The Tales of Sam, an Autobiography

Sam Wagstaff

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This note is a combination autobiography and family history with lots of stories I think are interesting or funny. I hope you enjoy reading it.

Please send me any corrections or comments.

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1 Family

Many Wagstaffs live in and near Manchester, England, which may be where the name originated. There are two theories about the origin of the Wagstaff family name. One version is that Wag-staff is a variation of Shake-speare and therefore quite distinguished. The other version holds that one of my ancestors—a very distant ancestor—was a famous flasher.

Most Wagstaffs in the United States live in Utah. Many years ago a Wagstaff was one of the leaders of the Mormon Church. I am not related to the Utah Wagstaffs.

The only place in the world named Wagstaff is a small municipality in Kansas near Kansas City. I don't know the origin of the name of this town.

1.1 Grandparents

My father's parents died near my birth, so all I know about them is what my father told me. My father and his father were both named Sam, so technically I am the third. Grandpa Sam had various jobs including guard and used car dealer. He was a martial arts expert. One time he gave a demonstration in which he invited twenty policemen to try to take him down. He threw them all and could not be taken. My Japanese friends are amazed by this story because all Japanese policemen are martial arts experts and any two or three of them could prevail over the best martial arts expert. In contrast, most American policemen know only a little about martial arts.

When Grandpa Sam was courting Agnes Townson, his future wife, few people owned cars. He used a horse-drawn buggy to take her on a date. When they were descending a hill, the buggy slid forward until the footrest touched the horse's behind. At this moment the horse pooped on their feet, ruining the date.

My father's parents lived in Fall River, MA, and my father was born in that city. Their house was near the Rolling Rock.

Grandpa Sam died shortly before I was born and Grandma Agnes died soon after I was born. My Aunt Gladys cared for her mother Agnes when she was ill near the end of her life.

My mother's parents, Ralph and Laurina, lived much longer. They lived on Irvington Street across from Brooklawn Park. Laurina's parents, the Darlings, were still alive when I was a child. They owned Darlings' Flower Shop in Fairhaven, MA. I visited my great grandparents a few times. Their house was located on US Route 6 where the Sweet Ginger Asian restaurant is now. Their flower shop was across Route 6 where the Midas Muffler shop is now. Behind the shop they had an acre or two of connected greenhouses where they grew their flowers. When I was three or four years old, I loved the sweet smell of the flowers as I ran through the greenhouses.

My Grandpa Ralph grew up on a farm in Fairhaven. He had to drop out of school in eighth grade to help on the farm. As an adult, he took correspondence courses to qualify him as electrician, plumber and stationary engineer. He served in the US Navy during World War I. His job was to repair battleships in the Brooklyn Navy Yard. He had a large collection of tools in his basement workshop. He worked in several mills in New Bedford as an engineer keeping the power machinery operating. Later (when I knew him) he worked as an engineer keeping the boilers running in the county jail on Court Street. He always claimed that some of his ancestors were Native American.

Once a year my grandfather would treat his children and grandchildren to a clambake at Gaudette's Pavilion[1] on South Main Street in Acushnet. I think it was the annual convention of local engineers. Workers would build a fire with rocks at its base. When the fire was almost burned out and the rocks were hot they would rake out the ashes and cover the rocks with wet seaweed. Then they added layers of soft shell clams, fish, sausage links, linguica, potatoes, sweet potatoes and ears of corn in wire baskets separated by more layers of wet seaweed. Finally, they covered the whole pile with a canvas. The steam from the seaweed would cook and flavor the food. After the meal cooked for about an hour, they would remove the canvas and serve the food to the guests. This is the traditional way to prepare a clambake. I loved these clambakes.

Grandpa Ralph heated his two-story house partly with a wood stove that circulated hot water through radiators in every room. When I was a child he would drive me to a saw mill where we would load his car with scrap wood. Back at his house I would unload the wood into his basement near the wood stove. Later he would cut it up with a table saw. The saw mill was on Bullock Road in Freetown. On the way to or from the saw mill, we would stop to visit his Aunt Annie who lived in an old farm house on Bullock Road. The house had no electricity or indoor plumbing. Sometimes I would fetch a bucket of water from her well. Aunt Annie lived (in that house) to about the age of 100.

Either Grandpa Ralph or Grandma Laurina (I'm not sure which) had an Aunt Belle who lived in Manhattan Beach, CA, and who also lived to about 100. She would visit New Bedford once per year and stay with my grandparents. One time in the 1970s when I was in Los Angeles, I visited her.

When I was a child, we always had Thanksgiving dinner at my grandparents house. My grandfather cooked the turkey and my grandmother cooked everything else. After the meal I would play in Brooklawn Park across the street. The rocking chair in my house now was

[1]The name was changed to Century House in 1984.

originally in my grandparents' parlor. It looks new because my parents had it reupholstered.

1.2 Parents

My father lived in Fall River as a child. In winter, he would sled down President Avenue, a long steep hill in Fall River. Later his family moved to New Bedford. As a teenager living in New Bedford's north end, he would harvest lily pads from Turner's Pond on Nash Road and sell them at a stand in front of his house. He served as a bombardier in the Army Air Corps in World War II. He flew from an airfield near Cambridge, England, and dropped bombs on Germany. The years 1944 and 1945 were unusually cloudy in Europe, which made it hard to see the targets on the ground. If the bomber flew below the clouds, German anti-aircraft guns could reach it. Near the end of the war, he may have flown on one of the first B-17s equipped with radar that could see ground targets through the clouds. This radar was invented in England and put into production by MIT engineers, perhaps at Round Hill[2]. (Before the war, radar antennas were as big as houses and could not be mounted on planes. The new radar antenna was small like the power unit in a microwave oven.)

My mother, Helen, was born in New Bedford. She enjoyed roller skating as a teenager and broke her collar bone in a skating accident on Irvington Street. Both of my parents graduated from New Bedford High School. Both were the first in their families to graduate from high school. They met while working in a furniture store on Acushnet Avenue. She was a typist; he delivered furniture in a truck. They were married in 1942, when he was on a brief leave from the army. They lived together in Carlsbad, NM, and a few other cities in the Southwest while he was training to be a bombardier. (When she was pregnant with me, she went through Carlsbad Caverns. That was my first visit to a cave, although I couldn't see it. I had to wait another forty years to see Carlsbad Caverns.) She moved back to her parents' house when he left for Europe and stayed there until he returned from the war in 1945. Then they bought a house on Reed Street and lived there until I was in college. She stayed at home while her children were young.

My father's first job after the war was as a milkman delivering quarts of milk in glass bottles to people's houses early in the morning. When he finished, he would drive to farms and collect 50-gallon cans of raw milk. He brought the cans to the dairy next door to our house. Another employee would pasteurize and bottle the milk for delivery the next day. One day, when I was 3 or 4, I got up at 4 am and went with him on his route. One time, the other employee fell into the pasteurization tank while cleaning it and my father had to pull him out.

My father liked vehicles, especially military vehicles. He owned many Jeeps in his life. He never bought a new car, but owned many used cars. His next job after the dairy was running an auto driving school. My mother kept the records for the business. He always owned at least two cars, one with standard shift and one automatic, to teach both types of transmission. Because of all the abuse by his students, the cars needed frequent repair and kept the Esso station on Kempton Street busy. He was also in the National Guard and went to drills every two weeks. My father liked driving and would take the family for a drive in the country every Sunday. In those days only race cars had seat belts. When I sat in the front seat and he had to stop quickly, he would put his right arm in front of me to keep me from sliding off the seat.

[2]See Section 2.2 for Round Hill.

In 1958 my father went to Fort Knox, KY, for a few months to take a course in tank maintenance. When it finished, my mother and sister and I took a Greyhound bus to Fort Knox and rode back to Massachusetts with him. This was the first long trip I took. I saw the gold depositary from a great distance.

In 1961, East Germany blockaded the route from West Germany to Berlin. President Kennedy responded to the Berlin Crisis by increasing US troop strength in West Germany. He sent the soldiers from Fort Bragg, NC, to Europe and activated National Guard soldiers to replace them. My father's unit was among those sent to Fort Bragg. When the crisis was resolved and the troops returned to their earlier locations, I again took a Greyhound bus to join him. This time I had my driver's license and I helped drive his car back home.

Before I made the bus trip to North Carolina, my father gave me his phone number at the base and told me to call him when the bus arrived in Fayetteville. I got off the bus and phoned him from a pay phone outside the bus station. He told me to go inside and he would be there in five minutes. I walked into the station and sat down. The room was dirty, the furniture was broken and everyone else in the room was Black. I remembered that many White people got off the bus with me and assumed that they had all been picked up already. I waited five, ten, fifteen minutes and my father did not arrive. I could hear a voice on a loudspeaker somewhere in the distance but could not understand the words. After twenty minutes, my father appeared in a door and called my name. I went through the door with him into a different waiting room. This room had new furniture, a clean floor and everyone in it was White. My father explained that he was not expecting me to be in the Black waiting room. This was the first time I saw segregation. In Massachusetts where I grew up the bus terminals were all integrated. I had a similar experience on my trip to Israel described in Section 5.5. My map of Israel, prepared by the Ministry of Tourism, showed two bus stations. I went to the one nearest to my hotel. It was dirty with broken furniture. The signs were in Arabic. I couldn't find a gate where they sold tickets to Ein Gedi. Finally, someone told me I should try the other bus station. I walked six blocks to it. It had new furniture, a clean floor, and signs in English as well as Hebrew. Apparently, the first bus station was for Arabs and the second one for Jews and Americans.

When I was in junior high school, my parents bought a piece of land in Shamrock Shores near the river in Westport, MA, and built a summer house. About this time, there was a fire at the county jail. One wing was badly damaged and had to be rebuilt. My grandfather arranged for the slightly damaged used wood to be hauled to my parents' house rather than to the city dump. Then my father and I loaded the wood into a truck he owned and moved it to Westport to build the summer place. As a result, the summer house is made of used wood and the sills are 12×12 inch beams twenty feet long. We spent many summers in that house. My Aunt Gertrude and Uncle Steve built a house nearby as did my grandparents and a few friends and other relatives.

When I was in high school, my mother went back to work. She had a job of typing lists of voters in the New Bedford election office, one for each precinct. After my classes at New Bedford High, sometimes I would walk down William Street to City Hall and visit her. She was proud of her title of Election Commissioner, which she needed to register new voters.

When I was in college in the 1960s, my father had a job as a clerk at the State Motor Vehicle Office in Boston. He took the bus from New Bedford every day. I visited him a few times while at MIT. Later he got a job as a civilian employee of the Army Reserve at Fort Rodman. He was still in the Reserve and later became commanding officer of the Fort before it

was decommissioned. He retired then and worked to establish the Fort Taber military museum. (Fort Taber is the original part of Fort Rodman.)

After my mother retired from City Hall, she kept busy working on genealogy. She traced some of my ancestors back to the time of Shakespeare. She found one of her ancestors who came to Plymouth on the Mayflower. She joined the Daughters of the Mayflower as well as the Daughters of the American Revolution. She also identified one of her father's ancestors as an Indian, as he had claimed.

1.3 Sister

My sister and only sibling Millicent preferred to be called Millee. She was three years younger than me. We attended the same schools for K-12. As young children, we would often go to the Lincoln Park amusement park on Route 6. We were together for various family events. However, we had separate sets of friends and seldom played together.

After high school, she attended Cape Cod Community College and became a licenced practical nurse. She worked mostly in nursing homes. When her boyfriend, Paul Meckowski, was injured in a motor scooter accident, she nursed him back to health. This association cemented their relationship and they were married.

Paul had a series of short-term jobs as a contract engineer. Millee stayed home raising a family. They had four daughters: Beth, Janna, Chrissie and Marilee. They lived in Maine, Florida and a few other places before they bought a home next to the Dighton Yacht Club on the Taunton River across from Dighton Rock. I visited them in that house many times. In 1989, when I had a one-year job at NSA, Paul had a job near Baltimore. We would meet once a week, walk along Baltimore's Inner Harbor and then eat at a nearby Chinese restaurant. When we were in Dighton, we would ride in his sailboat down the Taunton River to the Braga Bridge.

1.4 Aunts, uncles, cousins, etc.

I remember Aunt Gertrude, my mother's sister, and Uncle Steve and may have attended their wedding. Gertrude worked as a clerk at the Continental Screw Company, the Merchants' Bank and later for a company that leased giant spools to utility companies. Steve was a custodian in various New Bedford schools including my elementary school when I was a student there. He raised beagles and loved to hunt. They had a daughter Helen, so named because her birthday is almost the same as my mother's birthday. They also had a summer house at Shamrock Shores. They lived for a while on the second floor of my house on Reed Street and later on the second floor of my grandparents' house on Irvington Street. Finally, they converted the summer place at Shamrock Shores into a permanent home and lived there.

When I was very young, my father's sister Aunt Gladys lived in the house across the street from my house on Reed Street. Her husband Arnold was the other employee in the dairy next door, owned by his parents, the Chases. They had two children, Gail and Arnold Junior, who were a few years older than me. Junior was a smooth talker and had many girl friends. I was a shy teenager and he would coach me on how to ask a girl for a date.

Gladys and Arnold got divorced and Gladys married Carl Dupont, a land developer who also owned several bars in New Bedford. He divided a large tract of land on Brandt Island Road in Mattapoisett, MA, into house lots. Someone built an octagonal house on one of the lots

and sold it to my parents. My parents lived there for about a year because the house was next to Buzzard's Bay and they wanted "to commune with nature." In February, they vacationed in Florida with Gladys and Carl. There was a heavy snow and cold weather in Massachusetts and they were delighted to be in Florida and watch the weather reports on television. But when they returned and dug through the snow to their house, they learned that while they were away the power went off for a while, the pipes froze and broke, the electricity returned, the water pump filled the basement with water, the water froze and lifted the house off its foundation. They decided they had communed with nature enough and moved to the north end of New Bedford. After Carl died, Gladys moved into a house near my parents house on Pine Hill Drive.

I have a few other living relatives. Cousin Judy lived near me on Reed Street and was a classmate in K-12. A lady in Yorkshire, England, and I exchanged similar old family photos of my great grandparents at the same beach somewhere, which proves we are related. A woman in Florida told me that a DNA test with Ancestry.com showed that her father's mother was my Aunt Gladys and her father was my cousin Arnold Junior.

2 Education

2.1 Kindergarten through high school

I attended elementary school, Keith Junior High school and New Bedford High School. (In those days, middle schools were called "junior high schools.") We lived next door to the old fire station at the corner of Reed Street and Kempton Street. US Route 6 uses Kempton and Mill Streets. As a kindergartener I had to learn to look both ways crossing busy Route 6 as I walked three blocks to elementary School.

I have been fascinated by maps since the age of eight. The Esso gas station across the street from the fire station gave away free road maps to its customers. I took one of each; they let an eight-year-old have them because my father was a good customer. I studied the maps and planned road trips across the US. I followed Route 6 on maps all the way from Provincetown, at the tip of Cape Cod, to Long Beach, CA. (Now it ends in Bishop, CA, rather than Long Beach.) I drew a map of the local area on my bedroom wall. I rode my bicycle all over New Bedford and Dartmouth. When I came home I would add onto the map the new streets I had explored. Many years later I was delighted to learn that my daughter-in-law Heather Hostetler was another Route 6 person; she had lived next to that route in Walkerton, IN.

I had assorted jobs in high school. I was a paperboy for the New Bedford *Standard Times* newspaper. In those days, boys would walk and deliver newspapers to houses every day. After that, one summer I worked for a veterinary hospital on Ashley Boulevard in New Bedford. Each day I would ride my bike from the West End to the North End to get to work. I cleaned the cages and held the animals while the doctor gave them shots.

While a student at MIT, I worked one summer in the engineering office in the New Bedford City Hall. (My mother was a clerk in the Election Office one floor beneath the room where I worked.) I would update maps as new roads were added. I also computed the area of each property protected by the hurricane dike, which was being built that year. Another summer job was for US Ringbinder factory in New Bedford. A ringbinder is a metal strip with three rings that holds the paper in a notebook. I assembled about 500,000 of them during that

summer. Some coworkers were other college students. Many regular employees, including the boss, were of Portuguese ancestry. I learned the bad words in Portuguese that summer. The following summer (1965, I think) I worked for a land surveyor in Plymouth, MA. They were making new subdivisions and I computed the exact boundaries of each house lot. They did not have computers then, and I used a mechanical calculator and a large trigonometry table to do the work. During lunch hour I would walk a few blocks to Plymouth Rock.

2.2 How I happened to attend MIT

Let me begin with a short note about Hetty Green and her son Ned, who lived at Round Hill. For more information about them, see the book *The Day They Shook the Plum Tree* by Arthur H. Lewis. The title refers to January 31, 1952, when the Green estate was liquidated by an accountant mailing 119 checks totalling more than $100,000,000.

Hetty Robinson was born in 1835. Her family had owned Round Hill[3], an estate of about one square kilometer on the Atlantic Ocean in South Dartmouth, MA, since the 1600s. Her father owned many of New Bedford's whale ships. When oil was discovered in Pennsylvania around 1850, he was one of the first to guess that oil from the ground would soon replace oil from whales for lubrication and illumination. He gradually sold his fleet of whale ships. He died in 1865 and Hetty inherited millions of dollars. She invested it wisely and soon became the richest woman in the world. She married Edward Green in 1867 and they had a son Ned Green the next year. In addition to being the richest woman in the world, Hetty was also the stingiest. When young Ned broke his leg playing one day, Hetty took him to a free clinic to have it set. The doctor refused to treat the boy, telling his mother that the richest woman in the world should take her son to a regular doctor and pay for the treatment. She did not do this. The leg became infected and Ned was near death two weeks later when his mother finally took him to a doctor. By then the leg needed to be amputated to save the boy's life. Ned was in a wheelchair after that. (When my parents told me this story, they emphasized that if I ever were hurt while playing, I should tell them at once and they would take me to a doctor, no matter the cost.) Hetty Green died in 1915 and Ned inherited a vast fortune. Ned built a mansion at Round Hill in 1919. Ned was interested in technology and built a radio station WMAF at Round Hill. He broadcast music over loud speakers to the public, who came in about 10,000 cars to Round Hill, starting in 1923. My parents listened to this music as teenagers. Around 1930, Ned donated money to MIT and invited it to establish a laboratory at Round Hill. He died in 1936 and left Round Hill to MIT. Because of extensive litigation, his estate was not settled until 1952.

New Bedford, my home town, is a city on the south coast of Massachusetts. It is a long narrow city stretching north from the Atlantic Ocean on the west bank of the Acushnet River. The south end is a peninsula that extends a mile out into the ocean. The southern tip of the peninsula is a military fort, Fort Rodman, whose coastal artillery batteries (called Fort Taber) protected the city in every war from the Revolutionary War to World War II. In the latter war, its cannons could fire shells twenty miles out into the Atlantic Ocean.

The view from Fort Rodman on a clear day is spectacular. To the east, across the mouth of the Acushnet River, lies the town of Fairhaven, the home town of my mother's parents. To the south one can see the Elizabeth Islands, which hang from Cape Cod like a chain of beads.

[3]Round Hill is sometimes called Round Hills.

