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Bibliography

Primary Sources

Websites

Brown, David. "Q&A: Margaret Hamilton, Who Landed the First Man (and Code) on the Moon." *David W. Brown*. August 15, 2017. https://www.dwb.io/blog/2017/8/15/qa-margaret-hamilton-who-landed-the-first-man-and-fist-code-on-themoon.

This source was a very descriptive interview with Margaret Hamilton herself. She described everything from her thoughts on the gender barrier in STEM fields to her feelings when they finally landed on the moon for the first time. This source was extremely helpful to us and helped us understand Hamilton's take on many things as she remembered her work with the Apollo missions.

Creighton, Jolene. "Margaret Hamilton: The Untold Story of the Woman Who Took Us to the Moon." Futurism. July 20, 2016. https://futurism.com/margaret-hamilton-the-untold-story-of-the-woman-who-took-us-to-the-moon.

This website article has a detailed interview with Margaret Hamilton. Margaret Hamilton talks a lot about working at MIT as a programmer and working on the Apollo mission alongside her team, which includes some information of description from her about a typical day working on the Apollo mission to her inspirations of becoming a programmer. This helped us gain information on how Hamilton felt about her position at MIT and at NASA as a woman, a software engineer, and a mother.

Hamilton, Margaret. "Apollo Guidance Computer History Project." *History of Recent Science & Technology*. July 27, 2001. https://authors.library.caltech.edu/5456/1/hrst.mit.edu/hrs/apollo/public/conference1/hamilton-intro.htm.

This source is about a conference that Margaret Hamilton was a part of. During this conference, Margaret Hamilton describes the time and effort put towards working on the Apollo mission and the effects of working on this mission. This source helped us and have a sense of all things that occurred while Hamilton was working on the software for the mission.

_____. "What the Errors Tell Us." IEEE. October 2018. https://ieeexplore.ieee.org/abstract/document/8409915.

This article, written by Margaret Hamilton, is about the problem solving that was done by Hamilton and her team. It explains the thinking that they had to go through to create the code that enabled the spacecraft to land on the moon. It helped us further understand what Margaret Hamilton had to learn on her own to do this, and how she learned it.

Hamilton, Margaret H., William R. Hackler. “Universal Systems Language: Lessons Learned from Apollo.” December 2008. http://www.htius.com/Articles/r12ham.pdf.

This article is by Margaret Hamilton and the Lead Engineer of her company, and it helps the reader understand the development of the Universal Systems Language (USL). It helped us understand USL from Margaret Hamilton’s perspective, and it was a useful source for errors that occurred on the Apollo Missions. We used the information that it gave us to further understand the Apollo source code from Margaret Hamilton's view.

“In Their Own Words: Margaret Hamilton’s ‘Computer Got Loaded’.” *Hack the Moon.* https://wehackthemoon.com/people/margaret-hamilton-computer-got-loaded.

This source linked to a video interview of Margaret Hamilton, and also included a letter by Margaret Hamilton. This letter explains to the reader what happened on Apollo 11 which caused the computer to get overloaded. This source helped us learn about Hamilton’s work with Apollo 11 and also guided us to other useful sources.

“Recalling the ‘Giant Leap’.” *MIT News*. July 17, 2009. https://news.mit.edu/2009/apollo-vign-0717.

This source includes the perspectives of certain individuals that were a part of the MIT community and worked or contributed to the Apollo missions. All of the individuals such as Margaret Hamilton and Jeffrey Hoffman talked about the day of the moon landing on July 20, 1969. This source was beneficial because it helped us understand the different events that were occurring on that day and also Margaret Hamilton’s point of view of the occurrences that were happening at NASA during the moon landing.

Videos

Christie’s.“Software Pioneer Margaret Hamilton on Apollo 11 | Christie’s.” YouTube video, 4:07. July 1, 2019. https://www.youtube.com/watch?v=k1Tuwvq86YA.

