Death Rays: The Murder That Put X-Rays On Trial

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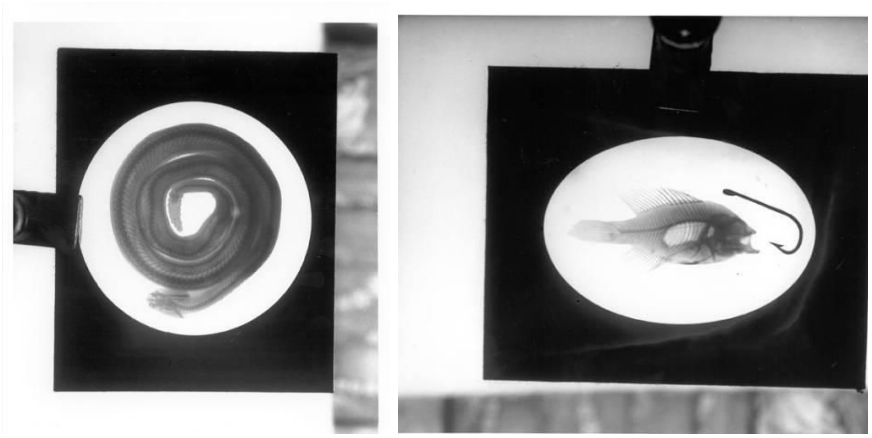
Around noon on July 8, 1897 in the village of Horseheads, NY, George A.C. Orme entered the home of his estranged wife, Susan Maria Orme, and shot her and her alleged lover, James Punzo. Orme had borrowed the .32-caliber Smith and Wesson revolver from Harry Reynolds, an express messenger, under the pretense of needing to shoot some cats. After the shooting, Orme left the home and was arrested. While those basic facts were generally agreed upon, every other detail in this crime was subject to debate, hearsay, and controversy.

While Susan Orme recovered from her injuries, James Punzo died just over a month after the shooting. In the ensuing murder trial, George Orme's lawyers launched a novel defense: the bullet fired by Orme was not responsible for Punzo's death. Rather it was the x-rays administered by doctors, in attempts to locate the bullet, that had killed him. What initially looked like another standard domestic assault case became a trial on the safety of x-ray technology. The case played into people's fears, misunderstanding, and misuse of the nascent technology and largely became a showdown between two expert witnesses, Frank Ward Ross and John T. Pitkin, who both represented distinct camps of early x-ray experts. While earlier cases used x-rays in trials, the Orme case was the first to essentially put the x-rays on trial.

German scientist Wilhelm Röntgen discovered x-rays in November 1895, less

than two years before they became the centerpiece of the Orme trial. Röntgen's findings spread quickly. By 1896, scientists, physicians, and photographers around the world had access to the new technology and were using it with little understanding of its hazards. Curious scientists x-rayed a wide variety of objects, like these undated early images by engineer Charles Steinmetz show:



These images of a snake and fish by Charles P. Steinmetz are representative of the types of experimental images early scientists were attempting.[1]

These new x-ray experts gave demonstrations, like a cheekily advertised "X-Ray Xhibit" in New York City in May 1896. [2] As these demonstrations spread rapidly beyond just major cities and got more press coverage, public fascination grew and the rays infiltrated pop culture. For example, just a couple of months after Röntgen's announcement, the *Pokeepsie Evening Enterprise* printed a comical poem entitled "The Boarder:"

> Unto affairs electrical
> He turneth not his gaze,
> To see a chicken's skeleton

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[1] Charles Proteus Steinmetz, "Early X-Ray (Fish) and (Snake)," courtesy miSci- Museum of Innovation and Science, obtained from nyheritage.org, http://cdm16694.contentdm.oclc.org/cdm/singleitem/collection/schmuse/id/254/rec/1 and http://cdm16694.contentdm.oclc.org/cdm/singleitem/collection/schmuse/id/255/rec/2.

