

# Biography and impact of charlotte angas scott



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Charlotte Angas Scott was an English mathematician born on June 8, 1858 in Lincoln, England. She was the 2nd child of seven to Caleb, a minister in a Congregational Church, and Eliza Ann Exley Scott (Encyclopedia of World Biography, 2010). In addition to his ministry, Caleb Scott was an educator and in 1865 became the Principal of the nearby Lancashire Independent College (O'Connor & Robertson, 2015). During this time in history, it was unusual and not encouraged for women to obtain any sort of education higher than the basics as people thought that intellectual wisdom and knowledge could damage the health and marital aspects of a women. Despite this, both of Charlotte's parents encouraged her to attend and participate in educational academic pursuits (Encyclopedia of World Biography, 2010). It was to her benefit that her parents were involved in the ministry as the Congregational Church was one of the few churches that supported women's rights at this time in history. In addition, there were only two higher education secondary schools available in England that allowed women to gain entrance. Due to her father being a principal of a school, Charlotte was provided with tutors and this is where her mathematical interest took off (O'Connor & Robertson, 2015).

Due to her academic abilities and the progress she made with her tutors, Charlotte was awarded the Goldsmith's Company Scholarship in 1876 to Hitchin College, which was soon renamed at Girton College. This college was founded in 1869 and was the first women's college in England. At first, it was not associated with the University of Cambridge, but in 1948 the ties to the college grew strong enough for it to be recognized as an official part of the University of Cambridge. When she entered, she was one of eleven female

students in her class (O'Connor & Robertson, 2015). In addition, to keep them separated from their male peers, the females had to sit behind a screen which unfortunately blocked their view of the board. In addition, due to women not being allowed in higher education school all that often, if a woman was seen walking around campus unescorted, she would be taken to the " Spinning House" which was a prison for prostitutes (Encyclopedia of World Biography, 2010).

In order for males to receive degrees at Cambridge University with honors, they had to take the Mathematical Tripos examination that was given to third year students. Since the males were required to take this exam, the women wanted a chance to take it as well. Therefore, starting in 1872, undergraduate females could take this exam in an informal manner, which was a 50 hour long oral exam. Women would have to apply to take this exam, and some were allowed special permissions to do so, including Charlotte Scott who was allowed to in 1880 (Kenschaft, 1987). After taking the exam, Scott had placed eighth out of her peers. However, since she was a woman, she could not graduate and did not receive a degree. In addition, her name was not mentioned on the list at the awards ceremony, she wasn't allowed to participate in the commencement ceremony, and she was not awarded with the title of " Eighth Wrangler" like any male would have which was given to students who received these top rankings (O'Connor & Robertson, 2015). However, the male students supported her and during the graduation ceremony they shouted out " Scott of Girton" when the names were announced, receiving praise throughout the crowd. To celebrate on their own, the women of Girton organized their own celebration, and the

local weekly paper, *Punch*, published an article congratulating her and her accomplishments (O'Connor & Robertson, 2015).

Scott's achievement and success with the Mathematical Tripos exam made a positive impact on education, and a petition that passed around at the University of Cambridge and was signed by over 8, 000 people is what led to Cambridge allowing women to officially take the Mathematical Tripos.

However, women were still not allowed to obtain degrees at Cambridge until 1984, long after the time Scott was attending the college. However, she continued to study at Girton on the topic of algebraic geometry, modern algebra, Abelian functions, number theory, and the theory of substitutions. She listened to lectures and received guidance and support from her mentor and professor at the University, Arthur Cayley. She was soon allowed to give lectures and teach at Girton in 1880 on the topic of mathematics for four years and lectured at Newnham college for three years. However, Scott wanted to obtain a degree, so she received her Bachelor of Science in Mathematics degree from the University of London with first class honors in 1882 and her Doctorate in Mathematics from the same university in 1885 (O'Connor & Robertson, 2015). She is noted as the second woman in the world and the first British woman to obtain her Doctorate in Mathematics (Encyclopedia of World Biography, 2010).

In 1885, founded by the Quaker Joseph Taylor, the nondenominational Bryn Mawr College was founded in Pennsylvania, United States. It was credited as the first higher education institution that offered graduate classes and studying for women. Due to her success in England, Arthur Cayley, her mentor, recommended her to the college and was offered to be the Head of

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the Bryn Mawr Mathematics Department (O'Connor & Robertson, 2015). In his recommendation, Cayley stated that Scott was known to have a “ high capacity for original work... [her] popularity as a teacher, her success in organizing the mathematical department of the College, and her personal courtesy of friendliness to students” (Encyclopedia of World Biography, 2010). In addition, while at Girton, Scott started to lose her hearing and she became fragile in her health. However, Cayley stated that neither of these downfalls negatively affect her abilities of being a teacher. Therefore, due to this recommendation, she joined the college as an associate professor of mathematics and contributed to the increase of criteria needed to be admitted to the college. Scott wanted all students, before being admitted to the college, to have competency in math courses, and those who were unable to pass these entrance exams in geometry and trigonometry needed to pass those classes before they could obtain their degree. She continued to teach here until 1924 when she finally retired (Encyclopedia of World Biography, 2010).

Charlotte Scott served on and participated in many organizations and is known for her work and publications on mathematical topics. In 1888, she was promoted to a professor of mathematics and joined the New York Mathematical society, which is now referred to as the American Mathematical Society, where she served on the council from 1891 to 1894 and from 1899 to 1902 and was the vice president from 1905-1906 (Kenschaft, 1987). She was a member of the London Mathematical Society, the Edinburgh Mathematical Society, the Circolo Matematico di Palermo, the Deutsche Mathematiker-Bereinigung, and was an honorary member of the

Amsterdam Mathematical Society. In 1899, she was the co-editor of the *American Journal of Mathematics* which she was involved in for an impressive 27 years. In addition, she was one of the 17 Americans who in 1900 attended the World Congress of mathematicians (Kenschaft, 1987). In addition to her participation in organizations, she published many books and articles. One of her most well-known publishes was the textbook titled *An Introductory Account of Certain Modern Ideas and Methods in Plane Analytical Geometry* which was published in 1894. This textbook covered the topics of groups, subgroups, invariants, covariants, and projective geometry (Encyclopedia of World Biography, 2010). In addition, she published another smaller textbook in in 1907, but it was not as successful as the ideas she presented were based on lines instead of points and not yet known worldwide (Kenschaft, 1987). The main work that Scott focused on was algebraic geometry and singularities in algebraic curves. In addition to her textbooks, she published eight papers to European journals along with a paper titled “ A Proof of Noether’s Fundamental Theorem” in 1900. Lastly, she founded the College Entrance Examination Board and served as the chief executive examiner for one year starting in 1902, and the regulations that they founded back then have only changed slightly until today (Encyclopedia of World Biography, 2010).

Charlotte Scott left a legacy that impacted mathematics, especially for females, during her lifetime. Her development of the math program at Bryn Mawr gave her a worldwide reputation. According to one of her students, Isabel Maddison, she had a rare gift where she could explain topics “ lucidly” and had an intuition of the concepts that students could understand. In

addition, she was ranked number fourteenth among the leading mathematicians in the world based on a poll her peers did (Encyclopedia of World Biography, 2010). In addition, her impact on the education of women allowed them to make academic economic progress in America. After retiring, Scott moved back to England. Her hearing deficiencies started to get even worse and she developed rheumatoid arthritis. As a coping mechanism, she took up gardening, cultivated a new species of a chrysanthemum, played golf, and traveled. Scott later passed away on November 10, 1931 in her home in England. She was 73 years old.

## References

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