This video is an interview with Margaret Hamilton where she explains all the problems that she and her team worked together to solve while she worked for NASA. These problems weren’t only errors in their code, they were problems like them not getting enough recognition. Hamilton’s solutions to these problems are always creative and work extremely well. This source helped us enhance our page about her problem solving by helping us see her perspective on it.

Computer History Museum. “Margaret Hamilton - 2017 CHM Fellow.” YouTube video, 6:27. August 4, 2017. http://youtube.com/watch?v=4sKY6_nBLG0.

In this interview with Margaret Hamilton, she tells the listener a lot about how she learned about software, and how she ended up working on the Apollo Missions. She explains that she was planning to go to graduate school, but she decided that she wanted to be a software engineer much more than she wanted to be a mathematician, and she especially wanted to help get men on the moon. This source helped us make our website better with the small details that she shared.

MAKERS. “Margaret Hamilton, NASA’s First Software Engineer.” YouTube video, 4:36. July 19, 2017. https://www.youtube.com/watch?v=kTn56jJW4zY.

This video interview with Margaret Hamilton includes many images to show the reader Hamilton’s story as she tells it herself. Hamilton explains everything from the problems that she solved to her team's accomplishments. This interview helped us learn about Hamilton’s work from her own point of view, and it also showed images to us that helped us further analyze her workplace.

Images

American Flag on the Moon. Digital Image. NASA Accessed April 10, 2020. https://history.nasa.gov/alsj/a11/AS11-37-5472.jpg.

This is a photograph of the American flag that they put on the moon on the Apollo 11 mission.

An Apollo guidance computer from an early lunar module. Digital Image. *Wall Street Journal.* Accessed April 12, 2020. https://www.wsj.com/articles/apollo-11-had-a-hidden-hero-software-11563153001?mod=searchresults&page=1&pos=1.

This is a photo of a prototype of the guidance computer for Apollo 11’s lunar module. It was extremely small compared to most computers at the time which could be the size of an entire room.

Apollo 11 mission patch. Digital Image. NASA. Accessed April 12, 2020. https://www.nasa.gov/feature/the-making-of-the-apollo-11-mission-patch/.

This is an image of Apollo 11’s mission patch. This was the seal of Apollo 11, and the eagle on it represents the lunar module, which was called the eagle. The eagle is also a symbol of the United States and their pride when they won the space race to the moon.

Buzz Aldrin. Digital Image. Medium. 1969. Accessed January 20, 2020. https://medium.com/@dippnallsc/be-ridiculously-optimistic-aa43e3846de3.

This image is of Buzz Aldrin on the moon. The fact that Margaret Hamilton isn’t in the photo proves that she isn’t given enough credit for her work, for she wasn’t on the front page of the news, so she wasn’t the one who became famous.

Core Ropes. Digital Image. (S)hero Margaret Hamilton. Accessed April 11 2020. https://sheromargarethamilton.wordpress.com/.

This is an image of core ropes which were used to store the software that guided the Apollo Missions.

Earlham College Seal. Digital Image. Crw Flags. Accessed April 10, 2020. https://www.crwflags.com/fotw/Flags/us_u_ear.html

This is an image of the seal of Earlham College, where Margaret Hamilton went.

Hamilton at MIT Lincoln Laboratory in 1962, when she was developing software for the SAGE system. Digital Image. Futurism. 1962. Accessed January 20, 2020. https://futurism.com/margaret-hamilton-the-untold-story-of-the-woman-who-took-us-to-the-moon.

This is a photo of Margaret Hamilton when she was developing the Semi-Automatic Ground Environment program at MIT and learning about software as she went.

Illustration of Margaret Hamitlon from Good Night Stories for Rebel Girls. Digital Image. Listen Notes. Accessed April 12, 2020. https://www.listennotes.com/podcasts/good-night-stories/margaret-hamilton-read-by-4aDXqmVRwT6/.

This is an illustration of the famous photo of Margaret Hamilton standing next her software which makes a pile almost as tall as she is.

Interior view of Apollo 11 Lunar Module showing displays and controls. Digital Image. NASA. July 20, 1969. https://science.ksc.nasa.gov/mirrors/images/images/pao/AS11/10075282.jpg.