To the southwest, across Clark's Cove, is the town of South Dartmouth. A prominent feature of the geography of South Dartmouth is Round Hill Point, a conical hill adjacent to the ocean. From World War II until the 1970s, when my father commanded Fort Rodman, one could see from the Fort a 65-foot diameter steerable parabolic dish radio antenna atop the round hill. Round Hill was the site of classified research in electronics during World War II. Operated by MIT, it continued its work and performed unclassified research after the war. In the late 1940s and early 1950s a helium-filled dirigible ferried scientists daily between MIT, in Cambridge, and Round Hill, fifty miles to the south.

As a small child I was intrigued by the dirigible and the sight of the giant dish antenna across the water. When I was five or six years old, one of my playmates was a boy who lived down the street. His mother was a secretary at the Round Hill laboratory. One Saturday she took us to the beach at Round Hill. I had been to few beaches at that point in my short life and this one was by far the best I had ever seen. It was uncrowded and had beautiful white sand. (Most New England beaches are littered with rocks and broken sea shells.) The giant antenna loomed above me and I got to see the tower where the great airship docked. As my friend's mother drove us back to New Bedford at the end of a wonderful day, I asked her who was allowed to go to that beach. She replied that people who worked there could use the beach. She added that MIT graduates could also go to the beach any time. I resolved then to become an MIT graduate so that I could use the beach.

As I progressed through elementary, middle and high school, I told my teachers that I wanted to go to MIT and asked what I needed to do to achieve this goal. I did everything they told me to do. I learned that MIT was a college specializing in science and technology, computers and mathematics, and I made sure that I prepared well in these subjects. Eventually, I was accepted by MIT, whose 1961 catalog mentioned that Tech House, Ned Green's mansion at Round Hill, was available to MIT alumni.

When I was a senior at MIT in 1966 I looked forward to swimming at Round Hill and visiting Tech House with other alumni. However, that year MIT decommissioned the laboratory and sold the property to the Society of Jesus. From that time on, only Jesuit priests could use the beach. That is where I drew the line. I certainly wasn't going to become a Jesuit priest in order to use the beach.

2.3 Experiences at MIT

I lived on the second floor of the East Campus MIT dormitory from 1962 to 1966. The residents often played pranks on each other. One student named Foster played many pranks but no one dared to prank him because he was so tough and fierce. One day crews were dismantling a railroad track near campus. Loose pieces of rail were strewn all along the track bed. When the crew was not at work, twenty dorm residents assembled, walked to the track, measured a rail that would fit in a dorm room (about 20 feet long and weighing 700 pounds) and carried it back to the dorm on our shoulders. On the way a campus policeman asked where we were going with the rail. I said we were taking it to the dorm. He told us to put it back when we were done with it. We hid it in a second floor dorm room until Foster was away at class. Then another group of twenty moved the rail into Foster's room. We waited for him to return. When he opened his door, he let loose a blood-curdling scream. The hall residents stood in the hall and waited to see what would happen next. Foster opened the door of the room across

the hall from his room and went back into his room. We heard loud grunting. Then, inch by inch, the rail emerged from Foster's room and slid across the hall into the room with the open door. When it was completely inside that room, Foster closed its door. Foster was strong.

When there was a problem with a room, like a burned out light bulb, we would fill out a repair slip in the dormitory office. The repair team was two men who resembled and acted like the comedy team Laurel and Hardy. The student who lived across the hall from Foster submitted a repair slip when he returned and found a rail in his room. I was in the hall the next day when Laurel and Hardy arrived. Laurel read the slip and remarked, "It says 'Please remove railroad track from room.' I wonder what that could be." They opened the door, saw the rail, told the student that railroad tracks are not allowed in dorm rooms, and left. They did not (and of course could not) remove it. After that day, whenever twenty hall residents assembled, the track would relocate from one room to another. In June, at the end of the semester we threw it off the fire escape at the end of the hall. It was still there beside the dorm when we returned in September.

In 1964 or 1965, an Orthodox Jew occupied the room across the hall from me. Every Friday evening before sunset, he would turn off the lights in his room, sit in his open doorway and read a book by the light in the hall. When he got tired, he would close the door and sleep in the dark room. Sometimes a nasty student would walk down the hall and turn on the ceiling light in the room as he passed the student's door. When this happened, the student would have to sleep with the light on because Orthodox Jews can't do work (not even flip a light switch) on the Sabbath. Whenever I noticed this situation, I would turn off the ceiling light for him.

At MIT I took lots of mathematics courses and *all* of the computer science courses they offered: 6.41, Introduction to Automatic Computation, in which we learned number systems and how to program in MAD, the Michigan Algorithm Decoder; and 6.251, Advanced Computer Science, in which we studied operating systems, assemblers, compilers and interpreters. In these classes, we wrote programs for the IBM 7094 on punch cards, turned in our decks during the day and got the results printed out the next morning. We were allowed four or five tries to run each program and get all the bugs out. Wanting to use a computer for more than the few seconds allowed in these classes, I registered to use the PDP-1, a 100kHz machine free to any MIT student. One had to sign up for time on this single-user machine, and usually the only available times were in the middle of the night. It was located in Building 20, a wooden building built when MIT expanded rapidly after WW II. I wrote my first research paper based on work I did between 2 and 3 AM many nights for a few weeks. I also got to play the first video game on this machine. Space War displayed two rockets and a star on a circular video screen. Using a joy stick and two buttons, a player could move his rocket and try to shoot down the other player's rocket. Sometimes we just tried to achieve stable orbits in the inverse-square gravitational field of the star.

In my senior year, I studied number theory with K. F. Roth, a Fields Medalist. He advised me as I wrote my first paper. Most of my MIT professors were excellent teachers. I remember I. M. Singer who wrote flawless notes on the blackboard from memory. His teaching assistant copied these notes and they were published verbatim as a topology book. G.-C. Rota was a great teacher for probability theory. N. Ankeny was less great for modern algebra. He never stated a theorem in the whole year. He would begin in the middle of a proof, work forwards and backwards until it was done, and then jump to the middle of the next proof. I copied

everything he said and then spent an hour after class constructing each theorem from what he had assumed and what he had proved. I learned a lot but it was hard learning. His homework asked us to prove assorted statements that were either true or false or trivial or unsolved problems. W. Ambrose was a real character for real analysis (calculus done rigorously). He arrived each day just as the starting bell rang and wrote furiously on the blackboard until the ending bell, at which time he would run out of the room. In the next class he would begin in the middle of the sentence he was writing when the previous class ended. Each midterm exam consisted of ten true-false questions. The grading was +10 for a correct answer, −10 for an incorrect answer and 0 for no answer. The class average on one exam was negative. N. Levinson taught complex analysis. The text was a mimeographed book he wrote, which we had to buy. In class, he simply copied the book onto the blackboard. The exams were very similar to old exams we could get from students who had taken the course before.

When I was at MIT, every student had to take four semesters of Humanities, in which we read literature from ancient Greece to about 1950. It was taught in small sections of about 30 students with lots of class discussion. Early in the first semester we read portions of the Bible as literature. The students in the class were of many different religions. The New Testament has many references to the Old Testament with the form, "Jesus did X, thus fulfilling the prophecy of Y and showing that He was the predicted Messiah." During the discussion of these references, a Southern Baptist student turned to a Jew sitting next to him and asked, "When you read all these references to prophecies Jesus fulfilled, how can you not believe that Jesus was the Messiah?" The Jew responded, "We're still waiting for the Messiah."

Dormitory life was lots of fun. I lived in one called East Campus, which was very close to the library and the Math Department. Recall the railroad track incident above. We also had water balloon fights every now and then. The dorm residents helped each other with their classes. Almost as much learning happened in dorm discussions as in the class room.

The earth science building (Green[4] Building) was built next to East Campus during my junior and senior years. All of its windows are on two sides. The side facing my dormitory room has no windows. It is just a solid white concrete wall twenty stories high, a perfect screen. Some dorm residents typed a message on a clear plastic sheet and used a slide projector on the dorm roof to shine it onto the side of the building eighteen to twenty stories up. The message was a line from *King Lear*[5], "Let copulation thrive." Its twenty-foot high letters were clearly visible across the Charles River in Boston. Another prank my dorm residents did was to save all their old broken super balls in a box and dump the box down the stairwell of the Green Building from the twentieth floor. The pieces of super ball bounced furiously as they went down the stairwell. They made a loud noise as they passed each floor, and settled as a pile of black debris on the bottom floor. Workers were sandblasting the white wall of the building during finals' week in 1966. East Campus had no air conditioning and it was warm in my room. I left my window slightly open early one morning when I headed for two final exams. When I returned that afternoon, everything in my room was covered with a centimeter of sand.

Now let me skip ahead 40 years and tell a story about my 40th class reunion in 2006. The

[4]This Green is not related to Ned Green.

[5]Act IV, Scene 6, uttered by King Lear when he noted that Gloucester's bastard son Edmund treated his father better than Lear's own legitimate daughters treated their father.

MIT administrators who run the reunions asked me to chair the fund raising committee. They said all I had to do was send a letter to all my classmates asking them to donate money to MIT. And they already had the letter written (last year's letter with 1965 changed to 1966) so all I had to do was sign it and they would mail it. This sounded easy, so I agreed. Then a few weeks before the reunion, they told me that there was one more job for the fund raising chair: I had to give a ten-minute speech at a large meeting with all alumni attending to report how much money my class had raised. They had the speech already written (same one as the previous year) so all I had to do was read it. They said that if I didn't like it, I could write a different one. The speech they supplied basically said, "When we graduated there was no internet, cell phones, etc. But our class invented all these things. And now we have raised X dollars for MIT." I thought this sounded cheesy, so I wrote my own speech. It was approved by one person in the alumni office. No one else saw it before the big meeting.

The big day came in June, 2006. We met in a huge auditorium with about 3,000 seats. I was on the stage with MIT President Susan Hockfield and representatives of the 25th and 50th reunion classes. My wife Cheryl sat in the front row with the families of others on the stage. Here is a summary of my speech. (See Section 4.1 for more about identifying primes.)

"We the class of 1966 have all done great things in the past forty years. For example, Bob Baillie and I invented a very fast way to tell whether a large number is prime." [All 3,000 alumni knew that large random primes are needed for secure communication.] "Our algorithm has become the industry standard. It is running on your phone and most other computers in the world. On my way to this meeting, I had to stop in an MIT rest room. While sitting there, I read the graffiti on the wall." [After the meeting was over, President Hockfield told me that at that point in my speech she worried that I might say something that her thirteen-year-old daughter in the audience should not hear.] "It said, 'For a good prime, call' and then there was a 100-digit number. I checked and it was prime." [At that point 3,000 people roared their approval. I was a rock star.] Later in the speech I said, "The class of 1966 has raised $17,843,291 for MIT. I wish it could have been a one hundred digit number." For days after that meeting, alumni would congratulate me on the speech, so different from the boring ones of previous years. And they kept asking me, "Which rest room was that?"

2.4 Cornell

After MIT I went to graduate school at Cornell. During the week before classes began in 1966, the new students had to take exams to see what math they already knew so that their advisors could place them in the right courses. I did very well on these exams. MIT had prepared me well. Although I majored in mathematics at Cornell I took several computer science classes. At Cornell I saw primitive computer networks for the first time. Cornell had a single IBM 360/65, a large computer for that time. In various buildings around campus were several IBM 360/20s, roughly the equivalent of a modern printer controller. The Model 20s were connected by phone lines to the Model 65. One could submit decks of punch cards to the central computer through any Model 20 on campus and have the output printed at the same site. My Ph.D. thesis was on mathematics and had nothing to do with computers. My advisor, Professor Oscar Rothaus, had worked on cryptography at IDA in Princeton before coming to Cornell. He left Princeton and came to Cornell because of a family tragedy.

Here is a joke my thesis advisor told me in 1968. That year was in the middle of the cold war

in which the US and the Soviet Union were spying on each other. When an American scientist was planning a trip to the Soviet Union, he would receive a visit from a friendly CIA agent who would ask him to gather a bit of intelligence for the agency. One American mathematician was preparing for a trip to Moscow to attend a math conference. The CIA asked him to get information about a Russian mathematician named Voreskin. The agent said that this person had published many papers without an address or affiliation. The CIA wanted to know his background and where he was located. The mathematician flew to Moscow, checked in to a hotel and went to the conference. When he arrived, his Russian friends gathered around him and asked, "Which one of us did the CIA ask you to report on?" The American looked at them and said, "It's none of you. They asked about a mathematician named Voreskin." His friends all began to laugh. The American added, "I looked up a few of his papers. Some of them are quite good." At this, the Russians rolled on the floor in laughter. When they calmed down a few minutes later, one of them explained, "The name Voreskin is an alias that we all use to publish our second-rate papers, ones that we do not wish to associate with our good names. Voreskin is Russian for *foreskin*, something you cut off and throw away."

While I was trying to write a Ph.D. thesis at Cornell there was an incident that gained national attention. A famous photo showed Black students brandishing rifles as they marched out of the Cornell Student Union. The photo won a Pulitzer Prize and was printed on the front cover of Newsweek Magazine for May 5, 1969. I was standing next to photographer Steve Starr when he took that photo. Earlier, the Klan had burned a cross on the lawn of a Black sorority. Black students at Cornell responded by taking over the Student Union Building and kicking out all the White people. The New York State Police then assembled several hundred officers in downtown Ithaca preparing to retake the building. The Black students brought weapons into the Union to defend themselves. Reporters were all over campus reporting this story. Five thousand White Cornell students met to discuss how to support the Blacks in the Union. The only venue large enough for this meeting was the Armory building. We followed strict parliamentary procedure to keep the meeting orderly. Eventually, we passed a resolution supporting the Blacks. The news media learned of this meeting and reported, "5000 Black students have taken over the Armory building where the ROTC guns are kept. It is not known whether they are armed." There was fake news even in 1969. Then cooler heads prevailed. There were negotiations. The Black students agreed to leave the Union and march to the Black Cultural Center. The police agreed no charges would be filed. Many people assembled at the entrance to the Union building when the Blacks were scheduled to leave. That was when the photo was taken. The Blacks marched to the Cultural Center with their guns and there was no further incident. The administration worried that there might be violence or arson later. Several math graduate students took shifts staying in the math building overnight for a couple of nights to protect the math library, one of the best in the world. We were told not to confront any demonstrators if anything happened during our watch; just call police and fire department as needed. I think graduate students in other departments did likewise. A political cartoon a few days later showed a basketball game between Cornell and another team, perhaps Syracuse. The Cornell players, all Black, were armed. The other team, all White, had their arms raised while a Cornell player on a step ladder stuffed one basketball after another through the hoop. A score board in the background showed Cornell 120, Syracuse 0.

Cornell graduate school required me to learn two foreign languages. I already had French from high school. I chose German and took a reading-German-for-scientists class one summer.

It was hot and the class room was not air conditioned, so the windows were open. One of the students was in a motorcycle club and was too embarrassed to tell his fellow cyclists that he was in the class. Somehow they found out. Every day during the class after that, about 25 motorcycles would ride past the building a couple of times making a loud noise. The first time we heard the motorcycles we were doing a lesson on comparison of adverbs. We were learning phrases like, "je grosser desto besser" ("the bigger the better"). We were allowed to say anything we wanted in class so long as we said it in German. When the motorcycles went by, the student in the club said, "so schnell wie möglich" ("as fast as possible"), which he had just learned. Today, whenever I hear a motorcycle I think, "so schnell wie möglich."

The final exam in this class had several passages in German taken from science journals with multiple choice questions also in German. One was from a veterinary medicine journal. It dealt with diseases of field mice. When I read it, I thought it was the children's story about city mouse and country mouse in which these two mice visited each other and a cat was killing some mice. I answered all the multiple choice questions with this interpretation of the passage. I guessed that "Feldmausplage" ("field mouse plague") was the German word for "cat" because that was what was killing the mice. If I did well on the final, it would satisfy my language requirement. The next day I went to see the teacher to learn how I did on the exam. He said I did quite well and met the language requirement. He remarked that I was the only student in the class who answered correctly all the questions about the field mice passage. I realized then how little I had learned about German, so I later took German 101 and 102 where I learned how to read, write, speak and understand the language. Now I can get by when I visit Germany and Austria.

In my third year at Cornell I lived in a rooming house with about twenty other students, including five or six Japanese. Sometimes they would stand outside my closed door and converse in Japanese. Now and then I would hear one of them say my name. I wondered what they were saying about me, so I registered to take Japanese 101. One of the Japanese in my house was a teaching assistant in this class. He told me that the teacher, Eleanor Jorden on loan from Yale, was the best Japanese teacher in the world. She was the first teacher of any language to have students memorize real dialogues, rather than learn to conjugate verbs. This is the way languages are taught now. That was another reason to take her class: If the best teacher in the world is available, you should take the class, no matter the subject. We used her text book and I learned enough to get by when I visit Japan. I attended these classes five days per week while I was writing my Ph.D. thesis!

The Cornell campus lies between two deep gorges. I often walked in these gorges to clear my mind while I studied and thought about my thesis. I also visited the waterfalls nearby. Ithaca is home to another university, Ithaca College, which has a fine music school. One year when I was at Cornell, Igor Stravinsky visited Ithaca College for the same year. I heard him conduct the New York Philharmonic Orchestra in *Rite of Spring* in Cornell's symphony hall. It was the best concert I have ever attended.

In addition to walking in the gorges, I did many activities with my friends Tony, Sai, Brian and Ron. Brian and I participated in several road rallies using my Camaro. This event is not a race. One must follow tricky instructions to drive on a certain route at a specified speed (below the speed limit) and pass through checkpoints at certain exact times. The car was given one point for each second early or late it passed a checkpoint. The car with the fewest points won, as in golf. I drove and Brian navigated. We won second place in one rally. The

prize was a full tank of gas at a local station. When I redeemed this prize, people at the gas station celebrated me as if I had won the Indy 500 race. I didn't tell them what a road rally is.

Ithaca has sudden weather changes. The classrooms in the basement of the math building have no windows. One November day it was sunny and 55 degrees when I went to class in one of these rooms. When I left the building after class, the temperature had fallen to 30 degrees and there were two inches of snow on the ground. Another time I was in a math class in a room with windows during a thunderstorm. Lightning struck nearby just as the professor wrote on the blackboard, "Let R be a commutative ring with descending chain condition." The room was filled with a blinding flash of light followed immediately by a loud thunder clap. The professor stopped writing. The rumbles of thunder died down and all was quiet in the room for a moment. Then a small voice from the back of the room said, "Maybe you shouldn't have done that, sir."

In my last year at Cornell I lived in an apartment next door to a bar with Brian, Sai and another graduate student. Bar patrons often parked in front of our apartment. We would drink at the bar on Saturday night until it closed at 2 am. Just before closing the police would arrive looking for drunks to drive away so that they could arrest them quickly. One night we pretended to be really intoxicated. The police followed us out of the bar as we pretended to be looking for our car. We stumbled around the parking lot for five minutes with the police following us from car to car. When we reached our apartment door we quickly ducked in and disappeared, leaving the police to find other drunks.

In 1947, two Cornell math professors, John Randolph and Mark Kac, wrote a calculus book and used it in their classes. Kac is a Polish name pronounced "Cats." At the end of a semester, a student in Kac's calculus class told the teacher, "I really like the way you taught this class, Professor Cats, but why did you use that awful textbook by Randolph and Kack?"

