Michèle Audin (1954–2025): A posthumous interview

Claude Sabbah

This text consists of personal notes by Michèle, organized as a mock interview.

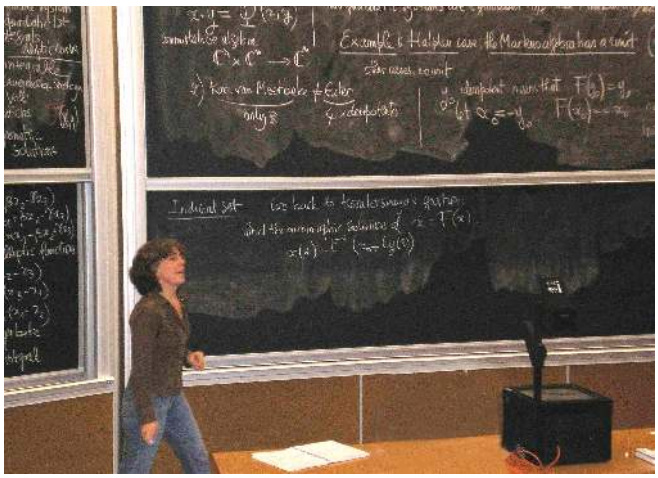
CS: How did your mathematical life start?

MA: The family balance leaned toward mathematics: on the one hand, my mother, a teacher of this subject, was omnipresent, at home, at the high school where I was a student and where she taught; and, on the other hand, no less present was the figure of my late father (a brilliant young mathematician, my mother said, murdered at the dawn of his life as a researcher). I have always loved mathematics, and at that time, it was almost exclusively thanks to my mother.
The happiest moment was when she had to start teaching what is known as "modern mathematics," an extraordinary discovery that she shared with me: Venn diagrams and Lewis Carroll's book [15], the solutions to the differential equation $y'' = -ky$ (that of the spring), they have the same structure as the set of vectors in the plane. At the same time she always showed me circles, triangles, problems of geometric loci to which their new name of "set of points" had taken nothing away from their charm. This is how I developed my taste for mathematics: recognizing and using all the structure present, but not neglecting the phenomena. Thus, for years, I thought that Feuerbach's theorem (Euler's circle is tangent to the inscribed and circumscribed circles) was the most beautiful achievement possible in mathematics. This is undoubtedly the main reason that prompted me, many years later, to write the book [4].

CS: How did you integrate into the French mathematical community as a woman?

MA: In the late 1970s, I started attending the topology seminar at Orsay as a doctoral student. If someone asked a question, the answer was often, "That's trivial!" That is what I call the "Orsay style," which one of my foreign colleagues described as arrogance. But during a year in Geneva, I learned mathematics and I also learned that anyone—including me—can ask a question and get an answer.
Another example: later, in the late 1990s, I was talking about quantum cohomology at the Bourbaki seminar. During the presentation, a famous mathematician in the second row opened his newspaper, unfolded it, and read it. That is also the "Bourbaki style."

To return to my first steps, the first mathematician to invite me to speak at a seminar was a female mathematician, Paulette Libermann. After my first presentation at a conference abroad (Oberwolfach), one of my colleagues asked a (French) mathematician to write a letter of recommendation for me. He refused, saying, "People will think I slept with her."
As a candidate for a professorship, I had dinner with several local bigwigs. One of them said to me, "I don't know if we're mature enough to hire a woman." I still wonder how his maturity issues concerned me. Nevertheless, I was appointed professor in Strasbourg in 1987. That same year, I helped found the association *femmes & mathématiques* (women and mathematics).



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CS: What were your main areas of research?

MA: In the early 1980s, I worked in algebraic topology, on applications of algebraic topology to symplectic geometry and in symplectic geometry. At the time, there was an article by a Russian mathematician, Viktor Vassiliev, who was working on enumerative geometry of singularities; there is a relationship between singularities in general and Lagrangian submanifolds, and it was while reading this article that I became interested in this topic. I attended the ICM congress in Warsaw in 1983 for the sole purpose of meeting Russian mathematicians, and

then Vladimir Arnold invited me to Moscow in 1986. My presentation at the Arnold seminar was the most difficult (and one of the most stimulating) things I have ever done in my entire professional life. My work then focused more specifically on integrable systems, rational curves and quantum cohomology, the relationships between these two theories (quantum cohomology and integrable systems) via Frobenius manifolds, integrability issues, and the topology of Lagrangian submanifolds.

