Chapter 5

Princeton Studies & Anne!



The Princeton University graduate physics department had a relatively small faculty. All the members of the faculty were involved in serious research as well as teaching a few courses. Each faculty member was the advisor for a few students. My advisor was Dr. Tom Carver. He was an experimentalist studying basic characteristics of lithium metal. Graduation from Princeton graduate school required a thesis project demonstrating a student's independent and novel contribution, either experimental or theoretical. Having no novel ideas of my own, I naturally drifted into working on

an extension of Dr. Carver's work over to lithium metal but before any of us concentrated in a particular area, there was the classroom work to prepare for the Generals examination which would be given at the end of two years of work. The generals are designed to cover all aspects of physics. We attended some eight courses over two years which did not totally cover the range it was expected in the generals. We were expected to do independent studies to prepare for the topics not covered, such as acoustics etc.

The department had a new student class meeting in the first week that we were there. At that meeting the faculty, or I should say, the younger faculty, Dr. Sam Tieman and Dr. Tom Carver advised us. They said that the selection process to get into Princeton had been selective enough so that there was no reason that any of us should fail. They viewed it as their responsibility to prepare us all to get our PhD successfully.

Here is the course of study for the 2017 Princeton graduate physics students. My actual courses are shown further below.

Quantum Mechanics/Quantum Field Theory:

- PHY 506 Quantum Mechanics
- PHY 509 Relativistic Quantum Theory I
- PHY 510 Relativistic Quantum Theory II
- PHY 529 Introduction to High Energy Physics

Condensed Matter/Biophysics/Atomic Physics:

- PHY 525 Introduction to Condensed Matter Physics I
- PHY 526 Introduction to Condensed Matter Physics II
- PHY 551 Atomic Physics (not taught every year)
- PHY 562 Biophysics

General Relativity/High Energy Physics:

- PHY 523 Introduction to General Relativity
- PHY 524 Advanced Topics in General Relativity
- PHY 529 Introduction to High Energy Physics

About the middle of the first year we had another faculty advisory meeting. Some of the students commented that they were having trouble keeping up. We then had a presentation of what would be considered a normal workweek. It was presented that unless we were putting in a 60 hour study week, we should not be complaining. It was also explained that this 60 hours was to be time at the desk studying, not preparing, not daydreaming, not thinking of something else, not sharpening a pencil, not resting between study times, but actually time at the desk. Incidentally, there were no such things as cell phones to distract us.

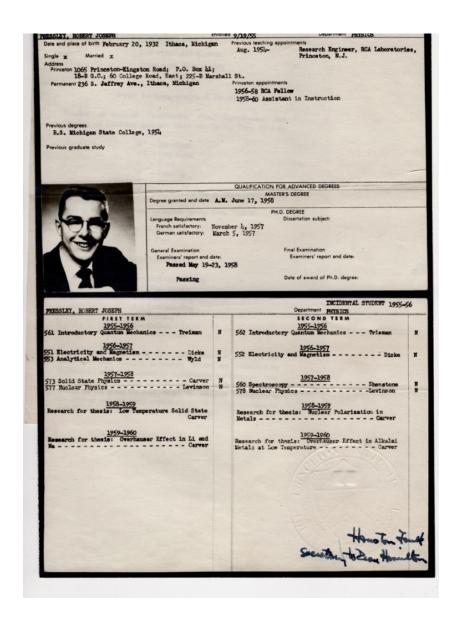
I actually kept records for the next two weeks and was amazed at how much of my day was taken up with eating, walking to class, doing other things, and how little was left to accumulate this 60 hours. We did get their point and stopped complaining about the amount of work.

I unearthed a transcript of my first two years which actually lists the classes. Notice that there were no grades given for any of the classes. Life was wonderful.