[2] *New York Evening Post*, May 1, 1896, 5. http://nyshistoricnewspapers.org/lccn/sn83030384/1896-05-01/ed-1/seq-5/

He needs no Roentgen rays.[3]

People also believed the rays could cure a variety of disease; at one demonstration in Ogdensburg, NY in May 1897, attendees claimed that the x-rays cured everything from their coughs to night sweats.[4] The lighthearted cultural understanding of the power of x-rays left people unprepared for the potential consequences that would be revealed in the Orme trial and after.[5]

Elmira physician Frank Ross was an early x-ray adopter. As early as 1893, Ross became interested in use of electricity in medicine and gave talks on the subject; In 1894 he was appointed as a lecturer in Electro-Therapeutics at Niagara University.[6] In early 1896, Ross was already establishing himself as the local authority on x-rays. He gave a paper at a Chemung County Medical Society meeting entitled, "Some Notes on the Use of X Rays in Medicine and Surgery with Exhibition of Apparatus and Fluoroscope."[7] He went to New York City in May 1896 to learn more about x-rays at Columbia University. He returned shortly after with a negative of an infant's skeleton, which a reporter at the *Elmira Daily Gazette and Free Press* marveled was "photographed through the flesh, and every bone was plainly traceable."[8]

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[3] "Newsy Notes of Interest," *Pokeepsie Evening Enterprise*, February 27, 1896, 4. http://nyshistoricnewspapers.org/lccn/sn90066261/1896-02-27/ed-1/seq-4/

[4] "Dr. Caldwell Gives Another Public Reception Demonstrating the X-Rays," *Ogdensburg Journal*, May 29, 1897, 4. http://nyshistoricnewspapers.org/lccn/sn85054113/1897-05-29/ed-1/seq-4/

[5] For more on early perceptions of x-rays see, Matthew Lavine, "The Early Clinical X-Ray in the United States: Patient Experiences and Public Perceptions," *Journal of the History of Medicine and Allied Sciences* 67, no. 4 (October 2012): 587-625; Simon Avery, "'A New Kind of Rays': Gothic Fears, Cultural Anxieties and the Discovery of X-Rays in the 1890s," *Gothic Studies* 17, no. 1 (May 2015): 61-75; and Carolyn Thomas de la Pena, *The Body Electric: How Strange Machines Built the Modern America* (New York: New York University Press, 2003).

[6] "Elmira Physician Honored," *Elmira Daily Gazette and Free Press*, June 23, 1894, 5.

[7] "Doctors Will Meet," *Elmira Daily Gazette and Free Press*, May 13, 1896, 5.

[8] "An X-Ray Photograph," *Elmira Daily Gazette and Free Press*, May 16, 1896, 7.

In February 1897, Ross read a paper, "The Ethical and Medico Legal consideration of the use of the X Rays on Fractures, Dislocations and Resulting Deformities, and in Diagnosis," at a meeting of the Chemung County Medical Society. After the meeting, most of the members in attendance went to Ross' office to see a demonstration of his x-ray apparatus. [9] While a transcript his lecture does not exist, the title indicates that he was addressing a larger international conversation about physicians' responsibilities in using x-rays and the legal potential ramifications for doing or not doing so.

An English case in April 1896 bore similarities to the Orme case. Doctors used x-rays to try to locate bullets in the head of victim Elizabeth Anne Hargreaves Hartley, who was shot four times by her husband, who committed suicide immediately after. The exposures were successful, but the bullets were not removed and Hartley died two weeks later. Her death was attributed to the bullets, however, not the effects of the x-rays.[10] Unlike the Orme case, with both Hartley and her attacker dead, there was no need for a trial in which these issues could be discussed.

As x-ray technology spread, so did its burgeoning use in malpractice suits. *Smith v. Grant* was the landmark case in early medico-legal x-ray debates. James Smith of Denver, CO injured his leg on June 5, 1895 and later alleged that his physician Dr. William W. Grant had negligently treated him. Malpractice suits were common in the late 19th century, but this case was unique for the defense attorneys' efforts to introduce x-ray photographs into evidence to prove Grant's misdiagnoses. After *Smith v. Grant*,

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[9] "Program of the Day," *Elmira Daily Gazette and Free Press*, February 16, 1897, 7.
[10] Bettyann Holtzmann Kelves, *Naked to the Bone: Medical Imaging in the Twentieth Century* (New Brunswick, NJ: Rutgers University Press, 1997), 43-44.

