Biography Paper:
Agusta Ada Byron

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Agusta Ada Byron, a lady of the Victorian Era and born in 1815, has become known as the first computer programmer throughout the history of computing. According to an article published in *IEEE Annals of the History of Computing*, by Betty Alexandra Toole, Ada considered herself an "Analyst and a Metaphysician" and possessed skills that are still needed today such as creativity, critical thinking, and collaboration (Toole, 5). She was the daughter of Poet Lord Byron and considered by him his "sole daughter of his house and heart." Like her father, Ada "had the ability by using imagination and metaphor to evaluate accurately a concept or idea" (Toole, 5). She died at the early age of thirty-seven, but was known to be a woman ahead of her time.

Ada's parents separated when she was very young and was raised by her mother. Her father died when she was eight years old. She spent a great deal of time on her studies and loved geography. However, this love was quickly replaced by her passion for mathematics, in which her mother tutored her (Gurer, Denise, 46). Ada's mother began tutoring her at the early age of five. She implemented a system of education where by she rewarded Ada with tickets for doing her lessons well. If Ada did not perform up to her mother's expectations, her tickets were "forfeited" and other measures taken (Toole, 5). The only day Ada did not have class was Sundays, and it was during this time that she focused on learning the theories of Swiss educator Johann Pestalozzi, one of the first educators to gear instruction to the level of the child by using concrete objects (Toole, 5). Ada used blocks and learned how to form a design.

At the age of twelve, Ada set out to design a flying machine because she had a yearning to fly. She first worked on constructing the wings and researched different materials and sizes. While doing this, she researched the anatomy of birds to determine the right proportion between the wings and the body. She further decided on the equipment she would need and felt that a compass was crucial in order to "cut across the country by the most direct road" (Toole, 5). Her last step would be to integrate steam, but this became the most difficult and Ada was quickly reprimanded for not focusing on her studies.

Ada frequently corresponded with mathematicians and by the age of eighteen met Charles Babbage, the inventor of the Difference Engine. Ada had the opportunity to see Babbage's studio where he kept the machine and corresponded with him regularly about his invention (Freeman). During a time when women were considered inferior and could not attend universities, Ada pursued her studies by attending public lectures and taking greater interest in academic learning.

She married William King in 1835 and became the Countess of Lovelace when her husband became first Earl of Lovelace. Together they had three children. William was not emotionally attached to Ada, and therefore spent much of his time away from her on business (Trainor, 376). He was, however, extremely supportive of Ada and encouraged her to continue learning and corresponding with people like Babbage and the Scottish mathematician Mary Somerville (Freeman). Ada used wooden mathematical models, such as spheres and polyhedra, to enrich and help her understanding of mathematics.

Ada looked to Mary Somerville as her role model and confidant. According to the *London Post*, she was "the Queen of the 19th-century Science" (Trainor, 376). She translated Pierre-Simon Laplace's "Traite de mecanique celeste," and was the person who actually introduced Ada to Charles Babbage.

In 1840, Ada wrote Babbage a letter inquiring whether or not the board game Solitaire could be written out mathematically. She began a process of numbering each peg and clearly describing each move. According to Toole, her idea predates Boole's first published work in 1847, *The Mathematical Analysis of Logic*, which with his other works formed the foundation for having the ability to program games on modern computers (Toole, 6).

Ada has become best know for her ability to translate the meaning of Babbage's Analytical Engine. No one in the government understood his ideas on this machine because the descriptions he gave became too difficult to follow. Ada, on the other hand, completely understood his designs, and in 1843 wrote a set of instructions and speculations of its possible uses (Park, 75). The notes that she wrote were combined with her English translation of other notes, which had been written in French when Babbage was invited to describe the Analytical Engine at Turin. Captain Luigi Menabrea published these original notes (Trainor, 376). Ada's notes were published anonymously in the scientific press because women were not believed to possess the ability to write scientific papers, and no publishing house wanted to risk its reputation by revealing that a woman wrote it (Park, 75). However, it was "a work that would become the definitive (indeed, the

only) detailed account of the Analytical Engine's design and applications" (Trainor, 376).

