

Primary Sources

“All Are Dying Slowly From Radium Poisoning.” *Minneapolis Star*, 11 February 1938.

This article provided a short summary of the dial painters’ story and gave additional information on it. It did a fairly good job of summarizing what was happening. The writer had a bias toward the girls because he published things that were happening in Ottawa in a Minneapolis newspaper.

“‘Doom Act’ Told by ‘Living Dead’.” *The Chicago Daily Times*, 11 February 1938.

This source gave a picture that was used on the board. This picture is an example of how the dial painters tipped the brushes. The newspapers were sympathetic to the girls and showed a lot of the suffering that they experienced.

Dotty, Mary. “Ottawa’s Doomed Women.” *The Chicago Daily Times*, 17 March 1936.

This Chicago newspaper published a lot of newspaper articles about the Radium Girls. Most of the articles were about the trial against the Radium Dial Corporation. The newspapers were sympathetic with the girls and printed many stories and pictures describing how sick they were.

Green, Win. “April Decision In Radium Test.” *Daily Republican*, 12 February 1938.

This article is from Ottawa’s local newspaper. It provides details about how scared the girls were of getting sick. The information I got from it was accurate and had a lot of information. The newspaper publicized a lot about the girls because they felt bad for them.

Grossman, Leonard to Tom Donahue. 1 July 1939.

This letter said what was happening with the lawsuit after Catherine Donahue died and that Radium Dial kept filing appeals to the lawsuit. It showed that Grossman continued with the case until the Donahue family received the money. It also showed how Grossman cared about the Donahue family because he sent best wishes from him and his wife to the Donahue children.

Inez Corcoran Vallat, vs. The Radium Dial Company, 360 Ill. 407 (1935). LexisNexis.com [Accessed June 2, 2014].

This court decision contains the judge’s opinion on the 1911 law which was declared invalid. The judge’s opinion, even though it ended the lawsuit by the dial painters, was intended to be fair to everyone. I used a quote from the judge’s decision on my board.

“‘Living Death’ Victim Wins.” *Chicago America*, 5 April 1938, p.1.

This front page picture shows that many people were interested in what happened with the dial painters’ trial. The newspaper felt sympathetic to the painters.

Main, John. “Radium Death Leaves Trail of 15 ‘Ghosts’.” *The Chicago Daily Times*, 7 July 1937, p. 2

This Chicago newspaper published a lot of newspaper articles about the Radium Girls. Most of the articles were about the trial that the girls brought against the Radium Dial Corporation, but the newspaper articles also told of the girls experience working as dial painters. The newspapers were sympathetic with the girls and printed many stories and pictures describing how sick they were.

Martland, Harrison, MD; Philip Conlon, MD; Joseph P. Knef, DDS. "Some Unrecognized Dangers in the Use and Handling of Radioactive Substances: With Especial Reference to the Storage of Insoluble Products of Radium and Mesothorium in the Reticulo-Endothelial System." *The Journal of the American Medical Association*, 5 December 1925, pp.769-1776.

This article stated that radium is dangerous. It was an important article because it was one of the first to state the problems with working with radium. The doctors who wrote this were interested in saving lives.

"Poisoned Paintbrush." *Time Magazine*, 4 June 1928.

This article was found on microfiche at the public library. It is one of the first articles published nationwide on the New Jersey dial painters so it showed to the Ottawa girls that the radium paint could be dangerous. It is a good article because it talks about symptoms, treatment, and the cause of the disease. It had factual information and the bias was towards the girls.

"Radium Death on Rampage." *Daily Times*, 7 July 1937.

The picture from this source shows how harmful radium can be by showing a woman who had her arm amputated. This newspaper printed many pictures of how sick the radium dial painters were.

"Radium Victim Tells 'Living Death'; She Faints as Doctor Charts Doom." *Chicago Herald and Examiner*, 11 February 1938.

This article tells Catherine Donahue's story being a dial painter. She quoted the management on what they said about radium poisoning. It is a quality source because the writer was at the trial and wrote about what happened in the courtroom. The newspaper wanted to show how the women were victims of the Radium Dial Company.

"Society of the Living Dead is Formed; Victims of Radium Unite to Help others."

