one day the news came out of San Francisco about the murder of the Mayor and the gay city supervisor, Harvey Milk. The murderer was a former supervisor and was well known to be a fundamentalist so-called 'Christian.' He had resigned his seat and then changed his mind, but Mayor Mosconi wouldn't reinstate him. That was why he had shot the Mayor. There wasn't any mystery about why he also murdered Mr. Milk; the sole reason was Milk was openly gay. I still didn't like gays, but I never had the least doubt that this murder was an act of inexcusable evil. Not even the distorted religion of the fundamentalists is so distorted as to condone cold blooded murder for *any* reason. The episode made me think.

Many years later up in Boise, after I had started hanging around the music scene, I casually met a group of three young guys, all twenty-one years old, who had formed a band and were trying to break into the hard-to-get-into business of getting bar gigs in Boise. I met them at a Pengilly's jam session one Monday night. They were pretty good young musicians and a few weeks after I first met them they were

excited to announce they'd gotten their first paying gig at another Boise bar. My friends I was sitting with started giggling and when I asked them what was so funny they told me this particular bar was a gay bar. I hadn't even known Boise had any gay bars. These young fellows weren't gay – at least I don't think so – and they, too, didn't know this place was a gay bar. After my friends had enlightened me, I chuckled about it, too. I never did hear how their first gig went; it wasn't a bar I was going to hang out in. Not now.

I had also met a talented young female musician who had a following of women fans. I came to find out this group of women were lesbians. I must have been mellowing with age or something, because when I found this out my reaction was, *Oh, that's a pity.* A couple of these women were real lookers and the pity was that they dated other women instead of men. Me in particular. As I said, a couple of these gals were real knockouts. Privately my pal Tom Simpson and I referred to this group as 'the twisted sisters' – there was a rock band by that name – but I got to know them casually and found out, rather to my surprise, that I even liked them as casual music scene acquaintances. But they were women, not men, and I discovered I didn't have the same gut wrenching disgust for lesbians as I did for gay men. There wasn't much chance of me being in a shower room with lesbians, after all.

A few years later, as I was finishing up managing Coyote IV, I was stunned to hear that a lab engineer I'd known casually, and who had a reputation of being a pretty good engineer, was going to have a sex change operation. As part of getting ready for it, he had started dressing as a woman and he, or I should say 'she,' had changed his name to Rhonda. I happened to bump into Rhonda down at the Sand Piper Restaurant a couple weeks later, where I had gone to catch one of John Hansen's gigs. I didn't recognize her until she came over to my table and spoke to me. She asked if she could join me – the place was pretty crowded that night – and common politeness demanded that I say it was okay. Besides, I was very curious because before she'd become Rhonda she had always seemed like a pretty regular guy to me. I didn't think Rhonda was ever going to win any beauty contests, but we talked for awhile and as we did I felt less and less uncomfortable about the situation. I'd never planned to date Rhonda when she was a man, and I didn't plan to date her now or any other time. But I did find out that, gender aside, she wasn't any different from the guy I had known. The situation felt strange to me, but Rhonda didn't seem like a stranger. Mostly she explained to me why she was doing what she was doing, and I found myself able to listen to what she was saying and even to understand it at least a little bit.

I was studying neuroscience in my off hours then, and one thing I came to learn from these studies is that there may very well be a biological basis for sexual preferences. The evidence isn't all in on this even today, but there *is* some scientific evidence for the hypothesis. To me that made one very important difference. I had always assumed that being gay or being lesbian was simply a matter of choice. But the science says otherwise. If the hypothesis holds up, it means there is nothing 'unnatural' about a person being homosexual. Uncommon, yes. There are a lot more heterosexual people than there are homosexual people. If it's true that this is just the way they were born, then that means God made them that way. And that means it is wrong for me to judge them the way I always had. God does not make mistakes. Not ever. Of course, the hypothesis might be wrong. But I don't *know* how that's going to come out, and that means I can't justify making moral projections onto homosexual people because their sexual nature is what it is. It's easy to hate and abhor abstract people; it's different when you're talking to someone you've known a long time, as I talked with Rhonda that night. I still don't want to be in a locker room in the company of a homosexual man, but I've come around to knowing that it really doesn't make a difference, good or bad, to me that some people are homosexuals. I can accept them for who they are. In a way, you could say that night at the Sand Piper with Rhonda really taught me what *tolerance* means.

When the 'don't ask, don't tell' thing happened, I thought it was kind of an empty thing. There *have* been 'gays' in the military before, I'm sure. And the military still treats them the same way now as ever if their homosexuality is discovered. What was accomplished? In ancient Greece the toughest army around was the Spartan army, and it is an historical fact that a lot of them were homosexuals. Maybe the answer to the whole thing is just to recognize there might be four sexes rather than two. Why not? It wouldn't change anything in my life if there were. Would it change anything in yours? If so, how?

One thing the Clinton administration did do during the first term was put the federal government on the Internet. The Internet had been around for years. For most of that time it was known as the DARPA net and it was closed to all but mainly the military and a minority of universities engaged in research and development on military projects. Now the technology was there to make it usable by a great many rather than a privileged few, and opening up DARPA changed the face of the American economy. It also opened up government to America's citizens.

Whether it was President Johnson and Vietnam, Nixon and his gang, President Reagan and Iran-Contra, or the Idaho Republicans in their closed caucuses, secrecy in government is the single greatest threat to liberty and justice for everyone that exists. Throughout the ages, tyrants have depended on it. Oppression relies on it. Slavery comes out of it. In one stroke, President Clinton and Vice President Gore made it much, much harder for the men who are supposed to be our elected representatives to hide from us. It was a victory for freedom and I completely liked what they had done.

So, did being kicked out of the Republican Party make me a Democrat? I wasn't sure. I only knew for certain that the Reagan Coalition was dead and I was no longer a Republican. As the 1996 election came and it was time to make a choice, I chose to vote for President Clinton. □

Jang Yi working in the electrophotography lab.

After the tumult of the Boise fiasco, the '96-97 school year in Moscow was pretty uneventful. All the important events in my life were taking place fifteen hundred miles away in Iowa. I published some papers, obtained funding renewal for the neural networks and electrophotography projects, taught some classes. In the fall of '96 I received my third year review. This is the one and only review between the time a tenure track professor is hired and the time he comes up for tenure review. It's usually a fairly uninformative event, and this was how it was in my case. The review basically said 'keep teaching, write some papers, get some grants.' It didn't say how many papers or how many grants or how much grant money. This sort of vagueness tends to promote a fair bit of uncertainty down the road when the tenure decision comes up, but it seems to be the kind of thing where no news is good news. It was a pretty stark contrast to the annual performance evaluations I was used to at HP, but the academic setting is a good deal less hidebound and dogmatic than is typically the case in the private sector. The '96-97 year was a time to meet new faces on the Moscow campus, pick up the pieces from the Boise disaster, and maintain a sad vigil for my brother as I received news of his condition and the progress, if one cares to call it that, of his fatal illness.

While we were in Boise I had developed three new graduate level courses for the department, and in the spring of '97 I developed a new senior-level undergraduate course. The topic was called 'coding and information theory' and it pertains primarily to mathematical techniques that are used in modern communication systems. The topic is typically taught, when it is taught at all, at the graduate level. My new course aimed to bring the basic principles of this topic to a wider range of students who in the main would not go on to graduate school and would instead be putting these methods into practice when they started work in the private sector. To satisfy the somewhat different needs of this student audience, I wrote an undergraduate-level textbook for the course. It was published in 1998 by Prentice-Hall under the name *Applied Coding and Information Theory for Engineers.* The book wasn't a particularly big hit in the United States, where by and large undergraduates are not exposed to the topic, but it was very popular in Europe, Canada, and South America. It was later translated into Korean and is now used in South Korea as well. I found out more recently that pirate copies of the book are doing a brisk business in China.

The new course also led to a discovery that turned out to be a pretty good deal for my research lab. His name is Jang Ho Yi. Jang was a senior in computer engineering who was finishing up his degree that semester and he happened to take my new course. It didn't take me too long to recognize there was something pretty special in this quiet, reserved young man who didn't talk a whole lot. Every once in a very rare while a professor comes across a student possessing a scholarly capacity far beyond even the best of his peers. Jang is one of these. He had immigrated from South Korea with his family to San Jose, where he had obtained his green card. He had learned English when he was well past the age where normally a person can learn a second language without an accent, yet Jang spoke with almost no trace of an accent at all. The only time you can hear it is when he gets excited and starts to talk fast. That is, I'm told by the experts, an incredible gift for languages.

From San Jose he had kind of drifted on his own up to Boise and decided to go to college there in our computer engineering program. I hadn't had him in any classes down there and with his quiet demeanor his talents had escaped my notice. Jang has kind of a pronounced tendency to sort of drift through life with no particular plan in mind. He was graduating that semester and hadn't yet even bothered to start looking for job to go to afterwards. Nor had he given any particular thought to graduate school. But with Aaron's graduation looming on the horizon in the not too distant future, I badly needed an excellent man to take the baton and help me carry on with the HP project. Jang looked like just the guy – and as it turned out, he was. After the final exam, I treated the class to some refreshments down at one of our local watering holes and sounded Jang out about the idea of coming to work in my lab and pursuing his Master's degree. When he found out he could get paid for going to graduate school, his reaction was, "Oh. Okay." He didn't even ask what the stipend would be. I thought at the time this kind of resembled the Forrest Gump School of Career Planning, but if it worked for him, it sure worked for me. We shook hands on it and I said, "Welcome aboard, son." He shot right back with, "Thanks, dad!" and a big grin. I knew right then there was a wiseguy after my own heart hiding inside that solemn exterior.

That was the start of a terrific and very productive six year working relationship between us. I had my man. The next trick was convincing HP to sweeten the deal a little so I could afford to have Aaron and Jang overlapping each other on the project. Greg had by then become the lab manager and I'd been working with a new partner at HP named Ken Lindblom. It turned out I didn't have much of a selling job to do there. Ken immediately saw the benefit of continuity in our research partnership and he had no trouble selling that idea to Greg. □

The 1997-98 school year was a fairly slow one for me. My new on-campus lab was starting to roll but we hadn't yet done enough research work to yield out anything I thought was worth publishing. Things were in the works but they weren't ripe yet. It was in this time period that word drifted up from Boise that the Disc Memory Division had finally been disbanded once and for all. This didn't come as any particular shock to me; it was something I'd foretold all the way back at the time they'd made the decision to go into the jellybean market. Even while I'd still been down on the BSU campus the handwriting was already on the wall. One of my friends from DMD, a physicist, had worked a stint with our program as an affiliate professor teaching electromagnetic field theory; he had told me word was going around that if the current crop of new products under development didn't succeed the division was finished.

He was plainly worried about things out at DMD but there wasn't much I could say that would be of any comfort. In Greg's old section we had always been pretty hard-nosed about the nasty realities of pushing a new product into the market, but I'd never detected any similar hard-nosed attitude on the part of the managers in the other R&D sections. Like Vashro, most of them seemed to me to be more interested in promoting peace and love in the workplace than in pounding out product in the face of what is for suppliers an unrelentingly hostile economic environment. The first major new product after Coyote IV had missed the all-crucial market window by failing to provide decent enough prototypes to their potential customers. My guess is that the all-or-nothing nature of the OEM market must have come as a pretty big shock to them. Then their next new product development had gotten into schedule trouble as well. As a manager, I'd been criticized from time to time for the way I would sometimes push people to

get results nailed down, but I'd never lost sight of the fact that companies – and divisions – *could* fail if they didn't deliver what their market was demanding. I never got the impression my fellow managers in DMD, Greg excepted, ever really understood that or that our Golden Age of disk drives was gone and would never come back.

I am convinced a lot of those guys never got it. One of the things I had been upset, but not surprised, to hear about was that sometime after I left the upper management had decided to turn Building 22 over to the production operation that fabricated three-and-a-half-inch disks. Not drives. Just the disks that went into them. The box product line factory was taken down and shunted off into a corner someplace back on the Boise site. In one move, they screwed up the only high profit production operation they had going so they could pour millions of capital equipment dollars into an operation that was entirely a cost center. I'd seen dumb decisions from time to time over the years, but this one really took the cake. What would my decision have been? There were companies out there in the world who made pretty good thin film disks by then; I'd have started buying my disks from them and I'd have shut down our own unprofitable disk fabrication operation and sold off the equipment. But that wouldn't have been a move that promoted peace and love.

Now, at last, the game was over for DMD and the division was disestablished. I was worried about what happened to my friends down there but, fortunately, HP was a giant company and they were able to arrange for a lot of the people there to find jobs in other places in the company where profits were still being made. A lot of my friends from engineering ended up over on the Laserjet side of the business. Laserjet printers are 'box' products, HP owned about sixty percent of that marketplace, and it was still very much a high profit seller's market. In the years to come that was going to attract a lot of new competitors into the business, but at least for now it was a terrific business to be in. Some of the rest of them, including my brother Vern, ended up becoming a kind of R&D colony in Boise for the tape drive division in Bristol, England that John Stedman had set up back in my Eagle days. Others ended up being placed in what was known as the Integrated Circuits Business Division, which was the part of HP that designed and fabricated custom application-specific integrated circuit chips for the operating divisions. ICBD had always been a strange division in the sense that it was geographically distributed all over the world so its circuit designers could be embedded in the divisions ICBD served. Its main integrated circuit fabrication operation was in Colorado. My friends who ended up in ICBD were circuit designers and so were also able to remain in Boise.

Why did DMD fail? In my opinion it isn't a mystery. Partly it was bad business management, partly it was appalling ignorance of economics. But above all else, they broke the social contract, and without it they lost the ability to lead, to build synergy, and to mobilize the human spirit essential for success. □

The financial problems accompanying the disestablishment of DMD did have one direct effect on my lab. With the belt tightening that had to go on down in Boise, HP's management felt the company needed to take a second look at its philanthropic support for universities. The money from this had always been a grant rather than a contract, the difference being that with a grant the university had no obligation to deliver some end result back to the funding organization, whereas a contract always has such a deliverable. My neural networks funding was a grant; the electrophotography modeling funding was a contract. HP corporate headquarters down in Palo Alto had always let HP's local sites manage their philanthropy decisions locally. Now, or so I heard, Palo Alto had reconsidered this and decided that in the future HP's university support would be entirely contract-based. This brought an end to my neural networks grant from HP, and so as we entered the '97-98 academic year it was without this source of funding. It was a blow to my research program because at the time the neural networks grant was four times larger than the electrophotography contract. It was a significant setback for me.

As a result, I spent most of that school year teaching courses in communication system theory, setting up a new lab course, based on what I had learned from Växjö University, to augment our lecture classes in that field, doing electrophotography research, and looking for new sources of funding to replace the

lost neural networks funding. I was also starting to become known by other folks on the Moscow campus, and one result of this was I started receiving a number of requests to serve as a committee member for graduate students by professors in other departments. This is a wonderfully broadening experience for a professor because it promotes working in more interdisciplinary arenas. At present 'interdisciplinary research' is a big national buzzword, but in '97-98 it hadn't yet become the big deal it is today. I found myself becoming more involved with colleagues working in mechanical engineering, computer science, and network security areas. This gave me a broader base outside of electrical and computer engineering and helped me establish my reputation among my peers up on the Moscow campus. As I write this today, I have served or am serving as a non-major-professor committee member for seventy graduate students, the great majority of whom are from disciplines outside of electrical and computer engineering. This all got started in '97-98. It was a year of base building for me. □

Mom in 1997.

Mom turned eighty in 1997. After Dad died and she no longer had to spend her days caring for him and nursing him, she had developed a pretty spry and active life as a senior citizen. She had to be a little careful because she had osteoporosis, a disease that afflicts many older women and causes the bones to become very brittle, but even so she was on the go a lot. She had become buddies with a younger senior citizen, a woman only in her seventies, and together they would hit the river-boat casinos and do I-don't-know-what-all. She even bought a nice new car, and my brother-in-law Ronnie was amazed and astounded by the way Mom beat down the car dealer in negotiations over its price. He thought he was dealing with a naive little old lady; that was his big mistake.

So, things were going pretty good for Mom and it warmed my heart to hear little snippets of stories coming out of Maquoketa about her exploits. Some of the family thought it would be fun for Mom to go on one of those ocean cruises down in the Caribbean, and she called me to ask what I thought of the idea. I guess the plan was that Mom, Sherri, and my cousin Doe (Dolores) would go together, sailing out of Miami. Without really thinking it through, I said it sounded like a fun adventure and I thought she'd really like it. As things turned out, I wish I hadn't said that. I wish I'd thought it over more deeply.