This image depicts the hardware of Apollo 11's eagle. It shows how complex the controls were, and that the error of the switch being in the wrong place would have been a very easy error to make, but hard to find what caused the error.

Margaret Hamilton. Digital Image. NASA. 1989. Accessed January 20, 2020. https://history.nasa.gov/alsj/a11/a11Hamilton.html.

This is a photo of Margaret Hamilton.

Margaret Hamilton. Digital Image. Smithsonian Magazine. Accessed January 22, 2020. https://www.smithsonianmag.com/smithsonian-institution/margaret-hamilton-led-nasa-software-team-landed-astronauts-moon-180971575/.

This is an image of Margaret Hamilton, and we used it to demonstrate that since there weren't any schools or facilities that taught software engineering. Margaret Hamilton was a pioneer and one of the founders of software engineering.

Margaret Hamilton and her team working on the software for the Apollo mission. Digital Image. Hack the Moon. Accessed January 22, 2020. https://wehackthemoon.com/people/margaret-hamilton-computer-got-loaded.

This image is of Margaret Hamilton and her team working on the software for the Apollo 11 mission.In the image, it shows how much work was put into the software for this Apollo mission and how during the time her workspace was male-dominated.

Margaret Hamilton at MIT During the Apollo 11 Mission. Digital Image. Computer.org. Accessed Jan 20, 2020. https://www.computer.org/publications/tech-news/events/what-to-know-about-the-scientist-who-invented-the-term-software-engineering.

This image is of Margaret Hamilton working at MIT. We used it to portray what her work looked like as she studied the software that got people to the moon.

Margaret Hamilton at Work. Digital Image. Hack the Moon. Accessed January 26, 2020. https://wehackthemoon.com/people/margaret-hamilton-computer-got-loaded.

This is a color image of Hamilton writing. This image represents all the hard work that she and her team did that no one had done before.

Margaret Hamilton is awarded the Presidential Medal of Freedom by Barack Obama. Digital Image. The Guardian. 2016. Accessed April 10, 2020. https://www.theguardian.com/technology/2019/jul/13/margaret-hamilton-computer-scientist-interview-software-apollo-missions-1969-moon-landing-nasa-women.

This is a photo of Margaret Hamilton and Barack Obama after Hamilton was awarded with her presidential medal of freedom.

Margaret Hamilton Lego Figure. Digital Image. Lego. Accessed April 6, 2020. https://www.lego.com/da-dk/product/women-of-nasa-21312.

This is a lego figure of Margaret Hamilton. It shows that Hamilton was recognized by many people for her work, but only years after her success. We used it to show that she has a legacy of making a great impact on the Apollo Missions.

Margaret Hamilton's MIT Instrumentation Lab employee card. Digital Image. *Wall Street Journal.* Accessed April 12, 2020. https://www.wsj.com/articles/apollo-11-had-a-hidden-hero-software-11563153001?mod=searchresults&page=1&pos=1.

This is a photo of Hamiton's employee card for MIT, which was literally a note card with a photo of her on it.

Margaret Hamilton's Team. Digital Image. (S)hero Margaret Hamilton. Accessed April 10, 2020.https://sheromargarethamilton.wordpress.com/.

This is an image of Margaret Hamilton with her team. There is only one other woman, Phyllis Rye. The team is mostly men.

Margaret Hamilton with her daughter, Lauren. Digital Image. Odyssey. Accessed January 22, 2020. https://www.theodysseyonline.com/margaret-hamiton.

This image is of Margaret Hamilton with her daughter, Lauren. We used it to show how Lauren also contributed to the Apollo mission by playing with the simulation, which led to Margaret Hamilton writing an error-checking code.

Margaret Hamilton Standing in a Spacecraft Model. Digital Image. Accessed January 22, 2020. http://1967.alumclass.mit.edu/s/1314/images/gid58/editor_documents/mit-1967-50_reunion-book-pages-080-to-099.compressed.pdf?gid=58&pgid=61&sessionid=50b74964-0c07-4ba4-aa37-ac4eb25ce5ea&cc=1.

