Know Your Wisconsin Mathematician

Interview with David Scott, Ripon College, by Benjamin V.C. Collins

Where did you grow up?

My father was a chemistry professor, and we moved quite a bit as he searched for the place that matched his desires. I was born in Berkeley, CA, but moved very soon to Amherst, MA, when he exchanged the University of California for Amherst College. That is where I started school. I then spent two years in Richmond, IN, while he was based at Earlham College working on a high school textbook project. But mostly I grew up in Ripon because he found what he wanted at Ripon College.

When did you decide that mathematics was what you wanted to do with your life?

That's difficult to say. I always enjoyed mathematics, but I liked lots of other things as well. In college, I took two and sometimes three math courses each semester after my first year, but I also studied a lot of foreign languages and could easily have ended up in linguistics, I think. If I were young now, I might be looking at cognitive science. I suppose really mathematics was my default setting, however, from middle school on, and I never moved away from it.

Are there any teachers who had influenced you to become a mathematician?

I had many math teachers who influenced me in a lot of ways, but I suspect that my sixth grade teacher and a high school teacher probably set me on the path. The sixth grade teacher gave us all the assignments for the year and set us free to work at our own speed. I finished sixth and seventh grade math in one year, did eighth grade math independently the next year, and walked over to the high school for algebra as an eighth grader. Partway through my geometry course the following year, my teacher let me go at my own pace, so I finished a couple more courses that year and took the Math 4 course as a sophomore. Being given the freedom to go at my own pace certainly strengthened my liking for mathematics, and the high school teacher also introduced me to the UW-Madison Math Talent Search. I really enjoyed working on the problems. At the college level, **John Greever** at Harvey Mudd College influenced me greatly with the modified Moore method approach he used in his topology course.

What was the influence of your family on your education?

Education was very important in my family, particularly the idea of a well-rounded education. As the fourth of seven children, I had lots of role models in addition to my parents. Both my parents were very active in the schools at all levels, and our wide ranging conversations at meals often drove my mother to fetch a dictionary or encyclopedia volume to support an argument or answer a question, sometimes to the disgust of my father who would have preferred less bustle while eating his meals. My oldest sibling knew he wanted to be a math professor from the age of three. He taught himself from University of Illinois materials and SMSG materials being developed in the 60's that my father procured for him, and was taking math at the college by the age of 14 or 15. So I had a very specific role model in mathematics education. However, like all of my siblings, he had lots of other interests, so there were many things going on in our house – but especially reading books.

Where did you go to undergraduate school?

I went to Pomona College, one of the Claremont Colleges. My brother had gone there because he wanted a small liberal arts college but needed more math courses than most colleges could supply,

because he had started taking college courses so early. The ability to take courses at any of the Claremont Colleges offered him the small setting with lots of course opportunities. My oldest sister followed him, so the college went on my list of possible schools when it was my turn to find a place. In the end, I actually based my decision more on the chance to play soccer and go to the national tournament – a goal I achieved there – than on anything else. (Although a very good financial aid offer helped too.) I certainly took advantage of the opportunity to take classes away from Pomona – particularly at Harvey Mudd College and Claremont Graduate School.

And what about graduate school?

Once again, I followed my brother, this time to Madison, where he had been a **Mary Ellen Rudin** student. I had very much enjoyed **John Greever's** topology course at Harvey Mudd, as well as a second topology course I had taken at Claremont Graduate School and thought set theoretic topology would be good to pursue. In retrospect, it has often occurred to me that my path was too easy. I had received a fellowship that would pay for my senior year at Pomona as well as two years of any further study at any institution. In combination with a good record, that pretty much ensured I could go wherever I wanted. Instead of using that to my advantage and thinking deeply about the future, I really just took the path of least resistance. Although I enjoyed my graduate school experiences, I might have made different choices had I thought more deeply about my future.

How did you end up at Ripon?