You see, Mom didn't know how to swim and had never liked the water. Later, in retrospect, I wondered if the reason she had asked my advice might not have been to find an excuse to not go. It didn't occur to me at the time because I love the water and I love boating; Mom didn't. But Sherri and Doe wanted to go, or at least Mom told me they did, and now I wonder if the reason she finally agreed to go might not have been that she didn't want to disappoint my sister and my cousin. They wouldn't have gone if Mom didn't go. But that thought never entered my mind the day Mom called.

The three of them flew down to Miami and checked into one of the hotels there. That was as close to the cruise ship as they got. That very evening when they were on their way to dinner, Mom was talking to Sherri and Doe and not watching where she was walking. The hotel had one of those little two-level floors in the corridor, the kind where there's a couple of steps down and no handrails or other things that make it obvious when you're coming up to the steps. Mom didn't see them and stepped into air. She fell and broke a bone.

They took her to a Miami hospital, and if the medical folks there had just confined themselves to

taking care of her broken bone, things would have turned out okay in the end. But they didn't. There was one doctor there who thought he had spotted something in her blood tests, and he kept running test after test until he could finally announce that Mom had a heart problem that called for immediate bypass surgery. Mom had had a bypass operation back when I was working in the original Eagle R&D group in the mid-eighties. I'd been terribly worried back then, but Mom had simply sailed through the operation and even laughed at me for being so worried. The idea of undergoing multiple bypass surgery didn't phase her in the least, and she always had more faith in doctors than a saint has in Christ.

Nobody asked me what I thought of the idea, but even if they had I can't see Mom taking my advice over that of a medical doctor. But if I had been asked, I'd have passionately opposed the whole idea. Yes, maybe Mom *might* have had a heart attack some day if she'd refused the surgery. *Maybe.* But I think this guy was just looking to make some money by plying his trade on Mom. I've never for one second been convinced that operation was in any way necessary. Mom had really been enjoying life, had been active and on the go, and had been living a life *worth* living. She did sail through the surgery okay, but in its aftermath her happy, active, on-the-go lifestyle was ended. That damned quack managed to convince her that she was really a frail little old lady who required a lot of treatment and medical attention after she got back home. Mom flew back to Iowa accompanied by an oxygen tank like the one Aunt Hazel had had.

She was never the same after that. Back in Maquoketa she ended up under the 'care' of two different doctors, one to look after her so-called heart problem and another to look at a 'lung problem' the guy in Miami managed to convince her she was 'suffering' from. These two miserable quacks stuffed her full of expensive pills. The quack prescribing medication for her lungs prescribed pills that interfered with the ones the other quack was prescribing for her heart. So he'd change her heart medication to other pills that counteracted the lung pills. Then the lung guy would change his prescription – usually just by adding more pills or upping the dosages – and that would fight against what the other guy was doing. Instead of treating my mother, they got into one of those 'well I'll show you!" pissing contests with each other. I am completely, totally convinced that between them these two quacks ruined her health. In their hands, they really did turn Mom into a frail little old lady. I will never forgive these three guys for what they did to my mother. Sherri and Melody quit telling me details of what was going on because I'd get so furious.

Unfortunately, I think guys like these three are typical of American doctors any more. I think they are members of a profession largely made up of people who don't have much of a clue what they're doing. □

Things began to get much busier for me as the 1998-99 school year got under way. Funding from HP for the electrophotography modeling project that year more than doubled as HP continued seeing ever more possibilities in the benefits of our research partnership. This additional money allowed me to set up an experimental research laboratory where we could carry out our own experiments on the physics of laser electrophotography. Up until this time our modeling work had been theory based and had used a number of approximations developed over the years by previous industry-based R&D. This was fine so far as the interaction between the laser and the photoconductor of a printer is concerned (this physics establishes what is known as the 'latent image' – it's kind of like what is on photographic film before this film is developed). But as it turned out, this theory was not entirely accurate. With the new laboratory we were able to improve the accuracy of the theory and begin to develop a precise theory of the process by which the laser exposure is turned into the print that ends up on paper. This is called the 'development' process of laser electrophotography. No one had a good quantitative model of electrophotography development yet and our mission was to come up with one.

Another new thing on my plate that year was civil engineering. More precisely, the MRC had begun to explore collaborations with the civil engineers at the UI's National Center for Advanced Transportation Technology, NCATT. I had met NCATT's director, Dr. Michael Kyte, shortly after I moved to the Moscow campus and we had hit it off well. Mike was interested in exploring how electrical & computer engineering could collaborate with civil engineering in the area of transportation systems for the purpose of improving America's highway and city traffic systems, and we had been discussing ways of doing so.

During the summer of ’98 I had been a participant at Mike’s strategic planning sessions for NCATT (which became an institute, NIATT, later that year). These meetings had brought in Mike’s external advisory board members (a kind of academic counterpart to the board of directors of a private sector company except that this kind of board only advises and does not direct) as well as high ranking officials from the U.S. Department of Transportation and the Idaho Department of Transportation. One critical national need identified in these meetings was the need for better tools that civil engineers could use in designing the system of traffic signals that controls the flow of vehicles in cities. Civil engineers use computer models of traffic flow in designing these systems and the basic problem was that real traffic controller electronics behave differently from the rather simple models of traffic controllers used in these tools. To make the situation even more interesting, how these traffic controllers really behave differs from one brand to the next and traffic controllers produced by different companies behave differently even when they are designed to the same set of standards. These differences can and do make the flow of real traffic on real roads different from how the computer model said it would be, and this can cause some major problems. One you might have experienced firsthand is enormous traffic congestion during rush hour.

Mike’s strategic planning meeting was a multi-day affair and during the brainstorming discussions that took place near the end an idea was proposed for addressing this problem. I don’t remember who it was that came up with it, but the idea was simplicity itself. If the problem was caused by mismatch between real traffic controller boxes and the computer models, why not find a way to incorporate real traffic controllers directly into the model? This idea became known as ‘Hardware in the Loop Simulation’ or HILS. To make this possible, it would be necessary to invent a new kind of device that would allow real traffic controllers to ‘talk’ to the computers the civil engineers use in their work. The proposed device became known, naturally enough, as a Controller Interface Device or CID. As it happened, this idea had first been proposed by a civil engineering professor at the university in Louisiana not long before, a young guy named Darcy Bullock. Dr. Bullock had developed a proof-of-concept model at Louisiana and was then carrying on additional research on his idea at Purdue University, where he had recently gone to work. Darcy had already shown the idea was very promising but his original CID demonstrator had some drawbacks in terms of expense and lacked the flexibility needed in a commercially practical CID.

The reason for this was pretty simple. Darcy wasn’t an electrical engineer and the electrical engineers at his home institutions weren’t too interested in collaborating with him to further develop his idea. There are usually some pretty high walls that get built around the different specialties in different academic departments at universities; this is often the main barrier in doing interdisciplinary, collaborative research. But Touraj, coming from his background, believed in the necessity for interdisciplinary collaborations and made that one of the goals for the MRC Institute. I was at Mike’s meeting not only because he and I liked each other and got along well, but also because Touraj had made it one of our Institute’s objectives to help Mike’s Center (soon to be Institute) succeed.

For an electrical engineer, development of a CID was more a matter of product development than it was research. But for the civil engineers it was very much an applied research project in an important research arena in their field. It turns out that’s often the way it is in interdisciplinary research. Some members of the interdisciplinary team spend their time applying already well known methods to solve the problem at hand, while others are breaking new ground in their field. The trick to making an interdisciplinary program succeed is teamwork; the successes and academic credit garnered by the individual members of the team are *team* successes. A lot of professors have a hard time getting used to that idea because the great myth in academia is the myth of the lone researcher working in isolation with his research assistants. In engineering at least, the world is a bigger place than this. My years at HP had taught me how to build good, strong teams, and Mike is by nature also a team builder. The CID program would have to be a lot bigger than just designing a CID. A part of it, for example, involved extending the capabilities of the modeling software the civil engineers used to accept the use of CIDs in the simulations.

Mike and I worked together in the weeks following the strategy meeting to put together the CID

proposal. One of Mike's very best moves was the decision to involve Darcy Bullock of Purdue as a full fledged member of the team. Darcy, as it turned out, was excited and overjoyed to find a partner for his research at Purdue. Thus, our program was not only interdisciplinary but went beyond the confines of our university. The DOT back in Washington, DC liked the proposal so in January of '99 my lab received a research contract funded by the DOT of just under a quarter of a million dollars to develop a CID box. This was part of a much larger research contract going to NIATT (NCATT had become NIATT by then), and this contract turned out to be one of the crucial research contracts for eventually propelling NIATT to the forefront of U.S. research institutes in America's civil engineering research infrastructure. For me it meant tripling the size of my research laboratory in one fell swoop.

Another initial collaboration also got started as the '98-99 academic year began, although this one would not actually bear fruit in the form of research funding for another few years. A new guy, Dr. Yang-Ki Hong, had just joined the UI's Department of Material Science and Engineering that fall. Yang-Ki was a physicist by training, a former executive in a company back in Korea, and was already a pretty well known scientist in the field of magnetic materials. You can see that 'new' when applied to him only meant 'new to the University of Idaho.' Yang-Ki is one of the more traditional types of university folks in the sense that he is a specialist. He studies a material known as barium ferrite and that's all he studies. The academic world has a lot of people like this, people who spend their entire careers trying to learn everything there is to know about one very, very specific thing. This is, in fact, very much the norm at universities; there are relatively few generalists like myself to be found there. That is one facet of my field, system theory, that is quite different from the other academic specialties. The most world famous scientist at the UI is a chemist named Dr. Jean'ne Shreeve, and Jean'ne has spent almost half a century studying the chemical fluorine. She's probably the world's foremost authority on fluorine chemistry. I never knew there was that much to know about fluorine.

Yang-Ki had gotten in touch with me not long after arriving in Moscow because he knew of my work in magnetic recording. In Yang-Ki's particular field, interest in his material (barium ferrite) depends very much on its practical applications and so he needed a partner from the engineering side of things with whom he could work on the applications end. It turns out that barium ferrite not only had potential applications to disk and tape drives, but it also had applications to circuits in high frequency communication systems. He wasn't yet far enough along in developing his new ideas for us to be able to immediately start seeking research funding for its applications, but our discussions in '98-99 were laying the groundwork for that to come later on.

All the while, my unfunded research work on electronic brains was continuing apace. By this time I was deep into those fundamental questions involved with 'what is mind?' and was making sufficient progress in this to give what I was doing a name that neatly described the nature of the work. I called it 'mental physics' because its fundamental aim is to produce the kind of mathematical theory of mind that could stand on par with the other arenas of 'hard' science such as physics, chemistry, and biology. The science of psychology, by contrast, belongs to the class of sciences termed 'social' sciences, a class often regarded as a lesser science by 'physical' scientists but which, in fact, is a much more difficult science than physics. In many ways, physics is the easiest of the sciences, and this is why it is also the most highly developed science. I saw – and still see – mental physics as the first truly new 'hard' science to come into being in over a century. Because this work was unfunded, I was spending a lot of my after-work time doing this research while my normal daytime hours were spent teaching and doing the funded research studies, all of which had graduate students and a few undergraduate Research Interns carrying out the main, time-consuming details of doing the work. My role was part researcher, part teacher, part coach, part mentor, part manager, and part marketing department. I was finding all those years of experience as a project leader and a manager at HP to be extremely valuable in wearing all these hats and juggling all these balls in the air.

Most of the time my professor job kept me busier than I had ever been at HP but, in compensation, the stress levels were by comparison almost non-existent. The '98-99 school year was, however, an exception

to the more usual low-to-no-stress condition because with the start of calendar year 1999 would come my tenure review. As I mentioned before, the consequences of being denied tenure are fairly fatal to the career of a professor. I knew my work was going well on all fronts, and nobody was making any disquieting noises about my job performance. But on the other hand, the Boise business had severely disrupted things for awhile and I wasn't sure whether or not my output of journal papers was going to come up to the mark required by the three different levels of tenure review committees. There weren't any specific hard number criteria for publication productivity that anyone at the University would admit to, so I was completely in the dark about whether my record was good enough to pass muster. This was making me very, very nervous. The stress showed up in three ways. The first, and most upsetting to me, was a big spike in weight gain. My body seemed bent on mimicking Big Jake, the Dean, who was a very big guy. The second and just as visible sign was my beard; it had now turned snowy white. It was around this time I started receiving a lot requests to play Santa at various people's Christmas parties. The third was a brief return of my dry eye condition. This happened just as my tenure review package was threading its way up the review chain, and so for awhile I was back on the eye drops again.

There was one entertaining incident that happened just a couple of days before the already-tenured faculty in my department were scheduled to vote on my tenure application. One of my younger colleagues, a very talented guy named Harry Li, one day unexpectedly invited me to join him for a soda pop down at the Student Union. He'd never done this before – and he never did it again – but I liked Harry a lot and was happy to take him up on the invitation. Although he was several years younger than me, Harry had joined the department straight out of graduate school and was by then a tenured associate professor. He was one of the guys who was going to be voting on my tenure.

We went down to the SUB (Student Union Building) and chatted pleasantly for awhile. Then, out of the blue, Harry asked me how long I expected to be working as a faculty member. The question caught me by surprise, but I answered, "Well, my guess is I should have at least another twenty good years left." Harry looked surprised and murmured, "Oh, that long?" Suddenly I understood, and I laughed. "How old do you think I am, Harry?" I replied. I was forty-five years old, but I guess my white beard must have made me look a lot older than this. It was amusing but also a little bit disquieting because I sensed that the reason we were sitting there was because Harry had been wondering if he wanted to vote in favor of tenure for a senior citizen. I don't *know* if that's what he was thinking, and it wasn't the kind of potentially trouble-making question I was about to ask with the vote coming up. But it's certainly possible that was what he was thinking, especially since he seemed to relax a lot after he heard my answer. If that's what he was really thinking, though, then I'd just had my first encounter with age discrimination. That was a factor that up until then had never entered my head. It gave me something else to worry about.

There was one comfort to counterbalance, in part, the worry that my tenure review was causing me. My personal investments and savings had continued to grow at a vigorous pace since 1983, and because I was debt free I would be able, with very careful budget management, to shift everything over into U.S. treasuries and probably live out the rest of my life in retirement if the tenure decision went against me and I couldn't find another job that I wanted to work at. In fact, my paper gains from my investments had been far greater than my UI salary for the last few years, and until I started selling off my holdings these gains were not taxable. So I was in pretty fair shape even though 'Plan B' would mean being stuck in Moscow the rest of my days. But it was mathematically do-able if I paid careful enough attention to the tax consequences in converting my holdings. However, this was something that would only be a last resort, and I didn't want to have to go with this plan.

As things turned out, I was worried over nothing. The tenure review went off without a hitch and near the end of the school year I received official notice that I was being awarded tenure and promoted to the rank of associate professor effective July 1, 1999. I'd made it and, quite literally, my worries were over. To add icing to the cake, during the month of July '99 my personal net worth reached a rather nice milestone; I had become a millionaire. That's a lot of bottles of soda pop even at today's prices. This was my first time for reaching this mark, as it would turn out; the days Fed Chairman Alan Greenspan would

famously characterize as ‘a period of irrational exuberance’ were about to come to a screeching end the next year and I’d end up dropping back below this mark and having to do it again. But for the boy who had nearly despaired of being able to go to college in the 1960s because his family didn’t have the money, for the young man who lived on a single one-dollar hamburger a day during his drive out to California in 1975 and still had to borrow money from his new employer just to get there, July 1999 felt very good indeed. It was a trophy accomplishment. □

Late in the year in 1998, during a lame duck session after the November elections, the nation was treated to a blatant display of abuse of power by the right-wing Republican House of Representatives: the impeachment of President Clinton. Our would be Republican rulers had been consistently going after him since the smear campaign started during the 1992 election, the one where I’d received that phone call when they had called him a sleaze bag. Special Prosecutor Ken Starr had been conducting an endless series of investigations since 1993: Travel-gate, Whitewater-gate, You-name-it-gate, and the House Republicans pounced on what was probably perjury by President Clinton during a deposition he made on his relationship with Monica Lewinsky. This came during a lawsuit brought by a nobody named Paula Jones, who happened to have a pretty good legal team for someone who impressed me as being pretty much the kind of person that in the old days they used to call ‘poor white’ in the South.

The Lewinski scandal had broken in January of ’98. At first I’d had trouble believing President Clinton could possibly have been dumb enough to have really done this, but it turned out he was. I deeply disapproved of what he had done and I was deeply disappointed in him as a man for doing it. A marriage vow is a promise and one thing I expect of everyone is that they keep their promises. A lot of times people don’t, and I know this, but it is a standard of conduct against which I judge the moral fiber of a person. But as much as I disapproved of his infidelity, I also saw it as a private matter between Bill Clinton and his wife. As for his Paula Jones deposition, I thought he acted pretty much like a weasel and I wasn’t the least bit surprised by his denial.