This image is of Margaret Hamilton and we used it to portray how Hamilton was quick at solving problems such as the problem when the 1202 alarm went off while the Eagle was about to land on the moon.

Margaret Hamilton With Stack Of Code. Digital Image. Lithios. 1969. Accessed Jan 20, 2020. https://lithiosapps.com/software-development-and-space-exploration/.

This image is of Margaret Hamilton standing next to all the source code for Apollo 11. It shows how much software they had to write to have the mission succeed.

President Barack Obama presents the Presidential Medal of Freedom to Margaret H. Hamilton during a ceremony in the East Room of the White House. Digital Image. November 22, 2016. Accessed April 11, 2020. https://obamawhitehouse.archives.gov/blog/2016/11/22/celebrating-presidential-medal-freedom-winners-science-and-tech-garwin-hopper-and.

This is an image of Barack Obama awarding Hamilton with her presidential medal of freedom for her work with Project Apollo and her pioneering in software engineering.

SAGE system sectors, direction centers, and radar sites. Digital Image. MIT Lincoln Laboratory. Accessed April 10, 2020. https://www.ll.mit.edu/about/history/sage-semi-automatic-ground-environment-air-defense-system.

This is a map of the SAGE air defence system's radars and locations. It helped us understand that the country was really depending on Hamilton's work even before she worked on the Apollo Missions.

Software Designer - Margaret Hamilton, Lead Apollo Flight Software Designer. Digital Image. NASA. Accessed January 20, 2020. https://www.nasa.gov/50th/50th_magazine/scientists.html.

This photo is of Margaret Hamilton in the simulator for an Apollo Spacecraft. It shows how complex the hardware and software together were and how all the engineers had to work together to create and understand all of it.

Weaving the core ropes at the Raytheon plant in suburban Boston. Digital Image. Smithsonian National Air and Space Museum. Accessed January 22, 2020. https://airandspace.si.edu/stories/editorial/rope-mother-margaret-hamilton.

This is an image of a woman weaving the core ropes and we used this image to portray the LOLs or the little old ladies, which were the women who threaded the ropes through the loops. We also use this image to demonstrate that before Hamilton was hired there weren't any female programmers. Most of the women working at NASA were either threading the core ropes or doing calculations.

Whirlwind magnetic-core memory banks at SAGE. Digital Image. MIT. Accessed April 12, 2020.

This is an image of a computer used at SAGE. It shows how large computers once were. From this image, we learned how new computers really were, and we saw how much they improved from when this image was taken, to the launch of Apollo 11.

Secondary Sources

Print

Piazza, Domenica Di. *Space Engineer and Scientist Margaret Hamilton*. Minneapolis, MN. Lerner Publications, 2018.

This book is about Hamilton's life, and it covers many of the things that she did from her childhood to her work now. Overall, this source was useful to see her work in chronological order with their useful timeline, and it also has interesting facts about her that help us to add to our website. The most prominent part of this book is about her work with Apollo 11 because it was helpful to know how mission control reacted when there was a problem.

Robbins, Dean, and Lucy Knisley. *Margaret and the Moon: How Margaret Hamilton Saved the First Lunar Landing*. New York: Alfred A. Knopf, 2017.

This book provided us many facts about Margaret Hamilton's life. It helped us understand her story told in simple terms, and it shows that she is an inspiration to everyone, including children. We decided to mention this book on our website, because it is a big honor for her to have a book about herself, and it shows that she is important to know about because the book is showing her work to children who may not understand software, but will understand the barriers that she broke.

Wayne, Tiffany. *American Women of Science Since 1900.* Santa Barbara, California: ABC-CLIO, 2011.

The section of the book on Margaret Hamilton includes a lot of information on this pioneering software engineer including her life before she joined NASA and her education. We also learned that besides NASA she worked at many other places that needed her knowledge of programming. Years after working at NASA she started and founded her own computer company.

Websites

"Apollo Missions." NASA. Accessed February 2, 2020. https://www.nasa.gov/specials/apollo50th/missions.html.

