

Chapter 4

Princeton Living



Princeton, New Jersey, was my first experience in living away from Ithaca. Michigan State really did not count as it was like living or almost living at Ithaca. Princeton was my New World with a new job and new friends. RCA Lab as a large three

story industrial complex located in a large open space near Princeton. It was really big, as large as one of the dormitory complexes at Michigan State.

RCA labs put me in contact with another engineer starting at the same time and suggested we get a room together. I was introduced to John O'Connell, an electrical engineer. We moved into a shared room in a boarding house on Nassau Street in Princeton. This was temporary and we soon found something much better outside of Princeton in a house at the lower end of Carnegie Lake. It was owned by the Traeglers, a retired local couple. I stayed there until I moved to the Princeton graduate college.

Carnegie Lake was a shallow dammed up stream built by the Carnegie Foundation. Usually they bought libraries for colleges as part of their guilt trip, but Princeton already had a library so they built the lake. The Treglers' house was adjacent to the dam that formed the lake. I took advantage of



the location for ice-skating. But in 1955, the world was a little cooler and the lake froze solidly every winter. This provided a magnificent location for ice-skating, sailing and a place for young couples pushing their baby

carriages while they skated. It was like a scene out of a Currier and Ives painting. John was not a skater. Several weekend days I got up early and was the only skater on the entire lower end of the lake. It was cold enough so the ice was forming and you could hear the entire lake cracking as you skated.



For reasons that I can no longer remember, John and I were involved with the local Catholic Church and got involved with the fundraising effort to modernize the church. This involved going to visit Catholic families and explaining why they should

donate a large amount of money to this project. John was far more Catholic than I was, so I think I was just going along. We were not donating, we were just fundraising. The church did not look to me like it needed money.

There was a group of young people at the RCA Labs who were socially active. They consisted of recent graduates, secretaries, young technicians, and a bunch of young people



from the town - mostly nurses, who formed a club called the Town Club. Each technical group at the laboratories had a secretary and the secretaries basically ran the Town Club. The club had multiple activities such as dances, excursions, and outdoor parties. We even had a bowling league, with a

couple of female technicians, as well as many of the young engineers. It was very much male-dominated technology company in 1955.

One of the first excursions was a trip to the Jersey Shore where we rented boats on Barnegat Bay, a large body of water which seems to run almost the length of New Jersey and is sheltered from the ocean by a long string of islands. We happily set out sailing in rented boats which did not have

very large sails and were more party boats than sailing boats. To my surprise one of the natives of New Jersey jumped overboard when we were well away from shore and was standing in maybe three feet of water. He dug around with his feet and ended up reaching down and pulling up some clams. I had no idea such things could be eaten raw, but discovered they were quite good. My first introduction to the wilds of New Jersey.

Town Club also had skiing expeditions. Early on I noticed that there were occasional Scandinavian girls at the parties. It turns out that the wealthy Princeton families had an established source of Norwegian and Swedish high school graduates who came over for one or two year stints to take care of the rich families' kids.

At this time I was dating Beverly, the RCA Labs receptionist. There were not many women working at the Laboratories except as secretaries. I was far too involved with the new job, new part of the country, and new independence to become seriously involved with anyone. Life was good, learning new stuff at work about color television, technology, and patents.

One day Pat Durnan, our group secretary, who was dating my roommate John invited John and me to a bridge party at her home in Trenton New Jersey. It seemed like a great idea and we happily accepted. Early on, I was partnered with Pat and John was partnered with a friend of Pat's from St. Elizabeth's College where the girls had met. My friend John was kind of a straight arrow and I will never forget the look on his face when his partner, the new girl Anne, said "Do you play Stamen?" I found out later that this is a bridge convention, but at the time

I assumed it was a reference to flowers that use a Stamen and Pistol method of reproduction (the first words I heard from my future wife).

Possibly the reason my relationship with Beverly was not too positive was the result of the two of us going together on a group ski trip. It was at a small hill and was serviced by a rope tow. The rope went at a fairly high speed and the proper technique was to let it slide through a metal gripper that you held until you picked up the same speed as the rope. I went first to show Beverly how to do this and headed up the hill on the rope tow. Beverly, following me, clamped down on the gripper and was jerked forward and broke her leg. This was not a great date.

