

Colloton, 1

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Cine-GT 2920

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As the Spirograph Turns...

Now, almost all media spins. From DVDs to hard drives to vinyl records, almost all information is stored on a format inscribed with media in a circular fashion. But, at the dawn of the modern age, the gramophone disc stood alone as a unique mechanism for delivering data via rotation. As engineers, inventors and tinkerers grappled with a method of delivering moving images, many turned to what would become the data delivery method of the future, only to be met with frustration and failure in the form of obsolescence. Their struggles would be to the benefit of history, and not to themselves, as demonstrated through the fateful story of the Spirograph. The Spirograph is at once a forward looking invention, predicting the demand for an amateur film market and the rise of documentary film, and inherently obsolete, due to production issues, market competition and a limited supply of content.

The late 19th century represents a boom in technological advancement, and the dawn of the cinematic age. An idea whose time had come, the ability to capture and reproduce moving images was attempted on many fronts, and more than one pioneer of the field found satisfaction. The Edison Kinetoscope, a device which allowed users to "peep" through a magnifying glass at a

moving image, was invented by W.K.L. Dickson in 1891.¹ It was quickly followed by the Lumière Brothers first demonstration of projected moving images on December 28th, 1895.² These early milestones were the snowball that would become an avalanche of future advancements. As the industrial world moved to capitalize on the technological feat of reproducing moving images on film, many looked to an only slightly less recent invention of the gramophone record for inspiration.

Invented by Emile Berliner, the Gramophone disc, similar to the vinyl records of today, reproduced sound through the subtle changes in an inscribed groove on the surface of the disc that a stylus would then "read" from the outer edge of the disc to the inside, traveling in a spiral path.³ Several inventors saw this as a model for inscribing information, and looked to replicate the success of the gramophone (which quickly outpaced the Edison phonograph's wax cylinders during the 1890s). In fact, the first Spirograph discs were market as "records," to emphasize their reminiscence to gramophone records.⁴ Most notable among these attempts at adaptation were the Phonoscope and the Kammatograph, invented in 1892 and 1898, respectively.

¹ Enticknap, Leo Douglas Graham. Page 12. *Moving Image Technology: From Zoetrope to Digital*, 29-73. London: Wallflower, 2005. Page 12.

² Enticknap. Page 12

³ Enticknap. Page 101.

⁴ Huhtamo, Erkki. "The Dream of Personal Interactive Media: A Media Archaeology of the Spirograph, a Failed Moving Picture Revolution." *Early Popular Visual Culture* 11, no. 4 (2013): page 368. doi:10.1080/17460654.2013.840247.

Georges Demeny, "at the request of Hector Marichelle, professor and director of the National Deaf-Mute Institute," invented the phonoscope in an attempt to document the movement of a speaker's tongue as they announced a short phrase.⁵ Demeny's prototype design, which he called the photophone, incorporated images that were glued to equidistant slots on a metal disc, 24 images in all. The refined phonoscope projected light through 24 printed images on a glass disc, and could be viewed by an individual or small group. The disc would spin in continuous motion, allowing the user to view a short sequence repeatedly.⁶ This non-theatrical, scientific playback is notable for its contrast to the objective of other early cinema technologies, and a theme which will be revisited as early disc-based film formats are explored in this paper.

The Kammatograph, another glass disc film format, "utilized a 12-inch circular glass plate with notched edges caught by gearing which provided the necessary intermittency."⁷ Far surpassing the playback of Demeny's phonoscope, the kammatograph disc held 350 to 550 images, in a sequential spiral pattern, as opposed to the phonoscope's circumferential

⁵ Braun, Marta, and Etienne-Jules Marey. "Animating Images: The Cinematographic Work." In *Picturing Time: The Work of Etienne-Jules Marey (1830-1904)*, page 176. Chicago: University of Chicago Press, 1992.

⁶ Braun, Marta, and Etienne-Jules Marey. Page 176-177.