This is a list of the Apollo Missions. It describes when they were launched and the important information form each one. It helped us learn about the tragic fire of Apollo One, which killed all three astronauts and how this disaster even encouraged NASA to change their approach on the space race. The source helped us create our timeline and historical context.

Braukus, Michael. "NASA Honors Apollo Engineer." NASA. September 3, 2003. https://www.nasa.gov/home/hqnews/2003/sep/HQ_03281_Hamilton_Honor.html.

This website article honors Margaret Hamilton for her work with software during the Apollo 11 mission and highlights the awards she has received because of her contributions during this mission. This helps us understand that Hamilton was an important part of the software team for that mission and that her work and her aid during the mission lead to the success of Apollo 11. Also, the article portrays that her work during the mission became very beneficial to many software engineers even today.

Cameron, Lori. "What to Know About the Scientist Who Invented the Term 'Software Engineering'" Computer.org. Accessed April 12, 2020. https://www.computer.org/publications/tech-news/events/what-to-know-about-the-scientist-who-invented-the-term-software-engineering.

This article mainly summarizes the work that Margaret Hamilton did on the Apollo missions. It shows the reader the precedents that she set. It helped us learn about how her colleagues didn't believe that her ideas would work, and they were surprised when she was correct. This source also provides useful images of Margaret Hamilton while she was working at MIT.

Ceruzzi, Paul. "The "Rope Mother" Margaret Hamilton," Smithsonian National Air and Space Museum. March 11, 2016. https://airandspace.si.edu/stories/editorial/rope-mother-margaret-hamilton.

This article is about the exact details of Hamilton's job at NASA and in the Apollo 11 mission. This article helps us understand how significant Hamilton's and other women's jobs were to this mission. This also helps portray that even though she is in a male-dominated

workplace, as a woman she was able to break the barriers between gender and find her place at NASA.

D'Amico, LuElla., McPherson, Jim. "Historical Context." Margaret Hamilton: Don't Forget About It. https://sheromargarethamilton.wordpress.com/context/.

This source is about what else was going on in both the country and the world at the time that Margaret Hamilton began her career. This source also provides a timeline that shows what had influence in the space race, and the United State's motivation to get to the moon before the USSR. We used what we learned from this source to further enhance our timeline, and to incorporate more historical context into our website.

"Margaret Hamilton." Encyclopaedia Britannica. August 13, 2019. https://www.britannica.com/biography/Margaret-Hamilton-American-computer-scientist.

This encyclopedia article gives a brief summary of the things that Hamilton has done in her life so far. It gives the reader some specific details about her education, and how she got into software engineering. It helped us look at unbiased facts instead of opinions which helps us make our website more informational.

"Vostok." Encyclopaedia Britannica. July 23, 2008. https://www.britannica.com/technology/Vostok-Soviet-spacecraft.

This article was about the Vostok spacecraft launched into space by the Soviet Union., which was the first manned mission to reach space. This helped us understand what the United States was fighting against in the space race, and where Americans got their motivation to get to the moon first. It helped us create our timeline and develop historical context.

Garber, Steve. "Sputnik and the Dawn of the Space Age." NASA. October 10, 2007. https://history.nasa.gov/sputnik/.

This article is about Sputnik, which was the first satellite launched by the Soviet Union. This put the Soviets ahead of the Americans in the space race. The launching of Sputnik not only encouraged the founding of NASA, but it angered the American public because they could not bear to lose the space race to the Soviets. It helped us understand the United State's reaction to the Soviet's head start on the space race and helped us build historical context.

George, Alice. "Margaret Hamilton Led the NASA Software Team That Landed Astronauts on the Moon." *Smithsonian Magazine.* March 14, 2019. https://www.smithsonianmag.com/smithsonian-institution/margaret-hamilton-led-nasa-software-team-landed-astronauts-moon-180971575/.

This article is mainly about Hamilton's work in Apollo 11, and it gives the reader a good idea of how much Hamilton did to help Apollo 11 succeed. This article also helped us learn about her work with Universal Systems Language, and how she took her skills with software

engineering and created two companies called Higher Order Software and Hamilton Technologies Inc.

