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Proof by example Portraits of women in Dutch mathematics

Renee Hoekzema

From the March issue Renee Hoekzema is one of our Editors-in-Chief. She is an Assistant Professor in the Department of Mathematics at VU Amsterdam. Renee was born in Utrecht, in 1987. In 2009, she earned two bachelor's degrees in mathematics and physics/astronomy, with a minor in biogeology, from Utrecht University. She then furthered her education at the same university, obtaining two master's degrees in mathematics and theoretical physics in 2012. Following her studies in Utrecht, Renee pursued doctoral studies at Oxford University, completing a PhD in earth sciences in 2015 and a PhD in mathematics in 2018. Her academic journey also includes postdoctoral appointments at the University of Copenhagen, at the Max Planck Institute for Mathematics in Bonn, and back at the University of Oxford. In 2022, Renee was awarded a Veni grant from the Dutch Research Council (NWO), and she joined the Department of Mathematics at VU Amsterdam. Her colleague Raffaella Mulas interviewed her last April.

Thank you, Renee, for taking the time to meet me. I would like to start by talking about your challenging, fascinating and very unique academic path. What drove you to pursue such diverse fields of study?

"Thanks for interviewing me! I think I always had a very broad interest. When I started university I really wanted to study all three subjects: physics, maths and earth science. I might have finished three bachelor's and three master's degrees, but someone recommended that I should just start doing research instead. So, after my maths & physics masters, I started a PhD in paleontology. The research was fun, but I also missed maths. In fact, I had a dream that I was a mathematician and when I woke up I knew that that's what

I wanted to do! So I finished the paleontology PhD and started a second one in algebraic topology with Ulrike Tillmann, who was very supportive.

In hindsight, the lack of female role models had contributed to me not choosing to continue with maths before. Meeting amazing female mathematicians at Oxford such as Ulrike Tillmann and Francis Kirwan changed my point of view. As a mathematician I do research in maths, physics, biology and even paleontology, so in the end I'm combining all of my interests!"

You made very exceptional choices! And I understand your point about the importance of having female role models. I find it impressive that you were able to merge your different expertises in mathematics, physics, paleontology and biology. Not only do you have a deep knowledge of each of these subjects, but you also connect them in your research, and you did so in your Veni grant proposal as well. Can you tell me something about it?

"As part of my maths PhD I studied 'shapes inside shapes' and their evolution through time (in maths language: manifolds with submanifolds and cobordisms on them). When I started writing the Veni, someone recommended that I



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Painted by Annelie Kerkhof

stay close to my heart, and rather than thinking about what would please a committee, write the proposal about what I really wanted to do. Now the cobordisms theory I was studying had close links to certain theories in mathematical physics called topological quantum field theories, so there was a clear link there. On the other hand, during my masters I had done an amazing course on vertebrate paleontology for which I wrote an essay titled ‘Evolution of vertebrates through the eyes of parasitic flatworms’ (which I personally thought was hilarious because flatworms don’t have eyes). Back then I was already curious about whether one could make a mathematical model to study the phylogeny (evolutionary descent) of a group of hosts together with the evolution of the parasites living on them (and co-evolution more generally). I realized that from the point of view of maths, this is also a shape within a shape evolving through time (namely a tree inside a tree), and therefore connected to the maths/physics projects that I had been thinking about. Putting these all together, I wrote a proposal called ‘Shapes inside shapes in mathematics, physics, and biology’.”

Amazing! There is also another subject that plays a role in your Veni grant. At the end of your proposal, you talk about collaborative projects with artists along the theme of ‘shapes inside shapes’...

“I grew up in a crossover art/science family, so art has always been close to my heart. I love drawing and painting and I also like to sing. I’m currently setting up

a collaboration with a pair of installation/theater artists that aims to capture the experience of understanding something in maths, without explicitly involving maths itself, but with a flavor of shapes inside shapes. It’s a very exciting process!”

Beautiful! Now, I need to ask you: Renee, what are you not good at?

“Haha, there’s plenty of things I’m not good at! I have a terrible memory for example, and I’m easily distracted.”

But this doesn’t stop you from doing anything! You are also a tireless traveler. You travel a lot for conferences and research visits, but also for pleasure. What has been your most beautiful trip so far?

“Last year my partner and I made a tour of South East Asia which was amazing. We spent a few days on a Thai island where the beach was perfectly white and the sea was turquoise blue and crystal clear. You could walk into the water and immediately see corals and seahorses. I didn’t know a place like that existed!

I also feel very fortunate being able to make beautiful trips for work. Recently I had a conference in Kyoto for example, which was also stunning.”

And the most adventurous one?

“I made a solo trip to Costa Rica at some point which was really spectacular! The Costa Rican rainforest is one of the most biodiverse places on Earth, and I found myself thinking about how every square meter contained at least one animal that could kill you (or at least seriously poison you). From the cute poison dart frogs to

the vipers, scorpions and Brazilian wandering spiders—one of the most deadly spiders in the world, of which I saw quite a few. At some point at the end of a night tour of the jungle, my phone had died after taking many pictures of snakes and giant insects. I didn’t have a torch and I had to walk back through the jungle in the dark. That was probably one of the most adventurous things I’ve ever done.”

Wow! Besides traveling, art and research, what makes you happy?

“Walks and games with my family and partner, and our baby on the way!”

Nice! I love the portrait of you that your mother, Anneke Kerkhof, painted and that you have on your website. May I use it for this article?

“Of course! My mom’s artwork has always been the decor of my life and she’s a great source of inspiration for me, so I was honored when she decided to make a portrait of me!”

You are going to be a great source of inspiration for your baby on the way! Thank you for all the beautiful things that you have shared. 

Acknowledgements

This interview has first appeared on the website of the Mathematics Department of VU Amsterdam. I therefore wish to thank the department for the permission to reproduce it here. I also want to thank Francesca Arici and Diletta Martinelli for their support, and for encouraging the publication of this article in NAW. Finally, I am very grateful to Renee Hoekzema for this wonderful interview.