⁷ McKernan, Luke. "Spinning the Spirograph." 6th paragraph. The Bioscope. September 4, 2010. Accessed October 22, 2014. <http://thebioscope.net/2010/09/04/spinning-the-spirograph/>.

arrangement, providing about 30 to 45 seconds of runtime. While the kammatograph's inventor, Leonard Ulrich Kamm, did not necessarily make the device for scientific purposes, a customized version was notably used by Henderina (or Rina) Scott beginning in 1902. Scott, a botanist, created brief time-lapse films of plant growth, capturing processes that were imperceptible to the naked eye, such as a seed germinating.⁸

The Phonoscope and the kammatograph are merely examples of a trend, a broadly attempted delivery format for moving images. Indeed, the phonoscope is highly indebted to the pre-cinema phenakistoscope, an early animation device dependent on sequential drawings ordered around the circumference of a disc, and Eadweard Muybridge's Zoopraxiscope, which Muybridge used to demonstrate his sequential image photo-studies.^{9, 10} Other examples of this trend are the Spiral Camera Projector, invented by E. & H. T. Anthony in 1897, which boasted the ability to expose or project 200 images on a glass plate, and the succinctly named Platrenkinematograph, invented in the same year by the Bettini Brothers, who increased the number of images on their glass plate to 576.¹¹

⁸ Bethel, Amy. "Henderina (Mrs D. H.) Scott Homepage." *Viewfinder* 78 (March 2010): 31. Accessed November 19, 2014. <http://womenandsilentbritishcinema.wordpress.com/the-women/mrs-d-h-scott/>.

⁹ Braun, Marta, and Etienne-Jules Marey. Page 180.

¹⁰ http://www.eadweardmuybridge.co.uk/muybridge_image_and_context/zoopraxography/

¹¹ Rogge, Michael. "Glass- and Semi-gramophone Records." *One Hundred Years of Film Sizes*. 2012. Accessed October 22, 2014. <http://wichm.home.xs4all.nl/filmsize.html#GLASS>.

Theodore Brown (1870-1938) began work on what would become the Spirograph in 1904.¹² Brown was an engraver by trade, but held a fascination with cinema and stereoscopic photography. He invented and patented several camera attachments for creating stereoscopic photographs, wrote a book on stereoscopic perception and imaging, and experimented thoroughly with an oscillating camera system which Brown hoped would reproduce the stereoscopic illusion without the use of a viewing aid (i.e. no 3D glasses).¹³ There is evidence that Brown published an advertisement for a "living picture record" he called the Magic Bioscope in 1906. According to the ad, the Magic Bioscope contained 2520 frames, that would spin inside a round container with a peephole. This film "viewer" was the catalyst for Brown's 1907 patent "Improvements in Kinematograph Pictures," British patent No 14,493, which depicts a viewer apparatus as well as "a process of obtaining photographic images of a reduced magnitude from ordinary kinematograph film pictures," via microscopic photography. The patent includes plans to print images either in a circle around the edge of the disc, or in a spiral, it's possible Brown had not yet decided how to inscribe the information.¹⁴ The truly notable difference between Brown's inventions and the other disc-based formats discussed earlier, is his

¹² Huhtamo, Erkki. Page 368.

¹³ Herbert, Stephen. "Theodore Brown's Magic Pictures: The Art and Inventions of a Multi-media Pioneer." Theodore Brown's Magic Pictures. Accessed October 22, 2014.

http://easyweb.easynet.co.uk/~s-herbert/theodore_brown.htm.

¹⁴ Huhtamo, Erkki. Page 369.

preference towards celluloid discs, instead of glass discs. The use of celluloid would make the discs more durable, flexible and easier to mass-produce. All of which, made the proto-Spirograph very appealing to producer, entrepreneur and salesman Charles Urban (1867-1942).

Charles Urban was first and foremost a salesman. Born in Ohio to German parents, Urban left home by age 15. He first sold books door-to-door, then phonographs and typewriters, and eventually the Edison Kinetoscope. On a business trip to New York in 1896 (just 8 years prior to Brown's invention of the first iteration of what would become the Spirograph), Urban saw a demonstration of the Lumière Cinématographe show. "I lost all interest ever after in slot machines" he said later (referring to the kinetoscope).¹⁵ Quickly frustrated with the Edison Vitascope, Urban commissioned the production of a new projector, which he named the Bioscope.¹⁶ Urban is best known, however for his involvement in the invention of Kinemacolor, a two-color motion picture system which created the illusion of color photography by rotating a green and red color wheel in the projector. While audiences had witnessed painted and tinted films before, Kinemacolor, which debuted in May of 1908, was a monumental step toward

¹⁵ McKernan, Luke, and Stephen Herbert. "Charles Urban." That Slick Salesman in the Silk Hat. Accessed October 22, 2014. http://www.charlesurban.com/history_sales.html.