Chicago Herald and Examiner, 27 February 1938.

This excellent image was put on my board and shows when the Society of the Living Dead was formed. It shows how the girls worked together to expose the danger of radium.

State of Illinois House. *Occupational Diseases*. HB 250, 47th General Assembly (February 24, 1911).

This House Bill was the first bill in the United States passed to protect employees from dangerous workplaces but was revised because Section 1 was vague. I requested a copy of this bill from the Illinois General Assembly Archives Department and Section 1 is on my board.

State of Illinois House. *Workman's Occupational Disease Act*. HB 10, 59th General Assembly, 3rd Special Session (February 7, 1936).

This House Bill is the revised version of the bill passed in 1911 and it clarified the rights and responsibilities of employees and employers. I requested a copy of this bill from the Illinois General Assembly Archives Department and a description of the bill is on my board.

Tolmachev, Sergei, Director of the United States Transuranium and Uranium Registries at Washington State University College of Pharmacy. Interview by author, 5 February 2014. Interview over email, Washington State University.

I contacted this source because he is in charge of the bone samples from radium studies done at Argonne. I received pictures and information on how scientists are using these bone samples today. I also quoted this source in my exhibit. He is an excellent source of information because he is very familiar with the radium exposure. He does not have a bias because he is interested in the scientific part of the dial painters.

Secondary Sources

Cervera, M., and M.A. Buchholz. "Radium Historical Items Catalog."
<http://pbadupws.nrc.gov/docs/ML1008/ml100840118.pdf>
[February 2, 2014]

This website has excellent pictures and descriptions of radium product. Many of these pictures were used in my project.

Clark, Claudia. *Radium Girls*. Chapel Hill, NC: The University of North Carolina, 1997.

This book talked about all the girls who were affected when there were dial painters. Most of the book talked about the girls in New Jersey but there was also information on the girls in Illinois. The writer researched extremely well when writing this book, and she showed that the girls did not get treated well by their employers.

"Demographics." City of Ottawa Official Website,
www.cityofottawa.org/masterplan2/demographics.htm
[accessed December 3, 2013]

This source is the Ottawa city website and has historical data on the population of Ottawa through the years.

Frame, Paul. "Radioluminescent Paint." Oak Ridge Associated Universities
<http://www.ornl.gov/ptp/collection/radioluminescent/radioluminescentinfo.htm>
[accessed December 9, 2013]

Oak Ridge Associated Universities is a group of universities dedicated to education and research. This website describes the history of radioluminescent paint and how it's made. It seems to be an accurate website. It is fair because it is based on historical facts.

Grossman, Len, son of attorney Len Grossman. Interview by author, 26 December 2013, Interview over email.

Grossman created a website called The Case of The Living Dead Women which contains about 180 newspaper articles about the Ottawa radium dial painters lawsuit. I contacted him to see how his father got involved in the case and why he did it. He was an accurate and important source of information. He may have a positive bias toward-the lawsuit.

Hintz, Charlie. "The Radium Girls." Cult of Weird, www.cultofweird.com/medical/radium-girls/ [accessed November 11, 2013]

The website is an online museum about weird medical and historical stories. This article does not have a bias, and it shows facts about the event. The radium dial story is in this website because it is not a well known story. This article provided a good overview of the story.

Inglis-Arkell, Esther. "The Woman Who Took Radium from Savior to Killer." io9, <http://io9.com/the-woman-who-took-radium-from-savior-to-killer-643594794> [accessed January 2, 2014]

This source talks about the medical issues that can happen when ingesting radium. From this website I was able to find what happens to bones when it is exposed to radiation. It appears to be a reliable source of information.

Keane, A.T.; H. F. Lucas; F. Markun; M.A. Essling; and R. B. Holtzmans. "The Estimation and Potential Radiobiological Significance of the Intake of ^{228}Ra by Early RA Dial Workers in Illinois." *Health Physics*, September 1986, pp. 313-327.

This article is about research on the radium dial painters and what type of radium they were exposed to. This is important because it shows that the management of Radium Dial lied to the girls about the type of radium they were using to paint. The researchers showed bias in the article.

