GERALD J. PORTER INTERVIEW
January 4, 2009
(with Ken Ross)

Jerry, when did you get interested in mathematics?

I have been interested in mathematics for as long as I can remember. After being in first grade for about a month, the teacher took me to the principal's office and asked me to write the numbers from 1 to 100. I assume I did this correctly because they then moved me to second grade. I always considered myself to be a problem solver, and I thought that I was good at mathematics. At Princeton, I considered majoring in other fields such as Economics but always came back to Mathematics.

Where did you grow up?

I grew up in Rahway, New Jersey. My maternal grandparents came to the U.S. from the Carpathian mountain region of Ruthenia and my paternal grandparents came from an area in the Ukraine just south of Kiev. They all emigrated to the U.S. in the early years of the twentieth century. Initially they lived in Brooklyn but moved to New Jersey about 1915. Rahway was predominately a working class town best known as the home of Merck & Co and a state prison (formerly a reformatory) which is actually not in Rahway.

Rahway prison

The high school in Rahway was not strong, but it was adequate. The majority of the students did not go on to college and many of those

who did went to state teacher's colleges. A fellow classmate and I went to Princeton. I was undecided between Princeton and MIT but Princeton offered me a $1000 a year scholarship. This was in 1954, and tuition was $1000 per year. Since my parents were not wealthy this made a major difference. Sometimes I wonder how my life would have been different if I had gone to MIT.

My class at Princeton was one of the last in which private school students outnumbered public school students..Most of my classmates were better prepared than I. Socially, it was a tough environment for a Jewish kid from Rahway.

As a freshman I took the Honors Calculus course from Emil Artin. In the middle of the term, the counseling service asked me how I was doing because my SATs were lower than average for that class. Many of my fellow students had 800's on their tests. Artin was a very strong personality and was a demanding teacher but always a wonderful teacher. As a sophomore I had calculus first from John Milnor and then from Willie Feller. I absolutely loved Feller's course and that course convinced me to be a math major.

What did your parents do?

My parents were smart but their schooling was limited by economic circumstances. My father left school after sixth grade to work in his father's business. My mother graduated high school but her income was needed to support her family since her father died at about the same time. She had two sisters and a brother but the brother was the only one who was able to attend college. He became a very well known Economist and received the Nobel Prize in Economics in 1976.

My maternal grandmother ran a dry goods store in Rahway and my father owned a bunch of those machines where you put in a coin and get a handful of peanuts or candy. He had one of his machines at my grandmother's store and that is how my parents met.

They married in 1932 at the heart of the depression and together built a small wholesale grocery business. Since I always saw my mother working, the idea of women working was never strange to me.

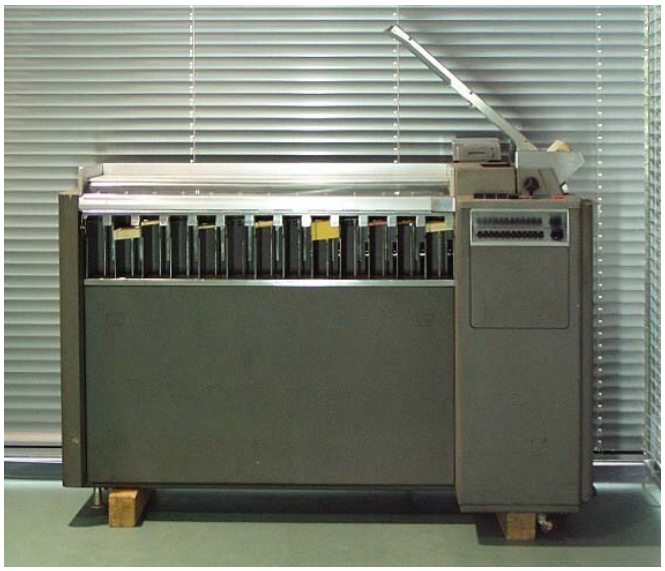
How about siblings? Did they influence your mathematical development?