¹⁶ McKernan, Luke, and Stephen Herbert. "Charles Urban." A view of life. Accessed October 22, 2014. http://www.charlesurban.com/history_bioscope.html.

motion picture color photography.¹⁷ Unfortunately, Urban's sales were never as good as his sales pitch, and Kinemacolor, like the Spirograph, eventually faded into obscurity.

Charles Urban purchased Theodore Brown's patent in 1908, and trademarked "The Spirograph" the following year. The name change would suggest that the placement of the images, in a spiral pattern, had been decided. Henry W. Joy, Urban's chief consulting engineer, was put in charge of designing a mass-producible version of the device. However, Urban and Joy were quickly distracted by the release, and issuing legal battles over Kinemacolor, and the outbreak of the first World War.¹⁸ Despite founding the Urban Spirograph Corporation in 1917, the first commercially released Spirographs would not ship until 1923.¹⁹

The completed Spirograph was made up of a black enameled body mounted to a mahogany base, which contained two tungsten "Ever-Ready" dry-cell batteries, making the

¹⁷ McKernan, Luke, and Stephen Herbert. "Charles Urban." The eighth wonder of the world. Accessed October 22, 2014. http://www.charlesurban.com/history_color.html

¹⁸ McKernan, Luke, and Stephen Herbert. "Charles Urban." The eighth wonder of the world. Accessed October 22, 2014. http://www.charlesurban.com/history_color.html

¹⁹ Huhtamo, Erkki. "The Dream of Personal Interactive Media: A Media Archaeology of the Spirograph, a Failed Moving Picture Revolution." *Early Popular Visual Culture* 11, no. 4 (2013): page 379. doi:10.1080/17460654.2013.840247.

device wireless.²⁰ A removable "compact projection lamp" was encased in a nickel-plated housing. When removed, the projector would swivel around, and the viewer would peer into the lens, illuminating the image by adjusting a metal plate to reflect ambient light.²¹ The final version of the Spirograph disc was 10 1/2 inches wide, containing 1,200 frames, each frame .22 inches wide and .16 inches tall, laid out in a spiral pattern (naturally) of 12 rows. It would have allowed for about one and half minutes of content.²² There is evidence of a preceding eight-inch disc, which used an alternating two color system - each consecutive frame was either red or green -borrowing from the Kinemacolor process, but this idea was abandoned.²³ Urban negotiated with Eastman Kodak to purchase safety film, while his own engineers created a customized negative converter, printer and perforator.²⁴ As early as 1915 Urban and Joy had patented a "push-pin" mechanism for grasping and releasing the disc. The disc would then be turned with a hand crank. Intertitles were only given two frames, to save room on the disc, so a viewer would have to stop cranking the machine in order to read the text.²⁵ An ad created by

²⁰ "Urban Motion Picture Industries Spirograph." WestLicht Photographica Auction. November 2006. Accessed October 22, 2014.

<http://www.auction2000.se/auk/w.Object?inC=WLPA&inA=10&inO=762>.

²¹ Huhtamo, Erkki. Page 377-378.

²² McKernan, Luke. "Spinning the Spirograph." 10th paragraph. The Bioscope. September 4, 2010. Accessed October 22, 2014. <http://thebioscope.net/2010/09/04/spinning-the-spirograph/>.

²³ Huhtamo, Erkki. Page 376.

²⁴ Huhtamo, Erkki. Page 378.

²⁵ Huhtamo, Erkki. Page 377.

Urban's company would emphasize the user's ability to start and stop on any frame, and playback images either forward or backward by using the hand crank. "Highly amusing" imagery such as a "log rolling uphill, divers jumping feet first from water, birds flying backwards, etc." could easily be achieved.²⁶

This level of interactivity is what makes the Spirograph particularly interesting. As a wireless, free-standing apparatus, which could be used as a personal viewing device or projector, the Spirograph foresaw the rise of a consumer movie market. Moreover, the relatively low cost of the (conveniently non-combustible) discs, one dollar, hoped to encourage the first consumer movie collections, even allowing users to "pause," or "rewind."²⁷ Indeed, Urban considered calling the Spirograph the "Homovie," as it was developed and marketed for amateur use. The "Spirograph Library of Motion Picture Discs," a catalog of Spirograph discs published by the Spiro Film Corporation in 1928, reveals this strategy plainly. Organized by subject, the 51 page booklet describes films about Biology, Arithmetic, Manufacture and Industry, Sports, Life Saving, and Miscellaneous films concerned with "Animal Comics," "Novelties," or "Just Folks." The catalog begins with an article titled "The Effective Use of Spirograph Discs In the

²⁶ Huhtamo, Erkki. Page 393.