What did surprise me was the way the Republican House used this to try to ram an impeachment through. I don’t know what the legal penalty for perjury in a civil lawsuit is, but I know it doesn’t come up to the standard of ‘high crimes and misdemeanors’ which is the constitutional ground for impeaching a President of the United States. To the charge of perjury, the House also added an ‘obstruction of justice’ charge, which was basically one of the same charges made against Nixon. All in all, the House Judiciary Committee approved a total of four specific charges after a very perfunctory hearing along straight party-line votes on December 11th and 12th. Debate by the full House was considerably livelier and they ended up passing two of the articles, the perjury and obstruction of justice charges.

There isn’t any ambiguity in the intent of the impeachment language in Article Two, Section 4 of the Constitution. Why? Because Alexander Hamilton had plainly stated the intention in *The Federalist,* (Number 65):

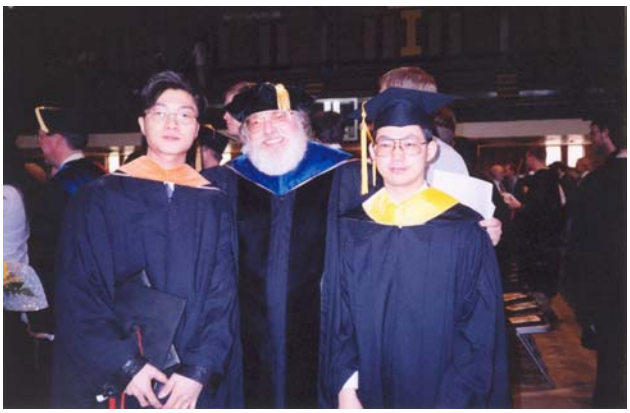
> A well-constituted court for the trial of impeachments is an object not more to be desired than difficult to be obtained in a government wholly elective. The subjects of its jurisdiction are those offenses which proceed from the misconduct of public men, or, in other words, from the abuse or violation of some public trust. They are of a nature which may with peculiar propriety be denominated POLITICAL, as they relate chiefly to injuries done immediately to the society itself.

Somehow I doubt whether very many of the Theocrats calling themselves Republicans in the ’98 House of Representatives have ever bothered to read *The Federalist.* They just saw an opening and used lawyer tricks to ram through an impeachment in full violation of the intent of the Constitution every one of them had sworn an oath to uphold and defend against all enemies, foreign and domestic. They had themselves become enemies of the Constitution and they were oath-breakers.

In 1996 I hadn’t known if, after being kicked out of the Republican Party, I would actually become a member of the Democratic Party again. After the House impeached President Clinton I no longer had any

doubts on this matter. It wasn't news to me that the Party of Reagan was dead; that had been obvious for quite awhile by now. But now I thought I could clearly recognize what that party had become. I'd seen this sort of thing before. It had returned to being the Party of Nixon. This time it wasn't just a rogue, criminal President and his gang; the cancer had grown across the body politic of the Republican national organization. For me rejoining the Democrats was no longer a matter of choice. It was now a matter of Duty. There's certainly no guarantee this will in the end turn out any better than when I became a Reagan Republican and trusted that he could keep the conservatives checked. The liberals aren't dead and gone from within the Democratic Party. But there was no other practical, viable choice for standing against what my old party had become. There was no other practical, viable thing I could do to keep *my* pledge of allegiance to my country. The day the House passed the Articles of Impeachment, I became a Democrat.

For twenty-one days, leading up to February 12th of 1999, I followed the impeachment trial in the Senate, waiting to see what the outcome would be. In the end, 45 Democrats and 10 Republicans voted to acquit the President on the perjury charge, with 45 Republicans voting to convict. Then the Senate split on a 50-50 vote to acquit on the charge of obstruction of justice. All told, only five out of the fifty-five Republican Senators stood by their oaths to the Constitution to the end. The Republican *coup d'etat* failed. Their national religion party leaders howled their disappointment and damned the rest of us for our lack of morality. Like Nixon in '62, they would not keep the pouting pledge they made to withdraw from politics forever. They're still out there and they still infect American politics as a cancer. □



With Jang Yi (left) and Hua Lin (right) at commencement (1999).

The close of the '98-99 school year saw a number of graduations from our corps of graduate students. One of these, Hua Lin, was my last graduate student funded through the old HP neural networks grant. By some fairly careful budget management I had managed to scrape together enough support to see him through to the completion of his degree. Hua's thesis was entitled "An Image Extraction and Recognition System Using Neural Networks." What this system did was take scanned images of printed text, figure out where the individual letters of the text were regardless of the type of font in which they were printed, and then identify what each individual letter was. The principal challenge for this system was to be able to see through the differences among various fonts, e.g. A vs. 𝔄, and still correctly identify the letters with a high degree of accuracy. This is something human beings do very well but getting a machine to do it has its challenges. Hua developed a new learning algorithm by which our neural network could come to be able to do this by being trained on a relatively small number of examples. The neural network proved to be accurate better than about 99% of the time with printed characters but it had much lower accuracy when we would ask it to identify letters produced from handwriting, which would have been our ultimate goal for this neural network if the funding hadn't run out. Still, it was a very promising start. This particular neural network was just a machine and didn't yet qualify as a "brain" under my mental physics definition of what an electronic brain had to be able to do.

Another graduate that year was Jang Yi, who had completed his Master's degree work and would be continuing on with his doctoral studies. Jang's thesis was based on our electrophotography modeling work funded through the HP contract and was entitled "A Xerographic Simulation Model." He had completed his Master's studies in two years, which is the minimum amount of time needed by a graduate student who has a full research assistantship appointment. An RA is required to work twenty hours a week on his research job, and to do so our graduate college mandates a maximum number of credit hours of classes per semester a student so employed can take. That is why an RA requires two years to complete

his studies instead of only one. Because many of his classes were classes I taught, he and I had an interesting but altogether typical professional relationship: half of the week he worked for me in my lab; the other half of the week I worked for him as his teacher. It's a very cool relationship and one totally unknown in the world of industry.

Jang had grown professionally a great deal during his two years of Master's studies and I was pretty proud of how far he had come already. I mentioned before that Jang didn't like to talk much, so you might guess he'd really hate to stand up in front of a room full of people and give talks. If you guessed that, you guessed right. One of the things I had required him to do late in his first year was make a presentation of his research to our weekly research colloquium. There would be around fifty or so people in attendance at these things each week, and this was the first time Jang had to face this kind of situation. His very first professional presentation had been something less than splendid. He was so nervous he ripped through about seventy slides in twenty minutes, almost all of which he spent with his back turned to the audience. Pretty much nobody in that room had much of any idea what he was talking about. Afterwards I told him the next time I was going to outfit him with one of those electronic shock collars they make for dogs and give him a jolt every time he sped up like that or turned his back on the audience. I was kidding, of course, and he knew that; but he got the message. By the time he had to present and defend his thesis, he had developed into a pretty good speaker – and also a much better writer – and he continued to hone those skills during his doctoral studies. Today he's an excellent speaker and writer. He talks more, too.

Another of Jang's big learning experiences during his Master's research was the discovery that highly idealized mathematical theories don't always work. Theory does work, of course, if the theorist puts all the relevant factors into the theory. But what are the relevant factors? Theorists quite often will 'simplify' the mathematical theory by leaving out factors they assume are 'minor' or 'inconsequential' to the model. This happens in every field of science. The problem is that mathematical equations don't come with an owner's manual that says 'use me here and here but not there.' Mathematics is the language of science but it is not the science itself. So how does a theorist know what factors are 'relevant' and what factors can be safely ignored? In a nutshell, the answer is 'through laboratory experiments.'

Over the past twenty-five or so years, one of the things I have noticed is that as science and engineering education has come to make more and more use of the availability of personal computers – every student has one nowadays – there has been a growth in reliance upon computer simulations and a downplaying of laboratory experience. This has, I think, grown to an unhealthy level in America and places like Växjö and other European schools have a much better balance in their programs. In the terminology of engineering, the word 'practical' means 'able to be reduced to practice' and this is what laboratory experience teaches. A computer simulation is not an experiment. A computer will just compute whatever mathematics you put into it and it is completely incapable of knowing or caring whether your mathematics is correct or adequate. As the old timers used to say, 'Garbage in, garbage out.' However, students tend to believe everything that comes out of a computer is the gospel truth. The fact that it is not usually comes as an awful shock to them. One of the worst things a scientist can do is fall in love with his theory. It tends to blind him to those bothersome things we call "facts."

One quiet morning as I was sitting at my desk, Jang had come to my office wearing a long face. "I've got bad news," he said. "I've just gotten the data from the experiment."

I just looked up, grinned at him, and asked, "How can data be bad news? Data tells us what is true."

What had happened was that when he'd put theory to the experimental test, the experiments had given him an answer other than what he'd been expecting from the theory. That didn't come as any surprise to me. I knew just how simplified the theory published in the literature was and the purpose of the experiment had been to see how accurate – or perhaps it would be better to say 'inaccurate' – the conventional model was. Quite a bit inaccurate, as it turned out, which was what had brought Jang to my office that morning. We sat down and I explained a few things to him about how theories are developed and what the role of experiment is in developing theory. I think that day was a kind of milestone in Jang's

development as a scientist. It was the first time he'd really had to think about the relationship between mathematics and nature. Data, provided the experiment is reliably and carefully done, is never a 'bad thing' in science because a theory that provides wrong answers is worse than no theory at all. As Will Rogers famously said one time, "It ain't what we don't know that gets us into trouble. It's what we know that ain't so." Jang's data that day led to our developing of a *better* theoretical model.

By the spring semester of '99 my own work on what I was now calling mental physics had made sufficient progress that I felt comfortable enough with it to present some of my findings at our research colloquium. My talk was entitled "The Problem of Pseudo-natural Machine Intelligence," and it was the first ever presentation to anyone to come out of all my years of work on the problem of electronic brains. Up until that time there hadn't been anything to say about the work that I felt was worth anyone's time to listen to. The date was April 16th, 1999. The talk generated quite a little beehive of excitement among the graduate students and professors attending the colloquium that day. If I'd had funding for this research, I could have signed up half a dozen enthusiastic graduate students to work on it that day. □

Nearly every university has what is known as a 'core curriculum' – 'the core' for short – that every undergraduate student is required to complete. The original intent of the core is based on the idea that there are some things every educated person should know. The UI core was fairly typical of the core curriculum found elsewhere across America. However, in my opinion the 'what every person should know' content of university cores had deteriorated badly following the days of the radicalization of the humanities and social science professors during the turmoil of the sixties. Today as then, the main theme one hears where the core is concerned is 'relevance.' It is the pouting old whine of the radical years.

During the 1998-99 school year, a task force had been formed to re-design and 'modernize' our core curriculum. In the spring this task force was holding forums for faculty members to come to and make known their opinions on what 'the new core' should become. In May I went to one of these to make my pitch for the kind of core I wanted to see.

I didn't go with a great deal of hope that I'd be able to have much influence. You see, I am something of a dinosaur these days. I am one of very few scholars who is a Great Books advocate. The Great Books is the name given to a somewhat loosely defined collection of the works that had the greatest impact on the development of Western civilization, culture, and thought. This is represented in philosophy by the works of Kant, Plato, and Aristotle. In government and society it is represented in the works of Locke, Rousseau, *The Federalist*, Mill, Montaigne, and others. In literature there are many representatives, including Homer, Shakespeare, Dickens, Twain, and many, many more. Yes, these are the dusty old works many people find boring and 'irrelevant' if they are fortunate enough to be exposed to them while still in high school. Not many are these days. Echoing the cry of the radicals in the sixties, people today demand to know what any of these old writers, long dead, could possibly have to say about the modern world we all live in. How could they be relevant? But these are the works that spelled out the ideas that made us the people we are today. What could possibly be more relevant than learning *why* Western civilization developed as it did, *how* it evolved into what we know today, and *what* the great issues and problems of the past were that those who came before us were confronted with on the path leading to the modern world? In short, why are we the people we are today and who are we capable of being? That is what the Great Books talk about. What could be more important to know than this?

It's not popular to advocate teaching and learning the great ideas of the West today. People outside of academia think the only important thing is for their children to learn a trade. People inside of academia tend to think we should pay equal attention to Eastern mysticism and the culture of the Mayans, Incas, and so forth. They think this promotes 'diversity' and 'cultural understanding.' To this I say, how do you expect us to understand other cultures if we don't even understand our own? Include some lessons in these things, yes, but first teach the lessons of America's heritage. Personally, I care a great deal less about the Mayans than I do about the great ideas upon which our own government and society, our own mores and folkways, are built. What good is it to teach tolerance of other cultures if we have no tolerance

for our own? Today many people seem to take it for granted that young people know about our own heritage. Do they think children are born with this stamped into their minds by genetics? In fact, almost all the students and young faculty I meet are entirely ignorant of this.

I don't blame my colleagues for this, nor do I blame the teachers in the public schools. It has been forty years since the destruction of the old Great Books core in the sixties, and the professoriate of today were almost all students in the time *after* these precious lessons had ceased to be taught. I would know nothing of the Great Books myself if I had not been so fantastically lucky to be exposed to their existence as a boy in the Civil Air Patrol's moral leadership classes. Professors do not teach these things today because they themselves were never taught about these things. That is the great fragility of education: mistakes once made in setting the curriculum propagate and last for generation after generation to come. How else do you suppose dark ages come about? They don't happen just because of the sword.

It isn't today's students who would oppose a Great Books curriculum. The students I know are fascinated to learn the topics contained in the Great Books had once been thought about and debated. The students I know are hungry for exposure to exactly these kinds of questions and answers. I think most people badly underestimate the young freshmen coming to us from high school. They aren't children. They're young adults. Naive, impressionable and often cocksure at the same time, true enough, but adults nonetheless. I treat them with respect, listen to what they say, and what I find is a maturity of outlook they are not usually credited with having by older people. Can we build tomorrow's leaders if we treat them as children today? Young people wish to learn great things. I think we should teach them great things.

Anyway, as I said, I didn't go to this forum with particularly high hopes of bucking the dominant trend of today. The best I hoped for was to at least get some kind of discussion going where inclusion of the Great Books in the new core would at least receive some somber consideration and debate. Unfortunately, I couldn't achieve even this much. The debacle of the sixties had done its work too well and no one was prepared to listen to a dinosaur. The new core eventually featured something called 'the core discovery courses,' and they turned out to be nothing but baby pabulum and trash. Every student I have asked has told me he or she hated the core discovery courses and regarded them as a complete waste of time. I agree. That's what they are. □

Periodically NASA announces a research competition called a "Grand Challenge," and in May of '99 Touraj and I got word of their latest one. A NASA Grand Challenge is a research question on par with Bob Allen's old Blue Sky projects except on a much greater scale. It is a research problem so challenging that no one knows whether or not it can even be answered, much less accomplished. Because a Grand Challenge problem is so challenging, the research is a two-phase process. Phase I is the proof-of-concept phase and has a duration of one year. At the end of one year, the project that has delivered the most convincing and successful result is awarded funding for Phase II, the phase where the proof-of-concept is turned into a full blown, practical implementation capable of going on a space mission. Funding for Phase I is relatively modest; funding for Phase II can amount to tens of millions of dollars in research money.

A Grand Challenge is overseen by Jet Propulsion Laboratory in conjunction with the California Institute of Technology, popularly known as Cal Tech. Usually around a half dozen independent research teams are chosen to work on the Challenge, and it is very common for these teams to team up with researchers from Cal Tech itself. Even being selected to compete in a Grand Challenge is very prestigious. In 1999 the Grand Challenge was: Find a non-earth-centric way to discover the signature of life on other planets. 'Non-earth-centric' was part of the stipulation because there is no guarantee life on other worlds would evolve along the same lines as life on earth. You can probably see the challenge in this. Life on earth is the only life we know and can study. How, then, can we look for alien forms of life without doing so by the methods used to study and understand life on earth?

Touraj and I had a meeting to talk about the Grand Challenge and to see if there might be something we could propose that would have any kind of reasonable chance of being selected for the competition. It didn't take us long to figure out that we lacked the expertise within the MRC Institute to do this and we

would need help from someone with deeper expertise on living organisms. Touraj knew just the guy: Dr. Ron Crawford, the director of the UI's Environmental Biology Institute. Ron's Institute was devoted to the study of bacteria and viruses and was closely tied to the UI's Department of Microbiology. From what was already known about Mars and the moons of Jupiter, it seemed like a pretty safe bet that if life existed at all in these places, it was going to be microbial life. Ron and his folks were natural partners.