McClafferty, Clara Killough. *Something of Nothing: Marie Curie and Radium*. Canada: Douglas & McIntyre Ltd., 2006.

This book is a biography of the woman who discovered radium. The book tells the story of her life and her scientific interests. It shows what a smart, hardworking woman she was.

Mullner, Ross. *Deadly Glow: The Radium Dial Worker Tragedy*. Washington, D.C.: American Public Health Association, 1999.

This book talked about radium and the dial painters from the discovery of radium to the closing of Argonne. This information was used from the beginning of my project to the end. It was a very accurate book and a very good source of information. There was no bias throughout the book.

"National Human Radiobiology Tissue Repository." Washington State University College of Pharmacy, <http://www.ustur.wsu.edu/NHRTR/> [accessed January 26, 2014].

There were pictures of tissue and bone samples, and this website explains how scientists can contact the university to get the samples. The website is run by scientists who are interested in keeping the research going and want to provide research materials to other scientists.

Radium City. Directed by Carole Langer, S.I.: Carol Langer Productions;, 1986.

This documentary told the story of the radium dial painters. It contained interviews of two dial painters, Marie Rossiter and Charlotte Purcell, and three sisters of Peg Looney, a dial painter who died in 1929. There is a strong bias against the Radium Dial Company because management did not tell the workers of the dangers of the paint. I used a quote from Marie Rossiter on my board to show that the girls didn't know the trouble that the paint caused.

Rowland, R.E. "Radium in Humans: A Review of U.S. Studies." Argonne National Laboratory – Environmental Research Division, September 1994.

This document describes the studies at Argonne National Laboratory on the effects of radiation exposure. It is a great source of information on the studies on the radium dial painters. I found a graph used on my board that shows the results of the studies. The scientist used the data collected from the women so there is no bias.

Sacks, Susan, Head of the Mendota History Club. Interview by author, 29 November 2013, at LaSalle County Historical Society and Museum. Utica, Illinois.

Mrs. Sacks has studied the Radium Girls story, and she was helpful in giving the many angles of the story of the radium girls. The most interesting thing that I learned is that some Ottawa citizens as late as 2007 still wanted to ignore what had happened.

Stout, Steve. "Beginnings of Radioactive Metal Radium." The Times, <http://mywebtimes.com/archives/ottawa/display.php?id=417773> [accessed December 5, 2013]

This website is a local news source for the people of Ottawa. The writer's bias is that it was a sad time in Ottawa's history. Also that some of the areas in town are still radioactive so they are concerned that there is radiation buried in the ground.

Toohey, R. E. "The Saga of the Radium Dial Painters." Oak Ridge Associated Universities, <http://www.ustur.wsu.edu/Radium/files/SagaOfRaDPs.pdf> [accessed January 18, 2014].

This source is a power point used by Toohey. It contains many pictures and bullet points having to do with the radium girls. It is a believable source because he is well familiar with the dial painters story and has been studying them for years. There is no bias.

Sites Visited

Catherine Wolfe Donohue Collection, McCormick Library of Special Collections, Northwestern University Library. Evanston, Illinois. 16 November.

In this collection there are eight folders of newspaper articles and letters about radium poisoning and the lawsuit against the Radium Dial Company. I found many primary sources such as pictures and newspaper articles that were useful in my project. The sources had a lot of excellent information about what was happening at the time. The folders were donated by Catherine Wolfe's niece in 1992 and were biased towards the radium dial painters.

LaSalle County Historical Society and Museum. Utica, Illinois. 29 November 2013.

This museum is dedicated to providing information about events that happened in LaSalle County. Examples of this include a carriage that Lincoln rode in, information about the I & M canal, and school items from an old one room school house. There was a big display of Westclox. This was the company that the girls made the glow in the dark dials for.

The library has two binders of photos and articles that relate to the Radium Girls of Ottawa Illinois:

Pearl Payne Scrapbook Collection 1936- 1977. This four inch binder is filled with personal newspaper clippings, letters, and other information related to Pearl Payne's experience as a radium dial painter. It was donated to the historical society by her and her family.

The Photograph Binder. This four inch binder is filled with photographs, signs, graphs, and advertisements about the radium dial company. There were no dates or captions on the photographs and in the binder but it appeared that they were photos from the 1930s to the 1980s

The Radium Girls Statue, Ottawa, Illinois. 29 November 2013.