²⁷ "Urban Motion Picture Industries Spirograph." WestLicht Photographica Auction. November 2006. Accessed October 22, 2014.

<http://www.auction2000.se/auk/w.Object?inC=WLPA&inA=10&inO=762>.

Classroom," which ensures potential customers that "seventy-five seconds is a long time, as anyone who counts the ticks of a watch's second hand will discover." The article goes on to espouse the benefits of the Spirograph compared to other film projectors, citing "the trouble of choosing between long film reels that are partly suitable and partly superfluous," and the ease at which a Spirograph disc can be shown multiple times.²⁸

The "Spirograph Library" is the embodiment of Charles Urban's lofty goal, "The Living Book of Knowledge." Undaunted after the failure of the Urban Spirograph Corporation, and drawn-out legal battles due to an over-reaching Kinemacolor patent, Urban started the Urban Institute in a large facility at Irvington-on-Hudson, north of New York City. Here, Urban hoped to create a "motion picture encyclopedia" drawing on the large collection of films his companies had created over the years.²⁹ Having now been in the motion picture business for almost 30 years, Urban had an "extensive library of non-fiction films stretching back to 1903."³⁰ This concept, while forward looking, was not purely for the benefit of students hungry for knowledge.

²⁸ Spirograph Library of Motion Picture Discs. Long Island City, New York: Spiro Film Company, 1928.

²⁹ McKernan, Luke, and Stephen Herbert. "Charles Urban." The living book of knowledge. Accessed October 22, 2014. http://www.charlesurban.com/history_irvington.html

³⁰ McKernan, Luke. "Spinning the Spirograph." 11th paragraph. The Bioscope. September 4, 2010. Accessed October 22, 2014. <http://thebioscope.net/2010/09/04/spinning-the-spirograph/>.

Urban could now re-purpose previously made works that would not have a large draw at the cinemas of the day. "The recycling of old Hollywood feature films" has now become common practice, first "by American television networks since the 1950s," and later "DVD collections, or online film distributions systems."³¹

Urban's hopes to focus on educational materials, and to market his product for home use is notable, as the cinema of the day was focused on spectacle and narrative, and not education or amateur exhibition. Urban looked to carve out a niche market where there previously had been none. Advertisements funded by Urban's company targeted parents of young children ("a fascinating way to study"), the bed-ridden and sickly (most likely with wounded soldiers of the first World War in mind), even traveling salesmen, as one ad read:

"If you want to sell a farmer a tractor and he is busy in the field, you need not to take him to his home, pull down the blinds, connects [sic] the machine with electrical equipment, in order to show him the advantages of the tractor by Motion Pictures – you simply set the Spirograph on his plow handle, give him a look to drive home your point and get his order *then and there*."³²

This use of portable moving image technology is only recently been broadly realized, with the use of smart phones, tablets and "pocket projectors." However, Urban and his engineers

³¹ Huhtamo, Erkki. Page 388.

³² Huhtamo, Erkki. Page 385.

were not the only entrepreneurs to realize the potential of the home market, and their competition would be their undoing.

In 1922 the Pathé Company began distributing 9.5mm gauge safety film, with the hope of being able to re-market their previously released films for home use. The Pathé Baby home projector was released the same year, striking at the exact market Urban had hoped to exploit. Pathé's catalog may have been a bit easier for children to digest as well, including titles like "Laurel and Hardy, Mickey Mouse, Betty Boop, Popeye and Feliz the Cat." Pathé quickly realized, however, that the greater potential was in the amateur movie *making* business, and not in amateur movie *watching*. By 1923, Pathé had released a reversal film stock and camera for their 9.5mm gauge, allowing amateurs to shoot, develop and project their own works at home.³³ The same year, Kodak released their 16mm format.³⁴ Although more expensive than Pathé 9.5mm, 16mm would become synonymous with amateur filmmaking and educational films, and spell the doom of the Spirograph.

Further complicating matters for the Urban Institute were production issues and frustrated investors. The production line at the Irvington-on-Hudson location was never fully operational,

³³ Rangel, Crystal. "9.5mm." *MIAP Student Work*, Fall 2007 (November 8, 2007). Pages 1-3.