physicians had increased fear that x-rays could be used against them to prove malpractice, but the Orme case opened another line of concern: their own use of x-rays could be used against them in court. This set up a lose-lose scenario for physicians: whether or not they used x-rays diagnostically, they could be found negligent.[11]

On the morning of the attack, George Orme arrived at Susan's small yellow house enraged because he thought "she was disgracing the family."[12] Susan had been boarding several Italian immigrant laborers, and was rumored to be having an affair with one of the men, James Punzo. Initial reports of the crime claimed that Orme first tried to convince his wife to end the relationship, and when she refused, he left and went to borrow a gun. When he returned to the house, he walked up to Punzo and shot him point-blank in the back of the head. His wife struck him with a heavy ladle and he shot her in the neck and face. Orme fled the house and encountered a neighbor who stopped Orme from committing suicide and brought him to the sheriff.

Susan Maria Orme's injuries were minor enough to be treated by a local doctor and she was released into the care of a friend. Punzo, however, was in critical condition and was brought to the Arnot-Ogden Hospital in nearby Elmira. His prognosis was poor and doctors feared he would not survive surgery. Meanwhile, Orme was arraigned before a Justice of the Peace and pleaded not guilty. He was brought to the Chemung County Jail to await his examination. [13]

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[11] For discussions of *Smith v. Grant* see: Tal Golan, *Laws of Men and Laws of Nature: The History of Scientific Expert Testimony in England and America* (Cambridge: Harvard University Press, 2004), and Daniel S. Goldberg, "The Transformative Power of X-Rays in U.S. Scientific & Medical Litigation: Mechanical Objectivity in *Smith v. Grant* (1896)," *Perspectives in Science* 21, no. 1 (2013): 23-57.
[12] "Two Shot," *Elmira Daily Gazette and Free Press*, July 8, 1897, 7.
[13] "Two Shot," 7.

Defying all medical odds, Punzo was still alive a few days later. He was still in critical condition, with a large hole in the base of his skull. Doctors had been unsuccessful in their efforts to locate the bullet during surgery. While they had been able to remove skull fragments from his brain tissue, the bullet remained.

While Punzo lay in the hospital, Orme's examination began on July 12. In the days since the shooting, the 60-year-old English immigrant began to realize the seriousness of his actions. Orme was in physical pain from the blow to the head he sustained from his wife's metal ladle, but his bigger anguish came from the uncertainty of Punzo's recovery. Orme was aware that if Punzo died, he would be facing murder charges. The *Elmira Daily Gazette and Free Press* reported, "Orme complains of having a loss of appetite and also of nervousness. The condition of the Italian is evidently what is worrying him and the possibility of the foreigner's death and in the advent of such an occurrence the vision of the electric chair with its attachments is not pleasing."[14] When the examination concluded, the judge determined that Orme would be held until he could go before the grand jury in September.

Meanwhile, Punzo's recovery continued to surprise his doctors. On July 14, doctors at the hospital administered x-rays to try to determine the location of the bullet. Physicians Frank Ward Ross, O.G. Drake, C.L. Squire, and Charles Farr brought two x-ray machines to the hospital for an examination. District Attorney Charles Knipp also attended in an effort to get a statement from Punzo. The combination of Punzo's poor English and head trauma, however, rendered him unable to provide much information,

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[14] "To The Grand Jury," *Elmira Daily Gazette and Free Press*, July 13, 1897.

but he did say that he was washing his face when Orme shot him in the back of the head. After he made his statement, the doctors anesthetized Punzo and x-rayed his head. The image was unclear and the doctors planned to make another attempt in the near future.[15]

Eleven days later, Punzo was still in the hospital, but was conscious and talking. Punzo's story was reprinted in dialect in the *Elmira Telegram*: "Me worka half a day; me go home and see mammie in a housea and gita da wata and washa my face, so, Orme come in a house, me say hello." Based on the angle of the entry wound, physicians corroborated Punzo's claim that he was stooped over the sink at the time of the shooting. That evidence directly refuted Orme's claims that Punzo was embracing Susan Maria Orme at the time of the attack.[16]

