Beyond the Limit: The Dream of Sofya Kovalevskaya

Reviewed by Ann Hibner Koblitz

Twenty-five years ago when I began research on my doctoral dissertation on the Russian mathematician, writer, and social activist Sofia Kovalevskaia (1850–1891), I was surprised to learn that most mathematicians I encountered had some smattering of information (often false) about her. The more diffident and cautious among them would recount their "knowledge" in the form of questions, such as "Is it true that she slept with her advisor and that he did all of her best work?" or "Did she really abandon math for literature?" But I also met a few mathematicians whose thoughtlessness or arrogance led them to state confidently that all of Kovalevskaia's papers were erroneous or that she was awarded the Prix Bordin of the French Academy of Sciences out of gallantry. One Swedish mathematician (who will remain nameless) condescendingly chided me for being interested in Kovalevskaia as a mathematician at all, saying that although she might have been something of an amateur mathematician, the Cauchy-Kovalevskaia Theorem (one of her best-known results) was her husband's, not hers.[1] And several people took great glee in recounting to me the aphorism often attributed to Hermann Weyl that there have been only two women in the history of mathematics, and one of them wasn't a mathematician [Kovalevskaia], while the other wasn't a woman [Emmy Noether].
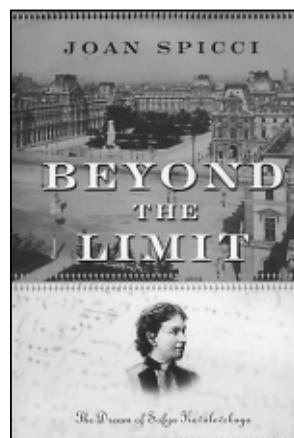
The plethora of misinformation about Kovalevskaia made me realize that I had a larger task on my hands than I had initially supposed. Naturally, I needed to comb the archives and libraries of Russia, Sweden, and elsewhere to put together the pieces of her life and set her within the intellectual and cultural milieu of her time. But equally importantly, I wanted to trace the various legends and insinuations to their sources and uncover the roots of commonly held misperceptions. This historiographical study proved

---

[1] *The most charitable interpretation of this bit of nonsense might be that since the theorem is often called Cauchy-Kovalevskii in Western European languages ("ii" is a masculine ending for names in Russian, while "aia" is feminine), he thought that the reference must be to a man. Also, Kovalevskaia's husband, Vladimir Kovalevskii, was indeed a scientist in his own right, but he was a paleontologist, not a mathematician.*

Ann Hibner Koblitz is professor of women's studies at Arizona State University. Her email address is koblitz@asu.edu.

almost as engrossing as did my research on the circumstances of Kovalevskaia's life and work and involved questions of changing political and cultural atmosphere as well as the idiosyncrasies of individual historians, mathematicians, and other commentators.

For those who know little about Kovalevskaia, let me digress for a moment to give a short summary of her life. Sofia Kovalevskaia (née Korvin-Krukovskaia) was born into a noble household in Russia in 1850. Like many young gentlewomen of her generation, she was caught up in the social and political movements of Russia in the 1860s, among which was nihilism. Adherents of this philosophy denied the value of everything in traditional tsarist society, had great faith in the power of education, believed that a transformative social revolution was imminent, and maintained that the best way to help the revolution along was through the study of the natural sciences and medicine. Kovalevskaia embraced nihilism and decided to pursue an advanced degree in mathematics. She married nihilist book publisher and sometime paleontologist Vladimir Kovalevskii in order to further her efforts to get a university-level education. Their stormy, unconventional marriage resulted in a daughter, born in 1878, and ended with Vladimir's suicide in 1883.

Kovalevskaia studied in Heidelberg and Berlin with Karl Weierstrass, Leo Königsberger, Paul DuBois-Reymond, and others and with their help in 1874 persuaded Göttingen University to recognize her three research works as sufficient for a degree. She was the first woman in the world to get a doctoral degree in mathematics in the modern sense of the term, and she was among the first women to earn advanced degrees in any subject. Because of the prejudices of the time, she had difficulty establishing herself in a professional position, and it was not until late 1883 that her colleague Gösta Mittag-Leffler was able to arrange a post for her at the newly established university in Stockholm. Kovalevskaia became an Extraordinary Professor (in modern American parlance, assistant professor) at Stockholm University in 1884 and joined the editorial board of the new journal *Acta Mathematica* at the same time.