Accessed October 22, 2014.

http://www.nyu.edu/tisch/preservation/program/student_work/2007fall_2/07f_2910_rangel_a1.doc.

³⁴ "Historic Sub-35 Mm Film Formats & Cameras." Historic Sub-35 Mm Film Formats & Cameras. 3rd paragraph below the red "Warning" box. Accessed October 20, 2014.

<http://www.sparetimelabs.com/animato/animato/filmhist/filmhist.html>.

in part due to lack of machinery, but most likely lack of interest and funding played a role.³⁵ Much of what is known about the Spirograph comes from the materials produced to promote the device, which makes determining the cause of its downfall somewhat difficult. In fact, S.F. Spira, in his article in the *History of Photography*, seems legitimately puzzled as to what could have caused "such an ingenious device" to fall into obscurity.³⁶ Erkki Huhtamo's in-depth media archaeology of the Spirograph delves further, to read between the lines of some correspondence between the Urban Institute and their investors. After several unfulfilled promises of production quotas, the stockholders were offered discounted Spirographs with the opportunity to earn a "\$25 commission for each machine they could sell, and 20 cents for each sold picture record." As Huhtamo points out, the idea of "turning stockholders into salesmen" is a very bad sign.³⁷

After Urban Motion Picture Industries declared bankruptcy in 1924, the company was divided up amongst investors. One of which, the Sprio Film Corporation, published the aforementioned catalog of Spirograph discs.³⁸ The patent for the device reverted to Theodore

³⁵ Huhtamo, Erkki. Page 378.

³⁶ Spira, S. F. "The Spirograph: The 'disc' Motion-picture Viewer and Projector." *History of Photography* 6, no. 1 (1982): 79-81. doi:10.1080/03087298.1982.10442712.

³⁷ Huhtamo, Erkki. Page 379.

³⁸ McKernan, Luke. "Spinning the Spirograph." *The Bioscope*. 12th paragraph. September 4, 2010. Accessed October 22, 2014. <http://thebioscope.net/2010/09/04/spinning-the-spirograph/>.

Brown, who attempted to revamp his design, but could not garner interest from investors.³⁹ And so, the Spirograph has now become an eccentricity of history, a path less traveled, an obscurity of the last century.

The Spirograph has not yet been forgotten, however. In 2003, Haghefilm Laboratories (now Haghe Film Digital) restored a Spirograph disc titled *Man's Best Friend* (1921). The restored film, transferred on to 35mm film, was shown at the Pordenone Silent Film Festival in the "Out of Frame" section of the program. The disc had been preserved by the George Eastman House, and was then restored "with the aid of digital technology and an animation bench." The resulting 35mm print was projected at 16 fps, with a run time of 1 minute and 30 seconds.⁴⁰ The decision to transfer the disc to 35mm is understandable, as many of the remaining Spirographs are not in working order.⁴¹

There are eight surviving Spirograph projectors. The National Media Museum in Bradford, England, has what is possibly the oldest model; it bears no serial number. It originally belonged to Charles Urban himself, who donated the device to the Science Museum of London in 1937. The other seven are spread across museums and private collections, notably, the American Museum of the Moving Image, New York, Georg Eastman House, Rochester, NY, and

³⁹ Huhtamo, Erkki. Page 381.

⁴⁰ Usai, Paolo C. "Man's Best Friends." Pordenone Silent Film Festival. 2003. Accessed October 22, 2014.

http://www.cinetecadelfriuli.org/gcm/ed_precedenti/edizione2003/FuoriQuadro.html#p2_3.

⁴¹ Huhtamo, Erkki. Page 380.

the JCII Camera Museum, Tokyo. An incomplete Spirograph is a part of the Eric M. Brendt Collection at NBC Universal Archives and Collections in Los Angeles.⁴² It is the only remaining "1923 model," a refined version of the projector Henry Joy was rapidly attempting to finish before the production deadline of the same year.⁴³

The Spirograph discs are, not surprisingly, mostly in the same hands. The National Media Museum holds the largest collection with 29 titles, and multiple copies of many of them, including 9 of the 11 part *Lessons in Jiu Jitsu* series. *Man's Best Friend* is the most widely held title, the JCII Camera Museum, the American Museum of Moving Images, George Eastman House, the Alan Heim Collection, the Ion Chirescu Collection, the Erkki Huhtamo Collection and the Nation Media Museum all have a copy.⁴⁴ This may have been why George Eastman House attempted digital restoration with this disc, comforted by the knowledge that, if anything were to happen during the process, the title was still in good hands. Eastman's rationale may have been more simplistic, however, as the institution only has two Spirograph discs in its collection. The other disc, titled *Oregon Lumber Flume* may have not held the same entertainment value, or as many cute animals, but this is only speculation.