I have one brother who is four years younger. He was also a Princeton undergraduate, and he practices law in Princeton.

I see you got your Bachelor's Degree at Princeton and your Ph.D. at Cornell. How were those experiences?

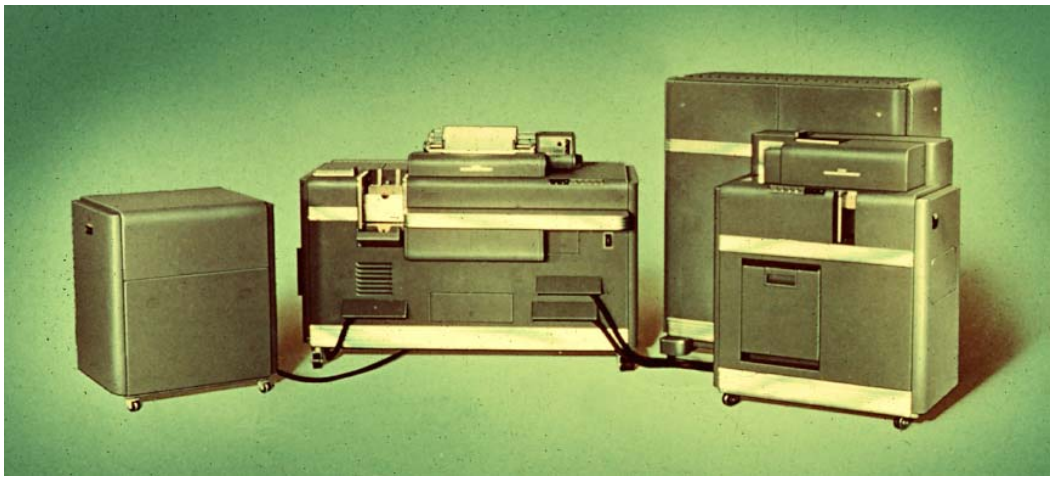
The chair of the Princeton math department was Albert W. Tucker. He believed that there should be a gulf between undergraduate mathematics and graduate mathematics. For example, the algebraic topology course was "cut-and-paste topology" as opposed to homology theory. Typically Princeton graduates were generally unprepared to be graduate students at Princeton. People like John Milnor were the exception. In my class there were only six math majors and Fred Richman was the only other one who went on to an academic career in mathematics. So, my undergraduate studies there didn't prepare me well for graduate school despite the fact that I had courses from faculty such as Steenrod and Helgason.

Between my sophomore and junior years at Princeton, I worked for an insurance company. This was supposedly training in actuarial science, but my job was to sort IBM cards. During that summer the company installed an IBM 650 computer and that got me interested in computers.



IBM Card Sorter

During my freshman and sophomore years at Princeton my student job was as a moving man, moving furniture and refrigerators. With my new found “expertise” in computing I became responsible for night operations at the university computer at the Forrestal Center. The “state of the art” computing at Princeton at that time was a card programmed calculator consisting of an IBM accounting machine connected to a reproducing punch and a printer. This was located in an old greenhouse which, as you might expect, often overheated. Every job was run three times and if the answers agreed on two of the three runs they were pronounced correct.



