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Proof by example Portraits of women in Dutch mathematics

Diletta Martinelli

Diletta Martinelli is an assistant professor in mathematics and MacGillavry Fellow at the Korteweg-de Vries Institute for Mathematics at the University of Amsterdam, working on algebraic geometry. It is not the first time that she crosses paths with the Nieuw Archief voor Wiskunde: in June 2021 she wrote an article about her experience teaching mathematics in Africa, and in September 2022 the NAW published the interview with Shanti Venetiaan she conducted together with Džemila Šero.

Let's start from the beginning. What was it that got you interested in maths in the first place?

“When I was at secondary school, I didn't really have an idea of what I wanted to do with my life. I was quite unsure. I was changing my mind every day. Then one day I was at a popular science lecture with the title ‘The job of a geometer’: It was about non-Euclidean geometries and I found it very fascinating. I think from the beginning it was really a love of geometry, not necessarily of mathematics as a whole, that motivated me.

I was not really into mathematical games and puzzles. It was really more the idea of abstraction, the fact that you could use the power of your mind to describe spaces that you could not even see in your daily life, that attracted me to the discipline. Strangely enough, this professor turned out to be in my research community. I ran into him again many years later and told him: ‘You convinced me!’”

Speaking of geometry, your field is called birational geometry. Can you tell us more about it?

“The idea is common in geometry: you look at geometric shapes, in this case algebraic varieties, and try to classify them. What we are trying to do is understand when algebraic varieties are similar enough that you can think of them as equivalent. It has taken mathematicians a long time to work out what the right notion of equivalence is in this context. The



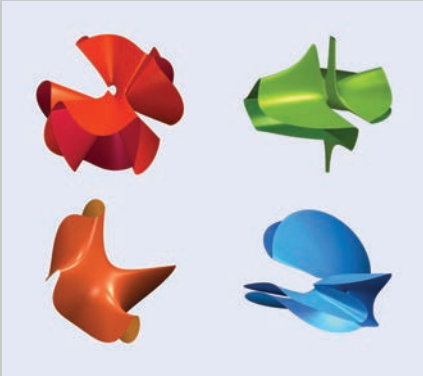
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real question is: ‘How strict do we want to be, do we want to allow for some flexibility?’ Roughly speaking, two varieties are birational if they differ only in something of lower dimension. The whole idea of the subject is given by this equivalence, and this word ‘birational’ comes from the fact that this equivalence is implemented by rational functions instead of polynomials.

As I said, the whole idea is to arrive at a meaningful classification of our geometric shapes and to try to understand the building blocks from which you can then reconstruct any other shape.”

And now you are teaching this very subject in the MasterMath programme. How have you found teaching so far?

“I was really happy when I started as an Assistant Professor because I could explore the other side of our job, not just research, but being part of a department and interacting with students. I like the human side of our job, when you go to work and you see some real faces and you try to communicate what excited you as a student. Especially when I get to teach geometry courses and I can try to share my passion for the subject and try to communicate it to the students. Besides, it's always fascinating to see how much you learn when you teach a course, you always get new interesting questions... I always get to the end and think ‘Now I really get it!’ It's always a good learning experience for me.”



Some slices of Fano varieties, one of the building block in the classification of geometric shapes.

You took up your new post just before the outbreak of the pandemic. That must have been challenging...

“It was. I had negotiated no teaching for the first term, I had travelled to a couple of conferences and spent almost a month in Africa... I had put a lot of things off until the spring. Then, suddenly, there was a new word that we were all trying to find our way around. I didn’t know any Dutch and, to be fair, it wasn’t exactly the right time to learn a new language because I didn’t get to meet anyone.

I really had the feeling that I was living in a bubble. It was really hard to connect with the city, and besides, it was recommended not to meet people. Sometimes I had meetings with some of my colleagues outside, in a park, and luckily my partner joined me in March 2020, so at least we were together. Looking back, I think it was a humbling experience for everyone.”

Are there any mathematical results that you are particularly proud of?

“I think I am most proud of the project that came out of my PhD. It is a single-authored publication and what makes it special is really the personal value. For me, it was the first time I could identify with a problem. It took me a long time to find the solution, and in the end I felt that I had produced a mathematical theorem, something that really belonged to me in the mathematical landscape. Having said that, I am a person who tends to do a lot of work in collaborative projects. I am so happy that we are now starting to organise face-to-face meetings again. To be physically together, in front

of the blackboard, thinking about the same problem... I missed that during the pandemic.”

And is there anything about your job that you do not like?

“The competitiveness of the academic system, this idea that your colleagues become your direct competitors. I really don’t like this idea of constantly comparing yourself with other people, checking who’s publishing more, who’s publishing better, and trying to reduce something as complex as research in mathematics to numbers and bibliographic indices. I think that’s almost against what good research should be, and it puts people under great stress. I see it in myself, but also in many other colleagues. I am not happy about the general trend I see in academia. It’s something that’s hard to fight as an individual. I know that there is — I think — a widespread discussion about it, so I know that a lot of people are trying to move in the right direction. But it’s something that worries me. I hope that as a community we can make it better...”

Community is a theme that pervades your interview with Shanti Venetiaan for this column...

“Interviewing Shanti Venetiaan was really amazing: it was really impressive to learn from her experience.

When she came back to Suriname, there was no department of mathematics, and she just created it all on her own. For me that is such an incredible achievement, to be able to do so much for your mathematical community in your country. She is so passionate about mathematics, about strengthening the community, and it has been great to learn from such a different experience.

Džemila and I asked her about the gender balance in mathematics in Suriname, and she told us that, given that the community is at such an early stage, there are not yet any bad stereotypes associated with women. I think it would be really fascinating to see how this turns out in a few years..., maybe it could be an experiment when one can really try to start a mathematical community without stereotypes.”

Continuing with the theme of community building, can you tell us more about your experience of teaching in Africa?

“During my PhD I started looking for opportunities to teach or do something with mathematics that had a bit of social impact. I was really lucky because there was a professor in my research community who was involved in a lot of activities in Africa. We once were at a conference together and during the coffee break I approached him and asked how I could get involved. So it was quite easy to start, having him as a contact.

He told me where I could go and teach: that was in 2018: I went to Cape Town to teach at one of the AIMS centres. After that, we organised a workshop in Kenya, and I really enjoyed the experience, it was very rewarding, and it was really nice to also kind of expand my community of students, to meet students who had very different life experiences and connect with them through mathematics. That was really something that I enjoyed a lot. So I kept looking for similar opportunities. During the workshop in Kenya I met the academic director of another institute in Cameroon, where I went in early 2020... I really enjoy this part of the work, and so I decided to look for more opportunities in this direction.”



Diletta with some of her students at the end of the course, AIMS Cameroon, January 2020.