

[Interviewed by his granddaughter circa 2010]

*Please introduce yourself, and say when and where were you born.*

My name is Liam O'Carroll and I was born on 10<sup>th</sup> June 1945 in the town of Strabane, Co. Tyrone, Northern Ireland, which is just across the border from the little town of Lifford in Donegal, Southern Ireland. Typically for Ireland, Lifford actually lies north-west of Strabane!

*2. Have you always liked maths?*

My first memory of Maths is of my father (a head teacher in a little two-teacher country school) teaching me (at the age of 3) counting and arithmetic using matches, and I got the hang of this very quickly. (He was a heavy smoker, cheap cigarettes being all too available over the border in Lifford - after a little bit of smuggling.)

I always liked Maths at Primary School and found it suited me. My next main memory is when my father taught me algebra when I was 9 or 10, just before the 11+ exam to try for grammar school. I struggled hard for hours with some Algebra problems one Saturday afternoon (hmm ...), and suddenly realized that if I just let the equations take the strain, they could carry all the hard work and I should just let them tell me what to do. This was a revelation!

Then in Secondary School I liked Maths the best by far of all my subjects. We covered a lot of Euclid's Geometry (which deals with properties of lines, triangles, circles, tangents and so on), which taught us the art of problem solving using logic based on intuition and imagination. Nowadays proof (which is crucial in university-level Maths) appears really only in Advanced Highers (if I've got that right) and then only in connection with some aspect of Algebra. This seems to me a loss (showing my age here?).

*3. When did you realize you wanted to pursue Maths as a career?*

I've never wanted to do anything else. Maths is to me what Music is to a musician – it's something you can't do without. (And by the way, a lot of Mathematicians really love Music, especially Bach.)

*4. What is your favourite area of Maths?*

The mix of algebra and geometry that I work in: the particular kind of algebra involved allows for really slick, elegant arguments, and the geometry (which is a visual reflection of the algebra) allows you to form intuitive, helpful pictures.

*5. What is your least favourite?*

I have to say that I've never been enthusiastic about Applied Maths. I know that part of the fascination of Maths in general is its applicability to the Sciences (Physics, Astronomy, Engineering, Computer Science, Chemistry and Biology), Social Sciences (Economics – as both your Mum and Uncle William will attest, Social Policy and so on), and Business and Finance ('Operational Research' - the Maths of using resources optimally, pricing of financial products, and so on). There are even applications of Maths to Music (in Electronic Music, or in analysis of symmetries in, say, Counterpoint) and to Philosophy (Logical paradoxes, Symbolic Logic and so on). But this has never grabbed my imagination. What I do like is how Pure Maths is used in e.g. Cryptography (encryption and decryption of electronic messages for Internet security, say) or Error-correcting Coding (software placed on CDs and DVDs to correct for errors due to smudges or scratches, or used in mobile telephony or satellite communication to correct for errors caused by electronic interference due to other signals or sunspot activity).

*6. Mathematicians have a reputation for being a bit strange ... Do you think this is fair?*

It's true that areas of life such as Maths or Music or Computing that involve symbolic worlds do attract people who find it difficult to deal with the 'real world'. But that holds only for a minority. What does get me

hot under the collar is the attitude that lies behind this claim, namely that Maths (and Science in general) is just a lot of weird stuff that normal people can't possibly understand. In fact it's taken to be an index of normality that one doesn't understand it or even attempt to understand it. Clearly this is just self-regarding, self-satisfied intellectual laziness, but that doesn't stop idiots who would regard themselves as well-educated complacently voicing this view in public. Arghh! (There, that feels better getting that off my chest!)

*7. If there was one great mathematician in history that you could go back and talk to, who would you choose and what would you ask them?*

Oscar Zariski ([http://en.wikipedia.org/wiki/Oscar\\_Zariski](http://en.wikipedia.org/wiki/Oscar_Zariski)), who left Russia in 1920 just after the Communist Revolution to go and study in Rome. Initially he worked in Geometry in the intuitive style of the famous Italian School but became increasingly disillusioned by the lack of rigour, and the incorrect results and confusion that this led to. He emigrated to the US in 1927 and reworked the foundations of Geometry using Algebra to put the subject on a properly rigorous basis, proving many deep and influential results in the process. In turn, his School was overtaken in the 1950s and 1960s by the mathematical revolution led by Serre and Grothendieck (one can google 'Wikipedia' for these names), who used 'global' methods in place of Zariski's 'local' methods. So, in time, the revolutionary was overthrown by the next generation of young turks (a phrase coming from Turkish history – one can google 'Kemal Attaturk!'). I use Zariski-style mathematics in my own work, so I'm an old-fashioned kind of guy (oh no! – a Tony Blairism).

I'd be interested to know if he ever tried to master these new techniques or whether he felt that they were just too foreign to him. In Maths you find that some aspects just fit naturally with the run of your mind, while you'll never be really at home in others – even though you can understand them.

*8. If you hadn't been a mathematician, what would you want to be and why?*

I suppose I could have been, say, an actuary (dealing in the Statistics of Life or other Insurance), or gone into computing (as your Uncle Nicholas did after his Maths degree), or Operational Research (as your Aunt Rachel did after her Maths degree). But you can tell from my tone that none of those careers fills me with any great enthusiasm. I really like teaching – which is a crucial part of my job, anyway - as you can see how people's understanding works (or doesn't work, or only partially). So something in that line, I suppose.

*9. What do you think is the most important skill for a successful mathematician to have?*

I take for granted a strong interest, a fascination even, in Maths. Remember that Maths is a very broad subject – there are all kinds of sub-areas of Pure and Applied Maths, Statistics and Operational Research, so there are many kinds of mathematician and the mix of skills required will vary accordingly. But here are the core ones (in my opinion): fluency in basic techniques, so that you don't get held back by not being able to 'speak' and use the 'language' of Maths easily; persistence (a proper amount of stubbornness even), imagination, intuition, flair, logical argumentation, luck (!)

*10. Overall, what would you consider to be your greatest achievement in Maths so far?*

This is very difficult to describe! Here's the best I can do – please forgive any vagueness.

In 1949, Zariski (see the answer to Q.7) developed a general theory of certain types of mappings. In 1978, two (pretty great!) US mathematicians gave an abstract generalization of this theory using various nice bits of algebra that had been developed in the 1950s and 1960s. They noted that another approach to their results could be obtained if one could supply a certain 'uniform' version of the so-called Artin-Rees Lemma from the 1950s (a lemma being a little result that helps you along the way to a big result). In 1987 and 1989, I (latterly with a PhD student) was able to supply such a version – by going back to Zariski's 'Main Idea' of his 1949 paper, as he had called it, reworking this idea and finally using an approach by Grothendieck (see Q.7) that was part of his refashioning of the subject that generalized the work of Zariski's School. A few years later, I used work of Greta Herrmann from 1927(!) to give a very simple answer to a particular but important instance of this question. And last year, a colleague from Barcelona and I were finally able to answer a question that had been left open ever since that work in 1989 - and there are still more open questions and conjectures to tackle in this area.