In the last three years of her life, Kovalevskaia received the Prix Bordin of the French Academy of Sciences for her work on the revolution of a solid body around a fixed point, a full professorship in Stockholm, and corresponding membership in the Russian Imperial Academy of Sciences (the rules had to be changed to permit her membership). At the same time she also distinguished herself as a writer; she published a much-acclaimed memoir of her childhood, several essays on political and social topics, and (in conjunction with Mittag-Leffler's sister, Anne Charlotte Leffler) two plays.

Kovalevskaia's life was eventful. Besides her pioneering efforts to open up higher educational opportunities for women in Russia and continental Europe and her literary endeavors, she participated in the Paris Commune, aided Polish and Russian revolutionaries whenever possible, and was on cordial terms with many of the most prominent mathematical and cultural figures of her day. She numbered among her colleagues and friends the eminent mathematicians Charles Hermite, Henri Poincaré, Hermann Schwarz, Carl Runge, Pafnutii Chebyshev, and Emile Picard. She was acquainted with such scientific and literary luminaries as Charles Darwin, George Eliot, Dmitri Mendeleev, Ilia Mechnikov, Ivan Sechenov, Herbert Spencer, Ivan Turgenev, Fedor Dostoevskii, Henrik Ibsen, and August Strindberg, and her salons in St. Petersburg, Moscow, and Stockholm were attended by these and other leading intellectual figures.

In fact, what emerged most prominently from my research in Russian and Swedish archives and libraries was the extent to which Sofia Kovalevskaia was not, as implied in the Weyl remark cited above or in Bell's *Men of Mathematics*,[2] some sort of barely tolerated amateur or outsider. On the contrary, she was a participating member of the European mathematical elite: she was consulted on hiring decisions, was asked for letters of recommendation, organized conferences, and so on. Kovalevskaia actively contributed to the "mathematical culture" of late nineteenth-century Europe, and during her lifetime she was accorded the respect she deserved. It was not until her contemporaries retired or died that the legends and distortions began to surface in the European mathematical community.

In the 1980s several serious works on Kovalevskaia and her mathematics appeared in English. My doctoral dissertation was published in 1983 and was soon followed by a comprehensive book on Kovalevskaia's mathematics by Roger Cooke, the English translation of a careful biography by the Soviet academician Pelageia Polubarinova-Kochina, and a volume of Contemporary Mathematics devoted to Kovalevskaia's life and mathematical legacy.[3] Since the 1980s there have certainly been enough reliable accounts of

---

[2] *Eric Temple Bell,* Men of Mathematics *(New York: Simon and Schuster, 1937), 423–429.*

[3] *Ann Hibner Koblitz,* A Convergence of Lives. Sofia Kovalevskaia: Scientist, Writer, Revolutionary *(Boston and Basel: Birkhauser, 1983; revised 2nd ed. New Brunswick, NJ: Rutgers University Press, 1993); Roger Cooke,* The Mathematics of Sonya Kovalevskaya *(New York: Springer-Verlag, 1984); Pelageya Kochina,* Love and Mathematics: Sofya Kovalevskaya *(Moscow: Mir, 1985); Linda Keen, ed.,* The Legacy of Sonya Kovalevskaya, *Contemp. Math. (Providence: American Mathematical Society, 1987).*

Kovalevskaia's life and research that one could expect the disparagement and innuendo to cease.

Unfortunately, it seems as if some mathematicians are more comfortable with the old rumors and tales about their predecessors than they are with the reasoned results of careful scholarship. Eric Temple Bell's *Men of Mathematics*, for example, still appears to be popular despite the fact that it is riddled with errors and his section on Kovalevskaia is inaccurate and coyly sexualized.[4] And Felix Klein's idiosyncratic two-volume history of nineteenth-century mathematics (which casts doubt on Kovalevskaia's originality) is still commonly regarded by mathematicians as authoritative, even though, as Jeremy Gray noted, historians have learned "to handle [it] with care."[5]

Even at the present time one occasionally comes across sexist treatment of Kovalevskaia. A few years ago the Russian edition of *Playboy* pasted her face onto the body of a nude masturbating woman. And just last year in *Mathematical Apocrypha* Steven Krantz perpetuated the canard that Kovalevskaia and her colleague Mittag-Leffler had been sexually intimate. Krantz also saw fit to illustrate his little anecdote with a photograph of "the lovely Sonja Kowalewska dressed up as a kitty kat."[6]

Given the persistence of sexist silliness about Kovalevskaia, I must admit that it was with mixed emotions that I agreed to look at proof pages of Joan Spicci's *Beyond the Limit: The Dream of Sofya Kovalevskaya*. Fortunately, I needn't have worried; the book is a respectful as well as entertaining treatment of its subject.