3 Marriage

When I first met my future wife Cheryl, she was working as a cook in the Earhart Hall Purdue dormitory. We were married in October, 1988, in Fowler Town Park. Her children Christina, Dean, Jason and Lance gave away the bride.

3.1 Train Trips

This section deals with trips by railroad, some of them with Cheryl.

Before and during World War II my parents travelled extensively by rail. Cheryl's parents did likewise.

When I was six or seven years old, the train between New Bedford and Boston was about to be discontinued. (In 2025 it was restored.) My parents wanted my sister and me to experience rail travel, so one day we went to the New Bedford train station. My mother took my sister and me on a short ride to the first stop, Taunton. As the train left the station, my father got into his car and drove to Taunton. He waited half an hour for us at the train station there, which may explain why rail service was ending.

In the 1990s, the daily rail service between Lafayette and Chicago was being cut back to two trips per week. Cheryl's sons had never been on a train, so I took Cheryl and her sons

by train from Lafayette to Chicago and back. We visited the Sears Tower and walked around downtown Chicago until the return trip. Cheryl was worried about missing the train. She made us return to the station an hour before scheduled departure.

During a trip to Massachusetts with Cheryl and her sons, I took them to ride through cranberry bogs on the Edaville Railroad in Carver, MA.

In the early 1990s Cheryl and I took a train from Rantoul, IL, to New Orleans. We stayed in the city for a few days and took a boat ride on the Mississippi River to the New Orleans Zoo. For some reason the train stopped for a few hours in the middle of the night in southern Illinois each way.

Cheryl and I travelled by train in Europe a few times, as described in the next section. Section 5 describes some train trips I made alone in Europe, Asia and Australia.

3.2 Travels with Cheryl

This section deals with travel I did with Cheryl, mostly not by rail. See the previous section for rail trips. Section 5 describes some trips I made without Cheryl.

We visited all fifty US states and all Canadian provinces that border the US. We drove on most of the interstate highway system. We visited many US national parks and most Indiana state parks. We also visited England, Scotland, the Netherlands, France and Germany. Our honeymoon was in Bermuda. We drove on parts of my favorite US Route 6 in every state it traverses. The Nevada section is desolate. While driving for hours on this road and seeing nothing but wild mustangs in the distance, Cheryl wanted a cup of coffee. We saw a building ahead that looked like a business next to the road. It had no signs but several cars were parked next to it. She thought it might be a restaurant and asked me to stop there. I was pretty sure it was a whorehouse and continued driving.

In the summer of 1988 Cheryl wanted to see castles. I took her on a trip to Germany. We went on a cruise down the Rhine River and saw lots of castles on the hills above the river. Then we took a train to Munich and had a tour of Neuschwanstein Castle, which was the model for the castle in Disneyland.

In May, 1991, Cheryl, Dean and I visited Europe. We visited France first and saw the Eiffel Tower, Notre Dame, the Louvre, the Arc de Triomphe and other sights of Paris. We took a train to Oberwohlfach, Germany, and stayed at the Mathematics Research Institute for a week. We met many famous mathematicians. Dean walked in the Black Forest and caught many bugs for 4-H. Cheryl attended some math lectures to observe the quirky mathematicians. She often did that when I took her to math meetings.

In June, 1995, I was in France and then in the Netherlands. Cheryl flew to Amsterdam and joined me. We travelled around the Netherlands and saw most of the old-style windmills left in that country thanks to a Dutch friend who drove us around. Then he drove us to the ferry to England. It was an overnight trip. We rented a car and drove to Scotland where we spent a week exploring castles, hiking through the countryside and touring England's Lake District just south of Scotland. Then we drove to southern England and visited Stonehenge. Finally, we flew back home.

Cheryl's mother Carlen went with us on a few trips, mostly to Missouri to see her relatives. Carlen came with us on one trip to Massachusetts. We took her to Plymouth to see the Rock. We showed her a cranberry bog. As she once lived on a farm in Indiana and didn't know how

cranberries grow, she was quite interested in this. I explained to her how cranberry bogs are flooded occasionally to prevent freezing in early spring. She wanted to see a lighthouse. I took her to Fort Rodman where you can see the lighthouse at Butler Flats out in the water. She said she wanted to touch a lighthouse, so I took her to visit the one at Ned's Point and she touched it. One the return trip to Indiana we saw Punxsutawney Phil, the groundhog who predicts whether winter will last six more weeks or not. We stayed in the same motel as singer Travis Trit and even caught a glimpse of him.

Cheryl's sons accompanied us on a few trips. One time the five of us were driving on a country road in Wyoming. Suddenly Dean said, "Stop the car. I see grasshoppers." I pulled off onto a gravel patch. He got out of the car, got his net and started collecting rainbow grasshoppers, which they don't have in Indiana. There was a barbed wire fence next to the road. No livestock were in sight. There were even more grasshoppers in the field, so he crossed the fence to get them. In a couple of minutes a pickup truck parked behind me and a cowboy got out. He asked, "What'cha doing?" Cheryl replied, "My son is collecting grasshoppers. He needs them for his 4-H project." The cowboy said, "It would be better if he collected them on this side of the fence. The other side is private property, my ranch." Cheryl said, "But he's just getting grasshoppers. What are you worried about?" The rancher answered, "Well ma'am, I'm worried about poachers. There have been a few cases of poaching here recently." Cheryl, who was a cook, exclaimed, "Back home in Indiana we poach eggs. What do you poach here in Wyoming?" We explained the other meaning of "poach" and she called Dean back to the car.

I happened to find the log file for one of our trips and include it here.

In July and August, 1996, Cheryl and I traveled to the western US with a brief excursion into Canada. Here is a detailed account of our vacation. The weather was cool until the last day. The sky was often clear and there was hardly any rain. Indeed, the only rain I remember was once during the night while we were in a motel and one brief shower while we were driving. It never actually rained on us.

Monday, July 29. The weather was clear and cool. We left West Lafayette on IN 26 west around noon and went into Illinois, where the number changes to IL 9. At Gibson City, we turned right onto IL 47 and went to Forrest. We turned left onto US 24 and went west to US 51. We went north on US 51 (same as I-39) to Rockford. We got onto I-90 and went north into Wisconsin. The terrain was flat with mostly corn and soy bean fields. In Wisconsin there were rolling hills, the corn fields were smaller and there were more dairy farms. I-94 merged with us at Madison. We stayed on it at Tomah where the two interstates separate. We went through Eau Claire and into Minnesota. We spent the first night in a motel just beyond (west) of Minneapolis.

Tuesday, July 30. The next morning we drove west on I-94 to Moorhead where we looked at the campus of Moorhead State University. Then we went into adjacent Fargo, North Dakota and bought gas and ate lunch at a Subway. (Tuesday is double stamp day at Subways.) We took I-29 north, crossed into Canada at Pembina and took 75 to Winnipeg, Manitoba. This was Cheryl's first visit to North Dakota and to Manitoba. The weather was clear and cool. The terrain was wetlands. There were many small, shallow lakes (most less than an acre) filled with tall grass and other vegetation. It was like this all through Minnesota, North Dakota and Manitoba. Ducks and geese love these wetlands. We went to the University of Manitoba and met Hugh Williams, an old friend of mine. I checked on my programs at Purdue from Hugh's

computer terminal. We had dinner with him and his wife, Lynn, in a plaza where the Red and Assiniboine Rivers meet in downtown Winnipeg. We had followed the Red River ever since Fargo. It is the border between North Dakota and Minnesota. We stayed at the Holiday Inn in Winnipeg. During dinner, Hugh and Cheryl talked a lot about cameras. Cheryl wanted a new one with a big lens. Most of the cultivated fields we saw in the United States had corn or soy beans or some other green crop. We were struck by fields of a lemon yellow crop in Canada. Hugh said it was canola.

Wednesday, July 31. We left Winnipeg going west on the Trans-Canada Highway, 1 in Manitoba. We saw another striking crop, flax. It has a water-blue color that makes it look just like a lake. We could tell that it was a crop and not a lake because we saw it on the sides of hills and they don't have slanted lakes on hill sides. We turned right at Portage la Prairie and visited Delta on Lake Manitoba. It is a big lake. We returned to Portage la Prairie and continued west on 1 to Brandon. About 20 years earlier I saw a total eclipse of the sun at Brandon. This time the sun stayed out and we had an oil change. We drove south on Manitoba 10 to the International Peace Park at the border. The entrance to the park is right on the border, between the two customs stations. The park has lots of flowers, lawns, monuments and statues. It has a chapel with many famous peace quotations carved in the walls. We spent two or three hours there. Then we drove into North Dakota, down US 281 to ND 5. We had dinner in the Dairy Queen in Bottineau and continued west on ND 5. One of the main highways in West Lafayette is US 52. It goes from Charleston, South Carolina to Portal, North Dakota. It merges with ND 5, and we drove to the end of it in western North Dakota. We went into Saskatchewan briefly. It was the first time either Cheryl or I had ever been to Saskatchewan. Then we returned to ND 5, drove west to US 85 and spent the night in Williston, ND. As we got into western North Dakota, the terrain changed from wetland to desert, with sage brush and tumble weed.

Thursday, August 1. We crossed the Missouri River on a long bridge and causeway and continued south on US 85, turned right onto ND 200, crossed the Yellowstone River, and went through Sidney, Montana. We followed MT 16 southwest to I-94. We got on to I-94 near Glendive and followed it to its end near Billings. Then we followed I-90 west. Between Bozeman and Butte we got off and visited the Missouri Headwaters State Park near Trident. Years ago I bet one of the Saturday hikers[6] that the Missouri River did not begin with three rivers merging at one place. I conceded defeat and brought a pie when I found that the Missouri River begins near Trident, Montana. The engine started to overheat as we crossed a high mountain pass through the Continental Divide just before Butte. We worried about it all the way to Missoula, where we spent the next night.

Friday, August 2. The owner of a radiator shop in Missoula advised us to have the radiator rodded out when we returned to Indiana. He said it would be okay so long as we stopped whenever it got too hot. We decided not to take a side trip to see Glacier National Park, a hundred miles north of Missoula. Instead, we continued west on I-90 through Idaho. We went through Coeur D'Alene, Idaho and into Spokane, Washington. This was Cheryl's first visit to Idaho and Washington. We got off of I-90 at Exit 220 in Ritzville, Washington, and followed US 395 south to Paseo. We crossed the Snake River near its mouth at the Columbia River. We drove along next to the Columbia River past a huge paper mill into Oregon. At this point,

[6]See Section 7.1 for more about bets on the Saturday Hike.

Cheryl had visited all fifty states. We turned left at Umatilla, Oregon and got onto I-84. We followed it through Pendleton, La Grande, Baker and Ontario. We crossed the Snake River again and went into Idaho again. We spent the night in Boise. The terrain was pretty dry with irrigated wheat and potato fields and occasionally a corn field. We saw machines harvesting potatoes.

Saturday, August 3. After breakfast we went to see the Idaho State Capitol building and then stopped at a camera shop. Cheryl wanted to buy a new camera, and was able to see and hold the one she wants. Camera shops in Lafayette don't carry it. We drove east on I-84 to Twin Falls, where we saw a large waterfall, Shoshone Falls, on the Snake River. We crossed the Snake River at least four times that I recall. We continued southeast into Utah. We left I-84 at Exit 24 and went down UT 83 to see the Golden Spike National Historic Site. The Site building was closed for the day, but we got to see the outside parts of it anyway. We saw the railroad track and the special tie that once had the golden spike in it when the railroad from the east joined the railroad from the west. On UT 83, we saw Morton Thiocol's rocket engine plant and rocket display. We returned to the interstate near Brigham City and went down I-15 into Salt Lake City. We could see parts of Great Salt Lake from the overpasses. The engine was running hot going up some hills, but it was not overheating. After we checked into a Super 8 Motel we went to visit Temple Square. We looked at the visitor center and made plans for the next day. The weather remained cool and dry.

Sunday, August 4. After breakfast, we checked out of the motel and drove back to Temple Square. We went into the Mormon Tabernacle and heard the Mormon Tabernacle Choir sing in a TV program called, "The Spoken Word." It was wonderful. After that we drove east on I-80. There is one very steep hill, a 6% grade for about twenty miles, leaving Salt Lake City. We had to stop once on the way up to let the engine cool. Eventually, we made it up to the top and into Wyoming. We drove past Flaming Gorge, which we had visited on an earlier trip. We passed Rock Springs and Rawlins. There was a big oil refinery in Sinclair, but no Sinclair gas station. We were surprised that gasoline was so expensive near oil wells and a refinery. I-80 goes around Elk Mountain, which looks very black. Just before Laramie, there was a statue of Abraham Lincoln. I-80 is the Lincoln Highway and the statue was at the highest point on it. We checked in to the Motel 6 in Laramie, and ate dinner at a steak restaurant. It was the kind where you first go to the feed lot, pick out the steer you want, then go inside and eat a salad while they cook it for you. After that we went to visit the University of Wyoming. At the CS department there, I was able to check my programs at Purdue.

Monday, August 5. We drove east on I-80 past Cheyenne and ate breakfast in Pine Bluffs, Wyoming. Continuing east on I-80, we passed Kimball, Nebraska, the missile silo capital of the world. (We saw many missile silos in northern North Dakota, but there are more of them in western Nebraska.) Our next stop was at Cabela's sporting goods store in Sidney, Nebraska. It is an enormous store with an exhibit of hundreds of stuffed animals. We bought some birthday presents for the boys there. After passing the northeast corner of Colorado, I-80 follows the South Platte River to North Platte, Nebraska, where the North Platte River joins the South to form the Platte River. We had another oil change at North Platte and got back on I-80, which follows the Platte River to Grand Island. We continued on I-80 through Lincoln, crossed the Platte River one last time, went through Omaha, and crossed the Missouri River into Iowa. I showed Cheryl a motel in Underwood, Iowa, where we stayed with the boys while returning from some other trip years ago, but she didn't want to stay there again. We tried to stay at

the Super 8 motel in Avoca, but it was full. The clerk called ahead and made reservations for us at the EconoLodge in Atlantic, Iowa, and we stayed there.

Tuesday, August 6. The next morning we drove east on I-80, which coincides with US 6 for a few miles. We got off at Exit 110 and headed south to Winterset and the bridges of Madison County. We made a side trip to see one bridge even before we reached Winterset, the birthplace of John Wayne. We drove around the county for the next few hours and saw four of the six covered bridges left in that county. We got on to I-35 at Exit 52, near St. Charles, and got off it at Exit 33, where we ate lunch at a Subway. (Tuesday is double stamp day at Subways.) We drove east on US 34 through Ottumwa, Fairfield and Mt. Pleasant. We turned right in New London and went through Lowell and West Point to Fort Madison, Iowa, on the Mississippi River. We crossed the bridge, turned right and went a short distance south to Nauvoo, Illinois, where the Mormons lived for a few years about 150 years ago. We saw the remains (a few foundation stones) of the first Mormon temple. For the first time during our trip it got hot. It was about 98 degrees in Nauvoo. We drove back to the bridge, which is the western end of IL 9. (Recall that we drove on the eastern end of IL 9 at the beginning of the trip.) At first we planned to drive the whole length of IL 9 back to Indiana. We decided not to do this because (a) it goes through the middle of Bloomington, a big city, and (b) we wanted to see Western Illinois University in Macomb. (Sam had visited Northern, Southern and Eastern Illinois Universities, but never Western.) We followed IL 9 for only about 50 miles, and turned right onto US 67 at Good Hope. We soon reached Macomb, saw the University and ate dinner in a barbecue restaurant. After that, we drove east on US 136 through Adair, Havana (the Illinois River was overflowing), San Jose, Maclean and Heyworth. The windshield was so covered with bug splats that I could hardly see out of it. I washed it at a gas station when we crossed I-74. Seven miles east we turned left onto IL 54 and went up to Gibson City. From there we drove east on IL 9 and IN 26 to West Lafayette and home. It was a great trip.

Here is the log file for another trip with Cheryl.

This note describes a trip Cheryl and Sam made June 17-26, 1999.

Thursday, June 17. We drove down IN 63 to Terre Haute, crossed into Illinois and drove down IL 1 from Marshall to Cave-in-Rock on the Ohio River. We checked into the lodge at Cave-in-Rock State Park and went to look at the cave. Pirates used this large cave as a base from which to prey on shipping on the Ohio River about 200 years ago. We saw many birds that lived in the cave. Cheryl tried to photograph an ibis standing in the river in front of the cave. The cave has a natural air vent near its back end. One can drop pebbles through it from the bluff above. We also hiked along a nature trail through woods and grasslands near the lodge. We saw deer in the woods. We spent the evening watching barges on the Ohio River from our balcony.

Friday, June 18. We drove north on Route 1 and then west to Pounds Hollow Recreation Area. We parked near the lake and hiked to Rim Rock, a high rock once used by the Indians as a defense position. We saw equestrians and hikers near Rim Rock. Our next stop was the Garden of Gods Recreation Area. There we admired many interesting rock formations, some shaped like animals. Next we drove to Golconda, where we saw a large marina in the Ohio River and high levees to prevent another great flood. We drove west on Route 146 and visited Dixon Springs State Park. We parked near the swimming pool, which was closed for cleaning, and hiked along a trail beside a cool mountain stream. As it was getting late, we drove to Vienna, where we ate dinner and reserved a motel room. Happy that we had found a motel

room on a Friday evening, we decided to visit the Cache River State Natural Area. We hiked on the Heron Pond Boardwalk, a fascinating place where one can see a cypress swamp with lots of cypress knobs. We heard many tree frogs croaking and saw the Illinois state champion cherrybark oak tree, which has a circumference of more than 40 feet.

Saturday, June 19. We drove north on US 45 from Vienna to the town of Tunnel Hill. We assumed that there was a tunnel somewhere and drove around town looking for it. There wasn't much to the town, not more than a dozen houses on three or four streets, but we couldn't find the tunnel. We stopped in a fancy new parking lot with restrooms under construction. A van was parked in the lot. While we studied the map and puzzled over the location of the tunnel, several hikers returned to the van and told us that they had just visited the tunnel. A railroad bed ran through town. It had been paved to make it a bicycle and walking trail. About half a mile down the trail the railroad had tunnelled through a hill. We walked to the quarter-mile-long tunnel, took some pictures and returned to the car.

We drove to Ferne Cliffe State Park and hiked along a small river under a highway overpass. We went to Devil's Kitchen, which turned out to be a lake for fishing and boating rather than a park with hiking trails. We visited Giant City State Park south of Carbondale. There we hiked a nature trail through an area with many huge rectangular stone blocks as large as buildings. They were separated by gaps, some as large as wide streets. A sign presented two theories about this formation: One theory said that the blocks were once connected and that they cracked and slid apart. The other theory claimed that the blocks had not moved but that the gaps between them had been formed by erosion. We also hiked on a shorter trail to see the Devil's Standtable, a high flat rock formation. Then we drove to Cape Giradeau.

Sunday, June 20. We drove to Poplar Bluff, the visited Big Spring State Park and hiked along a river. Next we went to Mark Twain National Forest and hiked some more. We went to Bartlesville, OK, where we spent the night.