Princeton itself was a university town and wealthy beyond anything I had ever seen in Ithaca. Large manicured lawns beautiful houses and a golf course between the graduate school and the Institute for Advanced Studies, another world-class academic Institute at Princeton. One day, the first year I was there I was walking from the grad school grounds and witnessed a thin man with bushy white hair walking on the path towards the Institute for Advanced Studies. It was an elderly Albert Einstein.

It was an amazing first two years at RCA Labs in Princeton. Each new scientific employee was assigned to a technical group for a four-month assignment. They were then switched to a different group for another four months assignment. Since RCA was a television company, the usual first assignment was an electrical engineering project with an engineer, Ben Kazan. This involved examining the properties of compound

semi conductors of differing materials. We did some technical measurements, but produced no significant results.

My next assignment was with a group investigating television type pickup tubes. The particular tube they were investigating was called a vidicon. This tube consisted of a semiconductor wafer in the front of the tube with the light striking the side of the wafer in a scanning electron beam striking the backside of the wafer to work successfully, it was important that the electrical resistivity of the wafer be of a particular value; it should have a high resistivity and yet have a resistivity changed by light impinging on the front surface of the wafer.

My direct supervisor was Stan Forgue, who suggested (as I mentioned in the previous chapter) that we try to make an infrared sensitive photo detector wafer by putting a balanced amount of positive and negative dopant into a Germanium wafer. The Germanium wafer would be cut from a Germanium crystal boule that was pulled from a flame heated ceramic cup containing the liquid Germanium.

The theory at the time was that one of the dopants would be absorbed from the liquid into the solid while the others dopant would preferentially remain in the liquid. We hoped if we resultant crystal boule in slices from top to bottom we might find one slice where the two dopants equaled each other.

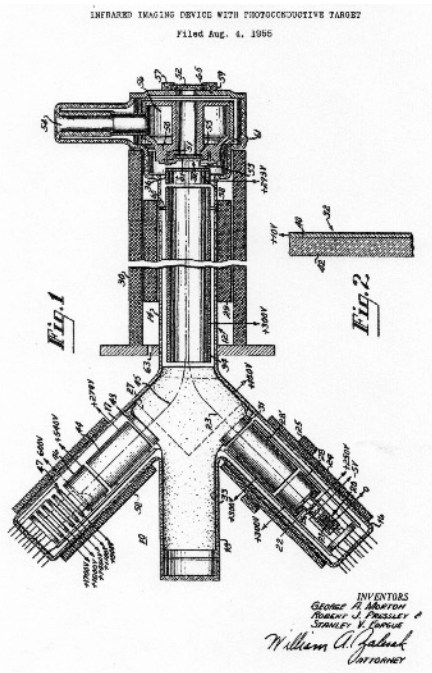
RCA Labs had a crystal growing facility and we submitted our request and our suggested materials. I had nothing to do for a couple weeks except wait for the crystal to grow. The atmosphere at RCA Laboratories was fairly relaxed and we had a couple of ping-pong tables in the lunch room. My boss,

Stan Forgue was quite competitive and convinced that he could beat me at ping-pong. We usually were the last two people to leave the lunchroom and go back to work.

Eventually the sliced germanium crystal arrived and we installed a random slice from the center of the boule into the Vidicon. Liquid nitrogen was added to the Vidicon to cool the wafer and increase its resistivity.

During the test, my boss' boss, George Mortan walked into our darkened lab with a cup of coffee. To our amazement the coffee cup was brightly imaged by the Vidicon. We had an infrared sensitive Vidicon; actually it was the most sensitive infrared pickup tube in existence at that time.

This strange looking device is a liquid nitrogen cooled Vidicon.



RCA Labs immediately patented the device with me as one of three co-inventors. The United States government then immediately classified the patent as secret. I routinely went on to my next assignment.

(The patent on this invention was finally declassified in 1968.)

My next assignment was supervising a large grading spectrometer and implementing the improved data acquisition and storage program. I set up a timesharing program with the laboratory's central computer. This was my first programming.

Life and work continued as normal until one day I was called into the laboratory director's office and told that I had been awarded an—

RCA Fellowship to Princeton University Graduate School.

I remember it took a long time for this to sink in. I traveled to the RCA headquarters building in New York City where I was officially awarded the fellowship. I was still unconscious of the implications.



