Know Your Wisconsin Mathematician

Interview with Professor Melanie Matchett Wood, by Benjamin V.C. Collins

Where did you grow up?
I grew up in Indianapolis, Indiana.

Was there a time in your life when you discovered that mathematics was what you wanted to do?
I started seriously thinking about a career in math academia when I was working on a research problem through the PRUV program as an undergraduate at Duke University. I was so delighted to make progress on the problem and understand new features of the mathematics that I felt like this is something that I would really want to do for a job.

I had previously done research at the University of Minnesota-Duluth REU where I had first learned what research math was like, but perhaps more importantly made a lot of connections with people on the academic path so I knew what I would need to do to become a mathematician.

Where did you go to undergraduate and graduate school?
I was an undergraduate at Duke, spent a year at the University of Cambridge doing Part III of the Mathematical Tripos (which is like a master's program), and then did my PhD at Princeton.

What was the influence of your family on your education?
My mom was a teacher and school administrator and instilled in me a love of learning. Thanks to that, I loved school and all different subjects. My mom also supported me in whatever I was interested in, so when I started doing a lot of math competitions in middle and high school, she was always encouraging in whatever I wanted to do but never directed or pushed my interests.

Are there any teachers who had influenced you to become a mathematician?
There were a lot of math teachers that were important in my development as a mathematician. Bob Fischer was the Indiana state coach for Mathcounts and the first person who gave me a lot of problems I didn't know how to solve. Joanne Black was a high school teacher that supported all of my preparation for Math Olympiads andhelped find solutions for me to keep learning mathematics after I had finished the high school classes.

You were the first female American to make the U.S. International Mathematical Olympiad team. Do you see yourself as a pioneer?
I have been excited to see many more young women participate in the U.S. Math Olympiad program at the highest levels since I was on the IMO team. In my experience, it is incredibly helpful to see other women doing mathematics as role models, inspiration, and just showing what is possible. I hope that I am sometimes providing that role model or inspiration to other women.

You surely could get a job almost anywhere. How did you decide to come to UW-Madison?
UW-Madison is a great department, especially in number theory and even more specifically in the topics I am interested in. The department is also a really friendly and supportive place. Madison is a wonderful place to live and to have a family. UW-Madison also turned out to be a great solution for my whole family. My husband is also an assistant professor here, and we have an arrangement with the department and the university where we each work part-time so that we can

each stay at home part-time with our young children.

How does your research inform your teaching? How does your teaching inform your research? Do you find it difficult to strike a balance between the two?
It is definitely an ongoing challenge to strike a balance between teaching and research. The demands of teaching are so much more immediate (as are the payoffs of a job well done) than research that I find it helps to specifically schedule time when I will work on each.

What courses do you like to teach?
Last spring I taught an undergraduate research lab and that was a lot of fun. The students worked, mostly by writing programs to produce data, on trying to understand distributions of points on curves over finite fields in various families. I learned so much from the experience and I think the students did as well!

Where do you think mathematics is going, and then closely allied to that, where do you think it should go?
There are many exciting developments in mathematics these days, but I have concerns about how results are written up and distributed. It seems that the focus on publishing new results that is a result of the tenure-granting and grant-awarding processes leads to a tremendous amount of new mathematics, at a rate much faster than most people can keep up with (even within their field) and relatively little work is done to streamline, improve, and communicate the most important and powerful results. The latter would be a very important contribution to the development of mathematics but our current system has little incentive for people to work in this direction.

What do you think is the best part of being a mathematician?
I love working on a problem that has an answer that I don't even know how to guess ahead of time and then finally figuring out the answer.

How would you describe what you do when you are talking to somebody outside of mathematics?
Here is a description I've given of some work I've done recently. Imagine we have a space and a lot of objects moving around in that space that are not allowed to crash into each other. A good example is a system of roads with cars on the roads. If we wish to describe all the possible ways that the objects can be in the space without crashing into each other, as there are more and more objects, intuitively things get more and more complicated. It is a lot easier not to get in a car accident if there are only a few cars on the road! However, I study certain ways of measuring the complexity of these systems in which it (surprisingly) does not get more and more complicated to describe the system as there are more objects.

What of your work do you like the best? What are you most proud of?
I really like my recent paper "Discriminants in the Grothendieck Ring," with Ravi Vakil (described just above for the non-expert). I think it is really fun how many different connections between algebraic geometry, topology, and number theory it raises and how many new interesting questions it leads to.

What would you say to young women who are interested in doing mathematics?
Wonderful! I always found that a network of other women doing mathematics was incredibly important to my staying happy and sane as a mathematician, so I encourage you to find such peers if you feel it will help you.

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