Getchell, Michelle. “The Start of the Space Race.” Khan Academy. https://www.khanacademy.org/humanities/us-history/postwarera/1950s-america/a/the-start-of-the-space-race.

This source is an article about the start of the space race in the late 1950s. This article includes a lot of information on the cause of the space race between the USSR and the US and the effects of the space race on the US. However, this source also includes the US’s responses to the USSR beating them in the first part of the race. This article showed us the US’s point of view of the space race and how the race deeply affected the lives of many citizens in the US besides the government. This article helped us provide a lot of context in the website on how the US felt about the space race and the measures the US took to ensure their success in the race.

Holt, Nathalia. “The Women Who Brought Us the Moon.” *PBS*. June 3, 2019. https://www.pbs.org/wgbh/americanexperience/features/chasing-moon-women-who-brought-us-moon/.

This source is about the women who contributed and helped to the space flights that brought men to moon and back to Earth. However, this article shows that many of the women didn’t get the recognition they deserved because of their gender and their race. Also, another reason they didn’t get the recognition they deserved was that there weren’t many women in the STEM fields especially at NASA, it was mainly a male-dominated workplace, so many men were given the credit and not many women. We used this source to provide information on other women like Margaret Hamilton, who was also beneficial and essential to the success of the space flights.

Loff, Sarah. “Apollo 11 Mission.” NASA. May 15, 2019. https://www.nasa.gov/mission_pages/apollo/missions/apollo11.html.

This overview mainly focuses on the moon landing and the launch of the Apollo 11 spacecraft. It doesn’t include the programming for the Apollo 11 mission and the work done before the launch of the spacecraft, which also involves Margaret Hamilton’s work with the mission. This helps us learn the positive effects of the work that was done before the actual launch and how successful the mission was because of her knowledge as a software engineer.

“Margaret Hamilton 2017 Fellow.” Computer History Museum. Accessed April 12, 2020. https://www.computerhistory.org/fellowawards/hall/margaret-hamilton/.

This article is about how her methods of software contributed so much to the field of software engineering, from then to the present day. This source also provides other information and details about Margaret Hamilton working as a software engineer and contributing to the field of software engineering in other places besides NASA. With this information, we are able to learn about how she contributed to the field of computer science and software engineering.

"Margaret Hamilton: MIT Software Pioneer Who Helped Save Apollo 11 Moon Mission." *CBS Boston*. June 28, 2019. https://boston.cbslocal.com/2019/06/28/margaret-hamilton-apollo-11-software-pioneer-interview/.

This news article is about Margaret Hamilton's work as a pioneering software engineer and how Hamilton helped the Apollo 11 mission succeed. The article helped us learn about how she became a software engineer during that time and how she learned to program. It also tells the reader specifically how she helped with the mission and why.

"MIT and NASA: A Match Made in the Heavens." *MIT News*. June 6, 2001. https://news.mit.edu/2001/commnasa-0606.

This article is about MIT's partnership with NASA on the Apollo Project, and it describes important dates and events that are useful for historical context. We used this source to further learn about NASA and MIT so we could enhance our understanding of the background of how Hamilton was able to work with NASA.

"The Moon Decision." Smithsonian National Air and Space Museum. https://airandspace.si.edu/exhibitions/apollo-to-the-moon/online/racing-to-space/moon-decision.cf.

This article helped was about the space race and President Kennedy's goal to get men to the moon by the end of the 1960s. It helped us understand why NASA had to work fast to meet this goal. It also helped us learn about how the space race was very important to many people and why many Americans would not let the Soviets win.

Mosher, Dave. "Lego 'Women of NASA' toy set is finally on sale - and it's already Amazon's best-selling toy." *Business Insider*. November 3, 2017. https://www.businessinsider.com/lego-female-scientists-engineers-nasa-kit-2017-11.