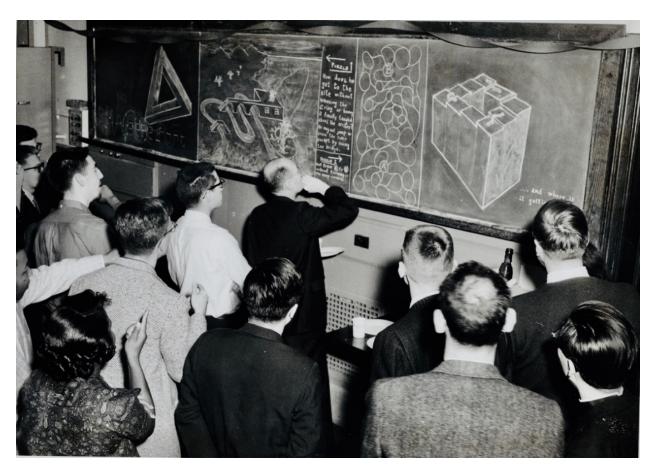
The actual classes were taught by the senior professors. The most senior professor was Dr. Eugene Wigner. He was a brilliant Hungarian physicist who was awarded the Nobel Prize in 1963. He lectured us on theoretical physics including

general relativity, quantum theory, and other topics that he thought were important. He lectured without notes deriving the equations on the blackboard as he talked. He commented that it was better to derive the equations from logic rather than remembering them from books because the books might be wrong.

He occasionally lunched with the graduate students and was a fascinatingly humble man. It was almost impossible to get through a door behind him as he would always hold it for the



lowliest graduate student. He occasionally tossed out verbal problems to the group. I only remember one time where I beat him to a result and that was when someone asked how many tennis matches it would take for a tournament with 137 players. I immediately said 136. He asked me how I calculated it so quickly and I said everyone had to lose but



one person. I count this as the only time I out-thought a future Nobel Prize winner. He was not only a brilliant mathematician, but a major consultant on the United States nuclear reactor design and industrial nuclear plant design

All of our courses as well as our experimental research work were done in Palmer Physical Laboratory pictured at the start of the section. The basement of this building had been used

for a variety of nuclear energy experiments during the Second World War and a fair number of the ventilation ducts were still sealed up and presumably radioactive. The basement had a machine shop and a laboratory where the experimental equipment used in the physics demonstrations for the undergraduates was kept and maintained.

Liquid Merrcury metal was used for a fair number of demonstrations and I remember that there was a technician who distilled the dirty mercury into clean containers on a regular basis. It certainly was not healthy working there as I remember when they changed the fluorescent lights, a stream of mercury metal poured out.

The man who supervised the equipment maintenance room was a small, somewhat frail, elderly man. In retrospect he may have been younger and was just showing the effects of years of working with Mercury.

One of my other senior professors was Dr. John Wheeler. He lectured on general nuclear physics and atomic physics. I remember him demonstrating with calculations on the board and how he calculated that if you had enough mass, gravity would collapse the mass to zero volume. He was describing a black hole singularity before any had been seen.

Dr. Robert Dicke was the third of the senior professors. His theoretical interests were in the evolution of the universe and the possibility of measuring some of the universal constants such as gravity with extreme accuracy. He was also theorizing about the existence of background microwave radiation from the early universe and was barely beaten out in detecting this microwave background by the Bell Laboratory

scientists who got a Nobel prize for doing so.

The department chairman during the first two years I was at Princeton was a Dr. Walter Bleakney. He was an older man and I mainly remember him as a graduate student advisor. He was however, the organizer of our physics department graduate school bowling team. This was one area in which I was plainly superior to the other

C•O•B•	ALL	EY 3
	НСР	AVG
PERRON, JOSEPH	47	121
GROVE + DON	20	155
HAMARICH, JOHN		182
MUSCHAL, DON	12	165
BREWER, BILL	20	154
EDENFIELD, ED	64	89
PESTER, FRED	44	125
BISHOP, AMASA	59	106
PHYSICS	ALLEY 4	
	НСГ	AVG
BLEAKNEY, W	20	155
PRESSLEY. BOB	14	162
REYNOLDS, GEO	27	154
CHRISTIANSEN, L	27	155
ZDANIS, R	4) .	129
SCARL, DON	3 3	138

physics graduate students. I was anchor bowler on the physics team. I had the highest average and figured that they would never fail a member of the team. It was good fun with three faculty members.