In mid-May just after final exams we met with Ron over at his Institute to talk about the problem. It was kind of a brainstorming session and it turned out Ron was indeed just the right guy to talk to. One of the most fundamental characteristics of 'life' is the presence of metabolic processes. These are the physical and chemical processes taking place in living cells that are responsible for such things as nutrition and cell reproduction, two properties biologists regard as being features that distinguish between living and non-living matter. When an organism dies its metabolism ceases.

At root, a metabolism works through a series of energy conversion processes, like the one by which an organism turns its food aliments into an energy source to power its cells. Going deeper still, this process of energy conversion always involves chemical reactions that move electrons from place to place in the cell's atoms in a precise way. This is known as 'the electron transport chain.' It depends on very basic thermodynamic properties not tied to the other characteristics of any particular kind of living cell. Every living thing on earth has an electron transport chain at work down at the molecular level. It is the one thing nothing that can be called 'living' can do without. Its presence, therefore, is a universal 'signature of life' and its absence implies likewise the absence of life.

If we could somehow detect whether an electron transport chain was present in a sample then that would satisfy the core requirement of the Grand Challenge. It would be a non-earth-centric way to detect the signature of life regardless of what sort of life form it was. Our discussion continued as we kicked around various ideas about how an electron transport chain might be detected, and whether our ideas of how we might do this were technologically feasible. By the end of the meeting, we had our ideas firmed up well enough to put into proposal form, and over the next few weeks we were able to add sufficient technical and scientific details to establish our concept well enough to be able to make a convincing argument to the Cal Tech panel that would review Grand Challenge proposals and select the teams that would be funded for the competition. Ron was the obvious choice to head the science team and lead the overall project, and Touraj put me in charge of leading the engineering team that would be responsible for making what Ron's science team came up with something that could be built, miniaturized, and put into a space probe. We also identified the other key members of the research team based on the areas of expertise that would be needed to accomplish everything. We put together a proposal, entitled "Measuring the Chemical Signature of Life," and sent it in to the Grand Challenge review panel at Cal Tech.

Later, in December of that year, we heard back from the Grand Challenge review. Our proposal had been one of six selected for Phase I. The other five teams were all from big name universities and every one of them had teamed up with researchers from Cal Tech itself. They had selected teams from five giant institutions and us, the itty bitty University of Idaho, popularly known down in California as 'U-Who?'. We were running with the big dogs now. JPL awarded us a quarter of a million dollars for the research contract and so began our Signatures of Life (SOL) project. □

By mid-summer of 1999 the CID project was in the lab prototype stage and we were preparing to take two prototypes down to Las Vegas to exhibit at the annual meeting of the Institute of Transportation Engineers. I had two graduate students working on the CID design, a bright young woman named Ying Zhou, who was doing the hardware and microcontroller design, and an equally bright civil engineering graduate student, Zhen Li, who was doing the software design needed to let a CID interface with the simulation software package most popularly used by practicing traffic engineers. In addition, we had a bevy of hard working undergraduate electrical engineering students working on the design as Research Interns. I have always made it a practice to employ undergraduates in all my research projects whenever I've had the funding to pay them. This is fairly unusual at many universities, where the professors usually

want Ph.D. students to do the real work and Master's students to, figuratively speaking, wash the dishes. As for undergraduates, well that depends on if there are heavy things to lift and carry. I exaggerate a bit here, but not too much. Personally, I think the usual attitude is a fairly appalling waste of the talent pool available and getting undergraduates involved in research projects greatly improves the quality of their education. The trick lies in how you manage the project. In my lab the undergraduates work under the direction of the graduate students, which turns out to be a really good way of giving the undergrads an opportunity to accomplish all they're capable of accomplishing – which is often quite a lot – while, at the same time, giving the graduate students a little taste of the experience of leading a small project team. At the project management level, it helps me get the most bang out of every precious research dollar. Everybody comes out a winner.

The Las Vegas exhibition was going to be crucial to Mike's success in growing NIATT. The project was part of a national program by the U.S. Department of Transportation (DOT) to establish a few 'centers of excellence' in transportation research at different universities across the U.S. This first year there were quite a few centers being funded by the DOT program. In the upcoming year this number was going to be cut back and the funding that had supported the centers that were dropped would be re-assigned to enhance the centers that had proven themselves the most successful in delivering research contributions that supported the nation's infrastructure needs. The decision makers from the DOT were going to be at the Las Vegas meeting and what they saw there was going to be a factor in deciding which research centers were still going to be around and receiving DOT dollars the next year. My friend Mike is sort of a thin nervous person under the best of circumstances; with this crucial checkpoint coming up fast he was so jittery he'd make coffee nervous.

Back in my Delcon days an event of this sort was called a 'field trial' and Las Vegas would be the CID's first field trial. For reasons I've never been able to figure out, lab prototypes have a habit of saving up their nastiest technical bugs (problems) and not exhibiting them until just a few days before field trials. That was the case for our CID prototypes as well. The team was all over them day and night finding and fixing bugs, trying to get the units into full working order. I'd more than half expected something like this because I'd seen the phenomenon over and over and over across the course of my career, so I was down there mostly keeping the young folks from panicking, occasionally lending a hand myself with the debugging (I'd seen thousands more bugs in my time than the youngsters had), and every now and again reaching up and pulling Mike down from where he'd be fluttering like a moth around the ceiling lights of the lab. I was enjoying myself tremendously.

As I'd expected, we got both prototypes working just in time to box them up and load them into the van, along with tools, spare parts, the traffic controllers, the computers, and a few hundred feet of cables, to make the drive down to Vegas. The undergrads took off in the van and the next day Mike, Ying, Zhen, and I flew down for the meeting.

Las Vegas in early August has a tendency to get a wee bit toasty, and when we got there we found out the air conditioning in the exhibition hall wasn't working. As the temperature in the hall climbed toward the hundred degree mark it would have been a good day for going around in shorts, sandals and nothing else, but decorum prohibited that. My concession to the heat was limited to not wearing a tie and keeping the top of my white shirt unbuttoned just down to the point where nobody would think I was from Hollywood. During the first day of the exhibit the heat got to one of the prototypes and it started malfunctioning. Fortunately, nobody noticed this except for us – and poor Mike – and at the first available break we took the sick unit upstairs to one of our rooms. We used a hair dryer to find the part that was caving in under the heat and replaced it. Then we took the unit back down to the hall. By the next day they had the air conditioning working again and we didn't have any more problems with the units for the rest of the exhibition meeting. We saved the malfunctioning part so we could do a failure analysis on the unit when we got home and figure out what we had to do to fix the problem permanently.

This being a convention of civil engineers, I didn't have much interest in going to the sessions where

they were presenting their technical papers, so after the exhibition ended I wandered off to the hotel's casino and tried my luck with the slot machines. As fortune had it, I happened to find a hot machine and won a couple of jackpots from it. I went home with about nine hundred dollars more than I'd come down with. All in all, a very good trip. The DOT people were impressed with the CID and later in the year Mike was overjoyed to learn NIATT was one of the winners and would be receiving a million dollars in DOT funding for the next year. Ah, Vegas! □

After the Las Vegas exhibition we began the production prototype phase of the CID design. Now, a university isn't a manufacturing company and in November we had a meeting over at NIATT with the Vice President of Marketing and the Chief Engineer of McCain Traffic, a company that manufactured and sold traffic equipment. The reason for the meeting was to discuss licensing the CID design to McCain. In university lingo this is called 'technology transfer' and it is the principal way by which things discovered and invented in a university make their way out into the private sector. The university receives a royalty from the licensing agreement and the private sector company takes care of manufacturing, sales, and support for the product they've licensed. At the UI, the inventors of a technology licensed to the private sector receive a cut of the royalties received by the University as an incentive.

Effective technology transfer was one of the things the DOT used to evaluate the centers their funding supported and had been an integral piece of the NIATT strategic plan from the beginning. Our meeting with McCain went very well and not too long afterwards a licensing deal was struck with them. One of the things we factored in to the production prototype design was McCain's production process. They had a few specific requests – conditions, really – for what they wanted the final design to look like, and these were easily incorporated.

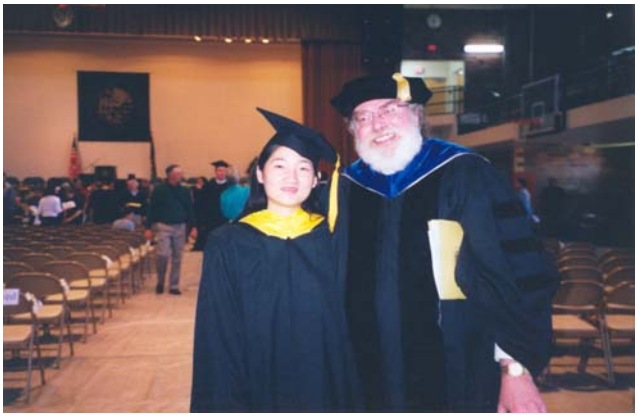
As it happened, I had another meeting that day immediately afterwards with Ron. We had just gotten advance word that our Signatures of Life proposal was being funded by JPL, with the funding and the official word slated to come in December. On top of this, in late July at a meeting with Ken from HP we had agreed to expand our research program beyond the electrophotography model itself and add a second project. Although the HP contract had already been approved and funded back in May, I was being designated an HP Master Researcher in December and along with this was coming a second project contract that increased my total funding. Then there was my electronic brain research, and I wasn't about to let that go for any reason. All this, added to my regular teaching assignments and committee assignments on various EE department committees, was about to make me a pretty busy guy.

My DOT contract – which was really a subcontract through NIATT – would run out at the end of December, but with Mike's success in keeping NIATT in the DOT's select group of funded centers of excellence there would be another contract coming in January of 2000. I had a big time problem coming; that was very plain to see and something was going to have to be done about it. It wouldn't do at all to let any of the contract projects suffer because of my time problem, and it wouldn't do either to turn any of them down. After all, Touraj and I were still working to build up our Institute's funding.

As it just so happened, one of my younger colleagues in the EE department, Brian Johnson, was just then going through a funding lull. That happens fairly regularly in the university setting. Some years just about every proposal you send in gets funded and then a professor finds himself busier than a one-legged man in a butt kicking contest. Other years next to nothing gets funded, not infrequently because the funding agencies have fixed budgets and pretty much always ten or twenty proposals submitted to them for each one they can afford to fund. Research funding is a very competitive environment and has a kind of feast or famine character to it.

Because my name wasn't vital to NIATT's funding and Brian had some time on his hands, the solution to my time problem was pretty obvious. Brian's specific training is in power engineering, but he is a generalist like me, has excellent people skills, is very, very smart, and I had a lot of respect for his abilities. I knew he could step in and take over the liaison with NIATT and do just as good a job as me, maybe even better. Certainly, I knew, he'd do a better job than I could with so many big projects on my

hands all at once. I went to see Brian, explained the situation, and asked him if he could take over for me with NIATT. To my relief, he agreed. The next thing was to sell Mike on the idea. Mike didn't know Brian all that well at the time, and he was understandably nervous about the whole idea. Of course, Mike tends to be nervous most of the time anyway, so that wasn't unexpected. It helped a lot that Brian is probably the smartest guy in the department, in my opinion at least, and I was able to give Mike my guarantee that he'd like Brian and was going to be impressed by his abilities. So it was that in mid-January of 2000 Mike, Brian, and I sat down for a meeting to kick off the NIATT project work for that year and Brian took the helm for the CID and the follow on work that was going to come that year. I still sat in on CID meetings for a little while after that, mostly just to provide a transition and to make sure Mike and Brian got off to a good start with each other, but soon I was pretty much out of the loop and free to give my full attention to my other projects and responsibilities. Brian did an excellent, excellent job, just as I knew he would. □



With Ying Zhou at commencement (2000).

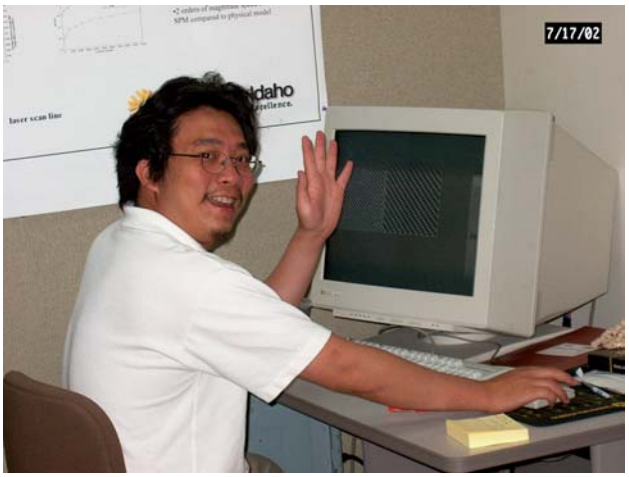
Ying, my RA on the CID project, was graduating in May of 2000 and needed to spend more and more of her time writing her thesis and preparing to defend it. In addition, most of the undergraduates on CID were also graduating. Thus, one of the things Brian had to do was bring on board a new staff of students to work on the NIATT jobs. One of his choices was a youngster named John Fisher I can't resist talking about. I had first met him in the 1998-99 school year when John was just sixteen years old. It's not unusual to meet prodigies in the college setting, kids who are so smart that they're college students before they're old enough to shave, and John was one of these. My initial impression of him was that he was one of the quiet, shy, serious kids who was probably something of a loner. That turned out to be a pretty big misperception on my part. He was already active in the student chapter of the IEEE (Institute of Electrical and Electronic Engineers, the main professional society for electrical and computer engineers) and if he wasn't already an officer in the chapter he became one soon afterwards. It turned out, too, that there was an impish sense of humor hiding just beneath that serious exterior of his. For the annual end-of-the-year Awards Banquet the student chapter held in 1999, at which I was one of the honorees with my second Outstanding Teacher Award from the students, he had gone around taking electronic photographs of all the members of the faculty. He'd caught me in the hallway for this, and when the slides came up at the Awards Banquet he'd doctored the photo. There I was for all the world to see standing in the hallway – playing a banjo! The photos of all my colleagues on the faculty had likewise been doctored to show them doing various odd or strange things. It was absolutely hilarious. John later went on to graduate school and received his Master's degree in electrical engineering in May of 2002. □

The new project being added to the HP program was a neural network project. When a laser printer's print engine is designed, the optics and mechanics are designed to achieve a specified density for the number of pixel dots per inch (DPI) it can print. However, it turns out the nature of the physical process by which the print engine's photoconducting drum is exposed to the laser beam makes it possible to print at a higher resolution of dots per inch by modulating the laser beam on and off in a very precise way. For example, it is possible to make a printer designed to print at 600 DPI print at 1200 DPI instead. Depending on the specific way this is done, the method is called Resolution Enhancement or Resolution Doubling ("RES-doubling"). It had been invented several years earlier and was being used in some of HP's Laserjet printer products.

The quality of the printed outcome depends in a very crucial way on precisely how the laser beam is modulated on and off, and it depends on what the surrounding pattern of pixels looks like. It also depends

crucially on a great many physical parameters in the print engine, and what works for one brand of print engine often does not work well for another. For this reason different print engines have to be supplied with print controllers that contain a custom-designed pattern-recognizing computer circuit called a 'modulation template.' The physical process involved is so complicated that no one has yet been able to figure out a mathematical description from which modulation templates can be analytically designed. Problems like this are said to be 'ill-posed problems' by the mathematicians. Instead, modulation templates were designed using a trial-and-error process that more or less followed a heuristic procedure. The word 'heuristic' just means 'helping to discover or invent' and a heuristic procedure is basically just a way to look for a solution that has usually worked in the past but has no guarantee it will work this time. An engineer would basically make an educated guess at a set of modulation templates (more than one is required for the printer), test his guess by printing out a test page and evaluating the quality of the result, and then he'd modify his guess and do it all over again. It was a slow, tedious, time-consuming process and the engineer who'd be assigned to it usually hated doing it. It was part of the 'art' of engineering.

The challenge Ken laid before me was: Is it possible to automate this process and still come up with modulation templates that give as good or better results than a human being could achieve? Nobody, me included, knew the answer to this question but I did know one thing: If it *could* be done, a neural network could 'learn' how to do it. Ill-posed problems are a neural network's specialty. Furthermore, because we had such an accurate computer model of the physics of laser printing, and one that could be set up to simulate any set of print engine parameters, I knew we would be able to completely automate our neural network 'template designer' provided that a neural network did end up able to solve the problem. It really isn't boasting to say my lab was the one place on earth where we had the tools and the expertise to solve this problem. If it could be solved.



Akaraphunt Vonghunghae, popularly known as Kwan. Kwan was my RA who worked on HP's neural network project. He is from Thailand and today he's a professor back at his home university.

For my RA on this project I hired a newly arrived Ph.D. student from Thailand with the jaw cracker name Akaraphunt Vonghunghae. It takes a bit of practice to learn how to pronounce his name, and most people never do quite get the hang of it. For that reason, he went by his nickname, Kwan. Kwan had recently received his Master's degree from Vanderbilt University for work in robotics and had come to the UI to continue his graduate studies.