Monday, June 21. We visited the Nature Conservancy's Tall Grass Prairie Preserve in Powhuska, OK, which Dean had told us about when we visited him in Manhattan, Kansas. Then we drove to Guymon, OK.

Tuesday, June 22. We drove west to Black Mesa State Park at the western end of Oklahoma's panhandle. This is the highest point in OK, 4973 feet above sea level. We crossed the Cimarron River and bought gas in Kenton, OK. We toured the Cimarron Short Grass Preserve and Monument Rocks in western Kansas. We ate lunch in an old hotel in Scott City and spent the night in Colby, Kansas.

Wednesday, June 23. We drove north into Nebraska, visited Massacre Canyon National Monument and drove a few miles on US Route 6. We went through Sterling, CO, to Sydney, NE, and shopped in Cabela's. We drove past Courthouse and Jail Rocks and went to the Chimney Rock visitor center. Then we drove to Scott's Bluff National Monument. Sam walked up the trail to the top while Cheryl waited at the visitor center.

Thursday, June 24. We visited Agate Fossil Beds National Monument in western Nebraska and saw a rare helix fossil. We drove to Harrison, NE, and visited Toadstool State Park where we saw many big rocks on top of little rocks. We drove on US 20 to Chadron and Valentine, NE.

Friday, June 25. We took some pictures at the Byron Bridge Overlook on US 20 near Byron, NE. We drove to the Desoto Wildlife Preserve north of Omaha and saw a killdeer.

Saturday, June 26. We visited the Amana Colonies near Iowa City and drove home.

Here is part of a log file for Sam and Cheryl's trip west in June/July, 2008.

We drove to Utah and followed US Route 6 to its end in Bishop, CA.

Friday, June 27. Bishop, CA to Mariposa, CA.

In the morning Cheryl took a picture of Sam at the end of US Route 6. Then we drove north on US 395 to the entrance to Yosemite. We crossed Tioga Pass and stopped at the Tuolumne Meadows Visitor Center, where Cheryl took pictures of the John Muir statute. Cheryl also saw two buffalo in a field near the road. We had lunch at the White Wolf campground and went into Yosemite Valley. Lots of water was gushing over Bridalveil and Yosemite Falls. Cheryl tried unsuccessfully to photograph Bridalveil Falls from the car. The blue haze from the forest fires obscured El Capitan and Half Dome. We saw many people rafting and swimming in the Merced River. We had coffee and ice cream at the Yosemite Valley Visitor Center. Cheryl finally was able to photograph Bridalveil Falls from the parking area on Wawona Road just before we left the valley.

We visited the Mariposa Grove and Cheryl saw Sequoia trees for the first time, which fulfilled her dream and was one important reason for this trip. A Japanese tour group passed us as we walked through the sequoias. Sam asked one Japanese man how these trees differed from the famous sugi (cryptomeria) trees in Nikkoo, Japan. After the Japanese group left and while Cheryl was admiring the big trees, we heard a loud snap. We turned and saw a 200-foot tall sequoia crash to the ground about 500 feet away. Although they are tall, they are relatively weak trees. There was some smoke in the park from forest fires outside the park. We spent the night in the hazy city of Mariposa, which is on the side of a hill. The front entrance to our motel was on the third floor.

Saturday, June 28. Mariposa, CA to Turlock, CA.

We drove to Merced and took CA 99 to Fresno and then CA 180 to Sequoia National Park. We ate lunch in the Lodgepole Visitor Center, which had a magnificent view of the big trees. Next we went to see the General Sherman Sequoia tree and the other large ones in its grove. Sam hiked around the Congress Trail while Cheryl climbed back up the trail to the parking area. Cheryl rested on each bench all the way back up the hill. We returned to Fresno and looked for lodging along CA 99. The motels in Merced were all full with a fireman's convention, but we found a room in Turlock, near California State University Stanislaus, where one of Sam's former students teaches. We couldn't find him in the phone book.

Sunday, June 29. Turlock, CA to Battle Mountain, NV.

We drove on CA 99 to Sacramento and took I-80 to Truckee. We got off the interstate, passed Squaw Valley, where the Olympics were once held, and drove around Lake Tahoe and then back to Indiana.

Here is the log file for another trip with Cheryl.

Between May 25, 2009, and June 5, 2009, Sam and Cheryl went to the West Coast and returned. Here is what we did.

May 25, Monday. Attended Memorial Day services at Fowler Cemetery with Cheryl's mother. Drove across Illinois and Wisconsin to Albert Lea, Minnesota.

May 26, Tuesday. Drove to Rapid City, South Dakota, to visit Landstrom's Black Hills Gold factory and try to get Cheryl's gold ring repaired. We arrived too late; the repair people leave at 3 PM. We continued west and visited Devil's Tower. The visitor center for Devil's Tower is on its west side and the sun was low in the west, so we had a perfect opportunity for photos of the sunlit tower. We stayed in Gillette, Wyoming.

While driving across Wisconsin, Minnesota and South Dakota, we saw many herds of cattle. The cows were black, brown, red and other colors. There were many small calves in these herds and the calves all were white. We were beginning to wonder whether all calves are white when they are born and change to the color of their parents as they get older. Then, in the middle of South Dakota we found the answer. In a field by himself we found the biggest white bull we had ever seen. He must have been very busy.

May 27, Wednesday. Passed Little Big Horn and the beginning of the Missouri River. Drove to St. Regis, Montana.

May 28, Thursday. Drove through Coeur d'Alene and Spokane to the Grand Coulee Dam on the Columbia River in Washington. Visited the visitor center and toured the dam. Drove past Banks Lake, which is connected to Grand Coulee Dam and FDR Lake, and looked at Dry Falls, a cliff which was once the largest waterfall in the world. Drove past the town of George, Washington, crossed the Columbia River and drove through Snoqualmie Pass, which is often closed by snow in winter. Crossed a floating bridge between Bellevue and Seattle and stayed in Lacey, Washington, near Olympia. Saw Mt. Rainier, which was "out," from many viewpoints.

May 29, Friday. Drove to Aberdeen on the Pacific coast of Washington and went down US 101 to Long Beach. Walked on the beach and looked at an exhibit of whale bones near where Lewis and Clark camped in 1805. Crossed the bridge to Astoria, Oregon. Walked on the beach at Rockaway. Continued down US 101 to Newport and stayed in Corvallis, Oregon. We entered Corvallis from the west, but Cheryl read the directions to the motel from the east and we wound up at the OSU football stadium. A campus cop on a bicycle gave us more directions and we arrived at a vacant lot at the address of the motel. Sam called the motel and the desk clerk gave directions from the vacant lot to the motel a few blocks away.

May 30, Saturday. Drove down I-5 from Albany to Roseburg. Followed OR 138 up the North Umpqua and Lake Rivers to the north entrance to Crater Lake National Park, which was still closed because of snow. Looked at Diamond Lake and drove around to the south entrance of Crater Lake, which was open. Took many photos of Crater Lake, which was still surrounded by snow. Drove down to Grants Pass and took US 199 into northern California. A few hundred feet past the agricultural inspection station, Cheryl saw her first bear in the wild. It was a black furry ball climbing on yellow rocks beside the highway. We saw the first groves of California redwoods. We stayed in Crescent City, California. Sam walked on the beach and the pier for fishing boats.

May 31, Sunday. Drove down US 101 almost to Ukiah. We stopped in two groves of redwood trees, Redwood National Park and Humboldt Redwood State Park. Drove through two redwood trees with holes large enough for a car. Had lunch in Eureka, California. Just north of Ukiah we turned onto CA 20 and stopped to read the map. Someone stopped to ask us directions for Potter Valley. We told them to go five miles on CA 20 and then turn left. We saw them later ten miles down CA 20 asking someone else for directions. We stayed at Upper Lake, California.

June 1, Monday. Continued on CA 20 past Clear Lake, across the central valley where much fruit and vegetables grow, through Yuba City and Marysville to I-80 and Emigrant Gap. Drove through Reno and Sparks to Elko, Nevada, where we stayed.

June 2, Tuesday. Drove into Utah and saw the Bonneville Salt Flats and Speedway. I-80 is perfectly straight for more than 50 miles across the salt flats. Drove past Great Salt Lake and had lunch in Park City near Salt Lake City. Drove into Wyoming. The weather worsened

after Laramie. It was a mixture of fog and rain from there to Cheyenne. The first motel we tried in Wheatland was full with a bus load of children. We stayed at another motel down the street.

June 3, Wednesday. Drove through Lusk and Newcastle, Wyoming, and Custer, South Dakota, to Rapid City and Landstrom's again. Cheryl got her ring repaired and cleaned and Sam bought her some matching earrings. We got an oil change and then toured the Badlands. We saw mule deer cavorting on a very steep hillside, some very tame baby rabbits eating grass near a board walk and eagles soaring above barren hills looking for lunch. There was a lot more green grass in the Badlands than on our previous visit about twenty years earlier. It seems that the Badlands are not quite so bad as they used to be. We stayed in Murdo, South Dakota.

June 4, Thursday. Drove to Mitchell, South Dakota, and toured the Corn Palace. Went through Sioux Falls and Sioux City into Iowa. We looked at the Loess Hills. (Loess is German for *wind-deposited soil*. These hills were formed when wind blowing across Nebraska picked up dry topsoil and deposited it in western Iowa just east of the Missouri River.) Then we drove through Des Moines to Newton, Iowa, where we stayed. We saw lots of windmills near I-80 in Iowa.

June 5, Friday. Drove home from Newton, Iowa. We saw what appeared to be a shiny metal cylinder 30 feet long and ten feet in diameter in the ditch beside I-80 in Iowa. When we got closer to it, we saw wheels on its side and we realized it was a tank trailer truck that flipped over on its side. The I-80 bridge over the Mississippi River was closed and we had to use the I-680 bridge instead at the Quad cities. On I-80 in Illinois, a small car in front of us was passing a semi when the truck pulled into the left lane. The small car avoided the truck by going partly onto the median, which had grass a foot high, and began to lose control. The trucker realized his error and returned to the right lane. The small car skidded in the grass and returned to the left lane moving slowly. Its driver noticed that we would hit him if he stayed in that lane so he swerved back into the median strip and finally stopped near the other side of the median. Cheryl wagged her finger at the bad trucker when we passed him. We went through Minonk and Pontiac, Illinois, on the way home. In West Lafayette, a traffic light suddenly turned red and a white pickup truck hauling a trailer full of traffic signs slid through the intersection, nearly hitting a car proceeding on a green light. On the side of the truck it said, "Indiana Traffic Safety Division."

Here is the log file for a trip Cheryl and I took July 7-15, 2015.

Tue, July 7. There was light rain. We drove through Hoopeston, Normal and Peoria, IL, then Davenport and Iowa City. We stopped in the Iowa welcome center and spent the night in Iowa City.

Wed, July 8. In Iowa City, we visited the U of Iowa campus and saw the dental school building shaped like a molar. We visited Lake McBride Dam, with impressive water flow through a spillway. We drove west to Pella, Iowa, where Pella windows are made. It has several Dutch windmills and many Dutch inhabitants. We drove west to Winterset and saw two bridges of Madison County. Visited a "castle" (three story stone tower) in the city park. Walked in a maze and saw another covered bridge in the city park.

Thu, July 9. Walked in the maze again to find the sundial in the middle, which we had missed on our previous visit. Saw the last three covered bridges of Madison County. Visited the John Wayne birthplace and museum. Drove north through Des Moines to Ames. Visited the

campus of Iowa State University, with its impressive water tower, similar to one in Fairhaven, Mass, but ten times bigger.

Fri, July 10. Drove to Madrid. Sam walked over the High Trestle Bridge between Madrid and Woodward. A former railroad, now a concrete hiking and biking trail, it has an interesting architectural design. Drove to Elk Horn, Iowa, to see a Danish windmill. Car battery died in Walnut, Iowa; got a jump start and drove to the nearest Toyota dealer, in Carroll, Iowa.

Sat, July 11. Got new car battery, drove to Sioux City, then to Royal, Nebraska, to visit the Ashfall Fossil Beds State Historical Park. Saw bones of rhinoceroses and horses who died of volcanic ash inhalation 12 million years ago. Saw interns digging more bones out of the ground. It was hot. Drove to O'Neill, then north to the Fort Randall Dam on the Missouri River. Stayed in Mitchell, South Dakota. All motels were full and we had to scramble to get a room.

Sun, July 12. Visited the Corn Palace in Mitchell. They were setting up the decorations. The street in front of the Palace was blocked off. In it were several large domes and turrets that go on the roof. There was also a crane ready to lift them to the roof when they were finished. Workers were nailing ears of corn to the walls of the Palace. Inside the Palace, Cheryl met Cornelius the mascot. She took pictures of the photos of the palace for each year for the past 125 years. Sam sat on a tractor for a photo. Cheryl wanted to see the bison in Custer State Park, but that was 300 miles west and we wanted to head home. We decided to head east instead. We ate lunch near Sioux Falls and stopped at the Minnesota welcome center. They told us that there were bison in the Blue Mounds State Park 12 miles away. We went there and saw about 50 bison. It was very hot. Sam went hiking in the Kilen Woods State Park, with trails, bridges and a tiny stream just like our back yard in West Lafayette. Stayed in Jackson, MN. A strong storm crossed Minnesota that night, through Minneapolis and across Wisconsin to Chicago and Indianapolis. We thought it might hit us, too, but it passed by just to the northeast of us. We got no rain at all. We saw some of its damage the next day when we drove north.

Mon, July 13. Drove 200 miles north on US 71 from Jackson to Lake Itasca State Park, the head of the Mississippi River. The name is from the Latin "verITAS CAput" meaning "true head." There was a lot of debate 150 years ago about where the Mississippi River begins. Sam walked across the Mississippi on stepping stones at the edge of Lake Itasca. Drove to Bemidji to see Paul Bunyan and his blue ox Babe. Drove east through Chippewa National Forest to Grand Rapids.

Tue, July 14. Drove to Hibbing, MN to see the Mahoning-Hull-Rust open pit mine, the largest open pit iron ore mine in the world. There was a bulldozer moving some dirt 500 feet below the visitor center. We saw and climbed on mining trucks that hold 170 tons of ore. The mine operates 24 hours/day 365 days/year. We also visited the nearby Greyhound Bus Museum and saw lots of old buses. Bob Dillon came from Hibbing, too, but we did not see his house. Drove to Virginia, MN, and then to Duluth. Cheryl went shopping for birthday presents, but didn't find what she wanted. We crossed the bridge into Superior, Wisconsin, and drove east along the south shore of Lake Superior. We visited the Apostle Islands National Lakeshore. Sam walked along the beach at Little Sand Bay. Many people were kayaking in the lake. Drove a short distance to the town of Bayfield, which has many gift shops. Cheryl found the birthday presents she wanted in one of them. Drove to Ashland and then to Phillips, WI.

Wed, July 15. Drove home via Tomahawk, Wausau, Portage, Madison and Janesville, WI,

then via DeKalb and Watseka, IL.

We saw several interesting sights in national parks. We were hiking on a trail in Sequoia National Park when we heard a loud crack. A 200-foot tall giant redwood tree broke near its base and fell over, shaking the ground as it hit the forest floor. It was 500 feet away from us, so we were not in danger. Mountain lions are rare and almost never seen. We saw one dead on the side of the road as we drove into Big Bend National Park. While we were driving on a road next to the Rio Grande River in that park we saw a strange sight. It looked like a twenty-foot long piece of very bright shiny red ribbon blowing across the road in front of the car. We saw it for about two seconds. Later we learned that it was a coach whip snake.

Cheryl and I were never involved in a traffic accident, but we came close once. We were driving from Burlington, VT, to Binghamton, NY. Part of the route follows New York State Route 7 from the Vermont border to Albany. That highway is a narrow two-lane road with deep drainage ditches on both sides. The ground goes down for twenty feet at a 45 degree angle from the edge of the pavement. One cannot pull off this road. There was heavy traffic in both directions and all cars were travelling at 55 mph, the speed limit. Suddenly one of the oncoming vehicles crossed the center line and sideswiped the car in front of me, knocking it off into the drainage ditch and replacing it in my lane. For a fraction of a second there was a car five car lengths ahead of me in my lane heading toward me at 55 mph and I could not pull off the road. I reasoned that, in the event of a head-on collision at 55 mph, I would need the services of a hospital emergency room if I were lucky. Then I noticed that when the offending vehicle crossed into my lane it left a small gap in the oncoming traffic. I swerved into the left lane, passed the offending vehicle and returned to my lane. The car behind me performed the same maneuver. The second car behind me stayed in the right lane and collided with the offending vehicle. The two cars caught fire and the highway was closed for three hours. Cheryl gasped and said nothing for the next hour. When I stopped for lunch at a bar and grill, she said, "I need a drink." I told the bar tender what happened. He said, "That happens all the time on that road. I know just what she needs." He fixed a drink and she drank it. That was the only time Cheryl ever had an alcoholic drink during our marriage.

During winter break at Purdue in January, 2016, Cheryl and I went south for a few days. We drove south along Natchez Trace from Nashville, TN, to Jackson, MS. Then we drove north to Tupelo, MS, and visited the house where Elvis was born. After that we drove north on I-55 and I-57 to Champaign and then home. It was the last trip we made together. She passed away a few days after we returned home.

3.3 The Joy of Cheryl

During the 27 years Cheryl and I were married, she was happy and upbeat most of the time. Our marriage was a very happy time for both of us. Cheryl worked as a cook when I knew her. She cooked in several Purdue dorms, starting in Earhart Hall when I first met her. During our trip to Hawaii she saw a palm tree planted by Amelia Earhart. She loved to cook at home and we gave many parties. We invited the Computer Science Department *and* her family to one party. Our kitchen is equipped with every device known to cooks, even a chocolate fountain.

Cheryl wanted her own copies of my books to show her family, friends and coworkers. In 2012 and 2013 I wrote a math book called *The Joy of Factoring*. When it was time to design a cover for the book, I secretly arranged with Dean to get photos of his triplet daughters. Cheryl

knew I was writing another book, but knew nothing about its cover. One day in the summer of 2013 a package arrived with my copies of the book. When I gave her her copy of the book, she was ecstatic to see her infant granddaughters Samantha, Mahala and Autumn on the cover writing math formulas with crayons. She showed it proudly to everyone. Usually, an esoteric math book like that one sells only 100 or 200 copies. However, that book has sold thousands of copies so far and still sells a few hundred copies per year now. Some attribute its success to the cover photo. I told my grandson Luke that I will put his picture on the cover of my next book. He responded, "It'll never sell."

Choice magazine is a periodical for academic librarians. It publishes nothing but reviews of new academic books. Each month it prints dozens of them. One of them is designated, "Outstanding Academic Title." This award tells its readers to use their limited funds to buy this book first and then consider buying other books later. *The Joy of Factoring* was a *Choice* Outstanding Academic Title and this may be why many college and university libraries have purchased it. In his review, the reviewer compared my book with two other *Joy* books, *The Joy of Cooking* and *The Joy of Sex*. He said that my book was better than those two because many people are already interested in those subjects while few people care about factoring, so I had to first explain why one should be interested in factoring, and then tell why it is joyful.