The bronze life size sculpture is of a 1920's radium dial painter was dedicated on September 2, 2011 as a memorial of the girls who suffered because of radium poisoning from the Radium Dial Company. The story and pictures of the dial painters are on a display in front of the statue. The importance of this statue is that the town of Ottawa finally accepted the tragic events that happened.

National Archives in Chicago, Illinois. 28 May 2014.

The National Archives has three boxes of documents and one box of high quality pictures. I used several pictures of the dial painters in the work place from this site. There was also a file of medical reports from the Argonne National Laboratories from the 1970's and 1980's of Charlotte Purcell, who lost an arm due to radiation exposure.

Endnotes

¹Marie Rossiter, *Radium City*, Youtube, directed and produced by Carol Langer (Carol Langer Productions, 1986).

²“Radium Victim Tells ‘Living Death’; She Faints as Doctor Charts Doom,” *Chicago Herald and Examiner*, February 11, 1938, final edition.

³Inez Corcoran Vallat, Appellant, vs. The Radium Dial Company, 360 Ill. 407 (1935)

⁴Sergei Tolmachev, interview by author, February 5, 2014.

LEFT

They painted 250 dials per day and got a penny and a half per dial. (1)

They mixed glue, water, and radium powder and used brushes made from camel hair to put the paint to make dials. The brushes would lose shape after a few strokes so the U.S. Radium supervisors encouraged them to use their lips or tongue to point the brushes. The girls painted their nails, teeth and faces with the radium. Many workers became ill. (1)

People admired the girls because they were working with high tech product. The average woman made \$5 per week in LaSalle County, but the women who did the dial painting earned \$18 per week for the same hours. Their pay was in the top five percent of women workers. (2)

Clocks were popular because people did not have electricity in their homes so they needed them when it was dark out. (2)

Radium Dial opened in Ottawa in 1923, in a school building. The girls worked at school desks. In 1925 it was the largest dial painting company with 100 girls. They only did dial painting. (3 p. 99)

The girls enjoyed their job and were happy. They painted rings on their fingers and decorated belts and buttons with the radium paint. They were young women and a few married women worked part time. (3 p. 99)

The women lip pointed the brushes. When at home their hair, eyebrows, eyelashes, fingers, and mouths would glow. They were told it was safe. (3 p. 99)

In 1920 35% of homes in America were wired for electricity.(4)

In 1920 the city of Ottawa has 10,816 people. (5)

In 1918 the Radium Dial Company began producing radioluminescent dials in Chicago for Westclox. Radium Dial move to Peru Illinois in Peru Illinois., Radium Dial moved to Ottawa Illinois in 1923 because Westclox complained that Radium Dial was stealing its workers with its higher wages. In the mid 1920s, the Ottawa facility was the largest dial painting facility in the US and was producing approximately one million dials per year. (6)

In the 1920s, "mesothorium" was sometimes added to the paint - mesothorium is the historical name given to radium-228 (5.8 year half-life) (7)

The girls traced over the numbers that a professional penman would make on the clock and watch dials. The 2, 3, 6, and 8 were hardest to make. To fix the parts that went over the pre printed lines, the brush was cleaned and then used like an eraser to remove the excess paint. A cloth or fingers were too heavy for wiping the paint off the brush, so they used their lips and tongue. This led to "tipping" or pointing the brush in the lips. The brush was also tipped before painting a numeral. The paint was swallowed."(7)

Zinc sulfide was mixed with a radium salt, glue, and water to make the paint. The paint was called "Luna" (7)

In 1902 the radioluminescent paint was invented. It wasn't used in the United States until WWI when it was used for military equipment. (7)

The girls painted rings on fingers, decorated buttons, eyebrows, hair, around their mouths for fun and they would glow in the dark. Most of the girls were in their teens and early twenties. They were a "happy, jolly lot." They had picnics and parties. (8)

The ratio of zinc sulfide to radium was 30,000 to 1 [p. 30] (9)1111

Marie Curie discovered radium in 1898 (10)

People believed that radium was good for your health and it was used in many items (10)

By 1925 Ottawa studio was the largest dial painting company in the country producing 4300 dials a day or 1075000 per year. They painted the radium dials used by Wesclox. P. 94 (11)

From 1918-1924, 1000 women worked in Ottawa. P. 92 (11)

First they dip the brush into water, then into the powder, labeled radium compound, then they would point the end of the bristles with their teeth. (14)

Center (sickness)

1925, company tested girls for radium, they were never told the results. 1928 they were tested again.