CS: You wrote, or contributed to, many books, didn't you?

MA: I took advantage of maternity leave to write my first book [2], which I completely rewrote in 2004: better written, much more material, new proofs. However, before that, there was my doctoral thesis [1]. I remember that, at a reception at Cambridge University Press, after two glasses of a robust Australian red wine, I managed to refuse to write a book on *the life of a mathematician*. But I found myself offering to write one about spinning tops, which I did [3]! I also tried to explain, geometrically, the Galois criterion of non-integrability of Morales and Ramis in [5], where there is a simplified presentation and an original example that is particularly educational. Finally, I co-authored at least one book that is not very funny ([13], on Floer homology), but my co-author and I had a lot of fun writing it! I also contributed, together with Jacques Lafontaine, to the publication of the multi-author book (including myself) [14], which remains a reference on the subject of pseudo-holomorphic curves. Moreover, several mini-courses that I have given have been published at various places.
Last, there is also the geometry book [4] that I mentioned at the beginning, which has been very useful to students preparing for the mathematics teaching certification exam.

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CS: And then there is that book [6] about Sofia Kovalevskaya.

MA: I wrote only one of my research articles in collaboration (with Robert Silhol). It was a great idea, which we tested using Kovalevskaya's spinning top as an example. Then, thanks to Jean-François Peyret, a theater director, and his 2005 play *Le cas de Sophie K*, I felt free to also take an interest in the non-mathematical aspects of Sofia Kovalevskaya's life. Why is it so difficult to say that she was very good at mathematics? The most surprising thing about her reputation is the harm done to her by her "friend" Anne-Charlotte Leffler, who described her as an unhappy woman—at the very moment when she was happiest—in a biography that is still published alongside Sofia's own childhood memories. I had a very hard time finding a publisher for this book on Sofia Kovalevskaya, which did not fit into any category. I see it as a manifesto for the consideration of mathematics, history, and literature as a whole. For example, I love Italo Calvino's *Cosmicomics*, and I could not resist writing one featuring Sofia Kovalevskaya studying Saturn's rings. Reintegrating mathematics into culture is a matter of democracy.

CS: Let us continue with your interest in history, and first of all the history of mathematics.

MA: Sofia received the Bordin Prize from the Academy of Sciences, and I became interested in the prizes awarded by this Academy, particularly the Grand Prize [7]. In 1918, it was Gaston Julia who received the prize, not Pierre Fatou, and there were also questions of priority with Paul Montel. I had questions about Julia: a war veteran who was seriously wounded in World War I and a renowned mathematician, but who maintained a lively correspondence with Nazi officer Helmut Hasse during World War II, which I wanted to publish, but the French side did not give permission… So I wrote a novel [11]! Research in the archives allowed me to discover Julia's first drawing of a Julia set! In the very first archive box I opened, I found a note by mathematician Jacques Feldbau, published under the name Ehresmann alone, because the Academy of Sciences had struck his name as author. I wrote an article showing how French scientists prevented their Jewish colleagues and compatriots from publishing during the German occupation, and I wrote the book [8]. I also re-edited the "Julia seminar," the predecessor to the Bourbaki seminar, which could not find a publisher [12]. I had access to first-hand documents because I helped catalog Henri Cartan's archives after his death, which moreover enabled me to edit the Cartan-Weil correspondence [9] and to write an almost finished biography of Élie Cartan (Henri's father).

CS: Now let us talk about your interest in history.

MA: I am not a historian, I have no degree in history. I am interested in history, but as a writer. I am a writer, but I am quite rigorous, so I like my fiction to be grounded in reality. I started my blog on the Commune `macommunedeparis.com` because I wanted to write a novel set during that period, so I learned a lot, too much even for a book. So I had the idea of starting this blog, which freed me up, and I was able to write the novel.
I was particularly interested in the Commune because, for once, just for that one time, lots of anonymous people, people who had no history, as they say, people whose opinions were never sought, spoke out and almost took power for two months. It so happens that, in terms of the history of mathematics, I was interested in the interwar period and World War II, which are somewhat delicate periods, not to mention the Algerian War. It is very complicated to do research on these periods because there are rights holders, and because we do not have access to the archives. Whereas for the Commune, there are still archives that no one has looked at, and we have the right to look at

all the archives. There are so many missing persons, so many unknowns, that there is still a lot to be done.
I then edited and annotated many texts and correspondences from this period and even earlier, as I did for the Cartan-Weil correspondence and the Julia Seminar.