Cheryl and I had several pets. One was Bob the Cat, a stray cat who would cry at our door every morning for a few months. We would let him in and give him a bowl of milk. When he finished he would cry at the door for us to let him out. One morning he had a fight with a skunk or mink and got sprayed. We didn't notice the smell until after we let him in.

In a different year we had an indoor cat. He had a litter box and stayed inside our house all the time. He would sit by the glass deck door and watch the squirrels on the deck. One time, I put acorns on the ledge just outside the deck door so that the squirrels would come closer to the window. The cat got very excited when he saw squirrels an inch away on the other side of the glass, but he couldn't touch them. The squirrels couldn't see the cat because of the light reflecting off of the glass. While a squirrel was sitting on the ledge eating an acorn a turkey vulture swooped down, grabbed the squirrel in its talons and flew away to its nest. The cat nearly went crazy when he saw another animal capture "his" squirrel.

When Cheryl and I were at home we would always have dinner together. After dinner we would watch television until bedtime. I would watch *Wheel of Fortune* and *Jeopardy!*. We would watch *JAG* and its spinoff *NCIS* together. She loved Mark Harmon. Her job as cook in a Purdue dormitory made her work on some weekends. On her day off in good weather, she sometimes planted flowers in our yard. We often had flowers inside our house, either cut flowers or flowers growing in a plant pot. She planted peonies next to the driveway. One summer she planted cone flowers on the hill next to Black Forest Lane.

Cheryl performed some community service. One year she was on Purdue's Clerical and Service Staff Advisory Committee, CSSAC, which met with and advised the University's administration on proposed rule changes. In this role she represented all the cooks at Purdue. A few years earlier, I represented the Computer Science Department in a similar way on the Faculty Senate. She was a member of the League of Women Voters. She also served as an advocate for battered women, sometimes going to court with them. In this capacity she once taped an interview for a local radio station. I was at work when it was broadcast and I invited my co-workers to listen to it with me. When my wife said, "I am a battered woman," I had to explain that she was referring to her first marriage, not the one to me.

On weekends when Cheryl wasn't working we would take Sunday drives. We often visited her family on these drives. They lived in Fowler, Lafayette, Remington and Orleans, Indiana. Sometimes we would take longer trips to Sleeper, Missouri (near Lebanon) to visit her aunt and uncle. Cheryl loved round barns, covered bridges and Mail Pouch Tobacco signs on barns. We often visited those within easy driving distance. She would photograph each one. Some of her photos hang on the walls of our house today. Another subject of her photography was old mills powered by water wheels like the one in Spring Mill State Park. There is a famous one in Babcock State Park in West Virginia. If you have even seen a photo or painting of an old mill with a water wheel, you have probably seen that one. We went there three or four times. We would usually have dinner on the Sunday drives. We had many favorite restaurants, including an Amish restaurant in Loogootee, Indiana, and a little diner next to a covered bridge in Park County. Another trip was to see the mouth of the Wabash River near Evansville. Cheryl always wanted to visit new restaurants we discovered while driving or that she had heard of.

Cheryl and I often attended local festivals, like the Feast of the Hunter's Moon in West Lafayette, the Covered Bridge Festival in Rockville, the Delphi Canal Days, the Fowler Fourth of July Festival, the Earl Park Fall Festival, the Wolcott Fair and the National Sweetcorn Festival in Hoopeston, Illinois.

4 Jobs

After finishing my Ph.D. I had two one-year postdoc positions. The first was teaching at the University of Rochester, New York, in 1970. They had me teach the introductory differential equations class. This class had about 300 students in a large lecture hall. I had never taught such a large class (or even any class) before. I was terrified on the way to each class, but I lost all my stage fright in one traumatic semester. Now I can speak to any group. I enjoyed the lilac festival in Rochester and often visited nearby state parks. My rental house was across the street from an abandoned four-story factory. The factory caught fire one day (boys playing with matches) and burned to the ground. Firemen stood in the street and sprayed water on my house to keep it from catching fire. The plastic curtains in my windows melted and the paint was scorched off the side of the house facing the fire, but no damage was done to my things. I have great respect for firemen. The University of Rochester campus is on the bank of the Genesee River in downtown Rochester. One day I was sitting on the bank watching three boys float down the river on a raft. I don't think they knew there was a fifty-foot waterfall around the bend.

The second postdoc was at the Institute for Advanced Study in Princeton. It was a pleasant experience. I met Joe Doob on my first day there and Wolfgang Haken a few days later. They became my good friends and, a year later, colleagues in Illinois. There were many Japanese scholars there that year as well, and I practised my Japanese with them. I ate meals with other mathematicians in the cafeteria. The Institute had no computers but I could use the one at nearby Princeton University. I sat in on K. Iwasawa's class at that school. I wrote a lot of papers and walked in the woods in my free time. A small creek ran through the woods and a large turtle rested on its bank. I saw the turtle every day for a few weeks. Then one day it disappeared. That evening the cafeteria served turtle soup. The diners wondered whether there was a connection.

Most hiking trails in the Institute woods are wide and straight, probably former dirt roads.

They cross at right angles. At each intersection, one can see hundreds of feet down each trail. I often jogged a few miles on these trails. One day, as I jogged through an intersection I saw a large dog on the side trail. It barked when it saw me and ran toward me. As it leapt at my head I raised my arm to protect myself. Then I saw the dog's owner fifty feet behind the dog. He yelled at me, "Don't you touch my dog!"

While in Princeton, I took day trips by train to visit an MIT classmate in New York City and a Cornell classmate in Philadelphia.

4.1 Illinois

My first real job was teaching in the Mathematics Department at the University of Illinois in Urbana-Champaign. There the computers were similar to those at Cornell, but the IBM 370s were faster. Telephone lines linked computers at various U of I campuses, and one could run jobs on a machine at another campus. Some of my mathematical research at this time concerned very fast tests for primeness of large numbers. I also factored large numbers and in 1975 became involved with the Cunningham[7] Project, whose goal is to factor numbers of the form $b^n \pm 1$ for $b = 2$, 3, 5, 6, 7, 10, 11 and 12 and n up to high limits. (See Section 8.3 for a simple explanation of *factoring*.) Allan Cunningham published the first book on this subject in 1925. I was a coauthor of the 1983 update of his book. In 1977, Rivest, Shamir and Adleman published their paper inventing a new kind of cipher (public key) whose security depended on the difficulty of factoring large numbers. Suddenly, number theory in general and factoring in particular became fashionable and useful. In the late 1970s and early 1980s I held the world record for factoring large numbers. Cryptographers studied my work to learn how large to choose the numbers for the RSA cipher so that it would run quickly but not be broken. I became friends with Bob Baillie and we wrote a paper about a very fast way to identify large numbers that were almost certainly prime. Our result is still widely used today to choose primes for public key ciphers and many other cryptographic algorithms.

I attended the Saturday Hike[8] almost every Saturday I lived in Illinois, beginning with the very first Saturday after I moved to Champaign from Princeton. Champaign and Urbana are twin cities, with the boundary down the middle of the University campus. Altgeld Hall, the math building, was right on that boundary. I would cross the street from Urbana to Champaign to eat lunch at Garcia's Pizza every day. I bought my first house while at Illinois.

Twice per year there is a number theory meeting in Illinois. In the 1970s it was usually held at Illinois State University in Normal. Every fall and spring about a dozen U of I number theorists would car pool for the drive from Champaign to Normal. At this meeting I met John Selfridge and many other number theorists from Northern and Southern Illinois Universities and other schools. I met Paul Erdős, a famous mathematician, for the first time at Illinois.

I taught various number theory courses at Illinois. One semester I taught a class for education students, future high school math teachers. I covered the standard material for an introduction to number theory. Near the end of the semester I was supposed to cover some more advanced material (my choice). Most of the students in the class were women. Every theorem that I had proved in class and in fact every theorem in the text was proved by a man. Of course there are many female number theorists and many theorems proved by women, but

[7] See Section 5.9 for more about Cunningham.

[8] See Section 7 for the Saturday Hike.

most are too advanced for a first course. I resolved to find one to present in the last two weeks to show the class that some women do number theory. I settled on Sophie Germain's theorem, whose statement and proof are not too hard. The students in the class thought it was really hard. One question on the final exam asked for the student to state Sophie Germain's theorem. I didn't ask them to prove anything on the exam. I expected all the women at least to remember the statement. But only one woman stated the theorem correctly.

4.2 Georgia

At the University of Georgia in the early 1980s, I became a computer scientist. I taught many computer science courses. Another computer science professor, Jeff Smith, and I had an NSF grant to design and build a special computer to factor large numbers. It had 128-bit wide words, a record for that time. The continued fraction factoring algorithm, which it used, performed endless division of 128-bit integers by 16-bit integers, but only the remainders mattered. The Georgia Cracker, as we called our machine, did this work in parallel with a bank of remaindering units called the "Mod[9] Squad." I collaborated also with Carl Pomerance in Georgia and later.

When the weather was good, I would ride my bicycle a few miles to work each day. One time I stopped my bike at a stop sign to wait for a break in the traffic on the other road. I noticed a rattlesnake come out of the woods and slither across the road towards me. I wanted to ride away but could not because of the traffic. One driver turned onto the street where I was stopped. He saw the snake and deliberately ran over it to save me. As the tire ran over the snake's body, the snake's head snapped up and it bit the side of the tire. I could hear air hissing out of the tire as the car drove away. The snake, with a tire tread mark on its back, continued slithering toward me, but slower than before. Then another car turned onto my street and finished it off. There was a break in traffic and I went on to school without further incident.

I visited the Okefenokee Swamp National Park near Waycross several times while living in Georgia. I also went to Savannah, the Dahlonega Gold Museum and Jekyll Island near Brunswick. I went with Carl Pomerance and several other math professors to parks in the north Georgia mountains, like Black Rock Mountain and Amicalola Falls State Parks. There were rattlesnakes in these parks. Later I took Cheryl to some of these parks.

One Saturday I wanted to hike in a state park in Athens. I followed a map and made a wrong turn into a trailer park. My car had no air conditioning and the windows were down. As I turned around on a dead end road surrounded by trailers, a man approached my car with money in his hand and asked, "Did you bring the stuff? The man said you would come." I assured him that I was not the guy with the stuff and left as quickly as possible.

4.3 Purdue

I was unhappy with the hot Georgia summers (which last from March through October) and decided to move back to the Midwest. At that time, Dorothy Denning had developed CS 555, Cryptography and Data Security. She and her husband Peter were leaving Purdue in 1983 and

[9]There was a television show called Mod Squad in the 1970s. "Mod" is the technical mathematics term for "remaindering."

someone was needed to teach this class after she left. Purdue hired me to do this. I taught CS 555 about once a year for the next ten years. Interest in CS 555 increased around 1993, when Gene Spafford founded COAST (Computer Operations, Audit and Security Technology), and the course was taught more frequently and by other faculty. Over the years, the course was transformed into one on just Cryptography. In 2002, I wrote a text for the new course. COAST was subsumed into CERIAS (Center for Education and Research in Information Assurance and Security) in 1998.

Another attraction of Purdue over Georgia was the proximity of West Lafayette to the Saturday Hike in Illinois. I only had to drive 50 miles to get to the hike rather than 500 miles.

When I first arrived at Purdue in 1983, I was collaborating with Jeff Smith at the University of Georgia. I had to visit Georgia frequently to supervise my part of the project. On the way to and from Georgia I would drive across Tennessee on I-24. I would stop for an hour at my favorite park, Old Stone Fort State Park near Manchester, TN. In this park the Big and Little Duck Rivers flow close together, then separate for a mile or two and finally merge. A thousand years ago Native Americans erected a ridge between the rivers where they are close. This created an enclosed space of about one square mile surrounded by steep cliffs. Early archaeologists thought this was a defensive position and called the site a "fort." More recent study suggests that this was just a gathering place, not a fort. In any case, today it an interesting place to hike.

A few miles east of this park I-24 has an unusual feature. The east and west bound lanes separate by almost a mile for a mile or two. Elsewhere they are separated by only a normal median strip. One day I heard an explanation of this feature on a local radio station while driving through this area. It seems that many years ago, before I-24 was built, a surveyor was walking through the planned route looking for obstacles. On a hilltop near Monteagle, TN, he found a gravestone with the name Colonel James Dunning on it. This grave would have to be moved if I-24 was to follow the planned route. He went into town and asked people who the Colonel was so that he could contact his relatives. They referred him to an old mountain man named William Dunning. William told the surveyor that he and the Colonel had walked through the woods for many years and that he buried the Colonel on that hilltop when he died. He said that the Colonel would not want his grave moved. After he heard this, the surveyor changed the route of the west bound lanes to avoid the grave. This change added five million dollars to the cost of the highway. Ten years later, after I-24 was built, the surveyor was again in Monteagle and he met William Dunning leaving a bar. He said, "We rerouted I-24 to avoid the Colonel's grave. You and he must have been really close." William replied, "Yup. He was the best durn coon dog I ever had."

Do you remember the shower scene in the movie *Psycho*? Something similar happened to me at Purdue. I had worked out one day at Purdue's CoRec Gym and went to take a shower. There was a small bottle of soap on the shelf when I stepped into the stall. I assumed someone had left it there, so I placed it just outside the curtain in case the owner returned for it. I was just soaping up when the curtain zipped open, just like in the movie. A large naked man stood there holding the soap bottle for me to see. Apparently he left it in the shower earlier to claim his stall while he undressed. He said, "Get out now. This is my stall." I didn't argue. I grabbed my soap and rubber duckie and moved to the adjacent stall, which was empty.

In winter I would often drive to work before dawn. When I opened the garage door to drive out, sometimes a confused bat would think my garage was a cave and fly in. I didn't notice it

because I was inside my car. Later, in the evening near sunset the bat might wake up and try to leave. If the door from the garage into the house happened to open, the bat might fly into the house. This happened two or three times. One morning I noticed something flying around a ceiling light in a circle. I thought it was a small brown bird, so I got a butterfly net, caught it, and released it outside. It was not until it flew away that I realized it was a bat.

While on the Purdue Computer Science faculty, I taught many courses besides cryptography and data security. In fact I taught courses with more different course numbers than any other CS faculty member. I taught numerical analysis (calculus on a computer), Fortran, C, Pascal, data bases, operating systems, compilers, theory of computer science and history of computer science. I even taught the COBOL language for business students once. I served on many committees at Purdue. The most exciting one was the Censure and Dismissal Proceedings Committee, the only committee with the power to fire a tenured professor. Usually this committee never meets. During the year when I was on it we had one case and it occupied us for several weeks. A professor was accused of making improper advances to a student and we had to fire him.

5 Major Trips

This section relates some of my trips to foreign countries alone. Section 3.2 concerns travel with Cheryl and her family. Section 6 deals with trips I made alone inside the United States.

5.1 My first trip to Asia

I visited Japan in 1970, 1975, 1980 and 1985. This section and the next few relate stories about these trips.

My first visit to Japan was in 1970 (Showa 45 in the Japanese calendar). It was my first trip outside of the US and Canada. I was amazed at the strange customs and also that my primitive knowledge of the Japanese language from Cornell was adequate to get around. A classmate from Cornell asked me to deliver a present to his sister-in-law in Tokyo. When we met, she brought two friends. The three girls showed me around Tokyo. We passed an American hippie sitting on the sidewalk. He heard us talking in Japanese and asked me, "Do you speak English?" I suspected he wanted money, so I replied, "Yes, but I prefer Japanese" and continued walking.

I visited Tokyo for a few days with a side trip to Nikko. Nikko means *sunlight*. It is often sunny there when it is cloudy in Tokyo. I joined fifty school children in chanting the iroha poem on the bus from the Nikko train station up the mountain to the summer palace. The Japanese language has only 47 basic syllables. Each is written as a different kana symbol. There is an old poem called the *iroha* poem which uses each syllable exactly once. It begins i-ro-ha-ni-ho-he-to and this ordering of syllables is the Japanese alphabetical order. Every Japanese child learns the poem in first grade. The number of syllables also happens to be the number of switchbacks on the steep road up the mountain. Each one is labeled with the next kana symbol. The children shout the syllable at each of the 47 switchbacks. The grounds of the summer palace has many temples and shrines. I had to duck into a temple to escape a sudden rain storm. The only other person in the temple was another American, a diva from the New York Metropolitan Opera. The palace lies in the middle of a forest of tall cryptomeria

trees (a kind of cedar tree) that were planted 400 years ago. The grounds also had several beautiful waterfalls.

After visiting a few American schools, I was surprised that the buildings at Tokyo University and Kyoto University looked like factories. I took the bullet train to Osaka and saw Expo '70 in that city and neighboring Kyoto. I stayed with a family in Osaka. One day I went to see Osaka Castle, which is surrounded by a moat. Following my map, I went to the nearest subway station, which turned out to be on the back side of the castle and not the one that most visitors use. I followed the map to the castle and was confronted not with the castle entrance but by a sign in front of the moat. In large red katakana (the italics of Japanese) I read *abunai*, which I knew means "Danger!" The rest of the sign was mostly in kanji (Chinese characters) that I couldn't read. So I never found out what the danger was.

September 4, 1970, was the longest day in my life. I got up at 5 am in Osaka, had breakfast, took the bullet train to Tokyo, went by subway and monorail to Haneda Airport, flew to New York, changed planes, flew to Ithaca, took a taxi to my apartment and arrived home shortly before midnight *the same day* (but 32 hours after I got up).

5.2 1975—Operation Babylift

On my way to Japan in 1975 I stopped in Honolulu to see Oahu. I swam at Waikiki and several less famous beaches. I visited the Pearl Harbor Battleship Missouri Memorial. I hiked all over the large extinct volcano crater at Diamond Head. I drove my rental car all around Oahu.

Then in early June I flew on to Japan and stayed there for ten days. There is one street corner near Tokyo University where you can see three separate McDonald's restaurants each about a block away in three different directions. I visited friends in Tokyo and Osaka and gave talks at schools in both of these cities.

Every Friday noon the math faculty at Tokyo University have a catered lunch followed by a faculty meeting. Visiting mathematicians are invited to the lunch but not the faculty meeting. I was invited and sat next to my host Shigeru whom I met first at the Institute for Advanced Study four years earlier. In the middle of the meal, one professor stood up and introduced his friend visiting from Kyoto University. The Japanese visitor stood, thanked his hosts and told a bit about himself. Then Shigeru stood up and introduced me. I stood up, thanked the math faculty and told them a bit about my work. Finally, a third Tokyo math professor stood and introduced a math visitor from Hanoi, who had been staring intently at me when I spoke. Everything up to this point, including my speech, was spoken in Japanese. Then the third professor switched to English and said to the Vietnamese visitor, "Now please tell us about yourself." He replied, "But I don't speak Japanese." His host told him it was fine to speak in English, and he described his work in English.