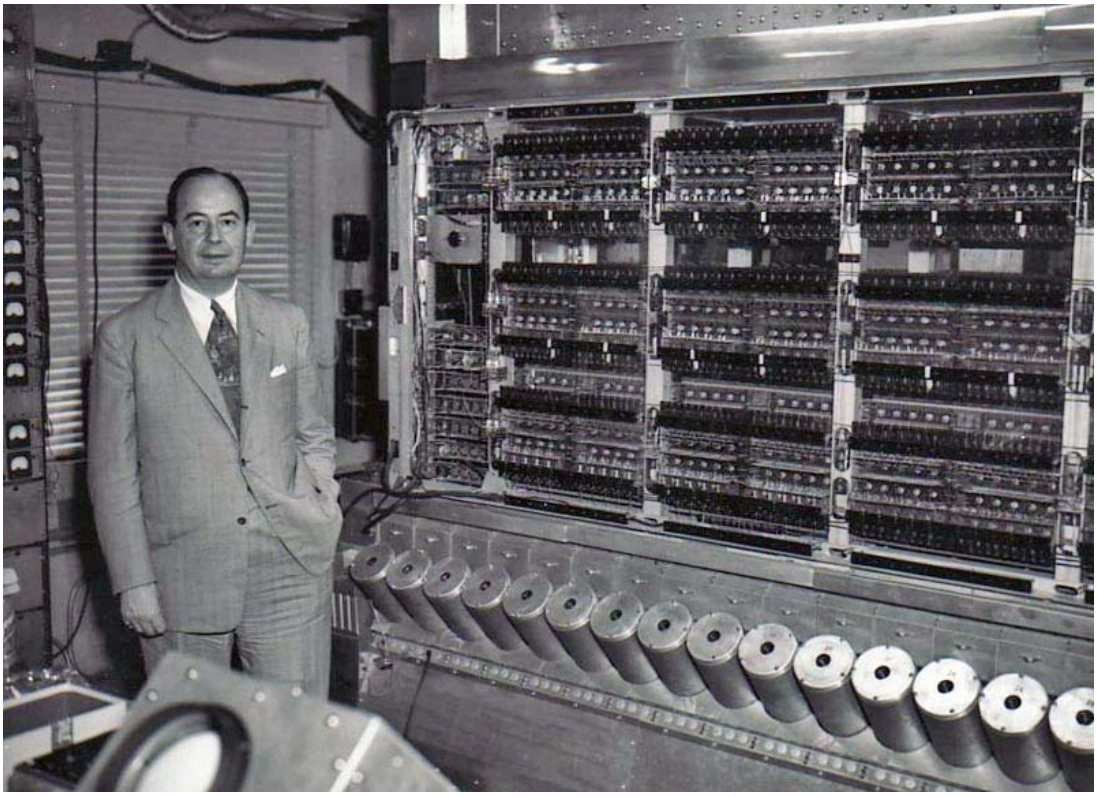
Card programmed calculator

During my sophomore year I had taken a “design of experiments” course from John Tukey and a statistics course from Sam Wilkes. As a junior, I took a course in numerical analysis from Phil Wolfe and wrote a junior paper on numerical solutions of differential equations. Basically this was a theoretical paper on various quadrature formulas and their error terms. There was no facility, other than desk calculators, that could have permitted me to actually investigate the properties of the solutions.

Between my junior and senior years, I worked for IBM in New York City. The memory on the IBM 650 computer was a drum. Programs needed to be written that could minimize computation time by storing data in locations on the drum that could be delivered “just in time” rather than waiting for a drum revolution. My job, that summer, was to write trig subroutines that ran as quickly as possible on that computer.

The drum from an IBM 650

At Princeton, meanwhile, research computing had moved from Forrestal to the original Von Neumann computer at the Institute for Advanced Study. I was responsible for evening operation of this computer. The memory for the Von Neumann computer consisted of 32 CRTs, each with a 32 by 32 grid of points (i.e., 1024 32 bit words). We monitored the CRT’s on an oscilloscope. One had to do this constantly. If the program got into a very tight loop, it could burn out one bit in each of the CRTs. This would be a very expensive failure.



Von Neumann and “his” computer
The tin cans are the CRTs

As a senior, I enrolled in an introduction to mathematical economics course taught by Harold Kuhn. This course touched a bit on linear programming, game theory and the like. Kuhn was my senior thesis advisor and my thesis was an empirical test of several start-up algorithms for solving linear programming problems. This was done on the Institute machine. It may have been the first Princeton senior thesis that was done using a digital computer. The actual algorithm used to solve the linear programming problem was one due to Ford and Fulkerson. I have been told that my thesis was the first time that algorithm was programmed for a digital computer.