Her description began with a mathematical description of the Difference Engine and how it differed from the Analytical Engine. She described how the Analytical Engine was capable of computing with general information, and emphasized how this machine possessed the ability to act on general instructions (Freeman). Her notes included a table describing the necessary operations for solving mathematical problems. This work made Ada the first "conceptual programmer" for Babbage's Analytical Engine (Gurer, Denise, 46). In later writings, she developed the "loop" and "subroutine" concept almost a century before the invention of electronic computers (Gurer, Denise, 46). Ada's brilliance led the US Department of Defense to name the military computer-programming language after Ada in 1980 (Park, 75).

Ada used the same methodology while writing the notes that she used while designing the flying machine. She used both "analog" and "digital" skills (Toole, 9). Before actually starting to write the notes, she asked important questions and chose a mathematical model that would illustrate the difference between the Difference Engine and the Analytical Engine. When she finally sat down to write, she began by stating the overall issue and then defining specific terms (Toole, 9).

To this day, there still exists a debate as to Ada's real contribution to the Analytical Engine and to modern computer design and programming. However, Babbage clearly stated in his autobiography that Ada wrote the notes based on

the material he gave her (Toole, 8). He also admitted that Ada actually corrected a mathematical error that he made (Toole, 8). Babbage paid her the highest compliment by refusing to return a copy of her notes to her "because he did not want her to alter it" (Trainor, 377). He felt that she possessed a depth of understanding and seen beyond his vision (Trainor, 377). Although the notes were a collaborative effort of both Ada and Babbage, the actual authorship, forethoughts and foreseeing were the results of Ada's talent (Toole, 8).

Ada called her Memoir "the first child of mine," as this would become the intellectual triumph of her life. After it became published, she called herself the "bride of science," and wanted to conduct a research program on the electrochemical aspects of neural functioning to develop what she called the "calculus of the nervous system" (Trainor, 377). This was never carried through because her efforts were considered "unfruitful" (Trainor, 377).

Upon completion of the notes, Ada began to feel overwhelmed by many problems including writing the notes, her illness, and her children. She experienced difficulty with Babbage because he wrote a preface to the notes describing how the British government did not support the completion of the Difference Engine, and wanted this preface included in the *Memoir*. Ada strongly disagreed with this and had her publisher, Richard Taylor, write a letter to Babbage confirming that it would not be included. As a result, Babbage requested that Ada withdraw the article and write an entirely new one. Ada refused and began to realize Babbage's habit of starting an idea or invention and moving on to another without finishing the first. She truly wanted to make his

Analytical Engine a reality and so set forth with Lord Lovelace to transform his ideas into a working model (Toole, 11).

Shortly after her third child and around the time of her publication, Ada fell ill to cancer. She died in 1852 at the age of thirty-seven. She was buried, at her request, beside Lord Byron in the Byron family Vault. She had a biblical epitaph at her grave that read, “You have condemned, you have killed the righteous man; he does not resist you” Games 5:6 (Trainor, 377).

Bibliography

1. Beardsley, Chuck. “The Lovelace Letter”; *Mechanical Engineering*; Jan. 1991; pg.4.
2. Freeman, Elizabeth. “Ada & the Analytical Engine”; *Educom Review*; Volume 31, No.2; March-April 1996.
3. Gurer, Denise W. “Pioneering women in computer science”; *Association for Computing Machinery. Communications of the ACM*; Volume 38; Jan. 1995; New York; pgs. 45-51.
4. Park, Daniel. “Stranger than fiction: Byron and the difference engine”; *The Lancet*; Volume 355; Jan. 2000; London; pgs. 74-75.
5. Toole, Betty Alexandra. “Ada Byron, Lady Lovelace, An analyst and Metaphysician”; *IEEE Annals of the History of Computing*; Volume 18, No.3; 1996; pgs. 4-12.
6. Trainor, Thomas A. “The calculus of passion”; *American Scientist*; Volume 89, Issue 4; July-August 2001; Research Triangle Park; pgs.4-6.
7. Anonymous Author. *The Literary World*; Jan. 1953; pgs.12-13.