While the creators of the Spirograph may have failed to properly anticipate the market of the 1920s, they successfully foresaw the future of the medium. Moving images would not be available for the home market on spinning disks until DVD, just under a century after Theodore

⁴² Huhtamo, Erkki. Page 405.

⁴³ Huhtamo, Erkki. Page 383.

⁴⁴ Huhtamo, Erkki. Page 406.

Brown invented the original Spirograph device. Furthermore, the Spirograph predicted the consumer desire for interactivity with media, being able to pause, rewind, or easily replay media is now standard practices, and almost a universal fascination (as anyone who remembers their first time "video scrubbing" will attest). Urban's understanding of the potential for moving images to educate and inspire viewers in the classroom or at home was also forward looking. Educational documentaries, science programs, even webinars are built on the concept of being able to *show* as well as tell.

While it is unfortunate that the Spirograph was unable to find its niche during the 1920s, it serves as a historical signpost for what was to come, and an indicator of the universality of consumer desires. At virtually the advent of cinema, entrepreneurs were able to predict the qualities that would define the home movie market decades into the future. This demonstrates the essential nature of moving images, and perhaps media in general. While technology, in the present, may limit the ability to realize certain applications, the innate urge to create and display may be more consistent than expected. Maybe movies are just made to spin.

Bibliography

Bethel, Amy. "Henderina (Mrs D. H.) Scott Homepage." *Viewfinder* 78 (March 2010): 31.

Accessed November 19, 2014.

<http://womenandsilentbritishcinema.wordpress.com/the-women/mrs-d-h-scott/>.

An article describing the scientific experiments and films of Henderina Scott, whom incorporated a Kammatograph into her practice to document types of plant growth. A well-written article which was useful in establishing important works made with the Kammatograph.

Braun, Marta, and Etienne-Jules Marey. "Animating Images: The Cinematographic Work." In

Picturing Time: The Work of Etienne-Jules Marey (1830-1904), 173-82. Chicago:

University of Chicago Press, 1992. Accessed November 19, 2014.

books.google.com/books?isbn=0226071758<http://books.google.com/books?isbn=0226071758>

Braun discusses invention of the Phonoscope, by Marey's former assistant Georges Demeny. The inventions that preceded the Phonoscope, which the device is indebted to, and the public's reaction to the device are also discussed.

Enticknap, Leo Douglas Graham. "Chapter Two: Cinematography and Film Formats." In *Moving*

Image Technology: From Zoetrope to Digital, 29-73. London: Wallflower, 2005.

I've only briefly referred to Enticknap's book to provide historical context regarding the state of cinema and sound technology at the time of the Spirograph's invention.

Herbert, Stephen. "Theodore Brown's Magic Pictures: The Art and Inventions of a Multi-media Pioneer." Theodore Brown's Magic Pictures. Accessed October 22, 2014.

http://easyweb.easynet.co.uk/~s-herbert/theodore_brown.htm.

Stephen Herbert is Theodore Brown's biographer and has written a book about Brown's many inventions. This website provides a brief summary of Herbert's book and Brown's birthplace, trade skills, and interest, which I have used to furnish Brown's background in this paper.

"Historic Sub-35 Mm Film Formats & Cameras." Historic Sub-35 Mm Film Formats & Cameras. Accessed October 20, 2014.

<http://www.sparetimelabs.com/animato/animato/filmhist/filmhist.html>.

I've peripherally referenced the release of 16mm film to the amateur market as one of the many reasons the Spirograph failed to be successful. This source confirms that Kodak's 16mm film was released around the same time as Pathé's 9.5mm.

Huhtamo, Erkki. "The Dream of Personal Interactive Media: A Media Archaeology of the Spirograph, a Failed Moving Picture Revolution." *Early Popular Visual Culture* 11, no. 4 (2013): 365-408. doi:10.1080/17460654.2013.840247.