Beyond the Limit is a bit difficult to categorize. Spicci uses real names and historical personages and is in most cases accurate in matters of fact. She has consulted some of the best sources on Kovalevskaia in both Russian and English and has read Kovalevskaia's collected correspondence in Russian. She has been interested in Kovalevskaia for many years, has mathematical training, and has produced translations of several of Kovalevskaia's literary works. But Spicci writes in a flowing, omnipresent narrative style, putting words in the mouths and thoughts in the minds of her characters in a manner one usually associates with the genre of romantic fiction. The book therefore has the feel of a novel, though the author refers to her study as a "historical work" (p. 7).

Spicci limits herself to a relatively short but exciting period in Kovalevskaia's life. The book begins in the winter of 1865 with a description of the adolescent Sofia's infatuation with her older sister Aniuta's beau, the famous author Fedor Dostoevskii. It ends with Vladimir and Sofia happily going home together to Russia in 1874 upon the successful completion of their doctoral studies. The long narrative (close to 500 pages) stresses Kovalevskaia's determined efforts to attain a university education and doctorate in mathematics, her nihilist political beliefs and those of her sister and friends, and the on-again, off-again relationship between Sofia and Vladimir. The Kovalevskii marriage initially had been what the Russian radicals of the day called "fictitious". That is, it was arranged for the purpose of transferring Sofia from her father's control to that of her husband so that she could go abroad to study, at which point he was theoretically supposed to leave the scene. At first, Sofia appears to have had no notion that Vladimir desired to share her life.[7]

Though a competent scientist, committed radical, and normally sweet-tempered person, Vladimir was a bit unstable. He could on occasion alienate his family, colleagues, and political associates with bouts of inexplicable rage or highhandedness (a facet of his personality Spicci tends to downplay). For her part, Kovalevskaia could be capricious in her dealings with Vladimir and sometimes took him for granted. The confused nature of the pair's relations during their university years in Western Europe is a major focus of Spicci's interest.

I enjoyed the book very much; it is charmingly written and engrossing. Despite its length it reads quickly, and I found myself sorry when the narrative came to an end. Spicci's characterizations for the most part seem plausible. She has nicely captured the personalities as well as the psychological and political dilemmas of several of the major figures in her heroine's life, and she has a fine talent for painting Kovalevskaia against a broad backdrop of European society and culture. While I might have doubts about a few of her interpretations of her characters' motivations and beliefs, and I am almost certain that she misdates the change in the Kovalevskii marriage from fictitious to real, on the whole I thought her account was artistically satisfying as well as

---

[4] *Eric Temple Bell, Men of Mathematics (New York: Simon and Schuster, 1937). For a careful analysis of Bell's errors with regard to another mathematician, see Tony Rothman, "Genius and Biographers: The Fictionalization of Evariste Galois", Amer. Math. Monthly* **89** *(1982), 82–106.*

[5] *Felix Klein,* Vorlesungen über die Entwicklung der Mathematik im 19. Jahrhundert *(Berlin: Springer, 1926); Jeremy Gray, "Who Would Have Won the Fields Medals a Hundred Years Ago?",* Math. Intelligencer **7** *(1985), 19.*

[6] *Steven G. Krantz,* Mathematical Apocrypha: Stories and Anecdotes of Mathematicians and the Mathematical *(Washington, DC: The Mathematical Association of America, 2002), 126–127.*

[7] *I discuss this further in A Convergence of Lives, "Career and Home Life in the 1880s: A Mathematician's Choices"; Uneasy Careers and Intimate Lives: Women in Science, Pnina Abir-Am and Dorinda Outram, eds. (New Brunswick: Rutgers University Press, 1987), 172–190.*

accurate. Several times I found myself initially resisting Spicci's take on some event, only to decide that her version was in fact believable and that the scene might have unfolded along the lines she suggested.

Who will be interested in reading this book? Any mathematician or scientist with a desire to immerse herself/himself in the vanished world of nineteenth-century European intellectual and cultural life will find *Beyond the Limit* absorbing. The book also might be attractive to young women (possibly at the advanced high school level but more probably college age) who like to read biographies of successful women of the past. This is the kind of biography that I read avidly when I was a teenager, and although prior knowledge of Kovalevskaia's history might be helpful, it is certainly not essential for the enjoyment of this charming story.