It was totally unplanned. After four years at Madison, I left without finishing. I had had significant surgery and was devoting time to rehab, but more importantly, although possibly related, I was also less sure about what I wanted to do. I went home to consider things, was asked to coach the Ripon College soccer team, and then had a chance to become an adjunct in the math department when **Norm Loomer** went on sabbatical. I was also teaching as an adjunct at UW-Fond du Lac and UW-Oshkosh. I really enjoyed teaching and had the chance to compare three rather different student populations. I was kept on at Ripon after Norm returned, and when he moved to Albion College one year later I replaced him, first temporarily and then on a tenure track contract.

What courses do you like to teach?

I get a great deal of enjoyment out of teaching almost anything, because I like seeing lights go on. Having said that, I particularly enjoy teaching topics from discrete mathematics of all sorts, and I like developing student ability to deal with abstraction and logical thinking. We have a mid-level geometry course that I particularly enjoy, and at the upper level, I like algebra and topology. But most students arrive at college with such a limited understanding of mathematics that discrete mathematics topics take them out of their comfort zones and open their eyes very quickly. I find I can make a lot of progress with many of them in such a setting. Of course at Ripon, with a small faculty, I often get to teach them repeatedly as they move through the major, and that is extremely rewarding. It is much easier to help them progress when you know their strengths and weaknesses well.

Over the years, did you find that teaching of mathematics changed?

I think mathematics teaching has moved in the direction of student-centered approaches with an emphasis on active learning. Inquiry based learning and the flipped classroom are approaches that are growing in popularity. Of course, the Moore method could be viewed as an ancestor, so topologists have been aware of such ideas for a long time. However, I would say that the teaching of mathematics in general has changed more than my own teaching has changed. I had the good fortune to have parents who were in many ways quite progressive pedagogically, and an older

brother, a topologist, who was progressive as a mathematics teacher. So I had the benefit of hours of discussion of pedagogy as I was going through school (and I mean from grade school on) and getting into the profession. Then I ended up at a small college, where one can probably experiment more easily, working with colleagues who were interested in improving pedagogy. I have always been a believer in a focus on student learning and have continued to tweak my approaches to teaching with that in mind.

Changes in student behavior and student preparation have caused me to change some things, however. It is not that students are better prepared or more poorly prepared. I haven't seen much difference over the years in that regard. Some are well prepared in general and some are not. We don't get huge numbers of the really poorly prepared at Ripon, so I have been dealing with a rather skewed sample. When I started, however, most students had seen set notation and understood basic ideas about sets, due to the fact that much of elementary school mathematics teaching was built on ideas about sets. Now I find that many of the best students are seeing these things for the first time, or claim to be. That does affect the way I approach things now; I am much more sensitive to the issue of prior knowledge. I also find that good students are less comfortable than they used to be with the idea that there might be problems on a problem set they won't manage to solve, and I need to spend a great deal of time trying to make them comfortable with that idea. Finally, more of them work longer hours to earn money – with good reason – and that needs to be taken into consideration.

What do you think is the future of mathematics education?

I am reluctant to predict the future of most things; however, I suspect that the trend toward student-centered approaches will continue. Certainly, we are all pretty convinced that active learning is necessary; it's just a question of how to achieve active learning. I personally believe that the strength of the Core Curriculum lies in the practice standards, but that these ideas will be the most difficult for many teachers to work with. If they can, however, I think undergraduate mathematics education could change quite a bit. I am a firm believer in teaching students how to learn, and if they come better prepared in that regard, conceptual understanding will be easier to develop. Currently, mathematics is pretty widely viewed as procedural or algorithmic among non-mathematicians, and many students can survive through quite a few classes with little understanding of the core ideas. I hope we are going to come to grips with that increasingly in the future. I would like to see the proliferation of good quantitative reasoning courses in high schools; I think such approaches would help make mathematics a more functional part of the student experience and open the door to improved understanding and appreciation of mathematics.

How were you involved with the MAA over the years?