When it came down to choosing a graduate program I was initially undecided between pure or and applied mathematics. Computer science did not exist in those days. If it had, I might have gone into computer science. I was accepted at both NYU (Courant) and Cornell. (I believe that a recommendation from Feller played an important part in my being accepted at Cornell.) Eventually I decided that applied mathematics (as I perceived it at that moment) was too limiting a field and I chose to go to Cornell.

I was at Cornell from 1958 to 1963. Cornell was an ideal program for me. On the whole I was on a par with my fellow graduate students. In my first year, I was able to fill the gaps in my education with point set topology from Isaac Namioka, algebra from Herstein, linear algebra from Bob Heineman, and advanced calculus from R. P. Agnew. Of course, the best students were the Cornell undergraduates such as Barbara Osofsky. At the same time, I was a teaching assistant in courses taught by Mark Kac and Gil Hunt, both of whom were excellent mentors.

The next year I took algebraic topology with Roger Livesay. This was an axiomatic treatment from Eilenberg-Steenrod. I would have been totally lost in this class if I had not taken the "cut and paste" topology course at Princeton. That course gave me examples that I could use to understand the abstraction.

I notice that you worked with Bill Browder, with whom I enjoyed working when he was AMS President. Any further comments about your thesis work?

Yes. I was his first Ph.D. student. My thesis was on secondary Whitehead products. It led to a series of papers on what I called wedges of spheres. It is interesting that recently those papers have been discovered and are the basis of current work on Toric Topology with applications to robotics.

Peter Hilton, Israel Berstein and Paul Olum were also important influences at Cornell at that time. After Cornell, I was an Instructor at M.I.T. for two years (1963-1965). MIT was a fantastic place for a young topologist to be. Frank Peterson, George Whitehead and Dan Kan were at the heart of very active group of topologists.

I accepted a job at Penn beginning in 1965 but my wife, Judy, needed to spend another year in Cambridge to finish her thesis at Harvard. As a result I applied for and received an ONR post-doc at Brandeis. Penn gave me a leave of absence for my first year.

Judy and I were lucky that we were both able to get academic jobs in the Philadelphia area, at Bryn Mawr and at Penn. We each spent over forty years on these faculties.

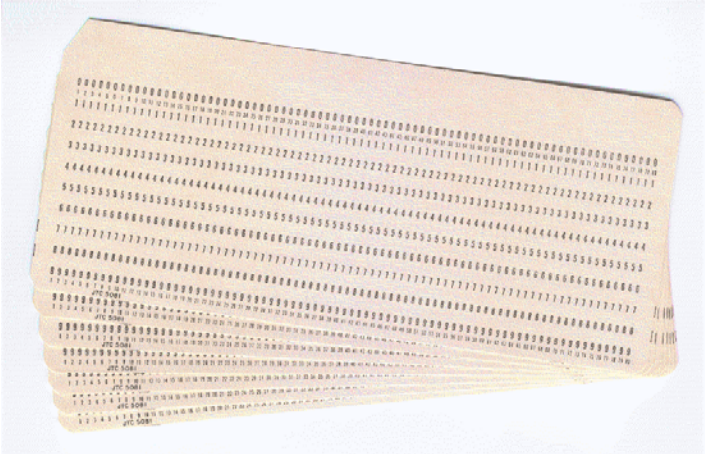
The Penn mathematics department under Hans Rademacher had been a very classically oriented department. Oscar Goldman became the chair in 1962 and was given a mandate to change this focus. As a result, in the few years before I arrived, Dick Kadison, Gene Calabi, Albert Nijenhuis, Andrew Wallace and Peter Freyd had been among those who joined the department. Herman Gluck and I both arrived in 1966.

You've been at Penn a long time. Tell me more.

I feel very fortunate to have been at Penn. I've had four or five careers here.

(1) In the beginning, I focused on my research.

