

Side by side: interview with Cristiana De Filippis and Tuomo Kuusi

Raffaella Mulas

In this new interview series for the EMS Magazine, each article brings together two mathematicians who share something – such as a research area, a passion, or a professional context – but differ in other ways, as for instance age, gender identity, background, or geographical location. Sitting “side by side,” they reflect on their personal and professional journeys, their views, and the worlds they live in.

The series is conducted by Raffaella Mulas and was born also thanks to the ideas and support of Apostolos Damialis (editorial director of EMS Press) and Donatella Donatelli (editor-in-chief of the EMS Magazine). By bringing together both common ground and contrast, side by side aims to reveal the richness of mathematical lives.

In this first article, Raffaella Mulas interviews Cristiana De Filippis (University of Parma) and Tuomo Kuusi (University of Helsinki).

Cristiana, Tuomo, and I are about to meet on Zoom. For the first few minutes, it’s just Cristiana and me. I’ve known her for a while, as we are both members of EMYA, and I have interviewed her before, on the occasion of her EMS Prize [1].

I know that she is a delight to interview, as she is a mathematical superstar who is also warm and easygoing. We chat about our summer plans and, of course, about Anakin – her cat, of whom I am a big fan.

We are waiting for Tuomo, and I’m not sure what to expect. Cristiana suggested him as her interview partner, and my pre-meeting search only turned up an intimidating list of publications and the fact that he is one of the most cited mathematicians. Impressive, yes – but will he be boring? Then Tuomo pops into the Zoom room, and my doubts vanish instantly. He radiates a spark of energy that’s immediately contagious.

Raffaella Mulas: *Thank you both so much for being part of this! I’m really looking forward to seeing how this first double-interview takes shape. To get us started, could you each briefly share your journey, from when you first discovered your passion for mathematics to where you are today?*

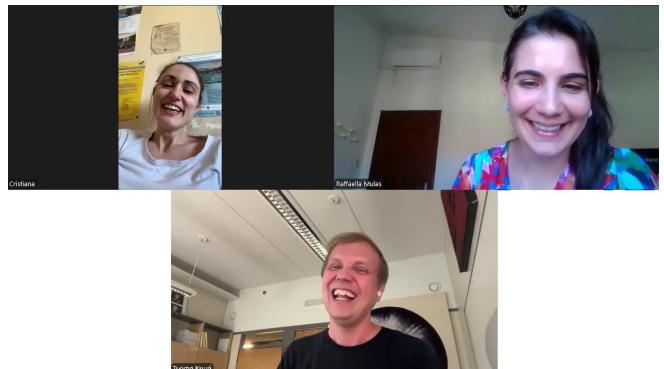


Figure 1. Cristiana, Raffaella and Tuomo on Zoom.

After a few “you go first” and “no, you go first,” Cristiana begins.

Cristiana De Filippis: My passion for mathematics probably began between primary and secondary school. Back then, I started doing a bit of extra work on my own, like trying to go beyond what we were learning in class and studying the subject more independently.

When it came time to choose a degree, I was actually surprised to discover that mathematics existed as a degree in its own right! Until then, it had been presented to me as something auxiliary – something you study only as a tool for subjects like engineering or physics. When I discovered that it can be studied at the university, that was it.

I did my bachelor’s in Turin, my master’s in Milan, then spent a few months in an internship at Inria Centre at Université Côte d’Azur, before moving to Oxford for my PhD. After that, I did a postdoc in Turin, and now I am a professor in Parma.

Tuomo Kuusi: For me, it happened later. I first went to an engineering-focused university. I had always been good at math, but I wasn’t especially fond of it at that stage.

Then, in my first year, I took a course called “The basics of modern analysis,” which, in reality, went much further. We were constructing Lebesgue measure, learning basic topology, and so on.



Figure 2. Giuseppe Mingione, Cristiana De Filippis and Tuomo Kuusi.
(Picture courtesy of Cristiana De Filippis)

That's when I had my "wow" moment and decided to graduate in mathematics instead. A couple of postdocs and positions later, I am now a professor at the University of Helsinki.

[RM]: *I rarely hear stories like yours, Tuomo! I feel that many mathematicians, like Cristiana and me, choose mathematics at a young age.*

TK: For sure. I think a lot of it comes down to luck, as having a teacher who is motivating and can explain math well makes a huge difference. That's why, at our university, one focus is on training future teachers, starting from primary school. It's a really important part of our math department's mission.

[RM]: *That's very interesting! Now, the two of you have collaboration distance 2. How close are your research areas?*

TK: Well, you know, what I was working on before is actually quite close to Cristiana's area, which is regularity theory for elliptic and parabolic partial differential equations. Over time, I've moved more toward mathematical physics questions, but the techniques I learned back then are still extremely important in what I do now.

In fact, the last couple of times we've talked about problems, Cristiana has been fantastic. I'll have this very complicated proof – ten pages of horrible details – and she will say, "Why don't you just do it like this?" Suddenly my monster proof turns into two pages. It's pretty nuts!



Figure 3. Giuseppe Mingione, Giampiero Palatucci, Tuomo Kuusi and Cristiana De Filippis. (Picture courtesy of Giuseppe Mingione)

[RM]: *Haha, that's amazing! Does this mean you are going to become coauthors?*

CDF: Hopefully yes!

TK: What?! Cristiana, of course we are!

At this point, Cristiana and Tuomo dive deep into a discussion about techniques in their fields. I have no idea what they are talking about, but their excitement is so infectious that I smile and listen as if I do. The one thing I do understand is that they both love working with Rosario [Giuseppe Mingione] (Figures 2 and 3). When there is a pause, I jump in with my next question.

