text: Róbert Jajcay
photo: Sydney Janda,
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INTERVIEW

WE HAVE A LOT TO PAY BACK TO MATHEMATICS

At the end of August, Comenius University hosted the European Conference on Combinatorics, Graph Theory, and Applications (EUROCOMB), which takes place every two years in a different European city and represents a forum for experts to exchange the latest knowledge. The honour of organizing this year's instalment of this biannual conference was awarded to the Research Excellence team led by Professor Martin Škoviera as a sign of recognition of his group's contributions toward research in Discrete Mathematics. Almost 200 experts from all parts of the world attended, including some of the world's best. Among the invited speakers was Professor Margaret A. Readdy, who works at the University of Kentucky in the United States. In an interview with Róbert Jajcay, who is a member of the abovementioned team (Graphs, Maps, and other Discrete Structures), she described whether it was difficult to be a woman in a field dominated by men, what made her realize that she wanted to be a mathematician, and what she thought of college students doing mathematical research.

Is this your first visit to Slovakia?
Yes, this is my first visit to Slovakia. In fact, I probably should mention that my mother's mother is originally from Slovakia. She is from Spišská Belá, so it is pretty exciting for my family that I am here now because it has been almost one hundred years since someone from my family has visited.

So do you now have, or have you ever had, Slovak collaborators?
No, not yet! It would be actually very nice to have them. Slovakia clearly has really strong mathematics. You are very welcoming, and the institute here seems to be a wonderful place to be doing mathematics and you care about mathematics. Not every country does.

Have you had any students from Slovakia?
That is a good question. I do not think so. No, I would say no. In fact I am not even sure if my university has ever had any students from Slovakia, but they should apply if they are interested in coming to the United States. We love having international students, they really do raise the level of the university.

Sometimes people wonder if it makes sense to conduct research in Slovakia in areas that are already covered by large research institutions abroad, like in the US. What is your opinion about this concern?
If you have more people working in an area then you are going to have advancement accelerate much faster. And also the fact that people come from all over the world, your perspective about how to solve problems is going to be different. So if you have only Americans working in mathematics it would be very boring, and after awhile it probably would not be very good. The United States really does depend on international collaborations and international students and professors coming to add to the mix. And you are especially lucky here that you have the ability to travel quite easily to nearby countries and have more interaction going on. You have more interaction here than I do in the US, where every major university is quite far from each other, with a few exceptions.

Is it possible to obtain world-class results at smaller, less funded universities?
I would say yes at smaller universities if they are properly funded. Mathematics is a science: once you show something is true, it is always true, unlike other areas of the sciences. Also mathematics does not cost very much. In other sciences you need very big laboratories with special equipment and students to run them, and new professors to run them. In mathematics all you need is a blackboard, office space, space to talk with each other, you need a very good library, or very good access to journals, and this is a fraction of what it would cost to run a laboratory in other sciences. So when you put money into mathematics you actually get a lot coming out of it. Mathematics is a good investment.

Is there perhaps a critical mass of researchers needed for conducting first-class research in mathematics?
Here is an example. I have read that when you work on a problem, you really have to be, distance-wise… your offices should be relatively close. The distance is basically around the corner from your office. So if you want to have a group that is going to be very strong, you need to have offices nearby so you can just walk by a colleague's office and say: "Oh, I have read something interesting today and I want to talk with you about it."
In mathematics you still need people in other areas to interact with. Speaking for myself, I work in combinatorics, which is in discrete mathematics, but I occasionally have to talk with the algebraists or the topologists, or the number theorists. You need to have this interaction going on to do very strong research.

When do you think it is good time to introduce young people to research in mathematics?
That is a good question. I have actually very mixed feelings about this. I think the push right now in the United States is for young people, meaning undergraduates, to be doing research. And that can work up to a point.
I think the bad thing occurs when the students get stuck while working on something. They think they are being dumb, when actually they need to learn more mathematics. Also, quite often when you have undergraduates doing research in mathematics, they are doing something that is more accessible that does not require a lot of background. So, I actually think it is better. I have had discussions with colleagues like Peter Sarnak (Princeton University and the Institute for Advanced Study). We both agree that it is important to learn as much mathematics as you can as an undergraduate and then worry about actually pursuing research problems, because it gives you more tools to work with to solve a problem. For some people I think it is great, that they really do want to work on some kind of research as an undergraduate. But this is my personal opinion. I am sure that other people see it differently.

You sort of disagree with the Hungarian school, where they pick up the students already from high school and start with them very early.
But what happens is that they then think: "Oh, I did something in combinatorics. I have to study combinatorics in graduate school." And they sort of block off other areas. I tell students: "No, you can work in whatever field of mathematics you want." And even professionally you will change. I am doing very different mathematics than at the start of my career. I had never imagined working in areas like number theory, algebraic geometry, or topology.

When did you realize you would eventually become a mathematician, and what prompted this realization?
I always loved mathematics, even as a small girl, meaning like the age of five or six. And in the classroom of my first grade teacher, there were models of polytopes and I just stared at them and wondered "What are these things?" I did not know you could become a mathematician until I was sixteen. I was planning on majoring in accounting in college, and my father, who is a research chemist, got very angry at me at dinner time one evening and said: "Why are you going to study accounting?" And I said: "Accounting has something to do with numbers, numbers have something to do with mathematics, and I love mathematics." And my father said: "Well, why don't you major in mathematics?" And this was a shock like: "You mean I can do the thing I really love in my life?" And he said: "Yes!" And my mother claims that light came down upon the kitchen table, and it was at that point that I knew I could be a mathematician. Because I did not know you could do that professionally. So thanks to my father for being brave enough to tell me, to challenge me to pursue the thing I really wanted to.

The proportion of women among the top mathematicians does not reflect the proportion of young women entering the field. What is the reason for this? Is it difficult to be a female mathematician?
I do not think it is harder to be a female mathematician. I think to go into mathematics requires a lot of training, because you are going to the very top level of your studies. I think a lot of women need to see other women going ahead in mathematics, and the fact that there are not so many women in mathematics is something that prevents them; there is no one they can look up to. For myself, this has never bothered me. I was just so happy to have professors who took an interest in me and my thinking so I really flourished under that. I think as a parent you have to be very supportive for both girls and boys. Even in the United States it is very hard to get anyone actually to study mathematics, and it is crazy. Every device you carry (cell phones or computers), making reservations online, looking up things online, purchasing items online, all of this is mathematics. Math is used everywhere, and people sometimes do not value it, they do not realize that every time you see a machine you are looking at a piece of mathematics. So we have a lot to pay back to mathematics. And again, the more people you bring together from different backgrounds, the nicer the mathematics that comes out and more applications emerge for people who are interested in that.

Combinatorics is a science about the relationships between finite sets of objects, how they are arranged, and what sort of relationships can be created so that the final structure will have the desired characteristics following the joining of these objects. It is used in the fields of information technology, graph theory, coding, data security, work with large amounts of data, and game theory. It is also used in many applications.

Margaret A. Readdy

She is a Professor at Department of Mathematics at the University of Kentucky. Her research area is algebraic combinatorics and especially its interactions with topology and geometry. She has also worked at Cornell University, the Institute for Advanced Study in Princeton University, Stockholm University, and the Massachusetts Institute of Technology.

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