Dr. Blakeney always seemed like a cautious quiet conservative man with a difficult to control hook bowling delivery and I was surprised to learn that when he retired at age 65, he took his first parachute jump.

The Generals Exam

I totally enjoyed the first two years of grad school as there were no tests during that time. We went to classes, took notes, and had an occasional quiz, but no grades. The testing came in what was called the generals examination. This occupied 3 1/2 days with two major question areas each day. The entire faculty evaluated these responses and prepared questions for a Thursday morning orals session where we were grilled in any area of weakness. I was grilled in electromagnetic theory as apparently I could produce some incorrect results in the quizzes.

There were 12 of us who took the tests and waited outside the building until about 2 o'clock in the afternoon when it was announced that we all had passed. One Chinese student was awarded the top grade and the rest of us had no idea whether we were in the middle or the bottom, but none of us cared.

Professors Dicke and Carver supervised most of the experimental work by the graduate students. There were multiple small laboratories in the basement of the physics building where we did our work. Again I realize I have no idea where the theoreticians did their work, it must've been in the library because I have no memory of them having offices. Not that anyone cares about these details, but I am incorporating a summary of the experimental work that I submitted for my thesis project.



fellow graduate student, Ned Vanderven also worked this o n lithium project. Here are the two of us with Prof. Carver pretending to 0 0 k

interested in the gas that is evaporating off the liquid nitrogen.

The technical aspects of the project were actually a lot of fun. I had to manufacture a miniaturized structure that would simultaneously hold the cold samples of lithium, irradiated with a microwave field as well as radio frequency field. The effect we were looking for was an interaction between the two resonances that happened at a specific magnetic field.

We tuned the radio frequency for nuclear magnetic resonance and the microwave frequency for the electron spin resonance. We then slowly varied the magnetic field in the large magnet you see in the picture above and looked for an interaction between the two signals.

My colleague in the picture is a fellow graduate student named Ned Vanderven. He was much more of a theoretician.

ABSTRACT

The interaction of the electron spin resonance and the nuclear magnetic resonance in Lithium metal is investigated over a temperature range of from 1.4 to 350 degrees Kelvin at a magnetic field of 3400 Oersteds.

The theory of electron resonance asymmetries and shifts and nuclear resonance shifts due to these interactions is expanded and discussed.

An experimental method of producing pure particles of Lithium metal of about 5 to 10 micron diameter dispersed in an inert oil by dissolving Li in liquid ammonia is discussed and the design and construction of the dual microwave r.f. spectrometer and a magnet field stabilization control is included.

An Overhauser enhancement of over 500 is obtained at room temperature in these samples while skin depth problems prevented attaining any polarization at 1.4°K. The Knight shift in the nuclear resonances is shown to be mainly due to electron polarization and the "g" value of the conduction electrons in lithium metal is found to be less than that of the free electron by 1 part in 10⁵.

It turns out that my experimental project provided data that was slightly asymmetric. His thesis topic was an analysis and explanation of the shape of the results that I obtained.

Ned was an interesting person. He had no spending money but he had a beautiful British convertible MG. He apparently had been in some kind of an automobile accident and used all of the settlement money to buy the convertible.

There were about 10 laboratories in the basement of the building and about 10 experiments going on measuring, or trying to measure, some absolute value of a physical constant or some theoretically predicted interaction of materials. My laboratory was not one of the neatest. Currently, all of these electronics could be handled by an iPhone

It was an interesting scientific environment. It was not competitive and secretive, it was more collaborative in trying to provide help. You could talk to any of the other



experimentalists. We all expected to ultimately get our PhD.

There was no set time for finishing a thesis project. Whenever your advisor felt that you had completed your work and were ready to defend

the results against the faculty evaluation committee (of three or four professors) a time was set and you were told to arrive for your thesis defense. Luckily your thesis advisor was anxious to have you pass and was available to help you out.