67 were tested

10 were positive

13 were very suspicious

11 were suspicious

12 were doubtful

21 were negative. P. 94 (11)

1st death in 1927- Mary Ellen Cruise age 24

2nd death in 1929- Margarey Looney. P. 96 (11)

1927- 1st death

1930- 2 more deaths

1931- 5th death (radium poisoning on death certificate)

1934- 6th death (first death recognized in Ottawa from radium poisoning) P. 99 (11)

35 women have died from radium poisoning. P. 108 (11)

The Radium Girls said the assistant manager told them there was no danger in the paint they used. He said it was good for them and would give them pink cheeks. (13)

Mrs. Donahue was fired in 1931 because the company managers told her that her "limping condition was beginning to cause talk."(15)

Katherine Donohue and Marie Rossiter were tested but they did not get their medical reports. When they asked Rufus Reed where their report was he said "My dear girls, if we ever give a medical report to you there will be a riot in this place." Neither of the girls realized what he meant. (14)

Radium is what's called a "bone-seeker." It is chemically similar to calcium, and so when it is ingested, it goes right where calcium does — into the bones but instead of strengthening the bones it puts holes in it. Radiation also kills bone marrow and it turns them anemic and weak. (16)

Because the jaw has a relatively high turnover rate of cells, generally it got the largest amount of radium. Some women's teeth fell out and their jaws fell apart. Then the rest of their bones began weakening and breaking. (16)

During 1926- 1927 Radium Dial switched from brushes to glass styluses for dial painting. (3) p. 199

June 7, 1928 the president of Radium Dial, Joseph Kelly printed a statement in the newspaper saying the the radium the girls were using was safe. (11)

"The health of the employees of the Radium Dial Company is always foremost in the minds of its officials." – Joseph A. Kelly, President of Radium Dial Company (11)

Margaret Looney went to a doctor in Chicago who confirmed that it was radium poisoning but the doctor said he could not speak out because it would be the end of his career (17)

The women noticed stiffening in their joints and did not realize it was a sign of radium poisoning. (18)

By 1925, the government and scientists concluded the radium was making the dial painters sick,(3) p. 2

The girls were scared about getting radium poisoning since 1928 when the New Jersey dial painters case acknowledged that radium was poisonous (19)

Dr. Charles Loffler, of Chicago, concluded that it was radium poisoning on April 14, 1934 (20)

CENTER (lawsuit)

No Ottawa lawyer wanted to represent them in a lawsuit against Radium Dial Corporation because the people of Ottawa resented the women's charges because they said the girls were giving a "black eye" to the community. (12)

At first the women couldn't sue because the law said that they had to sue within the first six months but radium takes 3-5 years to show up and then the law was changed so they could sue. (12)

Tom Donohue decided to sue Radium Dial so he contacted Marie Rossiter to see if she knew of any girls who wanted to sue the company. She contacted many of the girls but only 7 wanted to sue. The girls would travel by train to meet with their lawyer (17)

"The Society of the Living Dead" was formed by Leonard J. Grossman to make sure the Radium Girls are by legislation and for people endangered from the disease. (13)

In 1935 Catherine Donohue asked the Illinois Industrial Commission for workman's compensation money. (21)

RIGHT

"maximum tolerance level" was established May 2, 1941 with 0.1 microgram at the most can a person be exposed to. The value was one tenth the smallest amount of ingested radium known to have harmed the dial painters. P. 122 (11)

Center for Human Radiobiology closed on Sept. 30, 1993
1934, dialpainters were located and measured for radium. P. 139 (11)

Before each state would make their own laws for the workplace health and safety, but now it is a federal law. P. 139 (11)

Now workers have the legal right to see their medical records and employers have to keep records for 30 years. P. 140 (11)