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(interviewed by Kenneth A. Ross)

When did you get interested in mathematics?

I was good at mathematics in high school. Moreover, my dad strongly encouraged my academic pursuits. His formal schooling stopped at 8th grade, so his education was limited, but he certainly supported mine, especially since I was an only child.

I started out in electrical engineering in college, but I interned at Commonwealth Edison Company (in Illinois) and did not enjoy that experience. Meanwhile, I really enjoyed working with young kids in our church, so I decided I'd rather be a teacher. At this point, I was a junior in college, so it was an easy transition from an electrical engineering major to working toward teaching mathematics.

What did your parents do?

My father worked for a pipe fabricating company and ended up in sales. Most folks in Cicero, where I grew up, had an assembly-line job, so there was real motivation to get an education that would allow you to escape the line. My mother was a housewife.

What was the special attraction of mathematics?

It provided an opportunity to teach something, and of course it would lead to a job. For a long time, my goal was to teach mathematics in high school.

I know you grew up in Chicago. Where did you go to school?

Actually, I grew up in the town that Al Capone made famous, Cicero, and I attended Morton High School, which was named for the salt tycoon. There was a girl, Joelyn Smidl, who in keeping with the alphabetical seating in those days, always sat behind me. She was very good in high school mathematics, and I felt competitive with her. Incidentally, I learned years later that for some reason, even in our blue collar community, she did not feel that she was discouraged in mathematics because she was a girl. She chose to go to the University of Colorado where she studied languages.

After high school, I went to Morton Community College, which was in the same building as the high school! There I had a very demanding teacher, Alice Tucker, who taught the advanced mathematics. She was tough, but good for the good students. More than half of the students in my calculus class went on to earn a

Ph.D. There were no girls in her classes. Miss Tucker later influenced me to go to the University of Wisconsin, her alma mater.

Miss Tucker was near the end of her career. She had been a great teacher and a model for me, except for one thing: she hadn't stayed alive mathematically, which I soon realized was a big mistake. Here's the story. When I graduated from Illinois Institute of Technology (IIT), I planned to get a Master's Degree, and then teach. I applied to the University of Illinois, in my home state, and to the University of Wisconsin, which was actually closer to Chicago. I supplied three references: Miss Tucker, my church pastor, and a paint-store boss for whom I had worked.

I didn't hear from either school, so I drove up to Madison and talked to the department chair, C. C. MacDuffee, who was a very proper gentleman. He looked at my file and commented that at Wisconsin, they relied heavily on recommendations. "Why did you use a pastor, a paint store man, and Miss Tucker?" (because I was naïve.) He told me that the only reference that would count for anything would be the one from a mathematics teacher, but he had never heard of Miss Tucker. He had in fact learned that she hadn't published anything, and she didn't belong to either the MAA or AMS.

He then asked if I had been in any of Karl Menger's classes at IIT. I indicated that I'd taken a couple of courses from him, but he didn't know me as well as Miss Tucker. "That may be," he told me, "but I do know of him." MacDuffee told me to get a letter from Menger. After consulting his grade book, Menger told me he would be happy to write, and a week later I had a fellowship from Wisconsin. This encounter with MacDuffee was a great lesson for me.

Tell me about your transition from Morton Community College to Illinois Institute of Technology to the University of Wisconsin.

The curriculum at Morton Junior College was structured with the idea that graduates would all be going on to a four-year school, usually the University of Illinois Chicago campus or one of the state colleges. The Junior College faculty took great pride in having their students do well when they moved on to a four-year school, and the very good experience I had there was certainly instrumental in my later decision to want to teach in a small college.

So you went to the University of Wisconsin. Then what?

I still planned to teach high school, but when I said that my plan was to get a master's degree in math/education, MacDuffee virtually forbid it. His idea was that I had taken far more mathematics as an undergraduate at IIT than was usual, and that I should not waste that advantage by not getting my degree in mathematics. I learned later that MacDuffee had a running battle with the Education Department. I can hear him yet, when making us learn almost

verbatim certain proofs from his abstract algebra book, intoning, "My friends in Education tell me that memorization without understanding is useless, but I tell them that understanding without memorization is hopeless."

In my last semester of work for the master's degree, Creighton Buck who later became my wonderful mentor, called me in to his office to ask why I wasn't going on for a Ph.D. Nevertheless, I returned to Morton High School with the intention of teaching there. However, Miss Tucker had just retired, and they needed someone to teach her more advanced courses, so I ended up teaching calculus and differential equations at Morton Junior College. I didn't want to disappear from the mathematical world as she had, so I attended MAA section meetings and read the *Monthly*. After four years at Morton Junior College, I decided that Buck was right: I should get a Ph.D.