On July 27, physicians made another failed attempt to take an x-ray. The damp, humid conditions made the machine malfunction.[17] The doctors were feeling increased pressure to make the experiment work, however, because Punzo was growing more delirious and unstable. Doctors suspected his brain tissue was becoming infected.[18]

The weather conditions finally allowed a successful x-ray attempt on July 31. The *Elmira Telegram* described the exciting medical scene as follows:

> The physicians had constructed a head rest of two broad boards placed at angles. A hole was cut in the upper board, in which a hole was cut of a size sufficient to allow the upper half of the Italian's head to rest. A Crookes tube, with which the X rays are made, was placed upon the under board and directly under the man's head... Several tests were made, with the wonderful light, which, with the use of the fluroscope, could be seen passing entirely through the Italian's head. A large photographic negative was placed in a plate holder, and fastened directly over Punzo's face, in order that the shadow of the bullet or any other foreign object in the brain might be registered upon the sensitized negative, and then be printed in a photograph.[19]

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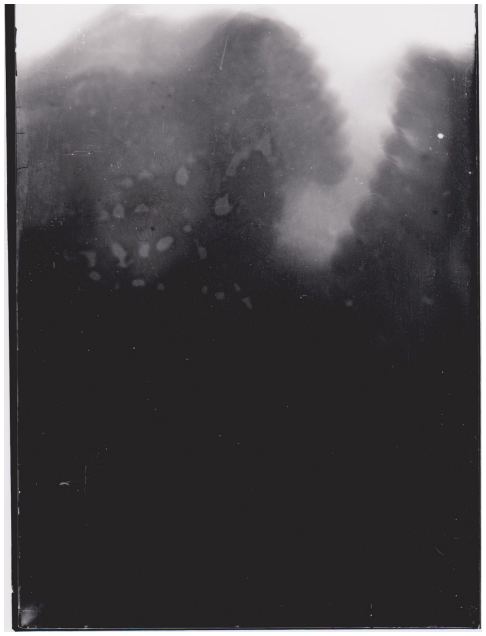
[15] "After The Bullet," *Elmira Daily Gazette and Free Press*, July 14, 1897, 7.
[16] "The Wounded Italian," *Elmira Telegram*, July 25, 1897.
[17] "It Was Too Damp," *Elmira Daily Gazette and Free Press*, July 27, 1897, 3.
[18] "Punzo is Restless," *Elmira Daily Gazette and Free Press*, July 29, 1897, 3.
[19] "Bullet Not Located," *Elmira Telegram*, August 1, 1897, 8.

The first test was a failure because Punzo's head moved five minutes into the exposure time. A second, thirty-one minute exposure was then completed. A local photographer developed the negative, but it disappointingly did not show the bullet. Doctors believed that they would need to make another attempt another day.



Undated x-ray of a skull from the collection of Elmira photographer Charles Van Aken. While not showing Punzo, this image would have been taken around the same time as the trial and shows the lack of clarity that early x-rays could have.[20]

Journalists raised the question of the safety x-ray exposure, of which Punzo had already received 36 minutes. Doctors Ross and Squire vehemently denied any danger. They said that other sensational cases that alleged injury from the "wonderful rays" were not caused by the rays themselves, but instead by the patients' pre-existing conditions.[21] Still, the *Elmira Telegram* claimed, "the condition of Punzo's head, which was exposed to

[20] Charles Van Aken, "X-Ray, Skull," Van Aken Glass Plate Negative Collection, CL 16, VA7, 86, Chemung County Historical Society, Elmira, NY.