My most embarrassing moment in my defense came near the end when one of the professors handed me an unmarked bar magnet and asked me how I would experimentally evaluate this. My thesis defense was in a classic high ceiling lecture hall where the blackboard was across the front of the room with the appropriate large tray for chalk etc. I could see no metallic material. Finally I realized that there was a small gas pipe with nozzles running underneath the tray which I could not see. Finally I remembered the gas pipes, bent over and gave them an evaluation of a magnetic material amid a goodnatured smile from them.

Anyhow they passed me.

1962 I Now Had My Doctors Degree from Princeton

In reviewing a little bit of history, I arrived at RCA labs in the fall of 1954 I started Princeton in the fall of 1956 I passed my generals examination in the spring of 1958 and I officially got my PhD with the class of 1962. During all my time at Grad school I was on leave of absence from RCA. After passing my generals exams, I was appointed an instructor. There was no salary, but with the position, tuition was waived. RCA covered my medical insurance during all of this time and actually credited me with seniority towards the coveted three week vacation that RCA employees got after 10 years. After passing my generals exams I worked each summer at RCA.

Graduate students were only permitted to live in the graduate college for two years, so after our two years, four of us rented a faculty home on College Avenue across from the Princeton football stadium. The faculty owner was on some kind of a sabbatical which made it available. It was sort of an eclectic group of guys. One was my grad school roommate Bruce, a

theoretical quantum physicist. We had an engineering graduate student and we had another grad student named Al Goodman. I do not remember what Al was majoring in but I remember that his requirement in getting married was to have a wife that played some classical instrument. Never understood this logic but I still remember it.

Each week, one of us took the responsibility of preparing suppers rotating through the group. I do not remember any serious arguments; we were all just starting on our thesis projects and probably were pretty much focused on our studies. Meals could not be worse than two years of graduate college food.

Anne

During my second year in the grad school, I discovered that Anne Conaty had returned from a year's work in a department store in Kansas City and was back in Brooklyn. I invited her down to a Princeton University football game. She was not staying with her girlfriend in Trenton, but we reserved a room for her in a Holiday Inn near Princeton. Anne arrived dressed for the game in a beautiful leather coat and high-heeled shoes. Needless to say it started to rain and we had a fairly long walk to the Stadium and back. This could have been the end of my relationship with Anne.

I think I may have been saved by John Benson, a classics major who had a suite in the graduate college on the ground floor below mine. Somehow his suite had a fireplace and when Anne and I returned from the game somewhat wet and bedraggled, he had a caldron containing Grand Marnier



simmering above the fire. The room was warm, the company was convivial, and the aroma from the from Grand Marnier was delightful. John received his PhD and classics in 1957 and went on to teach at St. Peter's College in New Jersey. I'm sure he never realized how grateful I was to him.

The summer after the football game, I had passed my generals examination, and Anne and a bunch of her friends from Brooklyn

rented a summer cottage at the Jersey shore. This was in a



town called Brielle, about 40 minutes away from Princeton. My work on my thesis project quickly became second priority.

I remember driving down and meeting Anne a few times at the

Jersey shore. I was living in the house on College Road with three other guys that summer, but I cannot remember any of them joining me at the beach. One weekend the Brooklyn girls gave a party at their cottage, I think in coordination with some guys from Brooklyn who had also rented a cottage. I remember they were serving cool drinks from a watermelon which had straws inserted in it. I remember this because one of the guys from the other cottage and myself had spiked the watermelon with vodka through some of the straws. I think I slept at the guys cottage that night.

There were a couple of other beach visits, but I spent a lot of my time that summer trying to get started on my experimental work for my thesis project.

John Benson also arranged a great date for Anne and me. He was an usher at the Metropolitan Opera in New York City on some kind of a volunteer basis. He took me into New York City one afternoon and we met Anne after work. He took us in through one of the back doors at the Opera and we watched the performance from one of the luxury boxes. This was a big time deal for a small town boy.

My only previous experience with theater since high school operettas such as the HMS Pinafore and the Mikado was with a local Princeton group affiliated with Town Club. They put on several shows a year at a small theater on the Princeton campus. I joined the group and ended up being their stage electrician. I found theater people to be fascinatingly imaginative as opposed to the pragmatic scientists that I knew.

