

## Annotated Bibliography

**Primary Sources**

"College Notebook On Crystal Analysis." 1940. *U.S National Library of Medicine*, profiles.nlm.nih.gov/ps/retrieve/ResourceMetadata/KRBBJY. Accessed 29 Sept. 2019. Working paper.

Rosalind Franklin's notes when she was an undergraduate. These handwritten notes that she observed genes, that can be inherited by offspring. With certain kinds of chromosomes in different positions. This is important because it shows some of her notes and how they pertain to the upcoming of DNA.

Franklin, Rosalind. *Lab Notes on Possible DNA Structure*. July 1953. *U.S National Library of Medicine*, profiles.nlm.nih.gov/spotlight/kr/catalog/nlm:nlmuid-101584586X124-doc. Accessed 25 Oct. 2019.

Franklin was working on an x-ray diffraction experiment which went on for six months in 1953. Her notebook had notes of her experiment trying to work out configurations of DNA in different forms like A and B, which she then compared to the work of Crick and Watson. After she compared the work to Francis Crick and James Watson's, it proved that both experiment findings fit together. This is important because it shows how long experiments can take and how the unknown structure ended up being compared with different forms.

---. Letter to Heinz Fraenkel-Conrat. 21 Feb. 1956. *National Library of Medicine*, profiles.nlm.nih.gov/spotlight/kr/catalog/nlm:nlmuid-101584586X100-doc. Accessed 25 Oct. 2019.

Rosalind Franklin wrote a letter to Dr. Fraenkel-Conrat after her visit to the United States in 1954. Franklin visited virus researchers in the United States. Dr. Frankel-Conrat was very helpful to Rosalind Franklin as she visited. Franklin states the reason she determined the RNA location was because of the preparations Dr. Fraenkel-Conrat sent to her. This is very important because this was a big discovery and if this was not discovered than DNA most likely would not have been discovered when it was, it could have been many years later.

---. Letter to Donald Caspar. 8 Nov. 1954. *U.S. National Library of Medicine*, profiles.nlm.nih.gov/spotlight/kr/catalog.nlm:nlmuid-101584586X89-doc. Accessed 17 Nov. 2019.

This letter is written by Rosalind Franklin to Donald Caspar. Donald Caspar is a biophysicist who worked on a Tobacco Mosaic Virus which is also known as TMV structure. The TMV virus is a helix-shaped structure found in the RNA strand. This makes notice of discoveries that have been discovered after DNA was found and how much impacts future discoveries that had been made.

Franklin, Rosalind E. *Rosalind Franklin with a Microscope in 1955*. 1955.

Rosalind Franklin is hard at work looking into a microscope. This picture was taken before the discovery of the DNA and RNA strand. This picture is important because it gives the importance of the microscope for the research Rosalind Franklin did and represents her being in the same position as a male scientist.

Franklin, Rosalind E., and R. G. Gosling. *Acta Crystallographica*. Vol. 6, Francis Crick Papers, 1949-1990. *Wellcome Library*, wellcomelibrary.org/item/b18179381#?m=0&cv=0&h=rosalind+e+franklin&c=0&s=0&z=0.164%2C0.1657%2C0.4965%2C2. Accessed 29 Sept. 2019.

The notes were written by Rosalind Franklin talked about what was encountered when Franklin and Gosling first made the discovery. These notes state that there was an influence of nucleic acid and water. Which contained a three-stranded structure. This goes into detail about what they did once Franklin and Gosling made the discovery of what we know today as a DNA strand.

Klugg, Aaron. "Klugg's Article about Franklin and her Work." 1968-1976.

*WellcomeLibrarysearch*.wellcomelibrary.org/iii/encore/record/C\_\_Rb1983173\_\_SRosalind%20E.%20Franklin\_\_Ff%3Afacetlocations%3Aelro%3Aelro%3AOnline%3A%3A\_\_P0%2C9\_\_Orightresult\_\_U\_\_X1?lang=eng&suite=cobalt. Accessed 1Dec. 2019.  
Manuscript.

This website contains an article by Aaron Klugg talking about Rosalind Franklin and the work she did with DNA. Klugg talks about Franklin's note and how they were very precise and how she always compared them with her notes. This is important because it gives an idea of how precise Franklin's work was for the discovery and another opinion on Rosalind Franklin.

Klugg, Aaron. Letter to Rosalind Franklin. 1968-1976, Cambridge.

The letter is written to Phil Cambridge, describing that some people now know Rosalind Franklin but not as many as there should be with her contributions and discovery to the double helix. The letter goes in-depth on what Franklin did and the time period it happened in for historical context.