[RM]: *What were your PhD years like, and how do you think that period shaped you, both mathematically and personally?*

CDF: I did my PhD at Oxford, and it was a fantastic experience. I had a lot of freedom to work on what I found interesting, thanks to my advisor, Jan Kristensen, who gave me guidance without forcing me to follow trends. I could travel, meet people, and build collaborations both inside and outside my group. It was a fundamental time for me, both mathematically and personally.

TK: During my PhD I jumped into a completely new topic with my advisor, Juha Kinnunen. Very quickly, I found an open problem that had been around for decades, and I got obsessed with it. Eventually, my group and another group solved it independently, almost at the same time.

CDF: Not just "another group" – the *masters* of parabolic PDEs!

TK: Exactly! It was led by [Emmanuele] DiBenedetto. When I saw their paper, I thought, "Okay, fair enough, they found the same trick I did."

CDF: You took it with so much fair play! I would have eaten the paper, like Scrooge McDuck's competitor does with his bowler hat!

TK: I sort of did! But in the end, Rosario read my version, he liked it, and he suggested that we work together – and that was the beginning of our collaboration.

[RM]: *Sounds like a happy ending! Is there anything about the academic system that you wish you could change?*

TK: Funding could be structured better. Instead of just a few huge grants, I'd love to see more medium-sized ones that support more researchers.

CDF: Yes, and funding should also be adapted to each field. For some applied researchers, 1.5 million can vanish into two pieces of machinery; for mathematicians, the same amount could build an entire research group. But even then, local laws and bureaucracy can make it hard to use the funds in a way that keeps you competitive.

They also reflect on the difficulty of finding permanent positions. Then, the conversation takes an unexpected turn to artificial intelligence.

TK: The progress in just the last few years has been incredible. Having mathematical conversations with ChatGPT is now totally relevant.

CDF: Yes. It's like knocking on a colleague's door – not necessarily an expert in exactly what you're doing, but still someone who can give feedback that helps you move forward.

TK: It's not going to prove theorems for you, but it can suggest directions. You play around, and suddenly you think, "Oh, wow, maybe this is the right track."

[RM]: *It's indeed great for brainstorming. Now, would you like to share a short story that had a big impact on you or on the way you work? It can be something uplifting or challenging... anything that has stayed with you.*

TK: Well, my collaboration with Rosario had a miserable start. In our first paper, I wrote the fateful words, "by a simple covering argument." Rosario went through the paper line by line, got to that point, and asked, "Okay, what is this simple covering argument?" Of course, it didn't exist. That taught me a big lesson: you have



Figure 4. Cristiana, Raffaella and Tuomo on Zoom.

to be humble and check every detail, even when you think you understand it. Rosario once put it perfectly: "I saw this beautiful bird flying free in the sky – it was your professorship escaping!"

CDF: Haha! Mutatis mutandis, I've had the same experience: something that looked "standard" turned out to be completely wrong in the simplest case. I had to rethink the proof entirely to fix it.

TK: And what's the moral of your story?

I love that the interviewees are interviewing each other.

CDF: The moral is that you have to be extremely careful, even with things that you believe are trivial, and it is helpful to check the most basic cases.

TK: So true! Here's how I see it: when you are coming up with an argument, you should think like an artist: with big brushstrokes, no boundaries, trying ideas just to see where they might lead. But once the painting is done, you have to switch roles completely, and become an accountant, checking every single detail as if the person who wrote it (even if it's you) had no idea what they were doing. It's a painful process, and it's not nearly as fun as the creative stage, but it's absolutely essential.

CDF: Yes, right. You need to be able to look at your research from outside, from above, from far away, pretending that it was not yours.

Cristiana is joining the Zoom meeting from her phone. When the battery runs low, she disappears from the screen and then reappears under her table, plugging it in.

TK: Why did you go under the table now, Cristiana?

CDF: I just wanted to give you a different perspective!



Figure 5. Cristiana and Anakin. (Picture courtesy of Cristiana De Filippis)

TK: Yeah, should I go as well?

Then Tuomo slips under his table too (Figure 4). We all burst out laughing.

CDF: Don't worry, Raffaella, this is normal! That's how we are all the time!

[RM]: *I'm amused!*

They remind me of the time I saw Bernd Sturmfels lying on the floor during a keynote talk at a conference. He is also one of the most cited mathematicians. I'm starting to see a pattern.

[RM]: *Thank you for these beautiful images: the painter, and the mathematicians under the tables. I'll wrap up with one last*

question. Outside of mathematics, what do you enjoy doing that recharges you?

CDF: I stay charged by running every morning from Monday to Friday. I also love riding horses and spending time with my horse and my cat (Figure 5).

[RM]: *My friend Anakin! How about you, Tuomo?*

TK: I love dancing on roller skates! I even made Cristiana try it once.

CDF: And he brings his roller skates with him when he travels. He has the suitcase of a rock star!

TK: Well, you know, nothing lasts forever!

I wish this interview did.

[RM]: *Thank you both very much, this was fun!*

References

[1] R. Mulas, [EMS Prize Winner Cristiana De Filippis' perspective on research and life's balance](#). In *Stories behind theorems*, pp. 41–45, Springer, Cham (2025)

Raffaella Mulas is a discrete mathematician but not a discreet one, as she loves listening to and sharing people's stories. She is an assistant professor at VU Amsterdam, where her work is supported by a VENI grant from the Dutch Research Council (NWO). She is also an elected member of EMYA and the founder of *Nora – Center for Science Communication*.

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