Know Your Wisconsin Mathematician

Interview with Robert Wilson, Jr. (UW-Madison), by Benjamin V.C. Collins

Where did you grow up?
Many people say I never really grew up.

We moved around a lot, but probably Knoxville, TN, ages 5-14, was the most formative.

Was there a time in your life when you discovered that mathematics was what you wanted to do?
I never really wanted to do anything else, but I probably only thought of it as a career sometime late in high school.

Where did you go to undergraduate school?
Ohio Wesleyan University. My family had just moved there, where my father was brought in as head of the math department, so we were freshmen together.

Where did you go to graduate school?
UW-Madison.

Your father was also a mathematician. Did you feel any pressure following him into the "family business"?
I never felt specific pressure. In fact, my father (as head of the math department) was astonished when he saw the paperwork declaring my math major. He thought I was going into physics. But at the same time, my grandfather and an uncle were also mathematicians and the whole family sort of "talked math" much of the time. So while there was not pressure, there was definitely an ambience. (One of my brothers was also a mathematician, as is one of my daughters. My sister and another brother are in CS. And my granddaughter is now a second-year grad student in math at another university. So that ambience has had extended influence.)

Are there any teachers who had influenced you to become a mathematician?
Most of all, of course, my father. He was an excellent teacher and he also won MAA teaching awards. In fact, he was a teacher I had as an undergraduate. At a small school that was a sure thing. He held me to a high standard and gave me my lowest grade in math. That was a B in ODE. He said I had been on the A-B borderline all semester and he would have given anybody else the benefit of the doubt and given them an A. In my case, he had seen me all semester not working so there was no doubt.

I have to say my memories of most of my math teachers before grad school are not very positive, though.

How did you end up at UW-Madison?
Again, my father was a big influence. His Ph.D. was also from Madison. (He was a student of C. C. MacDuffee, starting before WWII and finishing in 1947.) He remembered the place fondly. I only applied to Madison and Penn State. Penn State offered me one of the NSF fellowships of that time that could only be used at one school, but I also got a Woodrow Wilson fellowship which could be taken anywhere (although it paid a lot less and was only good for one year). I chose to come to Madison and use the Woodrow Wilson fellowship.

Over the years, your interests shifted from pure math research to mathematics education. What factors influenced that interest? What did you learn about the teaching and learning of mathematics?
I enjoyed working alongside John Harvey, who also was an algebraist who migrated into Math Ed. He established Ph.D. program in Math Ed within the math department, with the same prelims, etc. When he retired, I did not want to see the program die. So despite a lack of credentials, I tried to keep that going, and had two Ph.D. students of my own in Math Ed.

I eventually settled on one particular research interest, again something for which I had no credentials: What is the impact of "culture" on learning math? To clarify what I mean: In the Math Ed seminar I ran, one day a student was giving a talk about a particular paper. A faculty

colleague broke in with the comment (approximately) “If the US would adopt the Singapore math materials, all our problems would be fixed.” I did not want to extend the interruption of the speaker, but I had to say (again approximately) “Those are great books, but they would take some modification before they could be used in all of our schools.” The colleague replied (exactly, not an approximation) “Students are the same everywhere.” Now they may (or may not) be physiologically the same in all countries, but a student brings a lot of baggage to school that is *not* the same everywhere. Take, for example, the answer to the question “What does it take to succeed in math?” Survey data show that in Japan a typical answer is “Hard Work”, while in the U.S. it is “A Special Gift”. We could probably all agree that to win a Field medal takes both! But the question was asked about “ordinary” K-12 mathematics. I think a student might well learn differently if his/her parents said “get to work” rather than “doing badly in math is OK, Mommy and Daddy never learned that either.” I have lots of anecdotal evidence but I am not a sociologist and don’t really even know how to define culture.

What courses do you like to teach?
Almost any. In any course, from remedial math to advanced undergraduate major courses, there will be some students who are fun to teach, and some who are not. I remember teaching a “business calculus” large lecture, talking about the epsilon/delta definition of the limit, and having two students come up afterwards to ask me “How does that relate to Zeno’s paradox?” I suspect their interest was in a small minority, but it made it all worthwhile! I never got that neat a question in the science-oriented calculus sequence. (Even if my answer had to be that the careful definition seemed to me to make the paradox disappear.)