[21] Early x-ray scientists were deeply divided over the damage that the rays could cause. For extensive treatment of this topic, specifically on x-ray burns, see, Benjamin James Ford, "The Burning Question: Early U.S. Radiology and X-Ray Burns, 1896-1904," master's thesis, Salem State University, 2016.

the strong X rays for a period of thirty-six minutes, will be watched with interest by the physicians and hospital attendants."[22] Ross fought back, stating "The statement by the press, and various observers, of the injurious effects of the X rays is, I think, overestimated and wrongly, too... My own hands have been exposed for hours at a time, my office boy has been in the same light for numerous periods of time, and any patients and friends have been similarly exposed."[23]

On August 2, Punzo's doctors regrouped to determine how to proceed after the last unclear x-ray. Some doctors questioned if the bullet was even in his head anyway, a theory that was quickly refuted due to the lack of an exit wound. Still, they decided not to immediately attempt another x-ray image.[24]

Punzo's condition deteriorated rapidly and people speculated that the effects of the x-rays were the cause. Orme's lawyers, seizing this news, began to prepare a defense that blamed the x-rays in the event that Punzo died. They claimed that Punzo was actually recovering until the final x-ray was administered. Dr. Ross continued to deny that the rays were harmful and Dr. Drake said Punzo's decline was due solely to the bullet still lodged in his brain.[25]

Punzo died on August 10 or 11. An autopsy was performed on August 12. He was buried on August 14 at the cemetery at St. Mary's Church in Horseheads. His brother was the only mourner in attendance.[26]

The coroner's inquest into Punzo's death opened on August 17 with Orme's

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[22] "Bullet Not Located," 8.
[23] "Punzo's Head," *Elmira Daily Gazette and Free Press*, July 31, 1897, 7.
[24] "Punzo Very Feeble," *Elmira Daily Gazette and Free Press*, August 2, 1897, 3.
[25] "A Novel Defense," *Elmira Daily Gazette and Free Press*, August 4, 1897, 7.
[26] "Punzo Buried," *Elmira Daily Gazette and Free Press*, August 14, 1897, 7.

testimony. Orme's story focused less on the crime than his feelings about Italians.[27] Then Dr. Drake discussed the x-ray procedures and said he did not blame the rays for Punzo's death. Punzo's skull was entered into evidence and passed around the jurors to show the bullet wound.[28] Meanwhile, news spread of this strange trial and the defense's novel claim that x-rays were the true culprit. [29] Headlines appeared in newspapers across the state, including one that read "Fun For the Lawyers" in the *Pokeepsie Evening Enterprise*.[30]

On August 19, the coroner's inquest came to a close. The following verdict was issued: "We find that James Punzo came to his death from injury to the brain caused by a wound from the bullet fired from a revolver in the hands of George Orme, and other contributing causes, according to the best information we can obtain." The key testimony came from Dr. E.H. Davis, who testified that based on his findings in the autopsy, Punzo died from a combination of his wound, the anesthesia, and the x-rays. He said the bullet was less than two inches deep and the wound showed no signs of infection. His report read:

> It would appear then that the bullet wound was only a contributing cause and by no means the only or sole cause of death. It has been stated here in the account of the treatment given him that on two occasions anesthetics were administered and the X-rays used to locate the ball in his head. The administration of an anesthetic at any time after adhesive inflammation had supervened jeopardized his safety, and the application of the X-rays was hazardous to his life. It is idle to say we do not know that they penetrated the brain or do harm because we do not know what they are. We know no less what the X-rays are than we know what light, heat and electricity are. All we know of any of them is by their effects and we know what instances are now being published from all parts of the country of most disastrous and destructive effects of the X-rays in the unskillful and imprudent hands...[31]

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[27] "Punzo's Funeral," *Elmira Daily Gazette and Free Press*, August 13, 1897, 3.
[28] "The Inquest," *Elmira Daily Gazette and Free Press*, August 18, 1897, 5.
[29] *Bolivar Breeze*, August 19, 1897, 4. http://nyshistoricnewspapers.org/lccn/sn84031157/1897-08-19/ed-1/seq-4/
[30] "Fun For the Lawyers," *Pokeepsie Evening Enterprise*, August 13, 1897, 7, http://nyshistoricnewspapers.org/lccn/sn90066261/1897-08-13/ed-1/seq-7/
[31] "Those X Rays," *Elmira Daily Gazette and Free Press*, August 20, 1897.

They determined that the District Attorney would present the case to grand jury in September.