(2) Between 1958 and 1966 I had no interaction with computers. At a party in 1966, Herb Wilf and I began speaking about using computers to help students learn calculus. That year we each began teaching "computer calculus." At that time, all University computing was done on a mainframe several blocks away from the math department. We set up a room in our building with IBM key punches. The students used Fortran which was punched on cards that were trucked to the computer center and run overnight. The output was delivered back the next day. This was a very time consuming activity. If a student made a key punch error, he or she might have to submit a program several times before getting an answer. Each submission meant 24 hour turnaround.



IBM Punch Cards

IBM Key Punch

Because of my use of computing, I became active, served on, and chaired University wide and school based computer committees.

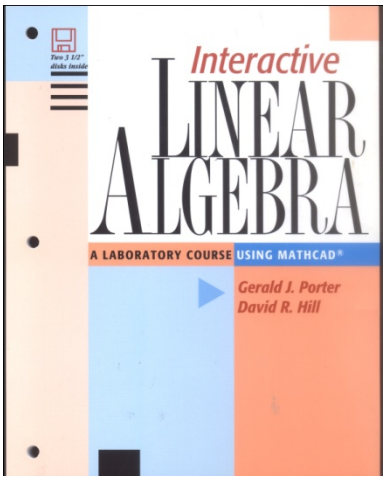
In 1980, I became Associate Dean for Computing in the School of Arts and Sciences. When I assumed this position, the School had 3 labs of microcomputers (TRS80s and Commodore Pets) and spent about $200,000 a year on research computing. Almost no one had access to email.

I continued in that position until 1990. These were very exciting years to be involved with computing. When I left the position, almost all faculty had a PC on their desk and used email. Research computing

was done on a $million plus supercomputer. There were computer labs for students to use located all over campus. This was a very satisfying period in my career.

IBM 3090 Supercomputer

(3) There is a parallel thread to my computing activities described above and my involvement in activities with regard to computing in the MAA. I discuss that later but in the 1990's the two came together, I had been running a project called the Interactive Mathematics Text Project for the MAA. This was funded by IBM and NSF to the tune of perhaps $3 million. The aim of the project was to encourage the use of computer based interactive math texts. When I stopped being Associate Dean, I thought it was time for me to do what I had been encouraging others to do. Dave Hill at Temple and I submitted a proposal to FIPSE for the creation of an interactive linear algebra text. The proposal was funded and we authored "Interactive Linear Algebra, A Laboratory Course using Mathcad." This was published by Springer and although it is currently out of print, can be downloaded from my web site. The idea was to use Active Learning to improve the learning of linear algebra and retention of that knowledge.



Dennis DeTurck was the PI on a mathematics across the curriculum project. When he became department chair he asked me to take the project over. One of the most difficult aspects of such proposals is dissemination. To deal with this, I created an online journal, the Journal of Mathematics and its Applications or JOMA. At some point I realized that this needed to grow beyond our project or else die. At that point the journal was taken over by the MAA and David Smith became the editor. For several years it was a part of MathDL. More recently it has been merged into Loci which is an important component of MathDL.

(4) Since 1992 I have been heavily involved with governance at Penn. From 1992 to 1995 I was Chair-Elect, Chair, and Past Chair of the Penn Faculty Senate. In 2001-2, I served a second term as Past Chair when the designated Past Chair resigned to become an administrator.

In 2000-01, I chaired a task force that considered the entire issue of privacy of personal information. The report of that task force led to the University ceasing to use social security numbers as student identifiers and eventually, to Blue Cross stopping the practice as well. In addition, Penn became the first school to create the position of Chief Privacy Officer.

More recently, I've chaired the University's social responsibility advisory committee. This committee advises the trustees on the voting of social action proxies. In particular, the work of this

committee led to the trustees' decision not to invest in any companies that were related to the genocide in Darfur.

(5) I'm still busy on campus as an emeritus professor. This year I am the President of the Penn Association of Senior and Emeritus Faculty (PASEF). PASEF's goal is to enable emeritus faculty to maintain their intellectual and social connections with the University. To accomplish this we hold, luncheons and sponsor lectures. It is also our role to mentor our colleagues who are considering retirement.

In summary, it's been great to keep changing careers without changing jobs.