This was the time of Sputnik, so I applied for an NSF fellowship to help me finish my doctorate at the University of Wisconsin. I went back to Buck and told him that he was right and that I was wrong. He served as my mathematical godfather and, in fact, he supervised my Ph.D. thesis work. I obtained my Ph.D. in 1965; my thesis was about Fréchet derivatives in Banach spaces and other settings. Buck treated me wonderfully and we became good friends. One of the greatest compliments of my life came when, at the time of his death, his wife Ellen invited me to give the eulogy.

Then you looked for a job, I reckon.

Yes. My goal was to find a small college in a relatively large city. I was lucky enough to get a job at Macalester College in St. Paul. I plunged into my teaching and into MAA activities, because I felt that they were important. Early on I was asked to be the Minnesota coordinator of the American High School Mathematics Examination (AHSME). I suspect that Buck had recommended me. I was also involved with the NSF Undergraduate Research Program (URP), the program where I first met Joe Gallian. I developed the Macalester program as a cooperative program with local industry that in those days included many of the world leaders (Univac, Control Data, Cray) of the main frame computer industry. Some Washington, DC publication identified me as a young man making an innovative difference. Why me? Buck, of course, had recommended me. At this time, Buck was chair of CUPM.

I understand that you are founder and Director of the Minnesota State High School Mathematics League. Can you tell me about that?

Gladly. This is a long story. When I began as coordinator of the AHSME in Minnesota, exams were graded by the high school teachers. Prior to my becoming coordinator, it had been noted that students in a high school in western Minnesota performed suspiciously well. Investigation showed that a teacher had cheated to make his students look better. Minnesota changed the system. Each answer sheet had a carbon which was sent to me before we sent answers to the

teachers. Teachers then graded the originals, reported their top three scores, and I had to re-grade the carbon copies of the top papers.. Three papers from each of several hundred schools made a lot of work for me, so I was highly motivated to enlist the aid of my friends in the computer industry. I did so, thus getting ahead of the curve in machine scoring, so Walter Mientka learned the procedures from me that were ultimately instituted nationally. This is how Walter and I first became friends.

The top scores on the AHSME in Minnesota were among the lowest of the top scores reported in the nation, so much so that the best students in Minnesota wouldn't have gotten honorable mention if they competed in any other region. This wasn't because of rampant cheating elsewhere. Minnesota students weren't doing well because we weren't doing much for our best students.

On sabbatical at M.I.T. in 1979, I decided to visit Hamilton-Wenham High School in Massachusetts because I knew from reading national results that their students did very well on the AHSME. I learned that it was, by my standards, a small school that didn't even have Advanced Placement courses at the time. Moreover, this was a wealthy area where many students went to private schools, and school bond issues regularly failed. Why did the kids do well? The secret, they said, was the Eastern Massachusetts Mathematics League, which I then investigated.

Back in Minnesota, I went to the Univac Company and others where the URP programs gave me entree, and explained that we needed a mathematics league so that we could do more in Minnesota for our best students. One evening I talked with a vice president of Univac about this. He asked what I needed. I said I had been counseled to start small, so I would like \$1000 for each of four mathematics coaches and \$1000 for me to devote a summer month to writing questions and recruiting high schools. He pulled out a checkbook and, on behalf of Univac, wrote me a check for \$5000. This was in 1980, and wouldn't happen today. Univac continued its support, and I continued to direct our League for 29 years, until 2009. The League has become a staple of Minnesota education, involving about 175 schools, and these days Minnesota students are nationally competitive!

And tell me something about the Scholars of Distinction in Mathematics.

Compared to the League, this is a minor chapter in my life. This was to be a statewide program, which the State Department of Education asked me to set up. It was to be funded by the state, but I had a hard time getting the legislators interested in it. They argued that the best students will do fine whatever we do, so the state should focus on the students in trouble. Then one day I asked whether it made sense to have bantam hockey leagues for the best little athletes in the state. Wouldn't the best athletes do just fine without special programs?

Should we not concentrate on the couch potatoes? This analogy helped get funding, but it ran out after a couple of years.

Though the program was doomed by lack of funding from the beginning, I enlisted the help of Joe Gallian for the short time that it functioned well, and I think we had a great model of a program that should be revived some day. The idea was that kids would be identified by performance on various exams, do a special project, and give three presentations at conferences. If they completed the program, they would be named a Scholar of Distinction upon graduation. One reason that it failed was that I have always been reluctant to ask for more work without additional remuneration from the high school teachers.

Have you enjoyed being Parliamentarian for the Board of Governors?

I was pleased to be asked by Ann Watkins and Martha Siegel to assume this position. This was originally in anticipation of some controversy at a business meeting, but then it became permanent. I find the position interesting at times, but I'm not sure an institutionalized parliamentarian is needed. I often feel like a fifth wheel. I was glad when I was asked to chair a committee to revise the bylaws; that gave me a feeling of contributing something useful. I hope it does not sound gratuitous to say that it also gave me a chance to work closely with you, as well with a few other highly visible leaders that I got to know a lot better during the two years it took to work our way through that task. I came away more convinced than ever that the MAA has been very well served by some dedicated leadership.