The grand jury convened on September 8 and the *Elmira Daily Gazette and Free Press* proclaimed that it "promises to be the most interesting trial ever held in this city." On the second day, Dr. Ross brought the x-ray machine into the courtroom to testify about its workings and safety. On September 11, Orme was indicted on one count of murder in the first degree and one count of assault in the first degree.[32]

Orme's trial began on December 14 with Susan Maria Orme's testimony. Still bandaged and recovering from her significant facial injury, Mrs. Orme denied having an affair with Punzo, claiming instead that he and the other Italian boarders were helping her and her son, Frank. She said that her husband was an unstable drunk. Mrs. Orme testified for over two hours and so many curious spectators filled the courtroom that it was standing-room only.[33]

Although Mrs. Orme's sensational testimony packed the room, the real focus of the trial began the next day. On December 15, Dr. E.G. Drake brought the x-ray machine used on Punzo into the courtroom to give a practical demonstration of the technology to the jury. The *Elmira Daily Gazette and Free Press* declared, "This is the first instance known of at the present time that the X rays have been brought into a criminal case and publically operated for the benefit of the jury."[34]

Ross gave his first testimony on December 16. The x-ray apparatus was in court with him. Orme's lawyer Knapp questioned Ross on the safety of the rays, asking if any

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[32] "Two Counts," *Elmira Daily Gazette and Free Press*, September 11, 1897, 3.
[33] "Trial Begins," *Elmira Daily Gazette and Free Press*, December 14, 1897, 5, 7.
[34] "Use of X Rays," *Elmira Daily Gazette and Free Press*, December 15, 1897, 5-7.

of his patients had ever lost hair or fingernails following exposure. Ross denied that he had seen either effect. When asked if he knew of any way to prevent injury from exposure to the Crooke's tube, Ross replied that an aluminum sheet could be used. However, he said he did not use one on Punzo because he did not feel that the procedure was unsafe. Knapp sowed more doubt about the safety of the rays by simply asking "What are the X rays?" Ross replied, "No one knows. They are an unknown quality."[35]

While Ross maintained his belief in the safety of the rays, the next day's witness, Dr. John T. Pitkin, a Buffalo physician, testified that the x-rays could have caused harm when used improperly. Pitkin said that the machines available in Elmira were technologically inferior and that they had been used without proper safeguards, like an aluminum sheet: "I am ashamed to find that the only apparatus in so beautiful and progressive a city should be so inferior an apparatus. I regard the use of this instrument for X ray purposes as dangerous to the subject who is being photographed." In a more sensational piece of courtroom theatrics, Pitkin tested the machine on Deputy Sheriff Daniel Mackey in court. Mackey showed no ill effects and Pitkin testified that the wound on Punzo's head likely caused extra exposure to brain. He concluded also that it was likely electricity generated by the machine, not rays, that caused the most significant damage.[36]

Pitkin's point about x-ray technology was a salient one. In the scientific frontier of early x-ray technology, machines were not standardized or regulated. While the rays could be made without a specially-produced apparatus, seizing on the popularity of the

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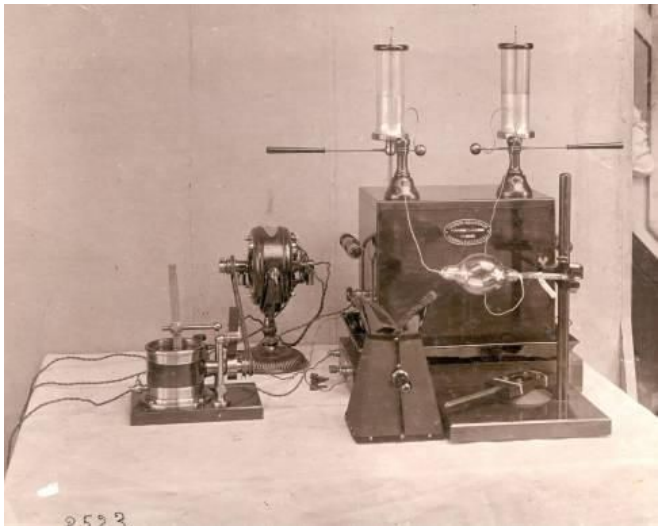
[35] "X Ray Defense," *Elmira Daily Gazette and Free Press*, December 16, 1897, 7.
[36] "Applauded," *Elmira Daily Gazette and Free Press*, December 16, 1897, 5,7.