Randall, J.T. Letter to Rosalind Franklin. 17 Apr. 1953. *U.S National Library of Medicine*, profiles.nlm.nih.gov/spotlight/kr/catalog.nlm:nlmuid-101584586X121-doc. Accessed 25 Oct. 2019.

J.T Randall sent Rosalind Franklin a letter stating that once she left King's college she is to not work on DNA experiments. Randall's letter also told her she is to cease from working with her assistant at the time Raymond Gosling. But once Rosalind left King's college she still proceeded to mentor Gosling about what is known as today, DNA. This letter is important because Rosalind still persisted in doing work on DNA and mentor Gosling even after she was not supposed to have anything to do with DNA at all. This was significant because Rosalind was only working on DNA because she knew something big was here.

Rosalind, Franklin. Letter. 7 Jan. 1956. *U.S. National Library of Medicine*, profiles.nlm.nih.gov/spotlight/kr/catalog.nlm:nlmuid-101584586X99-doc. Accessed 1 Nov. 2019.

This is a letter written by Rosalind Franklin to Dr. Fraenkel-Conrat. The letter talks about Franklin's visit to the United States with virus researchers. She used the information from the virus material for her x-ray diffraction findings with her own notes and information with a DNA structure. She used this for comparison with mercury and protein within the units of DNA, which provides information on how important DNA is.

Staedter, Tracy. "Live Science." *Surprising Find: Ancient Mummy DNA Sequenced in First*, 8 June 2017, www.livescience.com/59410-ancient-egyptian-mummy-dna-sequenced.html. Accessed 1 Dec. 2019.

This website gives more background information about DNA and Rosalind Franklin's contributions. This is one of the newer experiments done with DNA which actually had a favorable outcome. The website talks about the process of successfully sequencing DNA from mummies in Egypt. This is important because it gives an example of a future outcome from the discovery of DNA and how much we have learned from it.

United States, Congress, House. House of Representatives. Government Publishing Office, 25 Apr. 2013. *Library of Congress*, [www.congress.gov/bill/113th-congress/house-resolution/180/text](http://www.congress.gov/bill/113th-congress/house-resolution/180/text). Accessed 26 Oct. 2019. House Bill180.

This source is about three major ideas stated in the House of Representatives. The first idea they state is that the human genome is one of the most significant discoveries with in the last 100 years. The second idea stated was support for making a day for DNA called DNA day. Lastly, it stated the accomplishments of DNA discovery. This is important because it describes the impact the discovery had and important enough to create a day for it.

---, ---, Senate. DNA Testing Availability Act. Government Publishing Office, 7 July 2000. *Library of Congress*, [www.congress.gov/bill/106th-congress/senate-bill/2859](http://www.congress.gov/bill/106th-congress/senate-bill/2859). Accessed 26 Oct. 2019. Senate Bill 106 (enacted).

This is the DNA Testing Availability Act. This act states that DNA tests and analysis of all casework for crimes that have been unsolved to build profiles and help get them solved. This act is important because it is a result of what DNA has done for not just scientists but regular people; which made an impact on helping unsolved crimes. This is an example of an impact of the DNA discovery by Rosalind Franklin.

## Secondary Sources

Biography.com Editors. "Rosalind Franklin Biography." *Rosalind Franklin Biography*, A&E Television Networks, 2 Apr. 2014, [www.biography.com/scientist/rosalind-franklin](http://www.biography.com/scientist/rosalind-franklin). Accessed 29 Sept. 2019.

The site gives background information on Rosalind E. Franklin. This site also gives information on Rosalind Franklin's family and family history. The site gives information on Franklin before her discovery. I am using this for historical context for the time period.

The Editors of Encyclopaedia Britannica. "ENCYCLOPÆDIA BRITANNICA." *Rosalind Franklin*, [www.britannica.com/biography/Rosalind-Franklin](http://www.britannica.com/biography/Rosalind-Franklin). Accessed 1 Dec. 2019.

The biography impliments background information on Rosalind Franklin and her life before and during her job as a scientist. It gives background information on the DNA discovery and notes which Franklin took while coming across DNA. This is important because it gives background information on Rosalind Franklin and what was on her notes specifically when she came across DNA.

Egginton, Heidi. "Churchill College Cambridge." *Women in Science at the Archives Centre*, 20 Feb. 2017, [www.chu.cam.ac.uk/news/2017/feb/20/women-science-archives-centre/](http://www.chu.cam.ac.uk/news/2017/feb/20/women-science-archives-centre/). Accessed 1 Dec. 2019.