The equipment at the theater was quite old and the spotlights were dimmed by pushing a large lever on a

mechanical lever for each light. On one occasion the lever bent in the spotlight did not get brighter on the main performer who was about to sing. I was on a stepladder trying to straighten out the metal rod without electrocuting myself when I found the director, who, in retrospect was quite gay, tugging on my pants leg and telling me to "do something."

Once a year we did an event in the large campus auditorium called McCarter Theatre. This had a multistory stage and the lights were aimed by mechanically adjusting them from a catwalk at the top of this stage. The catwalks were accessed by a three-story open ladder on the back wall of the stage. One of my least favorite activities was climbing this ladder. As luck would have it, we only did one show in this big theater.

When I was living on College Road, Anne came down for a tennis date. She stayed with the Browns, he was a fellow graduate physics student and he and his wife were already living in married student housing. We played on one of two gorgeous composition tennis courts across from the Princeton University Stadium. I have no idea who won. We also went bowling in downtown Princeton, or I should say, I went bowling, Anne chose not to. With her watching, I bowled 266 which was the highest I had ever scored. I must've been showing off. As I mentioned before, Lake Carnegie froze over in the winter. It was like a scene from Currier and Ives with people pushing baby carriages with blades on them and people doing wind sailing as well as just plain ice-skating. Anne is an excellent ice skater as you can see from the early pictures of her competing and I am



tolerable, a date to skate on Lake Carnegie was great. I think global warming over the past 50 years has made such days unlikely. As you can see, Anne also enjoyed diving. I have no record of where the pool was.



Anne grew up in an Irish Catholic section of Brooklyn at a brownstone on Midwood Street. With her brother Jim and her parents James and Gertrude. Her father was the manager of Aetna insurance company in Brooklyn and

they were comfortable upper-middle-class family.



They lived at 119 Midwood St. in central Brooklyn. It was near Ebbets Field and the

Dodgers baseball team was a big



part of their environment. It is the brownstone house in the picture.

Anne went to Catholic schools and onto St. Elizabeth's Catholic College in Convent Station near Morristown, New Jersey. To Anne's parents, I was an unknown Midwestern guy studying to get a graduate degree at Princeton. I was in time introduced to cousin Bobby, Jim's wife Pat, and a few other

Murray Tarr
Miss Anne L. Conaty

Anne Lucile Conaty

Physicist's Fiancee

Announcement has been made by Mr. and Mrs. James J. Co-

naty of Brooklyn of the engagement of their daughter, Miss

Anne Lucile Conaty, to Robert Joseph Pressley. His parents are Mr. and Mrs. Cecil P. Pressley

A September wedding is

The bride-to-be graduated from the College of St. Elizabeth at Convent Station, N. J.

Mr. Pressley, a research physicist on leave of absence from

the Radio Corporation of America laboratories, is studying for

a doctorate in physics at Princeton University. He is a gradu-

of Ithaca, Mich.

planned.

relatives. I knew that Anne's job in the garment district of New York City was involved in buying women dresses for a chain of department stores. I really had no idea as to the scope of the job or the range of her responsibility until I discussed with her the possibility of going to see a new and very popular Broadway musical, "The Music Man."

Within a week, Anne told me that she had been able to get tickets. It was only after we had enjoyed the musical from seats in the front row center that Anne said they had been available from one of her manufacturers that I realized how her purchasing decisions influenced local dress manufacturers.

On another visit we went out to a resort on the Atlantic called Breezy Point. This was a private club that you have to be invited to join. It was called the



'Catholic's Last Stand." There was an array of long boardwalks stretching over the extensive beach with cabanas on each side of the boardwalk. Anne's family had a cabana at Breezy Point and they went quite often during the summer. The sandy beach was beautiful and the surf was very gradual here.

When I visited Anne on Midwood St. in Brooklyn, I

stayed in brother Jim's old room in the back of their house. They called it the maid's room. Anne's mother Gertrude was a great cook. Her father made a mean drink. The visits were great!

On a special one of these trips I asked Anne to be my wife.

To My Amazement She Said

"YES"

I was anxious for Anne to visit Ithaca. I expected that the visit would be as big a shock to Anne as Brooklyn was to me.