new discovery, companies began to advertise and sell a variety of models. Leaders in the field included General Electric, where x-ray innovations were led by engineer Elihu Thomson. By 1896, a variety of models bearing Thomson's name appeared on the market. The Arnot Hospital, Frank Ross, and Dr. C.L. Squire all owned a New Holtz x-ray machine, which was produced by the American Roentgen Ray Company. Ross' testimonial was featured in the company's advertising pamphlet, saying, "The apparatus--New Holtz-- arrived to-day in good order. I have set it up, and it works beautifully. Had a 7 1-2 inch spark to-night, and think I might have gotten an eight...I can only repeat my former statements in praise of the apparatus." [37]



A Thomson X-Ray machine, 1896. [38]

Ross was recalled to the stand at the end of the trial by the prosecution to reestablish his expertise in the field or x-rays. He described his training and the medical

[37] American Roentgen Ray Company, *The Roentgen Rays, Their Production and Use* (Cambridgeport, MA: Louis F. Weston, 1897).
[38] "Thomson X-Ray Machine, 1896," courtesy miSci- Museum of Innovation and Science, obtained from nyheritage.org, http://cdm16694.contentdm.oclc.org/cdm/singleitem/collection/p16694coll20/id/5739/rec/242.

organizations to which he belonged. He also gave another account of Punzo's examinations. Ross refuted Pitkin's early testimony that the electricity from the machine had killed Punzo. To prove his point, Ross reportedly took 150,000 volts through his body to show that the electrical currents at the levels produced by the machine could not be harmful. Regarding the safety of the rays themselves, Ross claimed to have personally been exposed 1,500 or 2,000 times and never had any ill effects.[39]

After closing arguments, the jury did not take long to deliberate. They found Orme not guilty of murder. The surprising result made news both in popular and medical and electrical trade publications. The *Electrical Review* printed: "Did the defense prove its allegation? Apparently it did. Here is a case worthy the closest attention of scientists. If true, this is the first fatality caused by X-rays, and the whole matter should be laid bare in detail."[40] The *Chicago Tribune* posited that the jury acquitted Orme because they were confused by the technical testimony: "The jurors refuse to discuss what effects the X-ray evidence had in the defendant's acquittal, but it is generally believed that the mass of conflicting testimony relative to the use of the mysterious rays raised doubt, the benefit of which was given to the defendant."[41] Newspaper blurbs ascribing the Orme's acquital to the x-ray testimony ran in newspapers throughout the state.[42]

In the aftermath of the trial, both Ross and Pitkin continued to speak about the

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[39] "Dr. Ross' Test," *Elmira Daily Gazette and Free Press*, December 22, 1897, 3.
[40] *Electrical Review* 31, no. 26 (December 29, 1897): 312.
[41] "X Rays Confuse The Jury," *Chicago Daily Tribune*, December 24, 1897, 2.
[42] See "X Rays Lead to an Acquittal" in papers like *Ogdensburg Journal*, December 24, 1897, 4, http://nyshistoricnewspapers.org/lccn/sn85054447/1897-12-25/ed-1/seq-5/; or *Watertown Herald*, December 25, 1897, 5, http://nyshistoricnewspapers.org/lccn/sn85054113/1897-12-24/ed-1/seq-4/; or "The Orme Trial," *Ithaca Daily Journal*, December 23, 1897, 2, http://nyshistoricnewspapers.org/lccn/sn83031157/1897-12-23/ed-1/seq-2/.

case and their respective viewpoints. Interestingly, however, neither referenced the other by name. In the March 1899 issue of the *American X-Ray Journal*, Pitkin argued that the machine, which was too small and operated without an aluminum plate, deteriorated Punzo's brain tissue. An editorial comment added at the end of Pitkin's essay stated, "There may be some force in the contention that under the circumstances an x-ray was not justifiable...The case is of interest from a forensic standpoint, as showing how a supposedly innocent surgical investigation may furnish the fabric of criminal defense."[43]