"Churchill College Cambridge" goes into detail on information with women not receiving credit to discoveries as a man would. It impliments insight on Rosalind Franklin's original findings of DNA structure. It talks about Franklin's discovery being overshadowed by Watson and Crick's model of DNA. This is important because it provides information on how Rosalind Franklin's name is not as memorable for the discovery as Watson and Crick.

Elster, Naomi. "In Her DNA." *History Today*, vol. 69, no. 1, Jan. 2019, pp. 12–15. *EBSCOhost*, [search.ebscohost.com/login.aspx?direct=true&db=khh&AN=133451368&site=src\\_ic-live](http://search.ebscohost.com/login.aspx?direct=true&db=khh&AN=133451368&site=src_ic-live).

This resource goes into detail about the experiments leading up to the discovery. It also goes over the experiment that leads to accidental discovery in more detail. Additionally, how it made such an impact on life and where we are because of it.

Friedland, Steven I. "PBS Frontline." *Vision of the Future*, [www.pbs.org/wgbh/pages/frontline/shows/case/revolution/reimagining.html](http://www.pbs.org/wgbh/pages/frontline/shows/case/revolution/reimagining.html). Accessed 27 Oct. 2019.

This article gives past information on DNA and possible future outcomes. The article specifies all the DNA tests for things like criminal backgrounds would not be a thing or anywhere near as good as they are today without DNA. The article goes on to the future use of DNA testings such as criminal backgrounds and testings such as that would improve significantly as time goes on and technology improves. This is important because it shows scientists are constantly improving DNA.

Gibbons, Michelle G. "Reassessing Discovery: Rosalind Franklin, Scientific Visualization, and the Structure of DNA." *Philosophy of Science*, vol. 79, no. 1, Jan. 2012, pp. 63–80. *EBSCOhost*, DOI:10.1086/663241.

Rosalind Franklin's experiment which leads to the discovery. This was an accidental discovery made by Rosalind Franklin and Raymond Gosling. Gosling was Franklin's understudy. This unknown structure then made them look into the structure even deeper. Using this "Scientific Visualization" because it leads to the experiment and who was with her during the discovery of the unknown structure.

"The History of DNA Timeline." *DNA Worldwide*, <https://www.dna-worldwide.com/resource/160/history-dna-timeline>. Accessed 27 Oct. 2019. Infographic.

A timeline that starts in 1859 with the very beginning of all sciences. The timeline goes on to the discovery of DNA, the first human chromosome being decoded, to genetic makeup. The timeline goes through the big discoveries before and after the discovery. This is important because the timeline gives general people an idea of what was happening before and after the discovery was made and what discoveries happened because of DNA. Once it was discovery happened it gave us information about DNA being species-specific and chromosome 21 linked to Down's syndrome.

*How Rosalind Franklin photographed DNA*. Christian Science Monitor, 25 July 2013, [web.b.ebscohost.com/ehost/detail/detail?vid=6&sid=31dc72a1-2d7a-4157-b1f7-4732221bbc4d%40pdc-v-sessmgr01&bdata=JnNpdGU9ZWwhvc3QtbGl2ZQ%3d%3d#AN=89530641&db=aph](http://web.b.ebscohost.com/ehost/detail/detail?vid=6&sid=31dc72a1-2d7a-4157-b1f7-4732221bbc4d%40pdc-v-sessmgr01&bdata=JnNpdGU9ZWwhvc3QtbGl2ZQ%3d%3d#AN=89530641&db=aph). Accessed 29 Sept. 2019.

Has a detailed description of how Rosalind Franklin came upon discovering DNA. Gives a description before and after the experiment. Talks about the famous pictures taken and used in the discovery. I am using this because it provides evidence from the experiment and pictures from that experiment that helps prove the significance of DNA.

Jacobsen, Katherine. "How Rosalind Franklin Photographed DNA." *Photographed DNA*. EBSCOhost, web.b.ebscohost.com/ehost/detail/detail?vid=6&sid=31dc72a1-2d7a-4157-b1f7-4732221bbc4d%40pdc-v-sessmgr01&bdata=JnNpdGU9ZWwhvc3QtbGl2ZQ%3d%3d#AN=89530641&db=aph. Accessed 25 July 2013.

Rosalind Franklin used x-ray diffraction to take the Photo 51 picture of the double helix in DNA. This picture is used all the time to describe and tell people about DNA strands and what they look like. It is used in cartoons and even in research papers. This picture represents how big an impact and how often we use Photo 51.