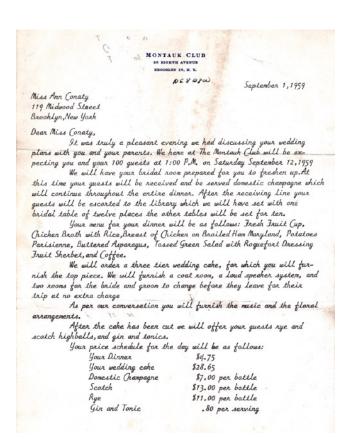
My parents gave an evening coffee at Cynthia Crawford's house; she was our next-door neighbor. This party was to introduce Anne to our Ithaca neighbors and family. To Anne's amazement all they served was coffee. Anne was still smoking in those days and bonded immediately with my father by borrowing one of his Kool cigarettes. She did sneak away to the Crawford back porch with some like-minded souls for a bit of a drink!



The different newspapers gave different space for this announcement.

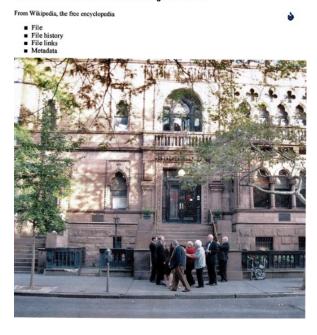
We agreed on a fall wedding, resulting in a seven month engagement. We were





married on September 12, 1959 in Brooklyn. I asked Tom Haley to be my best man and Anne asked her good friend

File:Montauk Club J43 jeh.JPG



Patty Rizzo to be her maid of honor.

I did not realize that my father was not well at the time and that it was not at all clear whether my mother would be able to attend the wedding in Brooklyn. But... at the last minute Tom Haley's mother, my aunt Ernestine and my mother took a train from Ithaca to Brooklyn and arrived the morning of the wedding. A number of my Princeton

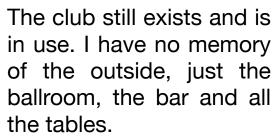
University friends also drove up to enjoy the ceremony. We were married at St. Francis of Assisi, Anne's parish church. One of the associate priests officiated at the wedding

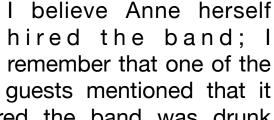


ceremony, he also was responsible for our single session of marriage counseling. It must've worked, since we are still married almost 60 years later.

Anne's father had been a long-term member of the Montauk club. He arranged that we could have the reception there.







appeared the band was drunk because of the way they looked. Anne told him not to worry as the members of the band were all blind!



The contract for the reception is kind of interesting, at least the

prices for the drinks.

Besides being beautiful and smart, Anne was an excellent dancer and we, of course, enjoyed the first waltz around the dance floor as well as a fair number of other dances. We had to be a little careful not to run into any one of the New York manufacturers sidling up to Anne to give her an envelope.

As at every wedding reception, we ducked out while the dancing was going on and changed into our traveling clothes and went to a hotel near the airport. We were off for Bermuda the next day.

I do not know where the three ladies from Ithaca stayed, or even how long they stayed. My guess is that they took the train back to Ithaca the next day as I never remember mom talking about the sights in Brooklyn or New York City. The next morning we boarded a plane and took off for Bermuda. The plane was a Boeing Strata-cruiser which is a double deck airplane where the lower deck is a bar. It was a short flight to Bermuda, where we had reservations at the Lantana Beach club.

The beach club, above on the left, was a collection of cottages on the curve of the island, far away from the main tourist area. A taxi shuttle took us to the beach club from the airport as there were no cars on the island.

We rented two small motor scooters for transportation and explored around the island and I discovered one of the first effects of married life - Anne had a motorbike that was just a little bit faster than mine! We checked out the shopping area with very formal Bermuda shorts clad clerks and I of course had to purchase knee length stockings and black Bermuda shorts.

After a delightful week, getting used to married life, relaxing and exploring the island, it was time to return to Princeton and seriously start married life.

Back to Our Married Life! Now In Princeton