

Sana Hizem

$$\left(A : C_A(f) C_A(g)\right)^{\widetilde{*}} = \left(A : C_A(fg)\right)^{\widetilde{*}}$$

Sana Hizem was born in Tunis, where she attended primary and secondary school. She later studied in Monastir, where she graduated in mathematics from the Faculty of Sciences in 1997. From 2004 to 2006, Sana Hizem worked as an assistant at the Faculty of Sciences in Monastir. In 2006, she defended her doctoral thesis in commutative algebra at the Faculty of Sciences in Tunis and the same year, she was appointed assistant professor at the Faculty of Sciences in Monastir. After her habilitation in 2012, she worked as a lecturer at the Faculty of Sciences in Monastir until 2018, when she became a professor.

- Research topics:
- Commutative algebra
 - Rings of polynomials and rings of formal series
 - Chains on ideals of a commutative ring



Mahdia, Tunisia, 2022



When and how did you choose to do mathematics?

I would hear people say that maths was difficult; I think I chose maths because of the challenge, and out of curiosity. At the end of my fifth year of secondary school, two years before the baccalaureate, I had to choose between maths [and physics], science [life and earth sciences], technology and literature. I was part of the second generation (this was in 1991) allowed to choose between maths and science. At the girls' high school in Monastir where I was at the time, only eight of us chose maths but this was not enough to make up a class. So I had to change schools and join the boys' high school. Since the boys' high school was also in Monastir, my home town, this wasn't an issue for me. I was curious and just wanted to explore mathematics, a subject that had attracted me more than others, even more than physics which I also enjoyed. I was aware that studying maths broadens your mind, and makes your mind more flexible. I obtained good marks in maths but wasn't sure I would succeed. I worked hard and did well. I passed my baccalaureate with "mention très bien", coming first in my school, first in my region¹ and third in the country. Since I scored so highly, I was granted a scholarship to study



in France at the Lycée Louis le Grand². Those who wanted to stay in Tunisia could do two years of preparation for the entrance examinations to Tunisian engineering schools at the Preparatory Institute for Scientific and Technical studies (IPEST) in La Marsa, as well as to some of the major French engineering schools such as Polytechnique, the École des Mines³ and the École Centrale⁴. I was convinced that I could study mathematics in Tunisia without moving to France, so I chose to study at the University of Monastir. There I completed a master's degree in mathematics, for which I obtained the presidential prize as the top student. I then took the entrance exam for preparation for the "agrégation⁵", which I topped, and after that I passed the agrégation itself, ranking first in Tunisia. This earned me my second presidential prize in 1999. I was recruited as an associate professor at the IPEST and benefited from a four-month internship under Professor Hervé Gianella at the Lycée Louis le Grand in Paris. After the agrégation, I felt that my thirst for mathematics was still not quenched. I did a DEA⁶ at the Faculty of Science in Tunis with Professor BenHissi and then started a PhD thesis under his supervision. I defended my thesis in 2006. During that time I also taught, first at



the IPEST and then at the Faculty of Science in Monastir as an assistant.

Were you encouraged by your family, friends or other people around you?

I grew up in a family where education was sacred, where studying was expected and valued. My father is an academic, an Arabic language teacher, my mother a housewife. My older sister, my brother, my younger sister and I were always supported by our parents, who never tried to dictate how we should live our lives. There was no discrimination between girls and boys in my family. My older sister is a professor of Arabic at university, my younger sister studied at the École Centrale in France, and my younger brother is a chartered accountant. At the boys' high school I benefitted from the support of my teachers in 6th and 7th grade, and later on at university I also benefitted from encouragement. My husband and my children, aged 11 and 16, encourage me too, they are always there for me and respect what I do. Thanks to the support of my whole family I have been able to attend conferences: when I went to conferences my mother, father and husband would look after the children. Without them, I wouldn't have been able to do what I do now.

They always encouraged me to push myself as much as possible.

Did you encounter any obstacles on your way to becoming a mathematician?

I don't remember feeling discriminated against as a woman. I don't remember any teacher who discriminated. After the independence, Bourguiba established parity between men and women in Tunisia, including equality of salaries. We women have learnt to defend ourselves, to be assertive and combative. If we show that we are here to work, and we work hard, we naturally impose ourselves. On the other hand, having children forces you to adjust your schedule, to find a certain balance between family and work. I defended my thesis just after the birth of my first child and passed my habilitation shortly after the birth of my second. Research doesn't wait and taking a break is therefore difficult. As is the case for all my colleagues, teaching, mentoring and research takes a lot of time.

Looking back, are you happy that you chose mathematics or do you have any regrets? For you, what are the joys of mathematics, what are the difficulties?

I have absolutely no regrets, if I had to choose again, I would make the same choice. What I like about maths is that I can do it at any time, even while travelling or at home. You can do maths alone or with others. It has given me the opportunity to travel a lot, to meet other people. This is also important. When you do research, you spend a lot of time thinking about a problem, sometimes in vain, without getting anywhere. You are constantly wondering whether what you are doing is interesting, if it will work out or not, if you are the right person to be working on that problem, which makes you doubt yourself. But mathematics also brings intense joy. Sometimes I wake up in the middle of the night with an idea that I just have to write down. Overall I am happy with what I do, however small my contribution. You have to persevere during the less fruitful periods of your research. These periods are not a waste of time, rather they can help clarify things. Above all, you should not lose confidence in yourself. Even a small result, no matter how small, can feel satisfying. Mathematics is



an ongoing challenge which requires strength, resilience, energy and perseverance. What would you recommend to a young mathematician knocking on your office door for advice on her scientific career? First of all let me say that I like to interact with students, to teach them and to see a spark in their eyes that shows they have understood. I like to see PhD students obtain a result that they are proud of. If a young mathematician came knocking on my office door for advice, then my first advice to her would be to do what she likes to do, and so I would ask

her straightaway if she likes mathematics. If you do like mathematics, then you have to persevere. By working hard, you can succeed. You have to work hard whatever job you do. This is the advice I would give to a young girl or to a young man. I would tell them not to hesitate to ask questions, to ask teachers for help. Above all, it is essential to trust your intuition. Once you've decided on your path, you just need to stick to it. Could you describe your field in a few words that are intelligible to a layperson? Commutative algebra consists of the study of sets satisfying certain rules. More precisely it

involves the study of the structure of these sets or of certain subsets of them. Commutative algebra is useful for algebraic geometry and for algebraic number theory. For my DEA I had a choice between a number of courses, but it was the commutative algebra course which attracted me most thanks to its abstraction and the structures it involves.

When I teach, I try to choose analysis courses to keep myself up to date with the subject. I enjoy that kind of challenge. Doing mathematics is a challenge in itself and to oneself. I enjoy doing maths and I think I will never stop doing it.

1 With distinction.
2 A preparatory school in Paris, which prepares for the entrance examinations for elite high schools such as the École Normale Supérieure and the École Polytechnique. The Lycée Louis le Grand is one of the most renowned preparatory schools in France.
3 Elite school for future engineers after high school.
4 See above footnote.
5 A competitive exam to become a high school teacher.
Diplôme d'Études Approfondies (formerly part of a Master's programme).
6 Diplôme d'Études Approfondies (formerly part of a Master's programme).

