Lowell Milken Center for Unsung Heroes
ARTEFFECT

Impact Statement

Gahyeon Kim, Grade 8
Beyond Limits, 2026
Colored pencil, marker, pen on paper, 15.5 x 12 inches
Seoul Foreign School, Seoul, South Korea
Unsung Hero: Sofya Kovalevskaya

As an individual with a keen interest in mathematics myself, Sofya Kovalevskaya caught my attention among the list of numerous Unsung Heroes. Sofya Kovalevskaya was a Russian mathematician who made noteworthy contributions to analysis, partial differential equations, and mechanics during her life. Kovalevskaya developed a profound early love for mathematics, reportedly studying calculus notes that covered her nursery wallpaper. Despite the unequal rights women were given during her lifetime, Kovalevskaya remains as one of the most influential figures in mathematics before the twentieth century. She was the first woman in modern Europe to achieve a doctorate in mathematics as well as one of the first women to work for a scientific journal as an editor.

The more I reflect on her life and the magnitude of her achievements and compare the obstacles she had to face as a woman mathematician to the opportunities I am given in education, the more I admire her. What I admire most about her is her persistence in the face of discrimination. She studied under Karl Weierstrass in Berlin, producing revolutionary mathematical work, and still continued even when there were very limited opportunities for women. She was a pioneer of equality for women in mathematics, changing the perspective of people on what they thought women could achieve in science.

Sofya Kovalevskaya's work significantly impacted the 19th-century's scientific community and beyond by breaking gender barriers in academia, pioneering new mathematical methods, and influencing literature. As aforementioned, she made lasting contributions to partial differential equations and their analysis. Her work helped develop what is now known as the Cauchy-Kovalevskaya theorem, which remains as a fundamental result in analysis, often used as a standard theorem in advanced mathematics. Experts in partial differential equations have used this theorem directly or found it to be an inspiration in their work, highlighting its lasting theoretical value. Additionally, her research on the rotation of a solid body around a fixed point, the Kovalevsky top, was a major advancement that continues to be relevant in mathematical physics. She also became an editor for Acta Mathematica, adding to her influence in the scientific world.

However, her impact went beyond the field of mathematics, demonstrating that women could succeed at the highest academic level. At the time when women were excluded from the highest levels of education, Kovalevskaya's accomplishments proved that gender should not be a

limitation to intellectual abilities, forcing a reconsideration of contemporary views on women's intellectual capabilities. Her life continues to inspire our community, with her papers still discussed at mathematical symposia and her name given to a lunar crater.

The more I got to learn about her, I wanted to reflect on both her early life and the weight of her accomplishments. I decided to draw a main figure of her childhood with newspapers surrounding her that display her achievements. This emphasizes her interest in mathematics from an early age, and the contrast between the limited opportunities she had and her achievements despite those limitations. To add on, there is a blue ribbon tied to the wrist of her, which reflects the opposition to societal norms in the nihilist movement that she was part of. Each newspaper in the drawing reflects her major achievements. The one she is holding shows Cauchy-Kovalevskaya theorem, the one on the left shows Kovalevsky-top, and the one on the right shows the professorship she had earned in Stockholm University, with an image of her wearing a graduation cap and the logo of the University on the top. Moreover, I decided to utilize the contrast of colors between the images in the newspaper and the drawing of her childhood self. While the main figure of her childhood utilizes vibrant colors that reflect our modern community, I wanted to utilize the faded tones of old newspapers to capture the historical context of her life. The font and colors of the newspapers are inspired by those of Russian newspapers in the 19th century. I made this decision since I thought reflecting the historical background of Kovalevskaya's life was crucial to emphasize the hardships she had to face as a woman mathematician. Additionally, I have chosen to include various symbols and equations from her work in the background. With the dark green background resembling a chalkboard, these symbols connect my artwork to the world of mathematics and academic study.

Creating this artwork made me realize how often important women in history are overlooked. Sofya Kovalevskaya's story reminds me how barriers do not define one's potential, and her life encourages me to value the educational opportunities I am given. I hope viewers to look at the artwork and face not a mere mathematician, but a woman who changed the future of further generations.

References:

https://www.ebsco.com/research-starters/history/sofya-kovalevskaya

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https://mathshistory.st-andrews.ac.uk/Biographies/Kovalevskaya/