At the end of my 1975 Japanese visit I took the monorail from Hamamatsu-cho to Haneda Airport. (Haneda is a beautiful name for an airport. The Chinese characters mean *the feather in the rice paddy.*) Ten minutes before the scheduled departure for Chicago, the cavernous 747 was nearly empty. There were only about a dozen passengers, and the plane had nearly 400 seats. I wondered whether Pan Am would fly this bird across the Pacific with so few passengers. I didn't have to wonder very long because soon nurses started bringing babies on board—hundreds of them. When we took off fifteen minutes later, about 300 babies, all under the age of two, and about ten nurses to care for them, had boarded. The captain

announced that, as a humanitarian gesture, we would carry some Vietnamese orphans to their new homes in the United States. I learned later that, during the final days before the fall of Saigon in April, 1975, humanitarian organizations had spirited several thousand orphans out to nearby friendly countries. As the paperwork for their adoption was completed, airlines participating in Operation Babylift transported them gratis to their new homes, mostly in North America. The infants cried for thirteen hours, all the way from Tokyo to Chicago. Due to a misunderstanding, the caterer had stocked the galley with 800 regular meals, unsuitable for infants. The babies drank all the milk on the 747 during the first hour of the flight. The stewardesses were handing out the extra meals to anyone who wanted them. I was hungry and had two dinners near Kamchatka and two breakfasts over Manitoba. Back in 1975, airplane food was excellent. As we taxied to the gate at O'Hare, the captain asked the orphans and their nurses to please remain seated until after the other passengers had deplaned. A nurse sitting near me remarked to a stewardess that the babies weren't orphans any more. They had all been adopted. Since that day, I have never been bothered by just one or two babies crying.

5.3 The 1980 trip to Asia

I visited friends in Honshu as well as Kyushu. The bullet train goes between Honshu and Kyushu in a tunnel under the strait between them. I stayed in hotels and with friends. I gave talks at several schools. The Hiroshima bomb memorial was unsettling. The temples in Kyoto were relaxing. The Merchant Marine School in Kobe has a wonderful collection of ship models that reminded me of Building 1 (Naval Architecture) at MIT.

Then I flew to the Philippines, bought a large map of Manila and checked in to a hotel. As I had slept on the plane, I wasn't too tired and went for a walk. I noticed immediately that the street names on the map did not match those on street signs. During the time it was a US colony, streets were assigned names and many of them were named after US states. After more than thirty years of independence, the country finally decided to give the streets names that reflected Filipino history and culture. The street signs were replaced with new ones but the map of the city sold at the airport still had the old US state names. I had to take note of when streets crossed or did not cross to match the streets on the map with those on the ground.

The principal method of public transportation in Manila is the Jeepny. At the end of WW II, when the country was in ruins, the only vehicles were Jeeps left by the US Army. Workers welded a small bus body to the top of a Jeep and created a vehicle that could carry about twenty people. These Jeepnies have worn out, but new vehicles are manufactured in their likeness. These are the modern Jeepnies. Traditionally, these vehicles are elaborately decorated with dozens of hood ornaments and many horns. The drivers sound the horns continuously to warn pedestrians of their approach. The Jeepnies never seem to stop. People just jump onto the vehicle and find a seat as it slowly drives past them on its route. The scene in downtown Manila is one of chaos and cacophony. I rode on a Jeepny only once.

I wandered all over downtown Manila from the bay, where I saw a beautiful sunset over the water, to many blocks inland. As a college professor I thought it would be nice to visit a college. I found the University of the Philippines on the map and walked there. The school was surrounded by a four-foot high wall with shards of broken glass cemented to its top to prevent one from climbing over it. There was a single entrance gate where I saw students entering. A

guard at the gate checked their IDs. Another guard about ten feet inside the gate manned a machine gun pointed at the gate. As I walked towards the gate, the gate guard made a quick glance at the other guard, who opened and closed the bolt on the machine gun to make sure it was ready. I stopped and decided not to visit UP.

It wasn't just the colleges that had armed guards. Every bank, restaurant and grocery store had a policeman stationed at the entrance. Even barber shops had armed guards. There must be a lot of crime in Manila. My walk took me near Malacanyan Palace where President Marcos lived. It was also surrounded by a high wall with broken glass cemented to the top. There was a line of people going into the gate. An armed guard at the gate checked IDs. I got into the line thinking that I might ask the guard if they had tours, like tours of the White House. Before I could say anything to the guard, he saw that I was a foreigner, waved his hand toward the palace door and told me to go ahead. Two soldiers with rifles flanked the door. When I approached, one of them opened the door for me and the other saluted me. When I got inside, the secretary apologized that President Marcos was out giving a speech, but that I could wait in the house. For the next half hour I wandered around the palace. I even went into a room that appeared to be the Marcos' bedroom. A large closet held a thousand pairs of shoes, which I later learned belonged to Imelda Marcos. I left before the president returned. I was amazed that I could wander around unsupervised in the presidential palace, but could not even set foot on a college campus.

The next day I went on a bus tour of the Manila area. We stopped in the country to see a farmer working with a carabao (water buffalo) in a rice paddy. The Philippines grows a lot of rice. We also visited Lake Taal. This large lake is in the crater of an extinct volcano. In the very middle of the lake is the cone of a small volcano which has not erupted for a few centuries. The restaurant on the shore of Lake Taal where we stopped for lunch had an interesting statue. It was of a man running away from the lake with one arm pointing back at the small volcano, which was just starting to erupt. Legend has it that the statue will come alive and the man will run away when the volcano actually erupts.

5.4 The 1985 trip to Australia and Asia

In May, 1985, I visited Asia again, but first went to Australia. As I left my house on Summit Drive in West Lafayette on the shuttle to the airport, the last sight I remember was the tall sycamore tree in my front yard. Its leaves had just sprouted and it was getting ready for summer. Thirty hours and several planes later I arrived in Sydney, Australia. I took a bus to the city center where I would change to another bus to my hotel. The bus dropped me off at a park with many trees. Right in front of me was a sycamore tree just like the one in my yard. But the leaves on this sycamore had just turned brown and were starting to fall off. I realized then that I had gone from spring to fall in thirty hours.

Another strange thing was that the sun was in the northern sky. When it got dark, there was even more weirdness. I know a few dozen constellations and was amazed to see Orion upside down and the Big Dipper not in view. I could see the Southern Cross for the first time. In fact, there are *two* southern cross constellations. Two bright stars point to the true cross.

I gave a talk at a math conference at the University of New South Wales and visited many Australian friends in the Sydney area. I took the train over the harbor bridge, which looks like the Golden Gate Bridge upside down. Then I took a train to Perth. As we crossed the

outback, I saw a couple dozen kangaroos out the train window. When they saw the train they all began to hop along beside us. They were all in phase, all hopping up together and down together, a fantastic sight.

Later I visited Canberra, the national capital city. It was designed by Chicago architect Burley-Griffin in 1908 and consists of separate neighborhoods with green space between them. I stayed in a hotel on the campus of Australian National University. I gave a talk there and visited my friend Richard Brent who does exactly the same math that I do. Some call him the "Australian Wagstaff." One day I walked around Lake Burley-Griffin. Another day I took a bus to the National Zoo, where I saw many strange animals. The Tasmanian devil never stopped moving. It just paced back and forth in its cage. One foggy fall day, I visited Canberra Nature Park, which has many varieties of eucalyptus trees.

When my visit to Australia was over, I flew to Hong Kong. Everyone there speaks English as well as Chinese. I took a tour one day and went hiking in the mountains above the city the next day. I met only foreigners on my hike. Hong Kong natives are too busy making money to waste time walking in the hills.

Then I flew from Hong Kong to Japan. I traveled around Japan and visited my old friends. My Cornell apartment-mate Sai was married now. He insisted that I stay in his house in Kobe. It was on the (new) "backside" over the ridge from the coastal (older) part of Kobe. Japan has only a few large flat areas where Tokyo, Osaka and Kyoto are located. Coastal Kobe, Okayama, Hiroshima, etc., are smaller flat areas. The rest of Japan is jagged mountains where it is hard to build anything. To help with overcrowding as population increases, Japan has bulldozed mountain tops and put the soil into the adjacent valleys to make room for new urban areas. Sai lived in one such area. I went jogging early every morning to the amazement of the Japanese natives I passed. Few Japanese jog.

One day Sai and his wife were busy with other tasks and asked me to babysit their two-year-old boy. Of course he spoke no English or even realized that I was not Japanese. I played a game with him, one that all parents sometimes play with their children. I would hold up an object and ask him, "Kore nani?" which means, "What is this?" For example, when I held up a pencil and asked, "Kore nani?" he would respond, "Empitsu des' " ("A pencil.") The little boy thought I was testing his vocabulary and was proud to respond. But actually I was learning new Japanese words from him. He had a plastic toy rabbit with little wheels on its feet and a string to pull it around. I held it up and asked, "Kore nani?" He replied, "Usagi-kuruma" ("rabbit-car.") I already knew that *kuruma* means *car*. That is how I learned that the Japanese word *usagi* means *rabbit*. That word does not appear often in the Japanese mathematics papers I read.

5.5 Israel: A swim in the Dead Sea

In July, 1984, I visited Europe to attend several conferences and sightsee. I flew to Rome and took a train to Naples. The first conference was in Maratea south of Naples. It was a computer science conference organized by two of my Purdue colleagues. The venue was a resort hotel on top of a cliff overlooking the Mediterranean Sea. An elevator through the solid rock took guests down to the private beach below. The weather was great. After the conference, I took the train to Vienna where I visited friends. I tried to take the train to Budapest, but I didn't have the right visa and had to go back to Vienna. I bought a plane ticket to Budapest and got

the right visa at the airport. I stayed in the apartment of Paul Erdős and saw other friends at the Hungarian Academy of Sciences. Then I went to the Budapest airport to fly to Greece.

When I entered Hungary I had to change at least $30 US into Hungarian currency. I changed the minimum and spent only about $10 on gifts because all my expenses were paid by the Hungarian Academy of Sciences. As I departed Budapest for Athens, they wanted me to exchange all my left over Hungarian currency for money from another country. I knew I would need money for a taxi in Athens, so I asked for Greek drachmas. The clerk handed me a wad of paper money, which I did not bother to inspect. I got on the plane and flew to Athens. There I took a taxi to my hotel. I tried to pay the driver with the wad of bills. He refused the currency, saying it was not Greek money. Then I examined the wad of bills carefully. It was not $15 worth of Greek drachmas. Rather it was the same number of Swiss francs, worth about $200. The Hungarian clerk had given me the wrong currency. This is the only time I ever made money changing currency. I paid the driver twenty US dollars and he was happy. Later I exchanged the Swiss francs for Israeli shekels. I saw the Parthenon and other sights in Athens.

The next day I flew to Israel for another computer science conference. Before the conference I spent a couple of days in Tel Aviv enjoying the Mediterranean beaches and the vibrant night life.

The conference was held in Caesarea in northern Israel. One day we toured nearby Roman ruins.

After the conference I spent a few days in Jerusalem. I visited the holy sites of all three religions. I walked along the *via dolorosa* where Christ carried the cross and visited nearby Bethlehem where He was born. I saw Jews praying at the Western Wall, all that remains of Solomon's temple. I climbed to the top of Temple Mount (above the Western Wall) and walked around the Dome of the Rock where Mohammed ascended into heaven riding his horse Lazlos.

The next day still in Jerusalem I wanted to swim in the Dead Sea. I considered taking a $30 tour to Masada where there is a beach. Since bus travel in Israel is cheap and good I decided to go on my own. See Section 1.2 for the story of how I bought the bus ticket. My map, prepared by the Ministry of Tourism, showed two beaches at the north end of the Dead Sea, the end nearest to Jerusalem. I showed the map to the bus driver. He let me out at the intersection of a dirt road and the highway that runs down the west side of the Dead Sea. As I walked down the dirt road towards the beach I saw several yellow buildings which I took for a motel or restaurant or bath house. As I got closer to them I observed that they were abandoned and marked with many bullet holes. The total absence of any sign of life bothered me a little, but I was cheered by the thought that I would probably have the whole beach to myself. I continued walking along the dirt road until I was stopped by a fence. It was about three meters high with coils of barbed wire on top. Signs in twenty languages prohibited access to the beach, just beyond the fence. I decided that the purpose of the fence was to keep out Jordanian terrorists and that I should not try to cross it.

I knew that some beaches on the Dead Sea were open. Therefore, the fence could not extend all the way down the west side. I decided to walk south along the fence until it ended and then go swimming. I was encouraged that it would end soon by the fact that the map showed a second beach about three miles south of where I was. After walking south along the fence for about an hour I decided that it would be easier to walk along the highway. The fence extended as far as I could see. I crossed the narrow strip of desert between the fence and

the highway and walked south along the highway for another hour. I could still see the fence. Once I thought I heard vehicles from the direction of the fence.

Although I was unaware of it, as I walked along the fence my presence was detected by numerous sensing devices. Alarms sounded in the Israeli military headquarters. An army unit of the Israeli Defense Force was dispatched to locate the suspected Jordanian terrorist (me). A jeep picked me up on the highway and took me to the military headquarters. They questioned me for a few minutes and gave me some water. They said that most of their business came from people going to the beach and very little of it from actual terrorists.

They took me to a bus stop where I caught a bus to Ein Gedi, which is about in the middle of the west bank of the Dead Sea. (The Dead Sea scrolls were found in a cave in the mountains near Ein Gedi.) I went swimming at a nice beach there and floated half out of the water, which is the saltiest on earth. Then I returned to Jerusalem by bus.

The total cost of the trip was about $3. And on the $30 tours you don't get captured by the IDF.

5.6 Europe

I visited the Mathematics Research Institute in Oberwohlfach, Germany, in 1975, 1988, 1991 and 1995. The 1991 trip was with Cheryl and Dean; it is reported in Section 3.2. The November, 1975, trip was my first trip to Europe. I flew Icelandic Airline to Reykjavik and changed planes to go to Luxembourg. Then I took a train to Oberwohlfach in the Black Forest of southern Germany. I was struck by how well the trains work. The Institute holds a series of week-long conferences, each on a specific area of mathematics. It is in an isolated place, so there are no distractions other than nature. One afternoon is free of lectures so that the participants can hike in the woods and through neighboring villages. Later trips in May, 1988, and May, 1995, were similar.

In May and June, 1984, I spent three weeks in Europe. I went first to London and took a train to Glasgow to give a talk. My host drove me around the city to see the sights, including a "wee burn" in a small valley. Then I took a train to Edinburgh and saw the palace. Next I stayed in London for a week to see more palaces and other landmarks. I took side trips to nearby Oxford and Cambridge where I gave more talks. I recall walking with my host between two buildings at Cambridge University. I walked on the paved path while my host walked beside me on the grass. A gardener saw us and yelled, "Don't walk on the grass." My host replied, "It's all right. I am a fellow of the college." The gardener said, "Oh, very good, sir" and resumed weeding. This experience has colored my understanding of the meaning of the word "fellow." When I became a Fellow of CERIAS in 2009, I thought it gave me the right to walk on the grass.

After visiting England, I took the ferry across the English Channel. It was an air boat with a huge fan that lifted it a few inches above the water and another fan that propelled it forward at 40 knots. It took about ninety minutes to cross. However, the fans blew so much water into the air that I could see nothing but spray during the trip. It was like travelling in a moving cloud. I took a train to Paris and visited friends. I attended a doctoral final exam at the University of Paris. The candidate spoke in French of course. Usually only members of the examining committee ask questions. But a rude American man kept interrupting with questions in English. Unperturbed, the candidate answered each question in French. He

passed and the audience applauded. I spent another week visiting friends in the Netherlands and Germany and flew home from Frankfort.

In October, 1997, I made a quick trip to Bari, Italy, for a computer science conference. I flew to Rome and took a train to Bari. During a free afternoon the conference organizers took us on a tour of a nearby old Italian castle.

5.7 Canada

My first trip to Canada was to see Expo '67 in Montreal. I got to practice my French and had lots of fun.

In February, 1979, there was a solar eclipse. Its path of totality passed through Winnipeg, but not near Illinois where I lived. Hugh Williams invited me to give a colloquium at the University of Manitoba the day before the eclipse and stay an extra day so that I could see it. The temperature was -40 when I arrived, so cold that it is the same number in Fahrenheit and Celsius. The snow was four feet deep, but workers were repairing roads and constructing buildings. Everyone dressed for the weather, but outside work continued as usual. We visited a museum during my stay. When I hung my coat on a hook at the entrance, I was concerned that someone might take it. Hugh assured me that coat theft is a capital offense in Canada. I was in a flat open field to see the eclipse. Just before and after totality the shadows raced across the snow at more than a thousand miles per hour.

The University of Manitoba in Winnipeg held a number theory conference every year at the end of September or early October. I gave several talks at that conference. My next visit to Winnipeg was in early October, 1980, to attend the annual conference. I drove to Dekalb, IL, and slept on Marv Wunderlich's couch. We got up at 5 am and drove his car to Winnipeg in one day. We arrived at our hotel at about 9 pm and went to the conference the next day. There was an inch or two of snow already in Winnipeg. It was snowing two days later as we drove back to Dekalb. I made another trip to the Manitoba conference the following October, but drove by myself in two days each way.

The Canadian Number Theory Association holds conferences every year and I attended a few of them. One was in Ottawa in August, 1996. Another was in Toronto. After that one I drove John Selfridge and his girl friend back to Ann Arbor, where he had a temporary job at Math Reviews. We bought the limit of duty-free alcohol for him as we crossed the border. Another conference was held at the University of British Columbia in Vancouver in August, 1993. The university is at the western end of Vancouver next to the Pacific Ocean. It was fun walking on the beach between lectures.

I attended several math meetings at the Banff Conference Center in Alberta. The meeting in May, 2003, was in honor of Hugh Williams' sixtieth birthday. At the one in November, 2005, I enjoyed hiking up a nearby mountain between talks.

5.8 Taiwan

In September, 2003, I visited Taiwan. I gave the keynote lecture at a computer science conference in Taoyuan. Then I toured nearby Taipei and gave a talk at a school there. The tallest building in the world that year was in Taipei. Then I took a train to Kaoshung and visited a former student. Taiwan looks just like the US except that the signs are in Chinese. There was a 7-11 shop every few blocks and lots of other US brand stores. My student drove me around

Kaoshung and told me its history. He showed me the city's defensive measures that would be used if China invades. He was surprised that I could tell which restaurants were Japanese by reading the signs on them.

The highlight of the trip was an overnight visit to KenTing National Park where I saw a lizard that lives nowhere else. I also swam in the South China Sea. I saw my first fumarole. It looked like a scene from the Saturday Hike[10]: Two men cooking meat in large frying pans over a small fire. Then I noticed that there was no wood burning in the fire. It was just a pile of rocks flat enough to set a frying pan on top. The flame was coming up around the rocks. A fumarole is a vent where methane gas leaks into the air from a pocket underground. It ignites and there is a small flame like on a gas stove.

5.9 India

I travelled to India in December, 2003, to dedicate the house of S. Ramanujan, a famous Indian mathematician who lived in the early twentieth century. Here is a day-by-day description I wrote at the time.

On Sunday, 7 December, I left home at 8:30 am, flew to Chicago and Frankfurt.

On Monday 8 December, I waited 6 hours in Frankfurt, then flew to Delhi.

On Tuesday 9 December, I arrived in Delhi at 2 am and was met by Mr. Bhargava (the father of a Purdue student) at the airport. We went to Le Meridien Hotel and saw monkeys in the street (RajPath) near government buildings on the way. [One wit suggested that these were not monkeys, but politicians.] Mr. Bhargava arranged for me to get extra bottled water beyond the one liter per day allotment in the hotel. When I woke up I walked around near the hotel, trying to avoid hustlers. One of them took me to a non-government shopping center, but I didn't buy anything. I told the owner of a tea shop that I didn't drink tea. He replied that I would start drinking it if I would just sample a cup of his tea. The temperature was 50-80 F in Delhi during my visit. It rained one night and never on me.