CS: So you are a writer. Tell us about it.

MA: After the book on Sofia, Oulipo invited me to become a member. They are a group of writers, somewhat modeled on the Bourbaki group, who are interested in potential literature, that is, who use forms or constraints to write. For example, I wrote a fairly long text following Pascal's theorem (six points on a conic...); the six points are characters; when three points are aligned, it represents a relationship between the characters. I also used the sextine, invented in the thirteenth century, which is a particular permutation of six letters (spiral permutation) or other permutations (of eleven letters in the novel [11]). These constraints help with writing but are not visible. Did joining Oulipo allow me to become a writer? My answer is: No, and Yes. The first real literary texts I published were included in the book about Sofia. But there is no doubt that I felt more legitimate writing about something other than mathematics after joining Oulipo. Memory is one of my areas of interest, the memory of those whom history overlooks. Life is easier for writers than for certified historians, since nothing prevents us, within the framework of extremely rigorous work, from conveying the emotion of our respect and love for the characters in our books.

CS: Finally, a few words about your book [10] (A Brief Life).

MA: As you may know, the Audin Affair concerns the disappearance and murder by the French army of a young mathematician, anti-colonialist activist, and communist during the "Battle of Algiers" in June 1957, Maurice Audin. The Audin Affair is also, and above all, the campaign waged for more than 61 years by my mother, Josette Audin, and those who supported her, notably Laurent Schwartz and, more recently, Cédric Villani, to uncover the truth about Maurice Audin's death and disappearance, but above all to fight against torture in Algeria at that time and the system that gave rise to it. Official recognition was finally granted by President Macron on September 13, 2018.

With President Macron, on September 13, 2018. ©AFP

While the search for the exact circumstances and perpetrators of Maurice Audin's murder has been essential for my family throughout all these years, and they remain unknown, it is instead my father's life, traces of which have not disappeared, that I tell in this book. For this book, I organized the data into categories (places, family, mathematics, etc. – count to six), with each of the six chapters containing elements from these six categories, which are permuted in a spiral pattern. This helped me in my attempt to cover everything and be exhaustive.

References

[1] M. Audin, *Cobordismes d'immersions lagrangiennes et legendriennes (Thèse d'état, Orsay, 1986)*. Travaux en cours, Hermann (1987)

[2] M. Audin, *The topology of torus actions on symplectic manifolds*. Progress in Math., Birkhäuser [Revised and enlarged edition: 2004] (1991)

[3] M. Audin, *Spinning tops, a course on integrable systems*. Cambridge University Press [Russian transl.: 1999, Japanese transl.: 2000] (1996)

[4] M. Audin, *Géométrie*. Espaces34 et Belin [English transl.: Springer, 2002; Second French ed.: Edp-Sciences, 2006] (1998)

[5] M. Audin, *Les systèmes hamiltoniens et leur intégrabilité*. Cours Spécialisés 8, Société Mathématique de France & EDP Sciences [English transl.: American Mathematical Society, 2008] (2001)

[6] M. Audin, *Souvenirs sur Sofia Kovalevskaya*. Orizzonti, Calvage & Mounet [English transl.: Springer, 2011] (2008)

[7] M. Audin, *Fatou, Julia, Montel, le grand prix des sciences mathématiques de 1918, et après*. Springer [English transl.: Springer, 2011] (2009)

[8] M. Audin, *Une histoire de Jacques Feldbau*. Collection T, Société mathématique de France [German transl.: Springer, 2012] (2010)

[9] M. Audin, *Correspondance entre Henri Cartan et André Weil*. Documents mathématiques, Société mathématique de France (2011)

[10] M. Audin, *Une vie brève*. l'Arbalète, Gallimard [Spanish transl.: Editorial Periférica, 2020] (2013)

[11] M. Audin, *Cent vingt et un jours*. l'Arbalète, Gallimard [English transl.: Deep Vellum, 2016] (2014)

[12] M. Audin (ed.), *Le séminaire de mathématiques 1933-1939*. Centre Mersenne, https://proceedings.centre-mersenne.org/books/, Grenoble (2015)

[13] M. Audin and M. Damian, *Théorie de Morse et homologie de Floer*. Savoirs actuels, Edp-Sciences [English transl.: Springer, 2013] (2010)

[14] M. Audin and J. Lafontaine (eds.), *Holomorphic curves in symplectic geometry*, Progress in Math., Birkhäuser (1994)

[15] L. Carroll, *The game of logic* (1886)

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