I first met Kwan as a disembodied voice. In the fall of '99 I was teaching our senior level course in communication systems, which is where our electrical engineering seniors and graduate students learn how radio, television, modems, and the like work and how to design such systems. The UI has one of the oldest distance education programs in the nation – it's called the Engineering Outreach Program – by which live courses are videotaped and sent to students (mostly graduate students in the private sector and the armed forces) all over the nation and, sometimes, all over the world. For example, someone on active duty in the U.S. Army, Navy, Air Force, or Marine Corps can earn a professional Master's degree in electrical engineering while stationed anywhere on earth. I've had quite a few graduate students in the service get their Master's degrees through this program, and that fall my course was being offered through EO from one of our TV classrooms.

I had an unusually large enrollment of on-campus students that fall, too, and the classroom where I was lecturing wasn't large enough to accommodate all of them. What we did was set up an 'overflow room' in a nearby building on campus and students who couldn't find a seat in my room would sit in the

overflow room and watch the lecture live on television from there. We had a talk-back system where each student had a microphone in front of him and could ask questions from the overflow room. EO trained a camera on those students, and I could see them on a TV monitor built into the lectern where I was standing so I had some feedback on whether or not the students in that room were understanding what I was saying. Most of them, that is. It turned out the camera couldn't pick up every seat in that room and there were blind spots. Kwan always sat in that room and he always sat in one of the seats just outside the camera's field of view.

And he asked a lot of questions. He speaks English with a very heavy Thai accent, so his voice was immediately recognizable. I'd look at my TV monitor to see who was asking the question, but when it was Kwan I could never see the person I was talking with. He was a disembodied voice coming over the speaker. It wasn't too hard to guess that the name Akaraphunt Vonghunghae on my class roster probably went with that thickly accented voice, but I didn't have a clue what he looked like. It wasn't until late in the semester when he came to my office one day for help on a homework assignment that I was finally able to put a person with that name and that voice.

Kwan had been an exceptionally good student in my class and he has a personality I'd describe as lovable and a little bit goofy. Over the years I'd met a couple other guys from Thailand and they, too, had the same delightful, joyous personality Kwan has. If these guys are typical of the Thai people, Thailand must be a very happy country. That combination of brains and a lovable personality was something I looked for in my RAs who worked on the HP contract because the ability to get along well with the folks down at HP was just as crucial to the success of our research partnership as our technical results were. HP in those days was very, very much a people company where teamwork was paramount. There was a good reason why over the years HPers would joke that HP stood for 'Have Parties.' Kwan, with his demonstrated knowledge of signal processing theory, his background in robotics, and his infectiously happy personality, was perfect for the new neural network project. When the contract for this project was awarded, I offered Kwan a Research Assistantship to work on it. His face lit up like the sunrise coming up over the Idaho mountains, and to my astonishment he grabbed me and gave me a giant bear hug. That was the first and only time I've ever been bear hugged by a student. I took it to mean he accepted the offer.

My electrophotography lab now had two graduate students, Jang and Kwan, plus two undergraduate students, Ning Choy and nineteen-year-old Mark Pigman, working as Research Interns assisting Jang. The last I heard, today Ning works for Boeing and Mark – who just dropped in to see me a couple of days ago – works for one of the electric utility companies. As January of 2000 got under way, one of the first things I had to do was start teaching Kwan about neural networks. His background in robotics from Vanderbilt didn't extend to neural network theory and neural networks are a bit different from other kinds of systems. The principal difference is that neural networks are self-modifying systems; they change in response to the inputs they receive and the outputs they produce in reaction to these inputs. In technical terminology, they belong to the class of systems that are called 'adaptive' systems. Bernie Widrow, my old professor at Stanford, used to say his course in adaptive systems was a class in 'machine psychology.' In a slightly romantic sense, a neural network is said to 'learn from experience.' All the way back on the Watchdog project at Delcon, twenty-three years earlier, Willy and I had started to look into using very primitive neural networks in that design. When I had given that division review presentation to Bill Hewlett and the Board, I'd remarked that Watchdog would self-improve its performance as time went by, and Bill had remarked, "Like a fine wine."

What all this means for the engineer is that he doesn't actually design the neural network. Instead, he designs how that network will design *itself*. A neural network's ability to design itself is what makes it capable of solving ill-posed problems. In engineering you usually can't design something that solves some problem unless you can adequately state that problem in mathematics. The inability to do this is what makes ill-posed problems ill-posed. But the problem of designing a neural network's ability to design itself is *not* an ill-posed problem. A well designed neural network will proceed to pick away at an ill-posed problem, sometimes just by trying things and seeing how they turn out, until it succeeds in

coming up with the best solution it can given the way it has been designed to evaluate its own performance. There aren't many kinds of systems that work this way. The human brain is one of them. The brains of mammals and most other animals are another. The artificial neural networks engineers build are another. Other kinds of adaptive systems are yet another. Electronic brains will be some day. That's pretty much it.

But most engineered systems aren't this way and almost all of an engineer's education is geared to the design of that vast body of systems intended for well-posed problems. That meant Kwan had a pretty big conceptual stumbling block he had to get over; he had to unlearn a lot of the habits of thinking all his years of engineering training had given him and learn to think in a different way. He had to forget about designing the neural network per se and learn how to design its ability to design itself. My years of experience in teaching this subject have taught *me* that this is usually the hardest thing for the student to grasp. It goes against the grain of a lifetime of education and training. The most rudimentary principles of neural network design aren't hard to grasp (although the sophisticated and advanced body of knowledge developed over the years can be). I've taught juniors how to put together simple working neural networks. But changing how one *thinks* about neural network design is tough. Habits die hard. Kwan is pretty bright and he picked up on the theory well enough pretty quickly. But it took him quite awhile to learn to overcome the temptation to try to design the neural network's *solution* to the problem we were giving it rather than the network's self-learning process by means of which *it* would find the solution.

In the end we were successful and by the year 2004 Kwan's neural network was producing modulation templates for Laserjet printers that produced images every bit as good as those obtained by human design. Sometimes even a little bit better. Compared to Hua's earlier neural network, this one came a good deal closer to satisfying the criteria that define what an electronic brain must be, but it still fell well short of this mark and is just another machine. But HP wasn't paying for an electronic brain; they were paying for this machine and I believe in giving the customer what he wants to pay for. After all, it's his money. □

In March of 2000 I had an unexpected experience with our criminal justice system. It began when the phone in my office rang one Monday morning. The call was from one of my students and he was calling from the Latah County jail.

The whole incident had begun late the Saturday night before. He and his girlfriend had been living together off and on in his apartment; as I understand it, she had an apartment of her own but it wasn't getting used very much. Apparently their relationship hadn't been going so well lately, and that night he had told her they were through, he wanted his apartment key back, and for her to take her stuff out and go back to her own place for good. After a long and noisy argument he got his key back, she got her stuff, and it looked like that would be that. But then she came back, pounding on his door, and when he wouldn't let her in she opened a window and crawled through it back inside. I guess that's when the real fireworks had started. In the process he had laid his hands on her, and when the Moscow police showed up they broke up the fight and arrested him on a misdemeanor battery charge. His bail was set at a couple hundred bucks and some of his friends were able to raise that. That should have pretty much been that; he'd have gone to court a few days later and, since he was guilty, he'd have spent a few days in jail and that would have been the end of it. I probably wouldn't have ever heard about it.

Unfortunately for him, that wasn't the end of it. We have an assistant county prosecutor here who I'd describe as a radical feminist. The next morning she saw an opportunity to make an example of my student and had him re-charged with felony domestic battery under a new law the Legislature had passed the previous session. Now he wasn't looking at a few days in the county jail; he was looking at two years in the state penitentiary down in the desert outside of Boise. Now his bail wasn't a couple hundred bucks; it was five thousand dollars. The police had re-arrested him on the new charge, he was back behind bars, and for him five thousand bucks might as well have been five million. He was calling me to ask for help – specifically, for bail money.

After I heard the details, I was indignant. I happen to think the punishment ought to fit the crime, and

in this case the charge and the penalty it carried was out of all proportion to what had happened. I didn't have any doubt that my student deserved to spend a few days in the county's accommodations. I also didn't have any doubt he did *not* deserve to spend two years in the state pen and he did *not* deserve to have his entire life ruined. What was happening to him didn't have one single thing to do with *justice* and it had everything to do with radical feminist politics. That's the way I saw it. I drove down to the county courthouse and gave them a check for five thousand dollars. I knew the student was a good kid and I wasn't worried about him jumping bail. About a half hour later the side door at the jail opened up and out he walked. And I gave him a pretty good talking to. He didn't yet appreciate just how much trouble he was in, and that was something I helped him understand. I told him flat out he deserved a few days in jail; I was helping him because I didn't think he deserved two years in prison. By that afternoon he'd found himself a lawyer. A pretty good one, as it turned out.

His hearing on the felony charge didn't happen until three months later in early June. Since I had a personal as well as a monetary interest in his case, I attended the hearing. The presiding judge was Judge John Stegner, whose brother happened to be a representative in the Idaho House. The hearing was on a motion to dismiss the felony charge my student's lawyer had filed.

I'll never make a lawyer. Try as I might, I couldn't follow the legal arguments going back and forth between my student's lawyer and the assistant prosecutor. Fine point upon fine point, technicality upon technicality; the whole thing soon became a legal haze to me. It kind of sounded like the argument was over the *intent* of the Legislature in passing this law. Probably the only three people in the courtroom who knew what was going on were the two lawyers and the judge. Then the prosecutor made a mistake and even *I* knew it was a mistake. She read into the record the language of an early *draft* of the bill that had established the law under which my student had been charged. Specifically, she read into the record the language *that had been dropped from the final bill.* I had to admit that under that language this young man would have soon had a pretty clear daily view of sagebrush and sand from a barred window in Idaho's not-so-cozy accommodations down south.

But that was just the point. This language had been specifically *dropped* before the bill had been passed. I couldn't believe what I was hearing. It seemed to me the prosecutor was presenting the clearest argument possible this case *wasn't* what the Legislature had intended. She was sinking her own case.

Apparently Judge Stegner thought so too. I was watching him closely during this and I thought the expression on his face said very clearly, *What does she think she's doing?* Our persecuting prosecutor didn't seem to notice. After she finished, the judge gave her what I would characterize as a very sharp reprimand. The fact that this language was dropped was significant, he said. That fact clearly showed it was *not* the intent of the law that it be applied to this case. Etc. Etc. Then he dismissed the felony charge and re-instated the original misdemeanor charge but with bail set at one thousand dollars. My guess is this might have been because it was now summer, school was out, and he thought there might be a bigger risk of a student not showing up for trial because of that. This raised the question, asked by Judge Stegner himself, if the party who had posted the original bail (me) would still be willing to post bail this time. They all looked at each other. That was when I stood up from where I'd been sitting in the audience seats. The judge looked at me.

"Your Honor," I said, "I'm the person who posted the bail and whatever you decide is okay with me." That settled that. I got four thousand of my five thousand dollars back that afternoon, and the rest of it after the subsequent trial. My student spent a few days in jail and that was the end of it.

I got involved because of the blatant injustice the prosecutor's office was trying to pull off. It seems to me from this incident and from others I read about in the paper or see on the news that there has been a growing trend in our justice system going on for quite a few years now. Legislatures pass laws that curtail judges' authority to exercise judgment. Extremist political groups get laws passed that make felons out of more and more people. More and more, a lot of our laws are starting to look like the sort of inquisition charges that got heretics burned at the stake in Middle Age Europe. The laws are being written to punish

abstract people stereotyped to fit what some mob of fanatics dedicated to some cause think their pogrom should do to whoever they don't like. One example that stands out in my mind was a tragedy I read about a few years ago. There was a single mom who was living in a motel room with her three children, ages thirteen and, if I remember correctly, five and three. The mother went to work one morning leaving the thirteen year old to baby-sit his younger siblings. The kid fell asleep, the two younger kids wandered out to the motel swimming pool and, sadly, had an accident and drowned. The police arrested the mother and charged her with felony child endangerment.

Under that precedent, today they'd be able to charge my mom for the same thing because my cousins babysat Melody and me when we were little. Is this justice? I don't think so.

Another of my favorite examples of stealth lawmaking was passed many years ago by some group who took it upon themselves to decide we were all wasting too much water when we flushed our toilets. This group got a law passed that outlawed toilet tanks above a certain volume and forced commode makers to only make and sell tiny little toilet tanks. Never mind that a lot of people ended up having to flush two or three times to get their business down the drain, thereby using up more water than before.

When I first moved to California back in the seventies, there was a dim-witted special interest group that was lobbying to make the standardized tests they used in the public schools easier. Why? They wanted more kids to score above average. Hey there, Mary Poppins: 'average' *means* half the kids score more and half the kids score less. I guess you missed class the day they taught that, eh?

The terrible fact is today we have a lot of fanatical special interest groups deciding their view of crime and punishment, or education, or social responsibility, or religion, or child-rearing should prevail, and they are getting lawmakers to quietly pass new laws to sanction their opinions. They use the justice system to unilaterally impose their rule over how the rest of us have to think and behave. Why not just toss out the state codes altogether and put *Leviticus* in their place? That's what stealth lawmaking to sanction special interests is anyway: the use of force to dictate social mores and folkways without debate in order to make other people dance to your tune. To these people, I say, "go screw yourself."

Lawyers and judges these days are fond of saying the justice system is about the law, not about justice. I think there's something fundamentally broken in any justice system that doesn't put justice first. □

One of the things that makes working at a university interesting is all the different people from all different disciplines, backgrounds, and points of view you get to meet. In March of 2000 I took the opportunity to become involved with a very interesting group in a program called 'Tools R Us.' This program was organized by three professors the UI named as Humanities Fellows that year. They were: Assistant Professor Michael O'Rourke from Philosophy, Associate Professor Rick Fehrenbacher from English, and Professor Dan Bukvich from our Lionel Hampton School of Music. Dan is a dignified older man who has so much talent in music that I've never been able to tell what his scholarly specialty in the music field actually is. I do know he's one fine conductor and composer. I had wanted to meet Michael for a long time by then, ever since coming to the Moscow campus. At a faculty workshop I'd struck up a friendship with a very brilliant guy from the business school named Ray Dacey. Ray is an extraordinarily well read scholar with whom you can converse on any subject as long as you can keep up with him, and he is, as the Irish say, a darling man. He had told me of a bright young philosophy professor interested in the philosophy of mind named Michael O'Rourke, and had described Michael as "a big elf." How could I not want to meet this guy? Rick Fehrenbacher looks a lot more like a cowboy poet than an English professor, and his area is Medieval Literature with special focus on the Anglo Saxons. I like him a lot but whenever I see him I usually can't resist asking, "Hey, Rick! What's new in Medieval Literature?" Turns out that occasionally something is. A few years ago he was excited to the glowing point over a new translation of Beowulf. He also told me a story once about when he went on a trip to Ireland and met Ireland's Poet Laureate. The two of them were talking over whiskeys in a pub, and Rick was amazed and impressed that his companion started speaking in verses. Whatever they talked about, the Poet Laureate conversed in poetry right there on the fly. I sure can't do that.

The Tools R Us program was focused on the topic of how technology ('tools') affects society as a whole ('us') and how society affects the development of technology. It drew people from all the different colleges and dozens of fields for interdisciplinary discussions on a wide range of questions, problems, and issues. Not the least of these was a fascinating discussion of ethical issues new technologies tend to raise. We never had any problem finding plenty of people to fill both sides of every topic we talked about. The diversity of viewpoints and opinions was astonishing, as was the uncovering of the many blind spots each different specialist brought to the debates. Since everybody involved was a college professor, there didn't turn out to be any 'pushover' issues, no 'if you knew more about this or that you'd see things my way.' The interaction between social issues and technology turned out to be far more complex than I'd ever appreciated before. I'm pretty sure everybody there learned a lot of things they hadn't known before. I sure did. A lot of food for thought was served up in the Tools R Us workshops and discussion groups.

One of our workshops was held at the UI's field campus just outside McCall, Idaho, which is about two hundred miles south of Moscow and a hundred and ten miles north of Boise. One warm summer afternoon after the workshop, my new friend Michael – who *is* sort of like a big elf – organized a volley ball game. My knees felt okay that day and I used to play a lot of volleyball in my days at Iowa State, so I eagerly joined the game. As usual, I was pretty close to the shortest person playing. There might have been a couple of women who were a little shorter than me. By then I also had put on a fair amount of excess weight so I looked like anything but athletic. But I still had pretty quick reflexes and I could still jump, so I managed to surprise a few people who'd assumed I'd be the weak spot in the defense and not much of an offensive threat. Michael in particular was impressed. Or maybe amazed is a better word. There was still a bit of the boy in the old, white-bearded Santa Claus character that day. I've always liked surprising people who underestimate me on the ball field, no matter what the sport. And I still don't like to lose.