Ross meanwhile parlayed his experience in the trial into talks about the safety of x-rays. However, Ross also used his work on the Orme case as a cautionary tale to his fellow physicians. On January 13, 1898, shortly after the conclusion of the trial, the Elmira Academy of Medicine made x-rays the focus of the organization's annual meeting. Ross, the president of society, gave the keynote address, "Remarks on the Use of X Rays for Diagnostic Purposes with Demonstration of Their Harmlessness and Utility."[44] He spoke about the trial, lamenting that Chemung County had "furnished the first murder trial in which the X-ray was used, as a means of diagnosis. And we are sorry to say this was used as a part of the defense." Ross spoke passionately about the need for progress, even in the face of a legal system rooted in the past: "We must ever live in the burning, active present...If we do not we fail in our duty to our patients and our profession."[45]

In June 1898, Ross took his message to larger venues when he gave a talk entitled "The X-Ray in Forensic Medicine" to both the Medico-Legal Society and the American Association of Physicians and Surgeons. He opened the talk with the following

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[43] "The X-Ray in a Murder Trial," *Medicine* V, no. 5 (May 1899): 437-438.
[44] "The Use Of X Rays," *Elmira Daily Gazette and Free Press*, January 10, 1898, 3.
[45] "The Academy of Medicine," *Elmira Daily Gazette and Free Press*, January 13, 1898, 6.

statement: "My personal experience and observation, from which I have evolved the subject matter of this brief paper, convinces me that the X-ray in forensic medicine is not necessarily a bed of roses. There are many pitfalls and unpleasant experiences, which must be considered and met." [46]

Ross implored physicians to use the utmost care while taking x-rays, particularly those to be used as evidence in court. Speaking of the Orme trial, Ross said, "My greatest consolation, in this case, was that same argument would have been used had I failed to use the X-ray to locate the bullet. Had the case died, then the omission would have been claimed as neglect." Ross believed that physicians were being punished, or at least treated suspiciously, for using new technologies. He said, "Evidences which to our trained surgical senses or deductive logic may be sufficient for us to use as a guide for treatment which holds a human life, may count for naught in a court of law, and our efforts to save live; and best intentions are often looked upon with suspicion by the court and jury. Especially is this true in regard to new discoveries, which are viewed rather in the light of experiments."

The Orme case expanded discussions of the possible dangerous effects of x-rays, but it took still another few years for the most serious ramifications to make news. Unlike Punzo's demise, death from x-ray exposure was normally a slower, more painful fate. Many x-ray operators began to notice a variety of symptoms, including fatigue and lesions that often required amputation. The death of Clarence Dally, an assistant to Thomas Edison, brought the ramifications of x-ray work fully into the public

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[46] Frank Ward Ross, "The X-Ray In Forensic Medicine," *Medico-Legal Journal* XVI, no. 2 (1898): 142-149.

consciousness. Dally died in 1904, after suffering for years from lesions, multiple amputations, and eventually the cancer that killed him. Dally's death was so prolonged and gruesome that Edison abandoned working with x-rays for fear of meeting a similar fate.

In the wake of Dally's death, Pitkin gave a powerful address to the American Roentgen Society about dangers of x-rays. He outlined the various symptoms of exposure and shared his own health struggles. Pitkin had suffered from pustules on his face and neck, abscesses on his hand, lost fingernails, muscle spasms, lesions, dermatitis, soreness of his arms, malaise, fever, headache, sore throat, vomiting, vertigo, and rash. At the end of his presentation, other doctors shared their own similar experiences.[47]

Ironically, Ross and Pitkin's differing opinions on the safety of x-rays mirrored their own personal experiences. Ross went on to serve as a surgeon in the Spanish-American War, and later World War I, and was a Chemung County coroner. He died in 1923 from an infection. If he ever suffered any identifiable health problems from his many x-ray exposures, they were never documented or publicized. Pitkin's experience, meanwhile, earned him a place in Percy Brown's 1936 book *American Martyrs to Science Through the Roentgen Rays*. Pitkin died in 1935 after suffering for years and ultimately developing carcinoma that led to multiple amputations and his death.

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[47] John T. Pitkin, "Danger of the X-Ray Operation," *Transactions of the American Roentgen Ray Society Fourth Annual Meeting* (Pittsburgh: Murdoch-Kerr Press, 1904), 232.

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