On Wednesday 10 December, I went on a bus tour of Delhi and visited the Birla Mandir, a Lakshminarayan Hindu temple, Humayun's tomb, the model for the Taj Mahal, and the Qutab Minar, a 200 foot tall victory tower and mosque (the first one in India) built from rubble of demolished Hindu and Jain temples. The latter recalled Aditya Mathur's remark that invading armies had destroyed many beautiful structures in northern India and that I would see preserved ancient temples in southern India near the end of my visit to India. I met Mr. Bhargava again in the hotel. He told me that all Mathur's come from one city in India. Perhaps it is Mathura, south of Delhi?

On Thursday 11 December, I tried to plan a trip to Roorkee for the next day—it didn't work—and solved a hotel checkout problem. I rode in an autorickshaw to buy a phone card. I bought an air ticket from Delhi to Chennai for a week later.

On Friday 12 December, I visited Gaurav at IIT Delhi. We met at the wind tunnel. A CS conference was in progress. We walked through the vendors' displays. One vendor made a point to assure me that his company was ISO 9000 compliant. I met the head of the CSE Department, M. Balakrishnan and Prof. S. Arun Kumar, the host for my talk the following Monday. I had lunch with Gaurav in a vegetarian restaurant just outside the main gate of IIT Delhi. (My diet was strictly vegetarian during my visit to India.)

[10] See Section 7.2 for cooking on the Saturday Hike.

On Saturday 13 December, I rested and planned talks at IIT Delhi and a visit to IIT Roorkee.

On Sunday 14 December, I visited the National Museum. The entrance fee is 10 Rupees for Indians or 250 Rupees for foreigners. After all, it displays the property of the Indian people, so it should be cheaper for them.

On Monday 15 December, I planned a trip to Roorkee for Wednesday, and bought train tickets for this trip. The travel agent asked my age when I bought the ticket. Then I took a taxi to IIT Delhi and gave my first talk, "Cryptographic mistakes you should avoid." I met Professor A. Tripathi of the Math Dept, a number theorist who got his PhD at Buffalo. He invited me to give a second talk the next day. I had more discussions with Gaurav.

On Tuesday 16 December, I gave a second talk at IIT Delhi, "The Cunningham Project." The audience raised the question of how Cunningham could be Assistant Principal of Thomason College and also an officer in British army. I had discussions with Professor Tripathi and Gaurav. I met with the Head of the Maths Department, J. B. Srivastava. I saw a monkey on a walkway outside the CSE Department.

On Wednesday 17 December, I went to Roorkee. I was surprised to see my age printed on my ticket. I guess only someone about my age could use it. Breakfast was served on the train. The train went on to the resort towns of Haridwar and Dehra Dun, but I got off at Roorkee, the home of several engineering schools. My host in Roorkee was G.S. Srivastava, the Math Dept Head. He showed me the old building where Cunningham worked. It was in this building where Cunningham taught mathematics and served as Assistant Principal for two terms in the 1860s and 1870s. I photographed the inside and outside of the building. In an alcove inside it, I saw photos of the principals but, alas, not the assistant principals, of the school when it was the Thomason Civil Engineering School. From 1863 to 1930 all faculty were officers in British Army. This answers the question raised about Cunningham at IIT Delhi: The best engineers in India in the 19th century were the military engineers in the British Army; some of them taught and administered at the Thomason Civil Engineering School. I had lunch with Math Head Srivastava. Then I took a taxi trip to Haridwar. The taxi took a road beside the canal. Curiously, the canal crosses the Ganga River at one place. Lion statues grace the canal here and there. (Allan Cunningham was a hydrologist who did experiments in this canal. In the 1870s he wrote a book on hydrology. Engineers in the US Army studied his book a few years later when they were planning the canals that carry water from the Colorado River to California's central valley. Cunningham retired around 1890, moved to England, began to factor integers of the form $b^n \pm 1$, and published a famous book on these numbers in 1925. His work continues today as the Cunningham Project.) The canal starts in Haridwar, where water is diverted from the Ganga—not from a lake formed by a dam. Haridwar has a colorful marketplace and lots of bridges. A Hindu priest invited me to bathe in the Ganga. I respectfully declined. It was cold. The taxi returned me to Roorkee. I met V.K. Mathur, a friend of Mr. Bhargava. His screen saver was a photo of him shaking hands with President Abdul Kalam. Mathur heads the Central Building Research Institute, which is much like CERIAS in organization. Math Head Srivastava took me to the train station, where we met another mathematician who had lived in the US. I had dinner on the train, saw big rats in the New Delhi train station and took a taxi back to the hotel.

On Thursday 18 December, I packed, checked out of the hotel and took a taxi to the Delhi Domestic Air Terminal. Amusing fact: The airline did not decide the gate until just

before boarding. I ate a full dinner during a two hour flight. US airlines would not have tried to serve a meal on such a short flight. Some conference organizers were meeting passengers in the baggage claim area at the Chennai airport. I worried that SASTRA was not there. One conference organizer suggested that there might be other people meeting passengers just outside the terminal. He was correct; someone from SASTRA was just outside the door, along with a hundred or so others looking to meet passengers. They took me to a guest house in Chennai. Other foreign speakers either were already there or arrived during the night. The temperature was 60-90 F and there was no rain on me while I was in southern India (always in Tamil Nadu State).

On Friday 19 December, We got up at 6 am, had breakfast in guest house and boarded a bus headed south. We left the guest house at about 7 am. We picked up one last speaker as we drove past the Chennai airport. We drove south on a busy four-lane highway past a large Ford factory. The quality of the highway declined as we went south. Construction reduced it to two lanes in many places. Eventually the road narrowed permanently to only two lanes. The ride became a series of near head-on collisions, always averted at the last second. This excitement gave our travel a surreal feeling, like a Disneyland ride or a car chase in a James Bond movie. It bothered some of the foreigners, but not me; I had traveled in taxis in Delhi. The plan was to reach SASTRA University in mid afternoon, have lunch and tour the campus. About noon, police stopped the bus for a routine check. The driver took a large leather wallet and got out. He negotiated with the police for about half an hour, giving them more and more money every few minutes. Our host, SASTRA professor Saravana Raj Mohan, assured us that the driver had done nothing wrong and that this check was quite routine. In early afternoon, the bus began having problems. The driver sat in a glass compartment at the front of the bus. Beside his seat was a hood that could be raised for access to the engine. While still driving and deftly avoiding head-on collisions every few seconds, the driver raised the hood and began reaching into the engine compartment with various tools. Unable to fix the problem while driving, he pulled off the road and worked on the engine for a few minutes. Our Tamil-speaking host assured us that nothing serious was wrong and that we would continue shortly. We did resume our journey and after a short distance the bus stopped again. After a few minutes of futile attempts to fix the problem, the driver decided to return to a town about a kilometer back for repairs. Our host told us that the problem was minor and that the repairs would take only a few minutes. He reported our delay to colleagues at SASTRA by cell phone. During the hour while the mechanic took apart the engine and fabricated new parts by welding pieces of iron together, our host summoned a coconut dealer near the repair shop. The man brought half a dozen coconuts he claimed he had just picked from a nearby coconut tree and shaved them for us. He first cut a small hole and gave us a straw to sip the milk out. After we drank the milk, he cut the coconut more so that we could eat the meat with a piece of the shell he cut in the shape of a spoon. We arrived at the main campus of SASTRA University in Thanjavur (Tanjore) at about 6 pm. We were greeted by some patient faculty, had a south Indian style vegetarian lunch prepared by the best chef in Chennai, listened to a brief presentation and slide show about SASTRA University, and toured the campus. The Computer Centre was well-equipped and boasted the only supercomputer on a university campus in India. The library is excellent. Professor Vijayalakshmi, who gave the presentation, asked me about the admission policies of the Purdue CS Department. She hopes that the Purdue CS admissions group realizes that SASTRA University is an excellent school even though it is only a few years old. SASTRA

is a Deemed University, which means that it has approval from an accreditation board to set its own curriculum and offer degrees. SASTRA, pronounced Shastra, is an acronym for Shanmugha Arts, Sciences, Technology and Research Academy. "Shastra" is a Tamil word meaning "plans for the temple." Because of the late hour we did not see the Brihadeshwara Hindu Temple in Tanjore as had been planned. Finally, at about 8:30 pm, we got back on the bus and rode to Kumbakonam, where Ramanujan lived and where our conference would be held at the satellite campus of SASTRA University. The drive took one more hour (to go 30 km) and left us at the Sterling Swamimalai Hotel where we stayed for three nights. This was a historic hotel with individual bungalows more than 100 years old. The significance was that this hotel existed when Ramanujan lived in Kumbakonam, so he probably saw it. When the foreign guests arrived we were presented with garlands and given foot massages. The furniture and doors of our rooms were made of heavy teak wood. The door latch was a heavy iron hook. Many statues of Hindu gods were placed on the hotel grounds. Some of us ordered dinner by room service.

On Saturday 20 December, I was awakened at 4 am by chants from a nearby temple. I got up at 6 am and had a quick breakfast in the hotel restaurant. At 7 am, we took our bus through Kumbakonam for a ten minute ride to the branch campus of SASTRA University. In the original schedule of the meeting some foreign guests were supposed to speak in the morning. The schedule had to be changed because of the presidential visit. We attended a session of contributed talks from 8 to 10:30 am. Many were given by students and some were quite good. Then we all went outside through heavy security into an elaborate tent adjacent to the conference hall. There we waited in the 90 degree F heat for 1.5 hours listening to loud Indian music. The foreign speakers were in Section B, a couple of rows from the stage. At noon, President Dr. Ali Abdul Kalam appeared with other dignitaries. The first half hour of the ceremony was a formal series of felicitations and presentations of mementos. It was a breath of fresh air when the president finally spoke. He was a nuclear scientist with his own web site. He knew who Ramanujan was. (Both grew up in Tamil Nadu.) He understood public key cryptography, intrusion detection and watermarking. He inaugurated the conference and dedicated the Srinivasa Ramanujan International Monument and the Srinivasa Ramanujan Centre to the nation. He cared more about youth than politicians and spoke for ten minutes directly to the students in Tamil, urging them to follow the example of Ramanujan. (Ramanujan was self-taught and excelled in doing mathematics.) His speech was followed by more formalities and the national anthem. After the ceremony concluded, the president called the students forward to meet with him. The non-students left. The organizers and foreign speakers of the conference went back into the adjacent Ramanujan Centre. We had a quick lunch and then lined up for a photo with the president. The background was a bust of Ramanujan in the middle of a helical ramp in the atrium in the center of the Ramanujan Centre. President Abdul Kalam shook hands with all the guests before the photo was taken. After the photo was taken, the president left and the Conference on Number Theory for Secure Communications resumed. I chaired the first plenary session, Number Theory Applications. The speakers were George Andrews of Penn State, Krishnaswami Alladi (who grew up in Tamil Nadu) of the University of Florida, Noam Elkies of Harvard and Antal Balog of the Renyi Mathematical Institute in Budapest. Professor Vijayalakshmi insisted that the speakers all sit on the stage with the chair during the session. At the end of each session each speaker was presented with a small bust of Ramanujan. All talks were videotaped. A staff of five technicians kept all the computers,

microphones and cameras working properly. After a break for tea (and coffee—I don't drink tea), Krishna Alladi chaired the session on Cryptanalysis. I spoke first, on "The hypercube quadratic sieve," joint work with Brian Carrier. The other speakers were P.K. Saxena of the Scientific Analysis Group, DRDO, Delhi and C.E. Veni Madhavan of the Indian Institute of Science, Bangalore. During the break at the end of the session the mathematical cranks[11] appeared and began to tell me about their latest theories on factoring and primality testing. India seems to have more of these cranks than most other countries. After all these talks it was about 9 pm. We had dinner in the Ramanujan Centre and rode the bus back to the hotel. The original plan, before the presidential visit was scheduled, was for the speakers to visit a famous temple in Kumbakonam in the late afternoon, but there was insufficient time for this event.

On Sunday, 21 December, I was awakened again at 4 am by singing from the nearby temple I was supposed to visit the previous day but couldn't. I got up at 6 am and admired the designs (kolam) drawn in chalk on the dirt or concrete in front of each door by a woman and her young daughter. It was a common practice of housewives in the area to drawn these designs in front of their houses to welcome the gods into their homes in the early morning, the only time they would enter. Krishna explained to me the meaning of a large statue on the hotel grounds. It showed Shiva holding his son on his shoulder. The son was whispering the meaning of the mantra "om" into his father's ear. Our bus took us at 7 am to the Ramanujan Centre for a quick breakfast. The second day of the conference was more relaxed than the first because the presidential security was gone. Seven more distinguished speakers spoke in three plenary sessions. I had more time to notice the audience. The male students sat on one side of the room and the female students sat on the other side. I also was able to visit the Ramanujan Museum, which occupies a large room in the Ramanujan Centre. We had lunch between the second and third sessions. All meals were south Indian vegetarian dishes served on banana leaves. Between lunch and the third session we made a quick visit to Ramanujan's house in Kumbakonam, recently purchased by SASTRA University and made into a museum. The house was about ten feet wide and fifty feet deep. The front room held Ramanujan's bed and the famous slate on which he made his calculations, the results of which he recorded in his notebooks. Behind his bedroom was a small living room and then a primitive kitchen. Further back from the street was an open area with a well that supplied potable water in Ramanujan's time. There was a toilet at the very rear of the property. After the third plenary session came parallel sessions for contributed talks and then a very formal closing ceremony. As much as we wanted to hear the contributed talks, we wanted to see the temples even more and so the foreign speakers skipped out of the conference. A SASTRA University bus took us to Thanjavur (Tanjore), a one-hour drive. We visited the Brihadeshwara Temple. A religious ceremony was in progress during our visit. In it, various liquids were being poured over the huge black stone statue of Shiva's bull in a low mandapa. Together with hundreds of other people we went into the inner sanctum in the towering vimana. The Hindu church has become more tolerant of non-Hindus in recent years. The priest asked our names and said a prayer to Shiva for us. We rested for a while on the stone steps and then walked clockwise around the courtyard before leaving. As some of the foreigners wanted to shop in Thanjavur, we went to a craft shop. We saw how they make bronze icons and Thanjavur paintings, both world famous.

[11] A mathematical crank is an amateur mathematician who thinks (incorrectly) that he has solved a famous hard problem and wants to explain his "proof" to a real mathematician for validation.

The bus returned us to the hotel in Kumbakonam, where we had a late dinner. Kumba means pail in Tamil. It is also the name of the inverted pail structure atop a Hindu temple. Konam means angle. Two rivers meet at a sharp angle in Kumbakonam. All the rivers I saw in Tamil Nadu were nearly dry. They have more water during the rainy season. Our host told us that because of changing rainfall patterns the rivers do not carry as much water as they did a few years ago.

Monday, 22 December, was Ramanujan's birthday and our last full day in India. We arose at 5 am, ordered room service breakfast for 7:15 or 7:30, packed our suitcases, and went on a bus at 6 am to the famous temple in Kumbakonam. This was the source of the chants that woke us each day at 4 am. We left our shoes at a flower shop near the temple. Some of us bought flowers for the temple. We saw an elephant near the temple, a good omen. We went again into the inner sanctum and told our names to the priest, who offered a prayer for us to the god (Karthicay?) represented by a peacock. Some of the foreign speakers prostrated themselves before the icon, praying that the bus would carry us to the airport in Chennai in time for our flights home. As we were leaving the temple we yielded the right of way to a farmer driving his ox into the temple to be blessed. We returned to the hotel, had the room service breakfasts we had ordered and checked out before 8 am, when the bus took us back to the Ramanujan Centre. George Andrews was interviewed by Radio India. They asked him about Ramanujan. At 9 am, George gave his second talk of the conference, this one just about Ramanujan. At the conclusion of his talk at 10 am our plan was to board the bus and head directly for the Chennai airport because Kwangjo Kim had to catch an 8 pm flight. Alladi was taking the bus to Chennai to visit relatives. The other five foreigners were on a 1:50 am Lufthansa flight to Frankfurt. At 10:10 am we boarded the bus and expected to leave immediately. We had to wait until 10:30 for the chef to deliver the food we requested so that we would not have to stop for lunch. Even then the bus did not leave. The conference organizers wanted more from us. We learned that they wanted us to make recommendations for improving math and CS education in India. This should have the form of a petition to the Ministry of Education signed by all of us. Krishna Alladi agreed to formulate the recommendations in consultation with the conference organizers. The rest of us agreed to sign anything if they would just let our bus leave. They typed up nine resolutions and carefully printed our names at the end of the petition. We all signed the paper without reading the resolutions (but we agreed with them). Finally, they let us go. The bus left Kumbakonam at about 11:30 am. We could see construction of a two-meter diameter water pipeline beside the road. When completed it will carry much-needed water from the Kaveri River near Kumbakonam to Chennai. There were many tall chimneys visible from the road. We learned that these serve as kilns for baking bricks. We ate the box lunches (vegetarian south Indian) at about 2 pm. Around 3 pm, halfway to Chennai, the bus engine started making funny noises. While still speeding down the highway and avoiding head-on collisions every few seconds, the driver again raised the hood next to his seat and began poking the engine with various tools. Our host checked with the driver and reported to us that there was nothing to worry about. After a while the bus stopped and the driver worked on the engine for a few minutes. We learned that the belt that runs the air conditioner was slipping. If the belt were removed, the engine would run fine but we would have no AC for the rest of the trip. We told the host to tell the driver to do this and go on. We opened the windows and the breeze kept us cool even though it was about 90 F. We reached the Chennai airport at about 6 pm, just in time for Kim to catch his flight.

By then the starter motor had died, so the driver would not be able to restart the engine if it stopped. He kept it running even when refueling an hour before Chennai. The bus took us to the Radisson Hotel five minutes from the airport. The five of us on the 1:50 am flight checked our luggage with the bellhop and had dinner in a restaurant in the hotel. We chose vegetarian meals even though the restaurant served meat as well. For dessert I had kulfi (or hulfi) ice cream, flavored with saffron. We shopped in a bookstore in the hotel. At about 9 pm our host returned in a taxi and took us in two trips to the airport. We thanked him for his hospitality and checked in for our flight. We went through passport control quickly before the crowds arrived. We spent the next few hours in limbo legally but not physically outside of India near the duty-free shops where we did our final shopping.