Of course, any more I end up using a lot more Ben Gay afterwards than I used to. □

UI's Signature of Life Grand Challenge team. Front row left to right: Ron Crawford, Touraj Assefi, Chen Wai; Middle row left to right: Andrzej Paszczynski, Dan Erwin (RA), Frank Cheng; Back row left to right: Giancarlo Corti (RA), Tony Anderson, me, Bruce Barnes (RA), Q. Lang (RA).

The SOL project – NASA's Grand Challenge – was fully under way, and under Ron's leadership we were making the fastest progress I'd ever seen a major project make. In addition to Ron and myself, the team included Dr. Chen Wai and Dr. Frank Cheng from the Chemistry Department, Dr. Tony Anderson (my colleague from our Boise days) from mechanical engineering, and Dr. Andrzej Paszczynski, a microbiologist from Ron's Institute. In addition we had an impressive squad of graduate and undergraduate students working on it. My RA, who was doing the electronics to support Frank's chemistry, was a very non-traditional Ph.D. student named Bruce Barnes. Bruce is older than I am by a few years. His goal in life was to teach at a teaching university and since a Ph.D. is pretty much mandatory for getting this kind of job, he'd gone back to school to get one. He was married with adolescent children and it was a real tight stretch financially to support a growing family and go to school at the same time. His RA appointment covered the costs of his schooling and his wife worked to bring in the rest of the money they needed. In such circumstances, academia refers to this as 'working on her Ph.T.' (Putting Hubby Through). I've always thought the university should honor the wives who do this with some sort of sheepskin to publicly recognize their indispensable contributions, without which their husbands' successes would not be possible. It wouldn't be an academic degree, but I can't think of too

many things more honorable and more deserving to be honored than a Ph.T.

The science team was very much leading the charge and our results were spectacular and completely vindicated our hypothesis that the electron transport chain could be detected and was a signature of life. The process we used is interesting and I'll try to describe it here without getting into too many esoteric technical details. A soil sample would be placed in a small metal chamber – Tony designed this and we called it 'the pipe bomb' because it looked like a pipe bomb – and the biological matter was extracted using what is called 'supercritical CO_2.' This is a special state of carbon dioxide gas produced through a combination of temperature and high pressure, and it acts as an extractor of chemicals. For example, supercritical CO_2 can be and is used to extract caffeine from coffee grounds. Chen Wai is one of the world's leading experts – maybe even *the* leading expert – on supercritical CO_2 and its uses. He and Tony and their students were teamed up to do this part of the instrument.

The supercritical CO_2 extraction process also ruptures the bacteria cells, after which the extracted molecular constituents were transferred to another gizmo that performed what is known as chemical electrophoresis. This is a process by which different kinds of molecules and atoms can be physically separated out of the chemical 'soup' produced by Chen Wai's and Tony's extraction process. The chemicals travel down a long, specially constructed tube and the electrophoresis process causes them to move at different speeds – lighter molecules go faster than heavier molecules. In this way, different chemicals reach the end of the tube at different times in a kind of batch process. At the end of the tube we placed an electrometer, which is a gadget consisting of three electrodes that can measure the properties of the current flow produced by the different chemicals as they exited the electrophoresis tube. Frank is an expert in electrochemistry and this measurement was the way we detected the presence or absence of the electron transport chain.

Finally, the molecules were sent into an instrument known as a mass spectrometer, which is a gizmo that measures the masses – think of it as the weights – of the different atoms present. Each atom has a distinct mass, and the mass spectrometer told us specifically what elements were present in the biological sample. Combined with the current measurements from Frank's electrometer, it was possible to positively tell if we had an electron transport chain and identify, by post analysis, what kind of electron transport chain it was.

The whole thing worked so well that by July of 2000 we were able to present our first paper on the system at a conference held at the Lunar and Planetary Institute in Houston. It appeared in the journal *Concepts and Approaches for Mars Exploration.* We would eventually publish three more papers on it in 2001 and 2002, which appeared in *Icarus* (the journal of the American Astronomical Society), *Analytical Biochemistry,* and *BMC Microbiology.* During the course of our work, Ron and Andrzej also came up with another and even simpler method that provided additional verification of the signature of life. It used a chemical reaction called 'dye reduction.' This measurement could be done using chemicals and what is known as a light spectrometer, a gadget that can tell what colors of light are present. Our paper on this won an 'Editor's Choice' award from *BMC Microbiology.*

We did all this work in the laboratory using off-the-shelf instruments and components. To make our method practical for space exploration, all these things had to be miniaturized and the process fully automated. During the second half of calendar year 2000, a lot of my time on the project was going into designing the system we would propose building for NASA. This is known as a 'block diagram design' because it is essentially a very detailed set of technical specifications for how the overall system worked and what each major subsystem within it had to do. One of the things Tony and I had to do was make sure that everything the science team came up with *could* be built in such a way that it could be placed in a space vehicle and flown to Mars or wherever NASA decided to send it. It had to be compatible with all the power, size, and weight restrictions imposed on it by the space vehicle, and it had to survive the very harsh environmental conditions found in outer space and on the other planets and moons of the solar system. For the mechanical and chemical components of the system we were planning to use what is

known as micro-electromechanical systems (MEMS) technology, which is a relatively recent engineering field credited to a challenge laid down one time by Richard Feynman, the Nobel Prize winning physicist who had investigated the Challenger disaster. The rest of it would use custom designed microelectronic chips, which was and is the central core of our expertise in the MRC Institute.

At the end of calendar year 2000, JPL held their final review and evaluation of the Grand Challenge research projects. Of the six teams, we were the only ones who had *demonstrated* that we knew how to detect living organisms in a non-earth-centric way. The itty bitty University of Idaho had taken on the big dogs and solved the Grand Challenge when they did not. We'd beaten them all. I felt six feet tall.

I was licking my chops at the prospect of the millions of dollars of funding that would now flow to us for Phase II of the Grand Challenge. From here on out, the emphasis would switch from the science team to the engineering team, and this team would be greatly expanded in size. Unfortunately, events in the bigger world took a hand at this point. While we had been solving the Grand Challenge problem, NASA had experienced two spectacular back-to-back failures of Mars missions. One of them was caused by an incredible blunder on the part of an engineer at one of NASA's contractors and led directly to the crash of a hundred million dollar mission. This guy had used the English system of measurements, instead of the specified metric system of measurements, in his design and this had caused the numbers coming out of his subsystem to be incompatible with the rest of the space vehicle's systems (in other words, wrong). It was a painful embarrassment for NASA, and the expense of these failures led directly to major cutbacks in a number of other areas within NASA. One of these was the Grand Challenge. All the funding for Phase II was cancelled so the money could be redirected to NASA's efforts to recover from the mission failures. I understood NASA's decision; I would have made the same one if I'd been running NASA. But I was very disappointed that incompetent engineering done elsewhere had cost me my Phase II project. Clearly for the space program, we weren't in the sixties anymore. □

Another new thing got started during the late spring and summer of 2000. I first learned about it at the Tools R Us workshop in McCall from my friend James Foster, who was at that time a professor in our computer science department. A diverse group of professors, including my new friend Michael O'Rourke, had just begun holding informal meetings to discuss the formation of a new graduate program in neuroscience – the study of the brain. James was already part of this group, he knew of the work I was doing on electronic brains, and he thought this was something I'd be interested in getting involved with. Was I interested? You bet!

The initiative to form the new neuroscience program was led by a young assistant professor from the Biological Sciences Department named Deb Stenkamp. Deb had come to the UI in 1997 after receiving her Ph.D. from Johns Hopkins University and putting in a few years of postdoctoral work. I was very impressed from the start by her leadership capabilities and her skill at building a team out of a diverse group of professors from all age ranges. Although biology has been studying the brain for a century, the field of neuroscience itself is a relatively new young science. Most neuroscience programs focus on just one of the three major subdivisions of neuroscience: biological neuroscience (the traditional and most commonly found subdivision), cognitive neuroscience (psychology applied to brain study), and, newest of all, computational neuroscience (the mathematical theory arm of neuroscience). Additionally, the sciences of chemistry (in the form of pharmacology, the development of drugs) and biophysics also play important supporting roles in neuroscience and, very recently, the science has admitted philosophers to its ranks in order to address the difficult problem of understanding the links between our understanding of the brain and what it is we mean when we talk about 'mind.'

Washington State University, eight miles down the road on the other side of the Idaho-Washington border, already had a traditional neuroscience program, which is to say they had a biological neuroscience program. The UI and WSU have cooperated with each other for a long time by cross-listing each other's courses, and students – both UI and WSU – can take cross-listed courses at either university and receive full credit for these courses at their home institution for no additional fees. The two schools even

coordinate their calendars so classes begin and end on the same days of the year and semester breaks likewise coincide. Classes at WSU start on the hour, those at the UI start on the half-hour to give students time to ride the free bus that runs back and forth between Moscow and Pullman, WA all day Mondays through Fridays. With WSU right next door, it wouldn't have made much sense to create a second traditional neuroscience program on the UI campus. Instead, under Deb's leadership, what we were proposing was a program that would promote interdisciplinary learning that cut across all three wings of modern neuroscience – biological, cognitive, and computational. Students in our program would be required to take three 'core courses' – one in each of these three subfields – before specializing in their chosen particular subfield. In this way we would be augmenting and supplementing what WSU was already doing rather than going into competition with them with a redundant traditional graduate program. Deb and three other professors from Biological Sciences – Mark DeSantis, Mike Laskowski, and John Byers – along with Nick Natale from the Chemistry department were representing the biological wing of the program. Four professors from our Psychology department, and also Michael O'Rourke, were handling the neuropsychology wing. A couple of other professors from Statistics and Computer Science and I comprised the computational neuroscience leg of the stool.

You might well wonder how someone like me, an electrical engineer by training and experience, could come to be accepted as a professor in a neuroscience program. The answer lies with my specific area of training and expertise, namely system theory. System theory is basically a discipline aimed at understanding and modeling how very complex things work. For example, the field of neural networks was originated by two psychologists – Walter McCulloch and Walter Pitts – in 1943, but since then most neural network theorists have come out of the discipline of system theory and most system theorists start out as electrical engineers because electrical engineering is the most mathematically intensive field of engineering. To a system theorist, the brain is just another system (albeit the most complicated one humankind has ever undertaken to study), and it can be treated by the same methods we use for less complicated systems. A system theorist has to be able to understand and use the special sciences that study the particular types of systems he works with, and the more he or she knows about those special sciences, the better. But once a mathematical model of a system has been developed, that system is now on our 'home turf" and we can bring our own special scientific tools and training to bear on it.

Under Deb's leadership, our group slowly crafted a curriculum for the new program we were proposing. The Neuroscience Program was to be a 'program' rather than a department. The difference is an important one. University faculty members 'belong' to departments, their salaries come out of their home department's budget, and their supervisors – to the extent that term actually means anything in the academic setting under a system of faculty governance like we have – are the chairs of those departments. A 'program' on the other hand is a somewhat looser organization inasmuch as its faculty members usually come from many different departments. The arrangement isn't altogether different from the matrix management organization I had known at DMD where people from R&D, marketing, manufacturing, and the other functional areas of the division took part in new product development. In a way, a university department is like a company's functional area while a university program is like a product team. In a program the academic counterpart of my old job on Coyote IV is the program's Director.

The Neuroscience Program was drawing its faculty from pretty close to all the colleges in the UI, and this meant we needed the support and cooperation of all the various departments to which our faculty members belonged as well as the support and cooperation of all the college deans in the colleges to which these departments belonged. Once we had a curriculum designed, the next vital step was getting this cooperation and buy-in, first from the departments' faculties and then from the deans. That order of precedence is another of the many things that make universities different from businesses in the private sector and is often something business people don't really understand about universities. In the business world if you want something you start with upper management and work down. In a university, you have to start with one or more faculty members and work your way up through the department (or program) next and then to the dean of the college. Chairs and deans aren't managers; they're administrators. The

faculty runs the academics of a university and the administrators are there to see to it things run smoothly. In a sense, a university is very much like the kind of republic our Founding Fathers envisioned. If you want a university to do something special for you and you think getting a dean to agree to it is all you need to do, you're likely to be disappointed. You see, the faculty doesn't work for the dean; they barely work for their own department chairs who, by the way, are *elected* by the department's faculty. Most of the time it's more accurate to say the chair works for his faculty. *That* is *true* republicanism. You'd like it.

But I digress. After we had the curriculum we were going to propose, we next worked on getting faculty buy-in from our contributing departments. That turned out to be pretty easy although Deb had to spend a lot of her time going around making presentations at various department faculty meetings. In the main, the faculty of the various departments were either enthusiastic about the idea or at worst indifferent. Nobody opposed it. Once the departments' faculties had bought in, the chairs came along. Next came selling the deans on the idea. This, too, didn't prove too difficult after we had the departments in our corner. One question that had to be answered early on was: To what college will this program belong? The answer everyone agreed to was that since this was entirely a graduate degree program as well as a very interdisciplinary program, the place where it most naturally belonged was the College of Graduate Studies rather than one of the special colleges.

Once all this had been accomplished, the next step was obtaining approval from the University Curriculum Committee. It isn't enough to get the nod from the departments and colleges. The university as a whole also has to give its approval. In many ways the UCC was the toughest step. Once the UCC had approved it, getting the Provost and the President of the UI to agree wasn't hard. Then came the last and biggest step: Getting the Idaho State Board of Education to give its approval. Throughout the rest of 2000 we worked on the curriculum, all through 2001 we worked our way up through the colleges, and in 2002 we worked our way through the university levels, particularly the UCC. Finally in 2003 our proposal went down to the SBOE, which gave its approval during the spring semester of 2003. In the fall of 2003, our new Neuroscience Program officially opened its doors and admitted our first graduate students. We elected Deb to serve as the Program's first Director and the rest of us became professors of neuroscience (in addition to our home department appointments). □

As the November 2000 elections drew near, one of the things I seriously thought about was if now wasn't the time to sell off many of my stock holdings and put the money into something a little safer. A new President coming into office meant new unknowns for the country and the stock market has a habit of changing directions when a new guy takes up residence at 1600 Pennsylvania Avenue. I was never in doubt about who I thought was the best man in 2000; I was supporting Vice President Gore. But I wasn't impressed by the Gore campaign nor by the tone coming out of the Democrats that year. I was all in favor of a more moderate Democratic Party, but in some ways the Democrats that year sounded a bit too much like the Republicans for my tastes – especially since they sounded kind of like timid Republicans.

HP was another factor in my investment considerations. Lewis Platt, who had taken over as HP's president and CEO after John Young retired in 1992, had retired in July of 1999 and HP had brought in an outsider, Carly Fiorina, to replace him. One of the things that had happened on Lew's watch was the Agilent spinoff. HP had split itself into two unequal parts, with the company's computer business keeping the HP name and the company's test and measurement, analytical products, and other non-computer businesses making up Agilent. Agilent had been called a 'seven billion dollar startup company.' From a purely business point of view I never understood that move. One of HP's strengths had always been its ability for one branch of the company to carry other branches through tough times, and HP's great diversity had always been the key to that. The spinoff looked like something designed to appease Wall Street, and when a company starts managing itself on the basis of what's good for the stock price that's pretty much always a huge blunder. I also didn't like the fact they'd brought an outsider in to take the helm. Ms. Fiorina knew nothing about HP and the now-popular myth that a manager only needs to know how to manage and doesn't need to understand in detail the company or its business is just bunkum. She had come out of Lucent, which once had been Bell Telephone Labs, and Lucent by then was well on its

way to becoming one of the more prominent lack-of-success stories in the high tech world, its stock price at the time notwithstanding.

I still owned several thousand shares of HP stock, so the matter was of considerable importance to me personally. The terms of the Agilent spinoff were a little complicated and one feature of these terms took the form of certain restrictions on when I could sell either my HP stock or my soon-to-be converted Agilent stock. I still had faith in HP's directors, particularly since my old *capo* Dick Hackborn was still around to keep an eye on Carly, but I was nervous. As it would turn out, hiring Carly Fiorina ended up being the worst disaster in the history of HP. But I listened to my head instead of my guts in 2000 and decided to stay invested rather than shifting money into safer havens. That would turn out to be the biggest investment blunder of my life, although up through the summer of 2000 it didn't look like a blunder. The Dow had actually peaked in mid-January of 2000, and the NASDAQ had peaked in early March, but my own investments didn't peak until August of 2000.