I was aware of the MAA early on, but when I came to Ripon, everyone was involved, so it was just natural to become active. At that time it was quite usual to ask young faculty to serve as room monitors at the spring meeting, so that was my first official involvement beyond membership. Going to the spring meeting was a great way to meet people as well as a chance to listen to some interesting talks. Ripon faculty had served as section chairs in the past, and Ripon had hosted a meeting, so the idea of the MAA was always in the background. **Bob Fraga** came to Ripon shortly after I did, and he was very involved, serving as a particularly active section chair. Later, our department decided we would like to host the spring meeting when **Wayne Larson** retired from Ripon, and I took care of all of the local arrangements, so I got a crash course in what it takes. Then I was asked to stand for chair and eventually was elected and served my three years. I have since

been asked to stand for governor a couple of times and have been willing, but the section has had some great alternatives and has chosen wisely. Then I led another push for Ripon to host just recently and took care of most of the arrangements again. I believe that the organization has done some very nice things over the years and provides a variety of tremendous resources. Involvement for me is a win-win. I get lots out of my involvement, and when the MAA can use my help I am happy to supply it, but I have lots of other things to keep me busy. I feel much the same way about my six terms on the Ripon School Board. When they don't want me I will have plenty of other things to do, but I like contributing.

What do you think is the best part of being a mathematician?

That is a really difficult question to answer, and it is part of the dilemma I faced in graduate school. I have so many interests outside of mathematics. Much of what attracted me to mathematics and what I enjoy most is pitting myself against interesting problems and wrestling with them. However, I find lots of problems (including small ones that others know the answers to but I don't) interesting, and I can wrestle with problems in other arenas as well, getting very much the same satisfaction and enjoyment. Still mathematics been good for me. It has contributed greatly to my ability to think logically; express myself clearly, precisely, and concisely; recognize analogous situations; and entertain hypotheticals without prejudice. Mathematics is not necessary for the development of any of these things, but for me it has been a great help. To be honest, however, my greatest satisfaction comes from teaching mathematics.

What was the worst part of teaching mathematics?

I can't think of anything that I would describe this way. There are challenges and frustrations associated with teaching anything. I am always amazed at teachers who don't change anything, because my students almost never do as well as I would like them to do. I am always thinking about what I could do to help them make more progress, and the term always ends too soon! Also, the fact that I see students repeatedly over four years makes it really clear how much they don't internalize. To be fair, it is also quite clear how far many of them have come. But perhaps my biggest frustration is the way grades continue to be the tail wagging the dog. Students too often think in terms of how to get a good grade rather than how to understand the material – and our culture encourages them.

What is your advice to new teachers?

Be patient and flexible, think about your students' lives outside of your classroom, and have a sense of humor. You shouldn't be afraid to admit that you don't know something, but you don't necessarily have to advertise it either. Try to get your students involved, but remember that you can neither force them to learn nor keep them from learning. They do the learning, so think about how to create an environment where they will learn. It should include prompt and accurate feedback. Finally, while content mastery cannot be ignored, it isn't necessarily the most important thing. Process, habits of thought, and communication are all examples of things that may affect students' lives much more in the long run.

What of your work do you like the best? What are you most proud of?

I consider my work teaching, and I look at what I do in the context of contributing to the development of adults who can and will teach themselves – in many areas, not just mathematics – as they move through life. Living responsibly requires numeracy in its widest meaning, and I enjoy pushing against the widespread acceptance of innumeracy. I am proud of the small local gains I have made in that fight, students who left my classes with a changed feeling about mathematics or a

better understanding of what mathematics is, and I am proud of the many students I have had who have gone on to succeed in mathematical studies or careers. I am happy that I have been pretty successful in maintaining high standards in my classes – which for many students translates into lower grades than they were hoping for – while getting students to understand why I teach the way I do. My daughter once said that she couldn't ask my wife for school help because she would be forced to get out her book and look through the relevant material to see if she could answer her own questions, and she couldn't ask me because I would just ask her questions back again. All she wanted was to finish her homework. My students often feel the same way, I suspect. "He makes us think," has been both a commendation and a criticism. But some students do come to appreciate what I am doing. One former student nominated me for a local teaching award saying that he hoped he would be able to teach others the same way. I don't know if he does, but he is himself the recipient of an MAA Section Teaching Award. If I had significant influence on his development in that regard, I am very proud of that, because I really believe that teaching is an extremely important but undervalued profession.

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