On Tuesday, 23 December, as we waited for our 1:50 am flight we met another conference participant heading for Singapore on Indian Airlines. His flight was scheduled to leave at 12:15 am, but was delayed until 2 am. Our flight was on time and took off just before 2 am. It was not crowded. I slept on three seats for about six hours between the two meals during the ten-hour flight. The five of us met again in Frankfurt. Security was much tighter than during our previous visits to Frankfurt a week or two earlier, because the US Homeland Security had been raised to Orange two days before. They checked our passports as we deplaned in Frankfurt, an unusual step. The five of us sat together for a few hours in the international transit area in the Frankfurt airport, watching each other's luggage as some of us went shopping or checked the gates for our five different flights out of Frankfurt. One by one we said goodbye and boarded our flights. My flight to Chicago was full and on time. The most exciting part of my journey home was the final flight from Chicago to Indianapolis. It was 45 minutes late, leaving me with five minutes to try to catch the last limousine to Lafayette. If I missed it, I would have to wait 8 hours in the Ground Transportation Center at the Indianapolis airport for the next one. I ran out of the terminal without my luggage and begged the driver to wait while I went back to get my suitcase. He said that all the flights were late that night and that he would wait a few minutes for several people who had reservations. My suitcase appeared right away. As the limousine was driving off, a man with a cart full of luggage came running after us. We stopped and let him get on. The rest of the journey home was uneventful. I arrived home at about 12:15 am on Wednesday, 24 December, 2003.

6 Local Trips

This section deals with assorted trips, mostly in the United States and mostly alone. Section 5 treats foreign travel and Section 3.2 describes trips with Cheryl.

6.1 Mammoth Cave

I visited Mammoth Cave in Kentucky several times. My parents took me there in 1958 when my father was at Fort Knox. I went there at least once with Cheryl in the 1990s. I went there a couple more times around 2018 and 2022. On one of the trips I asked the tour guide whether there was any danger of part of the cave ceiling falling on us. He replied, "No one has ever come out of Mammoth Cave and said that a rock fell on him."

6.2 Scott's Bluff

I visited Scott's Bluff in Nebraska several times, at least once with Cheryl. Each time I hiked up to the top on the trail. Cheryl waited at the bottom when she was with me. The hike is about two miles long and ascends about 400 feet. Usually the sky is clear and there is a nice view from the top. On September 16, 2025, there was rain in the vicinity and I saw lightning striking the ground as I approached Scott's Bluff. I asked the man at the entrance gate whether there was any danger of being hit by lightning while at the top. He replied that if lightning hit me, I wouldn't know it. I responded by telling him what the Mammoth Cave tour guide said. I saw lightning but was not hit during the hike to the top.

About half-way up the bluff the trail goes through a short tunnel. Many pigeons live in the tunnel. When someone walks through the tunnel, about a dozen pigeons fly out the other end. Once in a while a pigeon gets confused and flies the wrong way. Tunnel passage is always exciting.

6.3 Zion National Park

In May, 2016, I traveled out west and visited several national parks. One day I walked on the main trails inside Zion National Park in Utah, which was very crowded. The trail to Angels' Landing is a U-shaped trail two miles long which climbs a bluff about 1000 feet high. At the end of the trail one is very close to the parking lot, namely, 1000 feet above it. If they had a zip line, one could return to the parking lot in a very short time and avoid the long hike down.

6.4 Arches National Park

I have visited Arches National Park many times, including once or twice with Cheryl. This park has many natural rock arches. The premiere arch in this park is the Delicate Arch, which is featured on Utah's license plate. One can park a mile away from this arch and see it in the distance or one can park two miles away and walk to it on a rugged two-mile trek climbing over rocks and rising 400 feet. One time Cheryl parked at the view point and I hiked two miles to the arch. From a distance, she took a photo of me standing under the arch with my arms raised up. In September, 2025, I again hiked to the Delicate Arch. Whenever I climbed over a rock, other hikers would offer help. I always replied, "No. Do you need help?"

7 The Saturday Hike

Nearly every Saturday since 1972, I have hiked with a group of mostly faculty of the University of Illinois. This section deals with some of my fellow hikers.

7.1 Some Hikers

The first time I met Wolfgang Haken was in 1971 at the Institute for Advanced Study in Princeton. In 1972, I received a job offer from the University of Illinois Math Department and he was visiting from that department. He told me about Illinois and urged me to accept the offer, which I did. He also told me about a group of faculty who went hiking every Saturday and urged me to join the group. I went hiking with the Saturday Hikers on the first Saturday

I lived in Illinois. Wolfgang and I hiked together nearly every Saturday for the next fifty years. He always hiked with this wife Irmgard. Sometimes he would wander off and think about math problems while hiking alone. He often pushed over dead trees, and was better at this endeavor than most people due to his knowledge of physics. He drove a car with license tag "GUT GEM 8," which means "Well done" in German.

The Saturday hikers often made bets, with the loser bringing a pie the following Saturday. See Section 8.2 for another hiker bet. Joe Doob was the leader in promoting such bets. On a cold winter day many years ago, as the hikers walked near Plank Bridge, they found a small pond covered with ice. Sam bet Joe that the ice would hold all the hikers. Joe accepted the bet and then refused to step onto the ice, which held all the rest of the hikers. He won the bet through this ruse. I brought a pie to the hike the following Saturday. (I told this story at the memorial service for Joe in 2004.)

On the hike I learned that Joe Doob was the thesis advisor for MIT Professor Ambrose. Joe was amused by my stories about how Ambrose taught real analysis at MIT.

Another hiker was Carlos Moreno. Everyone called him Charlie Brown, not because *moreno* is the Spanish word for *brown*, but rather because of his striking resemblance to a comic strip character. Carlos and I coauthored a math book in 2006.

Joe Doob was in the National Academy of Sciences. He was also the editor of a series of math books for the publishing company Springer-Verlag. They gave him a free copy of each book published. Joe used these books as another way to promote Pie for the Hikers. Sometimes math professors who weren't even hikers would send a pie to get a free book they wanted. Carlos Moreno got many of these books. His wife Ofelia cooks the best flan in the world. Her flan was an acceptable substitute for a pie. In the 1980s the hikers ate her flan many weeks in a row.

On hot summer days the Saturday Hikers cool off by wading or swimming in a river or lake. One hot day several hikers waded in the Middle Fork River near Danville, IL, where the water was about waist deep. A hiker named Dave knelt down in the river so that only his head was above water. A canoe with a man and woman aboard floated down the river towards him. As they approached, the woman asked Dave whether he was naked. He replied, "No. I am wearing a hat." The woman demanded that Dave stand up. The man was visibly upset that his girl friend would make such a request. Dave, who was wearing a bathing suit, of course, refused to stand up, and the canoe passed. Dave had excellent balance. Whenever the hikers encountered a fallen tree across a stream or ravine, Dave would walk across it. He never fell once. Once we found a tree on the bank of the Middle Fork River that had toppled over into the river. Dave walked out on it almost to the end. We saw many wild flowers on the hike. Dave called all of them "mermaid's purse."

Paul Potter was a regular hiker in the 1950s and 1960s and hiked occasionally after that. Paul was a petroleum geologist who knew more than anyone else the location of the offshore oil in the waters near South America. In the late 1970s he had an NSF grant to "sample the sands of the beaches of South America." He feared that Senator Proxmire would read the grant abstract and visualize Paul sitting on the beach at Ipanema watching the girls while sifting the sand through his fingers. Then the senator might award him the Golden Fleece[12] Award, a negative prize given to those who waste the most taxpayer money. In actual fact, Paul had to

[12]This is a reference to the Greek myth about Jason and the Golden Fleece. A *fleece* is the wool coat of a sheep. The verb *to fleece* means to swindle.

rent a truck, drive over the Andes on barely passable dirt roads, dig up thousands of pounds of sand from the beach and then ship it back to his lab in Cincinnati for analysis. While doing this he worried that highwaymen might steal the truck and that the goons he hired to protect him and load the sand might shoot him, ditch the sand and steal the truck. Paul was fluent in Spanish, Portuguese and Quechua. Paul received the greatest honor the Saturday Hike can bestow when a hiking place, Potter's Field, was named for him.

A hiker named Vesna grew up in Belgrade. When she was seven years old in the 1970s her parents took her to the Adriatic resort city of Split for a summer vacation. The family went to an ice cream shop and the little girl had her first banana split. The next summer the family vacationed in Trieste. Again they visited an ice cream shop. Eight-year-old Vesna looked at the menu and exclaimed (in Serbian), "How can they have a Banana Split here? This is Trieste."

7.2 Hiker's Delight

Every Saturday the hikers would meet at a specified location in Urbana, IL, at 2 pm and decide where to go that day. Then we would get into cars and drive there. When email and texting became available, this procedure was changed. Now the leader of the hike texts the others where to meet and then we all drive there.

From 1909 to the 1990s, the hike went to farms where we had permission to walk and even build a small fire. As more farms were sold or we lost permission, the hike began going to state and county parks more often. Now we hike only on public land.

Before the Pandemic in 2020, the hikers would cook a meal after hiking for a couple of hours. We would light a fire (always in a place where we had permission or a grill in a park) and cook bacon and steak and sometimes sausage in large frying pans. We also boiled a pot of coffee over the fire. The person who brought the food was called the Commissar of the Hike. When Joe Doob was Commissar in the 1950's, he introduced a new dish. He brought onions and Jalepeno peppers which the cook cut up in one pan. After the bacon was cooked, the grease would be transferred to the onion pan. While we ate the crispy bacon slices, the cook would fry the onions. When they were soft, the cook would drain the grease from them over the fire, causing the fire to flare up in a great spectacle. Finally, the cook would add chunks of cheese to the onions and heat the mixture until the cheese melted. This ambrosia-like vegetable dish was called, "Hiker's Delight" and was loved by all true hikers, who ignored its ability to clog every artery.

7.3 Buck's Pond and Clarence Berdahl

Most hiking places are east of Urbana. One of the few west of that city is Lodge Park near Monticello, IL. Beside a pond in that park is the grave of a Native American. On the grave is a plaque that tells "The Legend of Buck's Pond." Here is that tale.

Two Indian maidens, Chesita and Manasua, came with their tribe (the Delawares) after the Battle of Tippecanoe (1811) to the camp of the Kickapoos on the Sangamon River. Both maidens fell in love with a young chief of the Delawares. Twins were born to Chesita, and according to Indian law, if they lived through the day, the young chief would become the husband of the mother. But during the day the babies were found murdered. Manasua was convicted of the murder and sentenced to die by stoning. She could be saved only by marriage

with an Indian chief. Old Buck, Chief of the Kickapoos, whose wife was dead, was the only prospect, and he married her. But both suffered banishment from the tribe. They moved to this spot. In 1834 Manasua died, and Buck buried her at this site, before moving to Indian Territory with his son Calish. In 1843, a band of Delaware Indians, finding the grave of Manasua, scattered the bones on the hillside, believing that the tribe could never prosper so long as a murderer of their tribe lay buried. White men re-buried the bones in the old grave. This body of water was thereafter known as "Buck's Pond."

Clarence Berdahl (1890—1989) was a regular Saturday Hiker from about 1920 to about 1985. He was a political science professor at the University of Illinois. After World War I he was a US delegate to the conference that created the League of Nations. (It failed because the US did not join.) After World War II he was a US delegate to the conference that created the United Nations. (It fared slightly better because the US did join.) From 1972, when I joined the Saturday Hike until his death, he was the oldest living person I knew.

In the 1980s, he would hike a short distance with the group, then return to camp and light the fire. One Saturday in 1980, Joe Doob, Clarence and Sam hiked at Lodge Park. Clarence, who was 90 years old at the time, left Joe and Sam after walking a few minutes. While Joe and Sam hiked around Buck's Pond and along a railroad track, Clarence lit the fire next to the grave stone with its plaque. Later, while they were cooking the hikers delight, a park ranger appeared and told the three hikers they should never build a fire so close to a grave. Joe offered him coffee and bacon. After the ranger left, Joe, who was 70, told Clarence that he (Clarence) was old enough to know better than to light a fire there.

Clarence retired from the University of Illinois in 1960 at the mandatory retirement age of 70. He still wanted to work, so he got a job at Southern Illinois University. After ten years there, he retired again and moved back to Urbana to be near the Hike and his friends. While at SIU he lived in a house next door to architect Buckminster Fuller. Bucky Fuller was famous for long lectures and for promoting geodesic domes in construction. When invited to give a one-hour talk about the domes, he would keep talking for hours. One evening Bucky walked next door to Clarence's house carrying a model of a geodesic dome. Clarence let him in. Bucky sat down in the living room and began to explain the advantages of geodesic domes. He was still talking five hours later, long after Clarence and his wife had gone to bed.

7.4 Some German on the Hike

Here are a couple of stories about the German language and Saturday hikers.

Many of the Saturday hikers come from one German family. On a typical Saturday between 3 and 10 of them hike. The whole family speaks German, even the youngest one, four year old Wolfgang. The usual German word for Saturday is "Samstag," which literally means, "Sam's day." An alternate German word for Saturday is "Sonnabend," which means, "Sunday eve." One day Wolfgang asked his father Lippold a question about me. He asked, "Jeden Samstag—Every Saturday I see Sam. Is there a connection?" His father answered, "Yes, there is. Sam is very famous, so they named the day of the week after him. Before Sam came along it was called 'Sonnabend'." For several years, this boy thought that the day Saturday was named after me.

Sometimes my friend and fellow hiker Hartwig writes to me in German, sometimes in English and sometimes in a mixture of the two languages. Recently, he told me that he had

moved into a new place in Hannover and wrote, "Mein Zimmer is hell and gross," leaving it unclear whether "hell" and "gross" were the German or English words. (In German, "Mein Zimmer" means "my room," "hell" means "bright" and "gross" means "spacious.")

8 Some easy math

I always try to get people interested in mathematics. This section gives examples of what I do. If you have any relatives or friends with an interest in math, you might try these on them. Don't worry. The math is easy.

8.1 Squares

This lesson works best in 2025. I have used it on fifth- sixth- and seventh graders, as well as several old people. [Remarks in brackets explain why it works using algebra, but no knowledge of algebra is assumed. Skip the remarks in brackets when you teach the lesson.]

To square a number means to multiply it by itself. This is how one finds the area of a square figure with the number as its edge length. A perfect square (number) is the product of a whole number times itself. The first few perfect squares are 1, 4, 9, 16, 25, ...

You will learn how to square numbers mentally far beyond the multiplication tables you memorized in second grade. But not all numbers, just whole numbers that end with 0 or 5.

The numbers that end with 0 are easy: Just cover up the 0 at the end, square the rest of the number, and stick 00 on the end. You probably already knew this trick. I learned from my second grade teacher.

Example: Square 70. Cover the 0, square 7 as $7 \times 7 = 49$, and stick 00 after the 49 to get $70 \times 70 = 4900$.

The "next number after a given number" is the given number plus 1. Example: The next number after 8 is $8 + 1 = 9$.

Now we square numbers that end in 5. Cover up the 5 at the end, multiply the rest of the number by the next number after it, and stick 25 on the end.

Example: Square 95. Cover the 5. The next number after 9 is 10. Multiply $9 \times 10 = 90$. Append 25 to get $95 \times 95 = 9025$.

[This works because $(10 \times n + 5) \times (10 \times n + 5) = 10 \times n \times 10 \times n + 2 \times 10 \times n \times 5 + 5 \times 5 = 100 \times n \times n + 100 \times n + 25 = 100 \times n \times (n + 1) + 25$.]

Now you try one. Square 45 for me.

Student covers the 5, multiplies $4 \times (4 + 1) = 4 \times 5 = 20$, and sticks on 25 to get $45 \times 45 = 2025$.

Very good. That's right. Have you seen that number before?

No.

Think harder.

Oh. It is this year.

Yes. This year is a perfect square. That hasn't happened for almost 90 years and won't happen again for more than 90 years. In fact, $44 \times 44 = 1936$ and $46 \times 46 = 2116$.

How did you do that mentally?

Easy. The difference between the squares of two consecutive numbers is always the sum of the two numbers. [Because $(n + 1) \times (n + 1) - n \times n = 2 \times n + 1 = n + (n + 1)$.] So

$45 \times 45 - 44 \times 44 = 44 + 45 = 89$. Thus $44 \times 44 = 2025 - 89 = 1936$. And $46 \times 46 - 45 \times 45 = 45 + 46 = 91$, so $46 \times 46 = 2025 + 91 = 2116$. (With this trick and the previous two, you can now mentally square numbers that end with 0, 1, 4, 5, 6, or 9.)

8.2 A bet on the Saturday Hike

Here is another simple lesson. See Section 7.1 for more about bets on the Saturday Hike.

The lore of the Saturday Hikers does not record the exact date of the first Saturday Hike of some professors at the University of Illinois, but all agree that it was in the Fall of 1909. On Saturday, October 3, 2009, the Saturday Hikers celebrated the one-hundredth anniversary of the first hike. One of the hikers wondered whether the event happened on October 3, 1909. He asked whether that date was a Saturday. I said immediately that that day was a Sunday. He didn't believe that I could have found that day of the week without using a calendar or a computer. I bet him that October 3, 1909, was a Sunday. He accepted the bet and had to bring pie for the hikers the following Saturday.

Here is how I did it. There is a saying among calendar buffs that, "A dozen years is but a day." This means that if you go forward exactly twelve years, you just move forward one day of the week. For example, if July 4 is a Friday in 2025, then July 4 will be a Saturday twelve years later in 2037. Everyone knows that each year has 52 weeks plus 1 extra day, unless it is a leap year, in which case it has 52 weeks plus 2 days. In twelve years there are 12 extra days plus three more for the leap years. Therefore, a dozen years has a whole number of weeks plus 15 extra days. Fifteen days is two whole weeks plus one day, which explains the saying.

Since $12 \times 8 = 96$, 96 years has a whole number of weeks plus 8 extra days, which is the same as one extra day. In four consecutive years, one is a leap year, so there are five extra days. Now $96 + 4 = 100$, so a century has $1 + 5 = 6$ extra days more than a whole number of weeks. This means that the day of the week for October 3, 2009, was six days of the week after that of October 3, 1909.

We know October 3, 2009, was a Saturday. Six days before Saturday is Sunday. Therefore, October 3, 1909, was a Sunday.

8.3 Mathematical *Jeopardy!*

This is what I tell people when they ask what my life work is.

There is a television game show called *Jeopardy!* in which the host reads an answer and the players try to think of a question with that answer.

In second or third grade you memorized the multiplication table. For example, you learned that $5 \times 7 = 35$.

Imagine a version of *Jeopardy!* played with multiplication tables. Host Ken Jennings reads the answer 35. You buzz in and respond, "What is five times seven?"

This sounds like a silly game. However, there is a small group of mathematicians and computer scientists who play the game with 100-digit numbers in place of two-digit numbers. I am the leader of the group and the large numbers are from the Cunningham[13] Project. Actually, even 100-digit numbers are too easy and today we use numbers with several hundred digits.

[13] See Section 5.9 for more about Allan Cunningham.

It turns out that the ability to play this game is strongly connected to information security. If one could play this game successfully with 500-digit numbers, then one could break secret codes and forge digital signatures on documents. Information security experts monitor my web pages to see the latest success in the game. When players have great success, security experts must increase the size of the numbers they use as keys, which makes cryptography safer but slower.

Playing *Jeopardy!* with multiplication tables is the same as factoring integers mentioned in Section 4.1. It is a famous hard problem in mathematics to find a fast way to factor large numbers. In the 1980s, a prison inmate wrote to me claiming that he had solved this problem and could factor large numbers quickly. He said he would send me the method if I sent him money. I was sure this was a scam. I sent him several large numbers needed for the Cunningham Project and said I would pay him for the method if he sent me the factors of these numbers first. He never wrote back.