By autumn of 2000 I was already very concerned about what was happening to my old company under Carly's reign. The secret to HP's success had always been that company culture called 'the HP Way,' which described its distributed system of managerial power and authority, its respect and caring for its employees, the loyalty, teamwork, and dedication its employees reciprocated, and everyone's careful and thoughtful adherence to the guidance provided by the corporate objectives. I was still plugged in pretty good to the internal HP employee grapevine – I probably knew a lot more about what was going on down in the engine room of HP than Ms. Fiorina and her brood would have liked – and what I was seeing looked like the early signs of the eroding of the HP Way. Decision making was becoming more and more centralized at corporate headquarters in Palo Alto and the people doing the real work were becoming increasingly afraid to speak up when they saw something going wrong. Still, up through September of 2000 Dick Hackborn was still chairman of the board and I trusted Dick. Always had since I'd first met him in 1979.

But on September 22nd he stepped down as chairman and now Ms. Fiorina assumed that post as well. Two months later, just after the Keystone Kops farce of the November elections, the ax fell on HP's – and Agilent's – stock. As Wall Street so colorfully puts it, the stock price fell out of bed and began the longest, deepest, and fastest price decline in the history of the company. Measured from the high to the point where I finally threw in the towel and got out, that plunge ended up costing me three hundred thousand dollars. I still ended up making a net profit – I'd owned that stock an awfully long time – but when my net worth drops by that amount in that short a time – well, I kind of notice that sort of thing.

To make matters worse, the rest of the market – or, at least, the part of it I was invested in – followed suit with a long, slow, erosion-like decline. I wasn't actually hurt that much by what has become known as 'the stock market downturn of 2002.' But I couldn't find a way to stop the bleeding. When the bear takes the market down, everybody goes with it. The years 2000 through 2002 were the first (and so far only, knock on wood) years since I'd started investing that my investments showed a net loss. My own personal bottom came in September of 2002 at a level half a million dollars below the high of August 2000. That's a lot of bottles of soda pop, too. I wasn't a millionaire anymore. It took me from October of 2002 to November of 2004 to climb back out of that hole and cross the million dollar mark in net worth again.

As for the November elections themselves, I was thoroughly disgusted and angered by what I saw. I'm sure the people of Florida can't possibly be the boobs they looked like on election night and the days that followed, as we were treated to the spectacle of 'hanging chads,' recounts, the blunders of the news hounds in calling and then un-calling the outcome in Florida, what looked to me like the blatantly political actions of Florida's Republican commissioner of elections to secure Florida's outcome for the Republican candidate (who happened to be the Florida Governor's brother), and, last but certainly not least, the Supreme Court's unprecedented act of, in effect, handing the election to George W. Bush. As American presidential elections go, 2000 wasn't the most controversial in history. The 1824 election, in

which the House of Representatives ended up handing the presidency to John Quincy Adams despite the fact Andrew Jackson had won a plurality of electoral college votes, makes the 2000 contest between Gore and Bush look like a little boys' fistfight on the playground. But one thing on election night bothered me more than anything else. After mistakenly calling Florida for Gore, the news went to where George W. Bush was sweating it out waiting for the returns to get his reaction to Florida. As I watched him, I said to myself in amazement, *My god, he's pouting!* I thought he looked and acted like a little boy who'd just been made to go clean up his room. *This* was the man who might become our next President? I was very shaken by what I'd seen, and even more so after all the dust and ruckus settled and he did become our next President. *Boy, oh, boy,* I thought to myself, *I sure hope nothing too important turns up over the next four years.* I was hoping for nothing worse than quiet mediocrity. □

I had continued having numerous discussions with my pal Yang-Ki Hong on the topic of blending his research into barium ferrite with applications to high frequency communication systems, particularly the sort of systems used in satellite communications. By late autumn of 2000 we had something taking shape and were able to put in a major proposal with Yang-Ki as principal investigator and six others of us as co-investigators. That paid off in May of 2001 when we received three quarters of a million dollars from the Office of Naval Research. My own part of this contract was pretty modest. My RA, Feng Xie, and I were doing some computer modeling of the ferrite materials being developed under this contract. But my main role was basically that of an interpreter, translating the language of the material scientists and physicists into language my colleague in electrical engineering could understand, and translating his language into theirs. That's one of the challenges in interdisciplinary research. All the players speak different technical languages and here is found another contribution a system theorist brings to the party. A system theorist, by the general nature of his work, has to learn to understand the languages of the special sciences and the special branches of engineering. He or she therefore finds a natural niche in an interdisciplinary project in helping all the different specialists communicate with one another. By this time my partnership with Yang-Ki had led to my being offered an adjunct associate professor appointment with the Department of Material Science and Engineering, which I had accepted. An adjunct professor is a professor who belongs to a different department in the university but who is regarded by the appointing department as a de facto member of their faculty as well. In my case, I was a non-voting member of the MSE faculty but the appointment brought me into contact with more of the folks over there and I started serving as a graduate committee member for more and more of their graduate students.

Also that fall I was teaching my graduate course in adaptive systems and adaptive signal processing through Engineering Outreach, and in that particular year this ended up leading to something pretty interesting. This course is about a topic that doesn't lend itself very well to traditional in-class exams. In place of this, I borrow a page from the playbook of my old professor, Bernie Widrow at Stanford, and the students' grades are based upon individual, semester-long research term projects. I usually have about a dozen or so students, on- and off-campus combined, in this course and each student proposes and carries out his own research project.

One of my students that term was a military fighter pilot. I won't be telling you which branch of the service for reasons that will become obvious. He had a rather keen interest in finding out if some kind of adaptive antenna and signal processing system could be discovered that would solve the problem of picking out enemy radar signals from friendly radar signals. Typically a pilot can assume he isn't likely to be shot down by his own side, but when his aircraft is lit up by an unfriendly radar, nasty things usually happen soon afterwards. In a complex combat environment where there are radars in operation by both sides all over the place, telling friend from foe can be a bit challenging. It turned out he was able to find and give a proof-of-concept adaptive system that suppressed picking up friendly radars and highlighted unfriendly ones. He turned in an excellent research report. The really interesting thing happened later on. After his term of service was up, he continued on with our armed forces as a civilian contract engineer and was able to further develop this system. His work is now highly classified – so classified he can't even tell me anything more about it. But I think it's a pretty good bet that America either has or will soon

have yet another key technology edge over our enemies. And it started in my course in the fall of 2000. A good teacher is a catalyst for his or her students' minds.

And, no, you can't see his term project report. After I learned his work had become classified, I made sure no one could. □

X. The Second Bush Years

In late January of 2001 I got a phone call from out of the blue from Dr. Jean'ne Shreeve. In the world of university research in the state of Idaho that isn't quite the same thing as a parish priest getting a call from the Pope, but it's close. Jean'ne is one of the most remarkable people I've ever known and, like Large Al, is probably best described as a fundamental force of nature. Her first passion is the chemical fluorine, which she has studied for almost half a century and has written hundreds of scientific papers on. Her second passion is research in general. She had first come to the University of Idaho in 1961 as a young assistant professor of chemistry after receiving her Ph.D. from the University of Washington in Seattle. I was a Junior Fire Marshal then. She had been Head of the Chemistry Department from 1973 to 1987, Associate Vice President for Research, Dean of the College of Graduate Studies and Director of the University Research Office from 1981 to 1991, Vice Provost for Research and Graduate Studies from 1991 to 1995, and Vice President for Research and Graduate Studies from 1995 to 1999. In 2000 she had announced that she wasn't getting to spend enough time in her lab anymore and stepped down from all her administrative posts except one: she was still the Principal Investigator for Idaho EPSCoR. EPSCoR is a major National Science Foundation program. The acronym stands for Experimental Program to Stimulate Competitive Research and its main purpose is to raise the level and quality of research performed at America's smaller and less big name public universities.

I had only met Jean'ne one time previously, and that had been at a new employees' orientation back in 1993 after I first came aboard. Her message to us on that day had been pretty simple: Do world class research and do it second to none. One of the things I would soon come to like about Jean'ne is that I never had to guess where I stood with her and I didn't need a secret decoder ring to understand what she was saying. I didn't always like what I was hearing, but I always needed to hear it. And Jean'ne leads by example. She's the best in the world at what she does and all she ever asked of me was to be the best in the world at what I was doing. Professionally speaking, when I grow up I want to be just like Jean'ne.

EPSCoR was what Jean'ne wanted to talk to me about and she came straight to the point. I was going to define a significant focus area for engineering research that industry would be interested in enough that companies would write letters of support saying this was important research. I was going to get them to write those letters. I was going to put together a research team to focus on doing it. And I was going to serve as the focus area leader responsible for getting it done. I had seven working days to come up with something before I had to tell her what it was.

Hello? Are you talking to me?

Oh, yes. She was.

Well, I was already busier than all get out, and I basically didn't want to take on anything more. But it turned out Jean'ne has a peculiar hearing defect. She can't hear the word "no." Nor the word "can't." Nor the word "won't." Her ears just can't hear those words. It's no use to say them to her.

"Look," I finally said in irritation, "why in the world would I want to do this?"

"One million dollars," she replied.

Oh. Well, why didn't you say so in the first place?

After getting off the phone with Jean'ne, I wandered down the hall to Touraj's office to tell him about the weird thing that had just happened. He just laughed at me. He'd already known all about it before it happened and it was he who had told Jean'ne I was the person she wanted for this. It looked like I was

about to become a focus area leader. Whatever that was.

In truth, I felt that taking this on was more or less my duty. We make very heavy use of computers in the MRC Institute, and although my HP contracts year after year had let me equip my own lab with up to date machines, those of the Institute were getting pretty long in the tooth and needed to be replaced. We had other infrastructure needs as well. On top of this, and most importantly, the graduate program in the electrical and computer engineering department had grown more rapidly than funding to support graduate students had, and there was a need to bring in more research money to support our students. A million dollars in funding would certainly take care of our infrastructure needs and support a lot of students.

But I could easily see this was something that was going to chew up a lot of my time, and that being the case I wanted this project to be something that would support my electronic brain research in some tangible way. Nobody had to tell me I couldn't propose 'electronic brains' as a 'research focus area' for EPSCoR; nobody on earth would agree to fund that. Idealist slogans to the contrary, funding agencies are very, very conservative about what kinds of research they are willing to invest in. I had already learned from personal experience the National Science Foundation, despite its lofty mission statement, only funds projects that are almost sure to succeed in meeting the proposal's stated aims. The popular ironic joke about NSF is that you have to do the research first before you can get it funded. Most of what they will fund is incremental contributions to scientific knowledge and very little of it is 'breakthrough' research. The National Institutes of Health, NIH, is pretty much the same way although generally their contracts are much, much larger than NSF contracts. Department of Defense (DoD) agencies are even more conservative. Despite the ridicule periodically heaped on them by Congress and the press, America's federal research agencies are very, very frugal stewards of the taxpayer's money. It's a good thing scientific advances do not exclusively depend on getting the financial blessing of the federal agencies. If they did, we'd have the best darned iron lung you've ever seen but no vaccine for tuberculosis.

Jean'ne had been specific that this 'focus area' had to be something that industry would endorse through letters of support, and I also knew no company was going to endorse electronic brain research. The 'artificial intelligence' (AI) community had been over-marketing what they could accomplish for forty years and had succeeded only in thoroughly discrediting the whole idea in the eyes of industry and, for that matter, most other people as well. If a research community makes a practice of seriously misleading the rest of the public, sooner or later the public finds out about it and the reaction is just what anyone would expect from someone who has been lied to. I think about the only thing that keeps AI going is that there is always a new generation of younger folks coming up who don't know anything about the history of artificial intelligence and so can be enchanted by romantic visions the phrase 'artificial intelligence' conjures up. I certainly had been, and AI was still in the bloom of its youth the day my class had gone to visit the Museum of Science and Industry. In science your reputation is everything. Good reputations take years and years to build; bad ones can be made in a heartbeat. No, I couldn't take 'electronic brains' to Jean'ne. It had to be something else we 'focused' on.

Neural networks, on the other hand, were another matter. They had already earned a respected place in the ever-practical world of engineering and although they aren't the answer to everything, there are some things they do better than any other kind of system we know about. Like AI, the history of neural network research isn't free of hype. Brassy claims about the promise of neural networks made in the sixties was a contributing factor in federal agencies abruptly cutting off all funding for neural network research in 1968. My old teacher, Bernie Widrow, liked to say neural networks 'died' in 1968 and were 'resurrected' in the mid-1980s. Strictly speaking this is a slight exaggeration. There were a very few researchers who kept going throughout this period. Stephen Grossberg of Boston is one of these and he made many very important discoveries during this period, most of which went unnoticed for over a decade until the field 'came to life' again. I call the period from 1968 to around 1985 the 'Dark Age' of neural network research.

But since then most of the hype has been eliminated and by 2001 'artificial neural networks' had

proven their worth in solving many practical engineering problems. The Industrial Electronics Society of the IEEE, which is one of the most practical, down-to-earth, old fashioned technical societies I am familiar with, always has several technical sessions devoted to the application of neural networks every year at IECON, their big annual meeting and conference.

Most people aren't aware of this, but neural networks are responsible for today's digital computer. In 1943 McCulloch and Pitts published a landmark paper in which they first showed that networks of 'neuron-like elements' were capable of implementing any proposition in symbolic logic. This created quite a stir because at the time scientists held the belief that 'the laws of logic' were responsible for the human ability to think. This turned out to be nothing more than a romantic notion, and we know today from hard evidence unearthed by psychological research that it just isn't true. But throughout the 1940s and 1950s, the 'brain as a logic engine' paradigm was accepted by pretty much the whole scientific world. The McCulloch-Pitts discovery quickly came to the attention of one of the twentieth century's most important mathematicians, John von Neumann. He generalized the McCulloch-Pitts result and used it as the basis for a new kind of machine, which he originally called a 'computing device' and which soon after became known as a 'digital computer.' The great, great majority of computers today are based on the original 'von Neumann computer' and von Neumann is generally regarded as 'the father of the digital computer.' The von Neumann computer was essentially a neural network made up of McCulloch-Pitts model neurons. It was regarded as a machine that approximated how the brain worked, and that is why science fiction writers and journalists called computers 'electronic brains' when I was a boy. Today's computer is without any doubt the most important application to have yet come out of neural network research.

(If you happen to be a history buff, I should mention that von Neumann's computer wasn't actually the very first digital computer. A few years before the McCulloch-Pitts paper appeared, an obscure physicist at Iowa State University named John Vincent Atanasoff had wanted a machine to help him solve differential equations and so he built one. It turned out that this machine used many of the same ideas that would later be used in the von Neumann machines. He is today regarded as the 'inventor' of the computer but not as the 'father' of the computer because practically no one knew of his work. It wasn't 'physics' and he himself didn't regard his machine as anything all that important. The only reason we know about him today is because in 1968 Honeywell sued Sperry Rand and IBM – Sperry held the basic patents on the von Neumann computer – and lawyers unearthed the Atanasoff story.)

I figured that research into 'neurocomputers' was something enough people would understand that I'd be able to line up some industry support for the idea and Jean'ne would be able to sell it to NSF. In point of fact, this is something von Neumann himself had always said was the next direction for 'electronic brain' research to go, but his early death from cancer in the 1950s, coupled with the amazing business success of the von Neumann computer, aborted this research direction before it could really get going. In the late 1990s this idea was just starting to come back in the world of neural network research, where it was and is known by the name 'neurocomputing.'

As it happened, the ECE department ('electrical and computer engineering,' as we were now known) had recently hired a new professor, Dan Wilamowski, to replace Jake Baker down at the UI's Boise Graduate Center. Little Jake had elected to stay in Boise after the fiasco, but I guess he felt like he was too out of the mainstream of things down there all by himself. He had decided to jump ship and go to work for BSU, presumably because after they had gotten rid of us, a lot of the villains who had participated in the smear campaign were themselves shunted to one side or sacked by BSU's upper administration when their new college was set up. This wasn't because of what they had done to me and my colleagues; in that these guys were just obeying their master's voice. It was because they weren't competent to take our place. BSU used its own people and then threw them to the side once the deed was done. I couldn't understand how Little Jake could stomach working with these people after what had happened, but somehow he managed to. Dan had come in to take his place at the Boise Center and his area of research was electronics for neural networks.

Dan was 'new' only in the sense of being 'new around here.' He was a great big man in his early sixties and had been a professor since the early 1970s. He was very well connected and was about to become the president of the IEEE's Industrial Electronics Society. He was a Fellow of the IEEE, which is the highest grade of membership that professional society has and which is a very prestigious recognition. At the time I held the grade of 'Member' of the IEEE, although in May of 2001 I would be elected to the grade of Senior Member. (Not too long after that happened, somebody asked me what it meant to be recognized as a Senior Member. "It means I'm old," I replied).