Over the years, did you find that teaching of mathematics changed?
Of course there are changes in details, like MOOCs and homework managing systems. I don’t think we yet know how all of that will turn out. But in a different area, sadly, I think more students these days have a feeling of “entitlement” that excuses their not working. My last semester teaching, and one of the reasons it was the last, I had a lot of them. One, for example, had gotten an F on each of three mid-term exams and a resounding F on the final, and could not believe that could result in a failing grade for the course!

Where do you think mathematics is going? Where do you think it should go?
Mathematics is certainly growing rapidly. Some of the areas that are booming are doing so because computing makes possible both different research strategies and different applications. For example, there is great emphasis these days on kinds of mathematics that can be used in data security. (When I worked for seven years in industry, I was involved in this both for commercial purposes and for the government.) In many cases, the mathematics derives from work done in the first decades of the twentieth century, but now using, in addition to lots of hard but traditional work, lots of computing power. It’s also true that it is enormous computing power that makes data security necessary in the first place.

While I enjoy that kind of mathematics and continue to follow it (mostly as a spectator) I hope that other areas don’t suffer. But I am sure that some will eventually disappear. The area of my grandfather’s Ph.D. thesis, Functional Equations, is entirely unheard of these days. I sometimes think I could use some of it in cryptography, so far with no success. Short of something like that, I don’t think it is likely to reappear. I expect some of the things I had to study (and pass prelims on) in grad school will do likewise.

How were you involved with the MAA over the years?
I grew up in an MAA household! But I was not very active myself, other than going to regional and national meetings, until maybe 15 years ago. My main organized involvement was being chair of the Wisconsin Section one year, with the expected duties also the years before and after. But I have also tried to be a “salesman” for the MAA among grad students. Although they are likely to be seeing themselves mostly as researchers, they are likely to spend most of their careers in situations that are principally concerned with teaching, where the MAA places most of its emphasis.

What do you think is the best part of being a mathematician?
I am not sure how to rank them. I certainly enjoy facing almost everything with a mathematician’s mode of thinking. Over the years I have been (as an amateur) a race car driver and mechanic, (as an amateur and professionally) an astronomer and a photographer. I have gotten back into

ham radio. I can't imagine thinking about either how to improve my race car engine or how to design a modern transmitter without both a mathematician's logic and also specific tools. Others working with me on such a project have frequently pointed out my mode of thinking. (Current editions of what used to be called "The Radio Amateur's Handbook" are filled with references to Hilbert transforms, Fourier series, etc.) I have always enjoyed talking with other mathematicians, who are usually clear-spoken and talk about things they understand and generally don't try to give edicts on things they don't understand. And a little part of me is proud of a theorem or two that will still be "mine" when the sun no longer shines.

What was the worst part of teaching mathematics?
Probably the bureaucracy, but that applies to all subjects and not just math. Specifically about teaching *mathematics*, and this relates to the culture interest above, is fighting the prejudices students bring in as to what mathematics is and why they hate it.

How would you describe what you did when you were talking to somebody outside of mathematics?
Both trying to discover inescapable truths and encouraging students to look for truth also. When in industry, one thing I worked on was being able to prove (with a QED at the end) statements about computing systems. Both the limitations of that endeavor and the merits were things that lay people could understand.

What of your work do you like the best? What are you most proud of?
While I won several larger scale teaching awards, I think I maybe was most proud of the ones that came spontaneously from something like a wing of a dormitory. I like to think that my work in computer security made the world a very tiny bit safer. I was very happy a couple of years ago when someone named a (not terribly important!) mathematical construction after me.

What is your advice to college students and new teachers?
My strongest advice to students is to find something they enjoy doing. It must be terrible to spend your entire career doing something you hate, just because some counselor said it paid well or there were lots of jobs.

To teachers: You presumably love math, since you chose to go into it. Try to show students how great it is, and why you love it, and maybe they can learn to love it at least a little bit also.

Do you have any other comments?
One thing that I think is relevant both in our national worries about education and particularly in Wisconsin as we debate our college emphases: When I was a manager in industry, one of my biggest problems was convincing the personnel office that I wanted to hire people who could think, not people with particular skills. For example, I had to hire people to work on a computing project that involved a million lines of code, would execute distributed all over Europe, and was being programmed by a team of over a hundred people. A new CS major typically thought he knew how to program because he had written some "toy" program of at most a few thousand lines. He knew nothing about how to work with others, how to make big pieces fit together, etc. I'd far rather hire a bright English major who knew he/she had a lot to learn than one who thought he had all the tools ready to apply.

Who is a Wisconsin Mathematician that you would like to know? Send suggestions for the next KYWM to Ben Collins, collinbe@uwplatt.edu .