<http://ezproxy.library.nyu.edu:2452/doi/full/10.1080/17460654.2013.840247#.VG0g35PF8a4>
[http://ezproxy.library.nyu.edu:2452/doi/full/10.1080/17460654.2013.840247 - .VG0g35PF8a4](http://ezproxy.library.nyu.edu:2452/doi/full/10.1080/17460654.2013.840247#.VG0g35PF8a4)

Erkki Huhtamo gives a detailed description of the development and ultimate demise of the Spirograph, with many quotations from primary source documents. Huhtamo thoroughly describes Charles Urban's business practices, the qualities of the Spirograph which were

forward looking, and in details the remaining Spirograph projectors and Spirograph discs. This article was extremely valuable, and greatly influenced my perspective on the device and its significance. Accessed via Bobst Library.

McKernan, Luke, and Stephen Herbert. "Charles Urban." , Motion Picture Pioneer. Accessed October 22, 2014. <http://www.charlesurban.com/history.html>.

A very detailed account of Charles Urban's life and career written by Stephen Herbert (Theodore Brown's biographer) and Luke McKernan. This site was helpful in establishing Urban's biography and the rise and fall of his many business ventures.

McKernan, Luke. "Spinning the Spirograph." The Bioscope. September 4, 2010. Accessed October 22, 2014. <http://thebioscope.net/2010/09/04/spinning-the-spirograph/>.

Luke McKernan's blog post about the Spirograph which provides many links to other sources related to Charles Urban, the Spirograph and related technologies. I used this post to discover more about technologies that preceded the Spirograph and about the eventual bankruptcy of Urban Motion Picture Industries.

Rangel, Crystal. "9.5mm." *MIAP Student Work*, Fall 2007 (November 8, 2007). Accessed October 22, 2014. http://www.nyu.edu/tisch/preservation/program/student_work/2007fall_2/07f_2910_rangel_a1.doc.

I've used Crystal Rangel's format paper from the 2007 version of this course to discuss the rise of 9.5mm in the amateur market, as it relates to the obsolescence of the Spirograph in the amateur and education market.

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Rogge, Michael. "Glass- and Semi-gramophone Records." One Hundred Years of Film Sizes. 2012. Accessed October 22, 2014. <http://wichm.home.xs4all.nl/filmsize.html#GLASS>.

Rogge's website provides a thorough list of pre-cinema and early cinema formats, which was helpful for developing a historical context within which the Spirograph was invented. I ultimately used this source as a reference regarding more obscure disc based film technologies (the Spiral Camera Project and the Platernkinematograph), although it was helpful in discovering the Phonoscope and Kammatograph as well.

Spira, S. F. "The Spirograph: The 'disc' Motion-picture Viewer and Projector." *History of Photography* 6, no. 1 (1982): 79-81. doi:10.1080/03087298.1982.10442712. <http://ezproxy.library.nyu.edu:2452/doi/pdf/10.1080/03087298.1982.10442712><http://ezproxy.library.nyu.edu:2452/doi/pdf/10.1080/03087298.1982.10442712>

A brief (one page) article which gives a scholarly description of the development and ultimate failure of the Spirograph. Spira's perspective was particularly interesting when contrasted with Huhtamo's. Accessed via Bobst Library.

Spirograph Library of Motion Picture Discs. Long Island City, New York: Spiro Film Company, 1928. Bibliothèque Numérique Du Cinéma. Accessed November 19, 2014. <http://www.bibliotheque-numerique-cinema.fr/notice/?i=35812>.

A catalog of Spirograph discs published by the Spiro Film Company in 1928, this document was briefly hosted on the Bibliothèque Numérique Du Cinéma's website. Since mid-October, the link has been broken, for unknown reasons. Luckily I had already downloaded the PDF file and have attached it to the email I used to submit the paper.

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"Urban Motion Picture Industries Spirograph." WestLicht Photographica Auction. November 2006. Accessed October 22, 2014.

<http://www.auction2000.se/auk/w.Object?inC=WLPA&inA=10&inO=762>.

WestLicht Auction house sold a Spirograph in the fall of 2006 and provided helpful information about the composition and dimensions of the device and the discs it uses for playback. I primarily relied on this source when giving a physical description of the device.

Usai, Paolo C. "Man's Best Friends." Pordenone Silent Film Festival. 2003. Accessed October 22, 2014.

http://www.cinetecadelfriuli.org/gcm/ed_precedenti/screenings_recorden.php?ID=523

1.

Excerpt from the program for a screening of Haghefilm Laboratories' restoration of a Spirograph disc from George Eastman House's collection. A very valuable source when attempting to establish preservation and restoration activities of this format.