"James Watson, Francis Crick, Maurice Wilkins, and Rosalind Franklin." *Science History Institute*, www.sciencehistory.org/historical-profile/james-watson-francis-crick-maurice-wilkins-and-rosalind-franklin. Accessed 27 Oct. 2019.

This source goes through and states how Rosalind Franklin and other scientists discovered DNA. Gives background on DNA and the process of the discovery. It also states what each scientist executed for the discovery including Rosalind Franklin, James Watson, Maurice Wilkins, and Francis Crick. Each had a part in the discovery Watson and Crick studied the molecular structure rather than pictures like Franklin did. Wilkins brought up the idea to study DNA by X-ray crystallographic techniques, which was his invention. The source talks about the different career paths each of the scientists have and how it all came together for the discovery. It's important because it gives and proves background information is correct and gives information on other scientists that helped.

Mackenzie, Ruairi J., editor. "Technology Networks." *DNA VS. RNA – 5 Key Differences and Comparison*, 24 Jan. 2018, www.technologynetworks.com/genomics/lists/what-are-the-key-differences-between-dna-and-rna-296719. Accessed 1 Dec. 2019.

The website impliments more background information and a greater understanding of what DNA and RNA are. The website also talks about the differences between DNA and RNA and how they compare. Additionally, the location of DNA and RNA. This is important to gain an idea of what DNA and RNA are and how they work together but how they are different too.

Maddox, Brenda. *Rosalind Franklin The Dark Lady of DNA*. HarperCollins, 2002.

Brenda Maddox talks about how Rosalind Franklin was “robbed” from not receiving the Noble Prize because of her photographs and data of the discovery. Many people do not even realize Rosalind Franklin was the one who discovered DNA structure. It also talks about the idea of how she broke barriers as a female scientist. Using this for evidence of Franklin not receiving as much credit to the discovery as she should have had and time frame.

Murnaghan, Ian. "Explore DNA." *The Importance of DNA*, 7 Jan. 2019, [www.exploredna.co.uk/the-importance-dna.html](http://www.exploredna.co.uk/the-importance-dna.html). Accessed 27 Oct. 2019.

This source talks about diagnosis, treatments, legal impacts, agriculture, and forensic importance in DNA. The article talks about the impacts DNA has changed over the years. This is important because it shows the impact of DNA not just in the past but on how DNA is still impacting today and in the future.

"Papers of M H F Wilkins: papers relating to Aaron Klugs research into DNA history." *Wellcome*, [search.wellcomelibrary.org/iii/encore/record/C\\_\\_Rb2004663\\_\\_SRosalind%20E.%20Franklin\\_\\_Ff%3Afacetlocations%3Aelro%3Aelro%3AOnline%3A%3A\\_\\_P0%2C2\\_\\_Orightresult\\_\\_U\\_\\_X1?lang=eng&suite=cobalt](http://search.wellcomelibrary.org/iii/encore/record/C__Rb2004663__SRosalind%20E.%20Franklin__Ff%3Afacetlocations%3Aelro%3Aelro%3AOnline%3A%3A__P0%2C2__Orightresult__U__X1?lang=eng&suite=cobalt). Accessed 1 Dec. 2019.

This database goes into detail about the two chain helix, which is now known as DNA helix. It gives information on what Rosalind, Gosling, Klugg, and Raymond did that helped with the discovery of DNA had. This is important because it gives more information on contributions by each person with the discovery.

"PBS Evolution." *The Discovery of DNA's Structure*, Clear Blue Sky Inc., [www.pbs.org/wgbh/evolution/library/06/3/1\\_063\\_01.html](http://www.pbs.org/wgbh/evolution/library/06/3/1_063_01.html). Accessed 27 Oct. 2019.

This article gives information on Rosalind Franklin and some background on her life before the discovery. It also gives some information on other scientists that helped with the discovery that Franklin had worked with. The article goes into detail about DNA and gives specific and important words to understand DNA and what Rosalind Franklin did and helped for the discovery. This is important because it gives specific details about DNA and more information on Rosalind Franklin.



Rettner, Rachael. "Live Science." *DNA: Definition, Structure & Discovery*, 8 Dec. 2017, [www.livescience.com/37247-dna.html](http://www.livescience.com/37247-dna.html). Accessed 1 Dec. 2019.

The website goes into detail about what DNA and RNA are and what it contains genetic information. "Live Science" talks about the history of DNA and how it was discovered by each person. Additionally, provides information on new research with DNA and details about DNA testing. This is important because the background information on DNA and the future of DNA testing and research.