This website article is about the Lego set, "Women of NASA," which includes four mini figurines of two astronomer Sally Ride and Mae Jemison, an astronomer, Nancy Grace Roman, and a software engineer Margaret Hamilton. However, this website article helped us understand how people reacted to pioneering women in the space field and NASA today.

"Mrs. America: Women's Roles in the 1950s." American Experience. https://www.pbs.org/wgbh/americanexperience/features/pill-mrs-america-womens-roles-1950s/.

This article is about the societal expectations or norms for women in the 1950s such as and. This helped us understand the expectations Hamilton and along with many other women and girls were expected to upheld and how those expectations or those roles differ today. With the article's help, we were able to include in the website, why women like Margaret Hamilton weren't seen as smart or good enough employees and how those societal norms for women were still seen during those times even though the gender equality movement was soon quickly rising among people.

"Nasa Honors Apollo Engineer." NASA Press. Sept 3, 2003. https://history.nasa.gov/alsj/a11/a11Hamilton.html.

This article is mainly about Margaret Hamilton's contributions to NASA and the awards she received from NASA for her scientific contributions. It helped us learn about how Margaret Hamilton has her work during the time impacted NASA and also how NASA recognized all the work she has done during Apollo 11.

Onwuamaegbu, Natachi. "Margaret Hamilton's Sister Shares Her Memories as Seattle's Seniors Celebrate the 50th Anniversary of the Moon Landing." *Seattle Times*. July 20, 2019. https://www.seattletimes.com/life/margaret-hamiltons-sister-shares-her-memories-as-seattles-seniors-celebrate-the-50th-anniversary-of-the-moon-landing/.

This article celebrates the 50th anniversary of Apollo 11 by interviewing Margaret Hamilton's sister, Kathryn Heafeald. The article includes quotes from her sister about their childhoods, and how Heafield believed in her sister from when they were only teenagers. This article helped us understand that many people didn't know what Hamilton did, and didn't believe the impact she made on software engineering just because she was a woman.

Puiu, Tibi. "Your Smartphone Is Millions of Times More Powerful Than All of NASA's Combined Computing in 1969." ZME Science. February 11, 2020. https://www.zmescience.com/science/news-science/smartphone-power-compared-to-apollo-432/.

This article helped us understand how new computers were, and how everyone working on the Apollo Missions was a pioneer in their field. We decided to use this information in our website because it helps our reader understand how much technology has evolved since the Apollo Missions. We learned from this source that a lot of the tasks that could be done by a computer on the Apollo Missions were done by people to save the computer for the tasks that were most important.

Rayl, A.J.S. "NASA Engineers and Scientists-Transforming Dreams Into Reality." NASA. October 16, 2008. https://www.nasa.gov/50th/50th_magazine/scientists.html.

This article, although it focuses on many scientists and engineers, has a good section of information on Margaret Hamilton. It focuses on her development of the Universal Systems Language, and her bravery when it came to creating the onboard flight software for the Apollo missions where lives were actually at stake. It helped us learn about how she had to think outside of the box because there was no box to begin with.

Redd, Nola. "Apollo 11: First Men on the Moon." Space.com. May 9, 2019. https://www.space.com/16758-apollo-11-first-moon-landing.html.

This article is about the moon landing, and even though it isn't about Margaret Hamilton, it is about Apollo 11, which she greatly impacted, and wouldn't have been possible without her. This article helped us understand that she wasn't given credit for all the work she did. Instead, the astronauts, who worked extremely hard during Apollo 11, received all the credit.

Russo, Nicholas. “Margaret Hamilton, Apollo Software Engineer, Awarded Presidential Medal of Freedom.” NASA. Nov 22, 2016. https://www.nasa.gov/feature/margaret-hamilton-apollo-software-engineer-awarded-presidential-medal-of-freedom.

This article was written in honor of Margaret Hamilton receiving a presidential medal of freedom and is about the legacy she developed from her hard work. It helped us learn about what people think of her work today, and how her work impacted our society. We also learned from this article that NASA is proud of her and her work on the Apollo mission.