I called Dan on the phone and explained what was going on. He was happy to take part in it and together we roughed out the basic ideas, contributions, and objectives for this 'focus area.' At Dan's suggestion we decided to call it 'Neurofuzzy Soft Computing,' which was a then-popular buzzword for a particular segment of neural network research. The full title of the proposal ended up being "Neurofuzzy Soft Computing via Silicon Structures" to emphasize the point that this research was aiming at electronic technology development for neurocomputing. Jean'ne came to refer to our team as her 'Fuzzies.'

There were some other people I very much wanted to have on this team as well. One of them was a younger colleague in our department and in the Institute named Jim Frenzel. Jim is an expert in what is known as VLSI circuit design. The acronym stands for 'Very Large Scale Integration' and basically it is what most people call 'computer chip' design. Since we were going to be researching neurocomputing, it made nothing but sense to have a computer design expert on the team and it so happened that at the time Jim was going through one of those lulls in external research funding and could use a financial boost.

Another guy I wanted very badly was my old pal from the computer science department, James Foster. James' area of expertise is in something called 'evolutionary computing.' EC is a methodology for using computer algorithms to solve problems that are presently too complicated for human beings to figure out how to optimize. The algorithms are based on making an analogy to the processes of biological evolution and the method is in one sense something that can be described as 'design by organized trial and error' using a 'survival of the fittest' design strategy. EC algorithms churn through 'generation after generation' of designs, eliminating the least fit and basing the next 'generation' on the most successful designs to have 'evolved' up to that point over time. To most people this doesn't sound like a very elegant or even particularly brainy approach, but the trick is to get the process to produce optimal designs in a practical amount of time. The method is based on much, much more than pure random chance and good EC algorithms require a great deal of expertise to invent. To be honest, I was very skeptical of the whole EC idea in 2001, but James had been telling me for years that EC was going to put *me* out of a job some day and I figured, "Well, buddy, here's your chance. Go for it." I wasn't worried.

James introduced me to another guy, a brand new recently graduated assistant professor in computer science named Terry Soule. Terry's last name is pronounced 'soul' and he was jocularly known around his department as their 'soul man.' Terry's area was also evolutionary computing and since he was just starting out – and since I liked him right away and knew we could work together – including him in the EPSCoR project team was just the thing I could do to give him a hand in getting his career launched. As it later turned out, Terry's work was so good and so significant and so impressive that he made a believer out of me when it came to this whole evolutionary computing idea. His results were so amazing that these days I kid him by telling other people, in Terry's presence, that he could design a flying carpet for them if they wanted one. He always winces whenever I say that.

A fourth guy I wanted on the team was my old pal Bob Rinker. Bob was back in Moscow now and leisurely putting the finishing touches on his doctoral dissertation. He hadn't yet defended it and finished up getting his Ph.D. – his leisurely pace would soon become a source of a great deal of humor at his expense around the college – but since we were doing 'neurocomputers' I wanted someone on the team who could fit seamlessly between the world of hardware electronics and the world of real people who would one day use this new kind of computer. Bob was perfect for that role. Unfortunately, at my first meeting with Jean'ne she blocked this because Bob did not yet have his Ph.D.

She also wasn't happy that my whole team consisted of UI people. I had to bring in somebody from Idaho State University, located in east Idaho at Pocatello, and somebody from BSU. I agreed to find somebody from ISU readily enough; I could see her point that Idaho EPSCoR was about Idaho, not just Moscow. But I flatly refused to have anybody from BSU on *my* team. Nobody gets a chance to put a knife in my back a second time, and I haven't forgiven those people at BSU for what they did to us when we were supposed to be partners and teammates in the Engineering in Boise Program. Even though many years have now passed and the people there now aren't the same ones who were there then, I've never seen one single thing coming out of BSU's administration that makes me think for a second that this leopard has changed its spots. Quite the opposite. The faces have changed but the dishonorableness remains the same. Jean'ne tried her best to appeal to my reason and common sense, but I was adamant. I wasn't going to be associated in any way with *those* people. She and I were at an impasse until I finally pointed out that Dan was down in Boise and so 'Adaho' wasn't without representation. Reluctantly, she gave way on this one point. You see, I can be pretty stubborn about some things too. After Jean'ne and I reached our compromise on this issue, I searched ISU's website until I found a likely looking candidate. He was a young assistant professor named Vitit Kantabutra, another native of Thailand who was now a U.S. resident. I got in touch with him, he seemed okay to me, and he agreed to take part in the team.

Over the next several months I worked with Jean'ne and her staff to fill in the details for my team's part of the proposal. I was able to get letters of support for our project from HP, Intel, and Micron, three fairly heavy hitters in the private sector. Our project was just one of three focus areas included in the whole package, and of the three we were the smallest team. The entire proposal ended up being a nine million dollar proposal, of which Jean'ne gave her Fuzzies one million four hundred thousand dollars spread out over three years. The contract was awarded by NSF in January of 2002 and we started work on it February 1st.

Considering Micron's role in the Boise business back in '95, some who were familiar with what we'd gone through had been a little surprised Micron supported us in this. But things were very different down in Micron by 2001. Not too long after we'd been run out of town, another brouhaha had erupted when Mr. Nobel, who was more or less the eight hundred pound gorilla in the kitchen on Micron's board of directors, tried to oust Micron president Steve Appleton. It was never clear to anyone outside of Micron why this happened, but the story that went around was that Micron's entire senior management staff had gone to Mr. Simplot with an ultimatum: If Appleton went, they'd go too. Mr. Nobel might have been the eight hundred pound gorilla, but Mr. Simplot was the two thousand pound gorilla and when the dust settled Steve Appleton stayed and Mr. Nobel went. Not long after he ceased to be the power on Micron's board, Micron started mending fences with the UI, and today Micron and the University get along very well with each other. A lot of my former students work at Micron now and a couple of Micron's higher middle managers are casual friends of mine. Sometimes the leopard does change its spots. □

The changing company culture within HP was starting to show even to outsiders such as myself by the winter of 2001. Ken began holding twice-a-year University Research Review Meetings down in Boise, which was something we hadn't done before. I didn't need to be told what was behind this. By now there was a lot of micromanaging of the company coming out of Palo Alto, and the commencement of these meetings was a pretty sure sign that Ken's technology group was coming under increasing pressure to show why HP, once one of the world's premiere high technology companies, should continue to invest in high technology research.

These meetings were not without interesting benefits. In addition to my laboratory, Ken also had a large group working on various things from Purdue University led by Dr. Jan Allebach, who was a Fellow of the IEEE and is very well known in the image processing field. Another smaller group was comprised of two very interesting guys from RIT who were likewise working on image processing related topics. I can't tell you anything specific about what these two teams were doing because that information is confidential, but I can say that I liked my fellow university researchers very much and what they were doing was very interesting.

The spring semester of ’01 saw us putting the last wraps on our Phase I work on the SOL project. One of the conditions for this contract called for us to turn over the hardware we had developed to JPL, and even though Phase II of the Grand Challenge had been cancelled we still had to turn over our stuff. I wasn’t under any particular illusions about the future of our SOL work. Our method had now been published – that, too, is a requirement – and if NASA ever did get around to implementing our instrument we were not necessarily the folks who would get this contract. This was a big disappointment but that’s life in the big city. The manager types in the private sector tend to think ‘competition’ is something that universities don’t know much of anything about, but these guys have never tried prying money out of the federal agencies that fund research. NSF, for example, funds only one out of every ten to fifteen proposals they receive each year and this isn’t because most of the proposals are bad; it’s because that’s all they have the budget to fund.

The end of the SOL funding meant I needed to come up with another source of research funding in order to continue to support Bruce, my Ph.D. student who had worked on SOL. There isn’t any rule or law anywhere that says a professor is responsible for doing this; it isn’t unknown in academia at all for a graduate student to find himself all on his own when a research contract ends before he has completed his degree program requirements. I wasn’t required to worry about what would become of Bruce now. But I think any professor who doesn’t feel a responsibility to find a way to get his or her students through in these circumstances lacks something pretty important in the makeup of a little thing called ‘character.’ Students don’t come to a university to serve the professors; the professor’s job exists to help the students. This is something I regard as an essential part of the social contract that binds a university community together. I have a fair degree of contempt for colleagues who forget this or cop out to the plea *What can I do about it?* My answer to this is always the question, *What have you tried to do about it?* In Bruce’s case I arranged a Teaching Assistantship (TA) for him to carry him through the fall ’01 semester. After that, Plan A was to put him on the EPSCoR project, assuming this funding was going to come through. In the meantime, I was putting in other research proposals to various agencies just in case. □

Melody and Aaron (1978).

Shortly after I moved to Moscow, I had started taking my Iowa visits in the summertime rather than at Christmas. I missed being back there for Christmas a lot, but winter travel conditions in and out of Moscow are fairly unpredictable and are always extremely inconvenient. It just made much more sense to go in the summer when the weather was good and traveling more predictable. It also meant that it was that much easier for Mom to get out and about during good weather in Iowa now that her health was going downhill.

My trip in June of 2001 was very special. My nephew Aaron had just graduated from college and was getting married. I wasn’t about to miss that for any reason. Besides, Melody had ordered me to be there for it and I knew better than not to do as I was told when my little sister was doing the telling.

The wedding was in Iowa Falls, which is a town in central Iowa and one I had never visited before. As I sat in the church that day watching my nephew – tall, slender, and now a handsome young man – taking his wedding vows, I was both filled with pride and at the same time filled with nostalgic memories, little vignettes of him while he had been growing up. I remembered that night in 1977, a few days before Christmas, when I’d walked into my parents’ house in Maquoketa and Melody had thrust baby Aaron into my arms so I could meet him for the first time. Little Aaron had sort of curled up in my arms and contentedly drooled all over my suit jacket as I held him. I remembered him as a little boy of ten, when I picked him up and gave him ‘airplane rides’ in the living room while he shrieked with delight. I remembered him as an adolescent in high school and seeing what a good big

brother he was to little Donald and Danielle, his younger brother and sister, at their farmhouse outside of Delmar. Now on this day Donald was a lad about to turn thirteen in another month, Danielle was a sweet little lady of eleven, and Aaron was a tall, strong young man about to embark on his life as a new teacher devoted to helping little kids with special learning challenges. I couldn't have been more proud of him if he were my own son. I don't remember what the weather was like that day in Iowa Falls, but for me it was a day bathed in golden sunshine.

Aaron with his son Holden, my great-nephew.

By now Mom was living in a care center for the elderly in Maquoketa. One of her two quacks had convinced her she could not live alone anymore and, in truth, their 'care' for her had by now turned her into a frail little woman who needed a wheel chair to get around and on which the ever present oxygen tank they convinced her she needed would go with her wherever she went. Both Melody and Sherri had tried to talk her into moving in with them, but Mom wouldn't have any of that. Mom had said to me one time, the last year she lived in her own house on the family settlement Sherri owned, "You kids never asked to be born. It was our choice to have you and our responsibility to take care of you. It isn't your responsibility to take care of us." Mom was a proud woman and it was a point of honor to her that she would not be a 'burden' to her children in her old age. She was a woman duty-strong her entire life.

The care center was an old house on Judson Street in Maquoketa. By coincidence it was only a block from our former house, and the old place could be easily seen from the front yard of the center. Mom had loved that house and had never liked it when we'd moved to Bellevue after my sophomore year of high school. I couldn't help but wonder what her feelings might have been seeing that house so close to where she now lived, but I thought it best not to ask. For me, standing in the front yard of the center and looking down the street to that house where so many boyhood memories hovered like ghosts, feelings both good and melancholy were thick in the air around me. The brand new car Mom had so proudly bought only a few years before she could now no longer drive, and she insisted I use it during my visits to get back and forth between Maquoketa and Ronnie's and Sherri's house out on their farm near the town of Oelwein. The care center weighed down on my spirits. I felt it a gloomy, depressing place where its tenants came to last out their final year or two. Many of Mom's housemates were senile, many too feeble to do more than sit on couches in the front room and watch the television with glazed eyes. The staff at the center were good and caring and devoted people, but, still, to me this was not a place to live; it was a place to wait for death. But Mom always said she liked it there, and I noticed that she and one old gentleman had struck up a friendship and they kept each other company. And so I kept these thoughts to myself and I put a mask over my feelings and I did what I could to bring cheer to my mother in this grim and awful place. And I silently cursed the incompetent witchdoctors who had put her here. □

I'm not overly fond of dentists, but as the 2001-02 school year got underway I found myself in need of one. I had developed a pretty bad toothache and just after Labor Day I was forced to admit to myself this was something that needed to be looked at. I asked around for different people's opinions on the local dentists, and Jeff Young, my next door colleague in the Institute, enthusiastically recommended his own dentist, a Dr. Jeff Kline. So it was that the next day I showed up at his office for my appointment.

I must say, I was and am very impressed with Dr. Kline. After examining me, he described what was wrong using dental terminology that I found completely incomprehensible except for the fact that it had something to do with one of my wisdom teeth. "Can you give that to me in English, Doc?" I asked.

"Your tooth has gangrene," he replied.

Uh-oh. *That* I understood. Well, what next?

We talked some more and he gave me a rundown on the options: root canal or tooth extraction. He favored the latter, and after he explained why I had to agree having the tooth yanked sounded like the right thing to do. Normally I'm not too keen on losing body parts, but this case seemed to be the exception. After we agreed on that, he told me the next thing to decide was whether to have him do it or to use an oral surgeon. He gave me a long rundown on local oral surgeons, but I was puzzled. Finally I asked him what was so special that I'd want an oral surgeon do to this. Hadn't he ever pulled a tooth before? Dr. Kline looked a little indignant. "Only a couple thousand," he said. Then why was he telling me about all these oral surgeons? "Some people are more comfortable having it done by one of them," he replied. "Well," I said, "I don't see the need. You do it."

So it was that I was back the next day, which happened to be my birthday. I'd never had a tooth pulled before, but I had friends who had and I was prepared for the worst. It turned out the worst was out of town that day. Dr. Kline was incredibly gentle and there was nothing at all painful about it. The only thing that even remotely resembled pain were a couple of tiny little pinpricks as he administered the local anesthetic. Pretty soon I had my jaw clamped down on some gauze for the bleeding and I was looking at what had been my tooth. "I'm writing you a prescription for hydrocodone," he said.

Uh-uh. Hold it. I knew what hydrocodone was. A couple years before I had, reluctantly, gone to see a doctor about a cyst that had grown in the middle of my back. It had been there for a few years by then, but since it hadn't hurt and I don't go around with my shirt off, I'd ignored it. Unfortunately, it had eventually become infected and something had to be done about it. I had more or less picked a doctor at random and had him do some minor surgery to get rid of it. He had also wanted to prescribe hydrocodone, but when he told me it was a narcotic I had balked. "Are you sure I need this?" I'd asked him. "This doesn't hurt all that much. Wouldn't just taking some Advil do?" He had been pretty skeptical but he couldn't talk me into taking the narcotic. Instead, since it was a Friday, he gave me one of his business cards with his home phone number written on the back. "If the pain gets to be too much over the weekend, give me a call at home," he said, "and I'll give you a prescription." Well, my estimation of him shot up a lot at that. Giving me his home phone number and telling me to call him at home if I needed him did more to inspire my confidence than anything else he could have done. But, like I thought, there wasn't anything more than some minor irritation and discomfort over the weekend. When I went back a few days later to have the gauze pad taken out and for him to do whatever to finish off the treatment, I told him, "The Advil worked just fine. No problems." He looked at me a little wide-eyed. "You're tough," he told me. Tough? Horse apples. It hadn't hurt that much at all. I'd played football with injuries that hurt more than this.

So now when Dr. Kline was prescribing the same narcotic, I wasn't convinced. "Are you sure I'll need this?" I asked, a bit of a challenge in my tone of voice. "Yes," he said. He shoved the prescription into my hand. End of discussion.

I put it in my pocket but I wasn't convinced. I walked out of his office, got into my car, and started for home, which was on the other side of town. I made it as far as past the downtown – less than a mile – before the local anesthetic started wearing off. Just as soon as that started, I suddenly didn't have any doubts at all any more. I made an emergency stop at a pharmacy on the way home and picked up my prescription.

The next day was Friday, September 7th. One thing I'll say about hydrocodone: it could knock an elephant flat on its behind. I tried to put in my regular day at the office, but well before noon I had to admit to myself that I wasn't doing anyone any good by being there. I was just too dopey to think straight and too sleepy to concentrate on anything. I threw in the towel, went home, and just crashed in the living room in front of the TV. Saturday went pretty much the same way, but by Sunday I was able to wean myself off the drug. When I had to have a second wisdom tooth yanked a couple years later, I didn't argue with Dr. Kline anymore. He knew what he was doing. □

The following week, as I was backing my car out of the driveway to go to work, I heard over the radio that one of the towers at the World Trade Center had just collapsed. It was Tuesday, September 11th.