



## Profile: Valeria de Paiva

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### EARLY INFLUENCES

*I took a complicated path to mathematics. I started University doing two degrees, in two different colleges, one in journalism, the other in law (in Brazil there is an undergraduate degree in law, unlike in the US). After seeing two semesters of beginnings of sociology, anthropology, and philosophy, I decided that I needed something more tangible, something more solid, where you could have certainties, so I decided to start a third course, this time in physics, which I had loved since I was little. After three semesters doing the basic work, I discovered that physics also has its side of "today the only thing we need to pay attention to is friction," tomorrow "friction is negligible." Thus I discovered that what I liked in physics was the mathematics underlying it, and that I might as well study it. After that, my path within mathematics has also been very convoluted.*

#### What sparked your interest in mathematics?

*While in high school I noticed by myself the issues plaguing Euclide's 5th postulate, which pleased my geometry teacher no end.*

#### When did you know that you would use math as a path to your career?

*Very late. For many years I thought I'd learn some more bits of math, because it's fun, but I thought my career as a computer scientist was a different subject. It took me a while to understand that what I do is mathematics, it's just an extended, generalized form of Mathematics, because modeling the world is always about mathematics, as extended a notion of mathematics as you may need it. Galileo was right all along.*

#### Was there a pivotal moment/experience/influential person that led you in this direction?

*Yes, my PhD supervisor in Cambridge, Dr Martin Hyland, gave me a new appreciation of what it is to do mathematics, the fun of it, the need for big strokes of imagination, as well as the hard work on proofs, the courage of new ideas, and the need to back them up with evidence and usability. Anyone can invent new bits of mathematics that are pointless and do not lead anywhere, the challenge is to build on the right stuff to produce more new and useful mathematics.*

#### Any memorable courses or experiences that made a difference in directing you to your career? Any obstacles you needed to overcome?

*Well, funny that you should ask: I did Part 3 of the mathematical tripos in Cambridge and this was by far the hardest I've worked in my whole life. Getting the phd was very easy compared to Part 3.*

*Maybe it was because I wasn't expecting it: I had no idea Part 3 existed until I applied to do my doctorate in Cambridge. I actually had read somewhere that there was less of a tradition of testing people in the UK than in the US, so I thought I'd avoid the qualifying exams in the US, where I had been accepted in several good universities. Boy, how wrong I was! Part 3 is a crazy, super-intense, six qualifying exams rolled into one year, or rather nine months. To top it off, I spoke very little English. I could read it and did fairly well in languages tests, but daily life is totally different and I was preparing to go to Paris, France, not England.*

### CAREER/CAREER PATH

#### Describe your current position and briefly, the path you took to get there.

*I'm Senior Research Scientist with Nuance Communications. I work with methods and systems to assign meaning to natural language expressions. I was a professor of computer science in the UK; for family reasons I moved to the US in 1999 and ended up working in the fabled Xerox PARC industrial lab. I have been involved with several projects in what used to be the Natural Language Theory and Technologies group. The group built a portfolio of technologies and patents associated with application of Natural Language understanding that was spun out partially as the start-up Powerset, later acquired by Microsoft. When that happened I moved out of PARC to another start-up, the search engine Cuil. From there I moved to Deem and ended up in Nuance, working again with my ex-manager at PARC, Ron Kaplan. My mission in this new Nuance lab is to make sure that the language technologies are taken seriously by the AI scientists and engineers and conversely that the engineer's concerns are heard by the linguists. I hope to work as a bridge between the linguists and the AI engineers. A second component of my work is to keep looking forward to new advancements in academe and make sure that we get to hear about the ones that are likely to be useful for us.*

#### What do you like best and least about your profession? What is the stress level associated with this type of position?

*What I like best about my profession is that we do invent the future, instead of predicting it. What I like least is that sometimes*

*we have to re-invent it over and over, because science is not only about being able to do things, but about having the commercial acumen to have the technologies coming from the science flourish and be accepted. It is sad to think about the huge amount of code bit-rotting around us. Old papers and manuscripts can be re-discovered, with code this is much harder.*

*How many hours per day or week do you typically work? Do you have flexibility that allows a good life/work balance?*

*I work very long hours, but I do have flexibility of where and how to work and this makes a huge difference to my life satisfaction.*

## **CAREER EXPECTATIONS FOR YOUR FIELD/POSITION**

*How/why are applied mathematics and/or computational science important to your industry? How are they used?*

*The industry that I work now needs applied mathematicians of all shapes. Understanding and dealing with big data is the new quest for mathematics and any kind of mathematical tool is welcome. For example I'm in this funny situation of using extremely pure mathematics, Category Theory, to reason about and conceptualize very applied problems in logics of language.*

*Where do you see the future of math in industry or in your particular career?*

*It is clear to me that industry needs math and every time more. I have a bit of a difficult time deciding for myself where I think math itself is going: it's clear that more collaboration among mathematicians is necessary; we need to move away from the cottage industry (the myth of the lone mathematician working for a whole life in a single problem) into full organizing and shaping of mathematics, to keep competitive with the other hard sciences. Mathematicians were very fast to embrace the digital technologies like email and self-publishing in Latex, but now more changes are required and it is not clear to me that many mathematicians are aware. Tom Gowers and Terry Tao seem to be two world famous mathematicians who understand that the profession needs to change the publishing model and the its modus operandi in general if it is to thrive as well as it did in the 20th century in the 21st century. We require more talking to each other, more understanding of other's problems, more ability to network and share tasks, the ability to share results and build on top of other's results, that is, some concerted effort into clear directions. Also the mathematical knowledge of the world needs to be better kept and understood, as there is no point in re-inventing the wheel time over time. There are several big challenges: physics served us well in the past as a source of problems; nowadays it carries on being a source, but there are other more pressing sources, such as computing itself and biology, not to keep repeating the issue of the mathematics of language and meaning extraction, my favorite one.*

## **ADVICE**

*If you could advise someone currently pursuing the same degree or profession, what would you say?*

*I would suggest not making the same mistake I've made of not paying enough attention to probability theory and statistics. When I was in Cambridge the departments were separated by walls in four floors: only on the fourth floor there was a common room, where the tea ladies served both mathematicians and statisticians. Not very conducive to working together. Of course the other essential skill is computing and being able to program for the answers you want to have. I am still working on this one for myself.*

## **SALARY**

*For 2015, can you speculate about the salary range of starting, mid-level and senior positions in your specific field?*

*I do not know much about salaries, but I do know that computational linguists and data scientists are in great demand nowadays. There are internships, scholarships, and plenty of jobs at the moment for data scientists and computational linguists, while there is a shortage of people with the appropriate skills. It is a good time to be joining this area.*