Shetterly, Margot. “Katherine Johnson Biography.” NASA. February 24, 2020. https://www.nasa.gov/content/katherine-johnson-biography.

This source was a very detailed biography of Katherine Johnson. This biography includes a lot of history about Katherine Johnson’s contributions to many successful space flights and to NASA. This showed us how many minorities such as women, African Americans, etc. were also a huge help during the Apollo missions and space flights, however, they weren’t given the recognition or credit they deserve during that time. This source helped us provide some historical context about the treatment towards African Americans and women during the time of the space and the obstacles they faced.

Smith, Amber. “Margaret Hamilton: The Women We Should All Know About But Don’t.” *The Odyssey Online.* Nov 16, 2016. https://www.theodysseyonline.com/margaret-hamiton.

This article focuses on the barriers that Margaret Hamilton broke as a woman, and it talks about how she deserves more recognition. It helped us to further understand how women who worked with STEM weren’t recognized for their work because many people thought that what they were doing was a job only for men.

Walsh, Kenneth. “The 1960s: A Decade of Change for Women.” *US News and World Report*. March 12, 2010. https://www.usnews.com/news/articles/2010/03/12/the-1960s-a-decade-of-change-for-women.

This website article is about the changes American women were facing during the time, mainly the changes dealing with their roles/positions in society, society’s expectations for women, and women’s expectations/goals for society. This showed us how women, especially in STEM fields, were trying to break away from old societal norms in the 1950s and bring changes to the 1960s the workforce and to the US. We used this source to provide historical context on how many women around the US were fighting for changes in the workplace and were fighting for gender equality in America.

“SP-4012 Nasa Historical Data Book: Volume IV Nasa Resources 1969-1978.” NASA. Accessed March 30, 2020. https://history.nasa.gov/SP-4012/vol4/.

This collection of records of NASA’s data helped us understand and graph the number of women who were permanent employees, along with NASA’s total staff. This showed us the

percent of the employees that were female slowly increased after the Apollo 11 mission. We decided to use this data on our website because it was an important historical context that helped us understand our topic, and we realized that it would help our reader also.

Weinstock, Maia. “Scene at MIT: Margaret Hamilton’s Apollo Code.” *MIT News*. August 17, 2016. https://news.mit.edu/2016/scene-at-mit-margaret-hamilton-apollo-code-0817.

This article was made to explain the famous photo of Margaret Hamilton standing next to a stack of paper that is the source code of Apollo 11. This article also includes a quote by Magaret Hamilton about how they had no second chance with the code because people’s lives were at stake. This article helped us understand how much work Margaret Hamilton and her team had to put in to write enough software to be almost as tall as a person.

Podcasts

Jagannathan, Poorna. “Margaret Hamilton Read By Poorna Jagannathan.” March 6, 2018, in *Good Night Stories for Rebel Girls: The Podcast*. Produced by Elena Favilli and Francesca Cavallo, podcast, mp3 audio, 16:19, https://soundcloud.com/user-388134347/margaret-hamilton-read-by-1.

This podcast illustrates Margaret Hamilton’s accomplishments and all of the hard work she did, while also acknowledging all of the obstacles she faced as a woman during the time, in a manner that is engaging for all ages, especially for younger ages. This source helped us understand some of the setbacks she faced because of her gender and it gave us some historical context on the space race between the US and USSR and the Americans’ point of view on the space race. We used this source to demonstrate how Margaret Hamilton and her life story inspired many young girls and women today.

Johnson, Steven. “XX Factor | The Woman Who Put Man on the Moon | 1.” March 14, 2019, in American Innovations. Produced by Wondery, podcast, mp3 audio, 42:50, https://podcasts.apple.com/us/podcast/xx-factor-the-woman-who-put-man-on-the-moon-1/id1370092284?i=1000431739811.

This podcast covers all of Margaret Hamilton’s life and is very detailed in doing so. It tells the listener everything from the challenges she faced to the triumphs that she and her team shared. It helped us understand her work further because this podcast had more detail than many other sources because it was longer. It also explained some of the technology she was using, which further enhanced our knowledge of software engineering as a whole.