What is your best memory of your work in the MAA? your worst?

I only have good memories. The MAA has been very important for my career. My invitation to work on MAA High School Exams in Minnesota led to my life-long work with the Minnesota State High School Mathematics League, easily the most satisfying experience of my professional life.

Also important were my appointments to CUPM and CRAFTY (Curriculum Reform and the First Two Years, later changed to Curriculum Renewal Across the First Two Years). I chaired CUPM for two years and CRAFTY for three or four years. In CRAFTY, I worked closely with Tom Tucker and David Smith. While on CRAFTY, I felt that there was a big need for better problems, problems that aren't trivialized by a calculator and which have modern applications. This led to my being the director of a project that produced the five-volume Resources in Calculus series, which was published by the MAA. Don Albers told me that the series was a big seller for the MAA.

What changes have you seen in the MAA since you first became involved?

It is more professionally managed. Here's an example from the early 1990s.

The NSF wanted to disseminate the materials developed in programs they had funded in the so-called “calculus reform” years. Don Small and I were actually invited to submit a big grant proposal to support national dissemination. It would have been natural for the MAA to be the fiscal agent, but due to some internal disagreements, the MAA decided that they were not set up for such an arrangement. To salvage the proposal, which was almost certain to be funded, I arranged at the last minute for Macalester to be the fiscal agent. The college was pleased.

Tell me about your involvement in the North Central Section.

It was through our section that I launched my short but very entertaining career as a writer trying to explain mathematics to the general public. It happened that the 1991 spring meeting of our section occurred just as the national Mathematical Awareness week was being kicked off, and on that very day, national columnist Colman McCarthy wrote a column belittling the idea of requiring all high school students to study algebra. It was an outrageous article that contained such statements as, “Algebra isn’t essential to much of anything,” “Algebra has little to do with mathematics,” “Too many of us were forced to take algebra when time and energy could have been devoted to subjects that were truly beneficial,” and he wound up with a flourish indicating that the study of algebra should, like the study of Sanskrit, be left for those who choose to wallow in it.

A copy of the McCarthy article was distributed to those at the section meeting, resulting in a motion just before lunch calling upon Lynn Steen and me to write a rebuttal. It was an easy article to answer, and when I showed Lynn a response that I wrote during lunch, he decided that a quick response was of the essence, so he withdrew from the assignment, and my response was sent. A number of papers around the country ran my article, and when Keith Devlin later reproduced McCarthy’s article and my response in FOCUS, my short career as a spokesperson for mathematics in the popular press began.

The next step came when Kathleen Holmay, Public Information Director for the Joint Policy Board for Mathematics, sent to me a problem relating to baseball that had appeared in the 1992 Michigan Mathematics Prize Competition. She wondered if I might use this and other baseball puzzlers to write a series of articles that could be run in daily newspapers during the 1992 Mathematical Awareness Week. I greatly enjoyed that assignment, and produced a series that got used in a few, a very few, newspapers around the country. That anemic reception ended my short career as a writer in the daily press.

I could have had a more enduring career as a writer, I think, if I could have gotten Colman McCarthy to write as a foil for me. Several years after our exchange, he came to Carleton College as a speaker, and the Mathematics department invited us to debate the role of mathematics in general education. I accepted the invitation, but he declined.

I did serve the section as secretary for a while, and in 1996 I received the Section's Certificate for Meritorious Service.

What personalities have stood out in the mathematical community, both in the MAA and in the community at large?

I've already mentioned the importance of Alice Tucker, C. C. MacDuffee and Creighton Buck in my life. David Smith was helpful in more than one way. An article he wrote on mathematical modeling was very helpful. And, of course, he was one of the key leaders in calculus reform.

Early in my career, Victor Klee, at the University of Washington, treated me wonderfully. I had taken my interest in convex functions at Wisconsin to Macalester, where the subject was a good source of undergraduate research projects in some URP programs that I supervised in conjunction with Dale Varberg who taught at the neighboring Hamline University. In time, Dale and I noticed that there was no suitable book on convex functions, so we decided to write such a book. We invited Victor Klee to Macalester to see what we were doing, and he encouraged us to write the book; in fact he encouraged us to use our sabbaticals to visit the University of Washington where we could write the book, and he would read it and make suggestions.

It turned out that Klee went to IBM for that year, but he kept his promise by visiting the University of Washington frequently and helping us while there. In addition, I used his office. His files were amazingly complete and extremely helpful. For most papers, there were attached notes, correspondence with the authors, and so on. It was a real treasure trove. The year in Washington also began one of the best and most influential friendships of my life. Dale Varberg and I share common interests in mathematics, in travel with our families, and in our interest in understanding our Christian faith.