

A career in Mathematics?

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Well, my career...

- BA, MA, MA2, PhD Pure Maths (Cambridge UK), several post-docs, professor in UK, industrial researcher from 2000
- What kind of mathematics?
- Mostly algebra (actually Category Theory) and logic (actually Proof Theory)
- Several hats: category theorist, logician and computer scientist
- I do research using mathematical tools, which is great fun

Category Theory?

- A recent branch of Algebra (around 1945), introduced by Eilenberg/MacLane
- Detractors call it: Abstract Nonsense
- Basic idea: there's an underlying unity of mathematical concepts/theories. More important than the mathematical concepts themselves is how they relate to each other.
- Topological spaces come with continuous maps, while vector spaces come with linear transformations.
- Morphisms, ie how structures transform into others is the way to organize the mathematical edifice.
- The language of CT is well-accepted in all branches of Math, the praxis and the philosophy less so

Proof Theory?

- Logic is usually divided into four sub-areas: Model Theory, Proof Theory, Set Theory and Recursion Theory
- Categorical Proof Theory, i.e. I investigate proof systems by constructing categorical models for them.
- Categorical models describe not only whether a theorem is true or not, but also allow you to distinguish different proofs of the same theorem.
- Because my models are categorical I can use the mathematical intuitions coming from Geometry, Analysis, etc, to bear on the different kinds of applied logic that I use for my **(implementable) systems**

Theoretical Computer Science

- *Which implementable systems?* You may ask...
- Loads of them: all kinds of software require modeling, using all sorts of logics.
- I've done work on the logic of theorem provers, of authentication systems, of type systems of functional languages, of models of concurrency, etc.
- Nowadays I work on the logic of Knowledge Representations (KR) of natural language sentences
- This is kind of easy to sell (NYT 8th Feb 2007) as people realize that if we could ask search engines to look for what we mean, as opposed to looking for key words, life would be easier...
- But yes, selling what I do, is the hard part of the job...

How to best prepare?

- It's a tough question!
- One must be prepared to sell “ideas”, “questions”, research programs, etc...
- Tax-payers, program managers, even your neighbor, want to know what you do and how wisely do you use their dollars
- I guess everyone here has heard the usual, “how can one do mathematics for a living?”
- “Because it's beautiful mathematics!” doesn't cut it, we need to be able to dream up applications uses/synergies
- On a personal level I wish I hadn't taken such a dislike to statistics and probabilities...

References

- For Category Theory: Conceptual Mathematics by B. Lawvere and S. Schanuel (1996)
- For Logic, The Handbook of Philosophical Logic, eds. D. Gabbay and F. Guentner (4vols, about to become 13)
- For NLTT: The Natural Language Theory and Technology Group of PARC (Palo Alto Research Center) <http://www2.parc.com/isl/groups/nlitt/>
- For my work: <http://www2.parc.com/isl/groups/nlitt/>
Or <http://www.cs.bham.ac.uk/~vdp>