This fellowship provided room, board, and tuition for two years to any graduate school in the country. I was already taking one part-time course at Princeton, I lived in Princeton, and had many friends in Princeton. I never considered any other option but Princeton University. I did not realize at that time that RCA Laboratories had an agreement with Princeton University that insured acceptance of an RCA fellowship winner to its Doctoral program. I was amazingly innocent and lucky as I did not realize how unusual the arrangement was. The unexpected extreme success of my RCA experiment made me an “outlier.” This term refers to someone who is doing good work but happens to be in the right place at the right time.

Life in the Graduate College

The Princeton Graduate College was not in the Princeton University undergraduate campus it was a mile or so away. There were no classes taught in the graduate college; it was strictly a living and eating establishment. As you can see it was built in the style of an English college with two courtyards and a tower. There was a large reading room next to the tower with a high vaulted ceiling as well as a classic medieval dining hall with long tables, also a high vaulted ceiling, with the proctors seated at a raised table at the end of the room. All of the meals in the dining room required the students to wear black academic gowns. This presented a uniform look, although the sleeves acquired colors more representative of the food than the original black. The meals were served family style and often seemed to consist of mystery meat.



The large student apartments consisted of a double bedroom, a large study room, and an adjacent bathroom shared with a matching apartment. To my amazement there was housekeeping provided whereby an elderly black gentleman made the beds, cleaned up, and

changed the linens every so often. We were free to do nothing but study and live the good life.

My fellowship provided room, board, tuition, and a few hundred dollars cash stipend at the beginning of the academic year. A couple of weeks after we got settled in I decided it would be a good idea to throw a beer party. I bought a couple of cases of beer and a few other things and invited the guys at our end of the grand college. I also invited the Scandinavian girls that I had gotten to know over the past two years. Some 12 girls joined the party. This established my social reputation among the all-male graduate student body.

My roommate Bruce, was a studious theoretical physics major from the Philadelphia area. He was interested in something called "string theory." This was theoretical physics involving a multidimensional universe. We had a geologist across the hall from us and an experimental physics major in the other direction. I did not realize until later that the experimental physicists were a distinct minority among the theoretical guys.

Let me go on for a little bit about life in the graduate college before I start on the actual studies. Breakfast was served in the aptly named breakfast room and dinner was served in the Great Hall. The only sporting activity that captured the graduate students imagination was Frisbee. We developed a competitive sport played in the inner court where the object was to careen a frisbee off a brick wall behind the other team in some direction such that it got to the ground before they could catch it. As you can see from the picture, the three-story windowed walls had plenty of locations to cause a crazily careening Frisbee.

I also discovered that every Wednesday there was an outdoor folk dance held on the edge of the golf course adjacent to the graduate college. This dance program had been going on for at least 20 years and the regular dancers set it up and provided the music and lights. They were not grad students, but Princeton area natives. There was an Israeli Kibbutz some 10 or so miles away and we usually got a couple of carloads of dancers from there. The dances were both circle dances and various couple dances. They were wonderful experiences on warm Wednesday evenings. I met a couple of new girls who were really wonderful dancers. My experience from my course in social dancing at Michigan State really came in handy.

Since I had no need for my car I continued to loan it to the Scandinavian girls every Thursday which was their day off. They mostly were the equivalent of junior college graduates who had come to the United States to learn English and take

a job as a childcare person to support themselves. They came from upper-middle-class Scandinavian families. They were generally quite unhappy with the treatment they got as house servants. They had expected the majority of the work to be the care of small children. Mostly they stayed for two or three years.

In the large community room in the graduate college there were comfortable chairs, newspapers, a couple of game tables, and ongoing discussions. This is where we mingled in our black academic gowns before the dining hall opened.

There were no women grad students, strictly not allowed, in fact married grad students had only recently been allowed. The old idea had been that if you wanted to be a graduate student you should be male and totally focused on your studies.

There was no attendance taken at the evening meal where everyone was in their academic gown. It was considered a challenge to try and sneak a non-student into the dining room. It was even more of a challenge if the non-student was a female.

This ploy was successful several times each year.

But enough on life in the graduate college,

My goal of being at Princeton University graduate school in physics was to obtain a degree. Life was interesting but studies reared their ugly head. Actually it was not a very ugly

head because there were no tests until the generals exam at the end of two years.

I will discuss what the classes were in the academic life at Princeton in the next chapter.