A Spectacular Failure: The History of Electronic Video Recording (EVR)

Electronic Video Recording, pioneered by CBS laboratories in 1967 and released to market in 1969[1], was the first commercially available variable speed home playback system. Despite its name, it was not strictly speaking *video*, nor did it provide for home recording. What it did do was allow users to consume media in a way they never had before. Unlike its predecessors, 16mm and 8mm film, EVR offered users a simple, durable means of viewing content in their own homes that incorporated the ability to pause, fast-forward, and rewind at their leisure. This invention was heralded with extraordinary hype and backed with sizeable capital; predictably, it was met with diverse reactions. Ultimately, industry competition and inborn technical problems brought the rapid demise of this technology. While EVR continued to be manufactured in Japan through 1975, production in the US ceased in 1971 and in the UK in 1973.[2] Even during its brief life span, production consistently fell far below its targets, making EVR players and cartridges very difficult to come by in the years since it became obsolete. Although its legacy has been largely relegated to the fan sites of AV fanatics, the format and historical context of EVR still holds special interest for media historians today, both for its resonance with contemporary changes in media culture and its fascinating design.

EVR was developed at CBS laboratories by a team led by Peter C. Goldmark, a man who had already established himself as one of the most important media engineers of the mid twentieth century. Goldmark had been instrumental in the

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[1] Fisher, David. "The Quest for home Video: EVR Page 1: The System". *Terra Media,* 2010. http://www.terramedia.co.uk/media/video/evr.htm (October 2010).
[2] Fisher, David. "The Quest for home Video: EVR Page 2: Manufacturing". *Terra Media*, 2010. http://www.terramedia.co.uk/media/video/evr2.htm (October 2010).

development of CBS color television and was generally regarded as the inventor of the LP record.[3] Perhaps unsurprisingly, his concept for the EVR drew heavily on both these accomplishments. While his experience working with color broadcasting enabled him to develop an innovative new means of recording color information for playback (discussed below), Goldmark drew heavily on the consumer success of LPs when developing EVR. In fact, in the entire design, from the circular cartridge, which was 17.7 cm in diameter and 1.3 cm thick with a large hole in the center – similar in dimension to a 45rpm record, to the playback device, was intended to mimic the look and feel of an a audio record. [4]

Anatomy of EVR Film

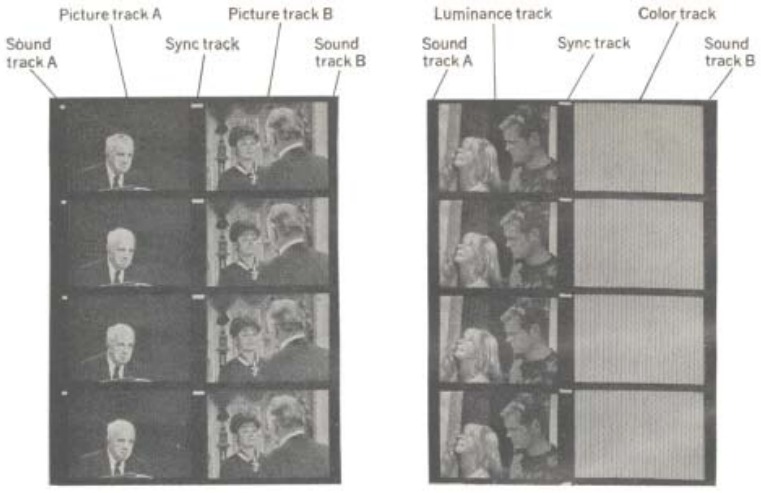

Figure 1 – EVR film diagrams. Goldmark, 25.

[3] Fisher. "The Quest for home Video: EVR Page 1: The System".
[4] Goldmark, P. "Color Electronic Video Recording." *IEEE Spectrum V. 7 (September 1970) P. 22-33*, 7 (1970): 22.

EVR is essentially a hybrid of film and video (or more appropriately, television) technology. Like film, it holds a visible image; however, EVR has the unique distinction of having two frames side by side across the width of the film. Each frame is 2.34mm tall and 3.12mm wide. Two magnetic sound tracks run along the outer borders of the film and two frames are separated by a thin synch track. In order to accommodate these contents, the film is 8.75mm in width, slightly larger than traditional 8mm film stock. [5]The synching method employed by EVR also resembles film in its design. Just as the motion of film is controlled by its sprocket holes, the synchronization of EVR is controlled by tiny synch marks or "windows" aligned with the top of each frame which very closely resemble their film equivalents (see figure 1). Each window is recorded during the horizontal blanking interval and keeps the transport moving in synch with the CRT scanner during playback.[6]

The dual frame design of EVR has important implications for playback. In the case of black and white EVR, both frames contain visible pictures. As a result, two separate programs can be recorded on the same strip of film. Interestingly, the player allowed users to switch back and forth between programs at will. In the case of color EVR, one frame is utilized for luminance information (picture) while the other frame contains encoded color information in the form of black and white horizontal bars (see figure 1 for detail).[7]Because color EVR utilized both frames, it could only hold half as much content as a black and white cartridge. Each EVR

[5] Goldmark, 22.
[6] Golmark, 26.
[7] Goldmark, 26.

cartridge contained a 750 foot long[8] spooled strip film, enough to hold 50 minutes of NTSC or 60 minutes of PAL black and white programming or 25 minutes NTSC and 30 minutes PAL color programming.[9]

This system provided revolutionary new developments in audio playback as well. Since EVR contains two separate audio tracks, users of black and white EVR could select which track to play with a given program. This had interesting applications for multilingual audiences, as tracks could be recorded in different languages. Audio tracks on color EVR could be played back individually or simultaneously, so films could be recorded either with discreet soundtracks (as with black and white EVR) or with stereo sound.[10]

In order to assure maximum durability and playback length at minimum cost, CBS worked closely with Ilford, Ltd. to develop an appropriate film base for EVR.[11] Ultimately, the Ilford produced a specially adapted stock with Diazo emulsion coated on a 75 microgram thick triacetate film base. This process had been popularized by its application in the duplication of microfiche,[12] but according to Goldmark this film was a good fit for EVR because it was "less expensive than silver halide film, and virtually grainless." Since all color and image information was

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[8] Fisher. "The Quest for home Video: EVR Page 1: The System".
[9] Goldmark, 22.
[10] Goldmark, 33.
[11] Ilford, Ltd was owned by two major stakeholders in the EVR consortium, CIBA and ICI. Johnson, A.W. "John Donald Rose. 2 January – 1 October 1976". *Biographical Memoirs of Fellows of the Royal Society,* Vol. 23, (Nov., 1977): 458.
[12] Introduced originally by Kalvar in 1958, Diazo film received an onslaught of negative publicity around the period of EVR production when it was discovered that when decomposing the stock released corrosive hydrogen chloride fumes. It is unclear whether the Ilford stock was affected by this issue as well. Nelson, Clark W. "Technical Notes." *The American Archivist*Vol. 36, No. 4 (Oct., 1973): 577.

recorded in black and white it did not matter that this process did not have color capabilities. Additionally, making duplicates on Diazo film stock was low-cost and extremely efficient, which lowered overhead costs and increased potential output of EVR plants. [13]With a crystal size of less than 0.1 micrograms, the definition obtainable from this stock was approximately 800 line-pairs per millimeter.[14] The thinness of this film stock allowed more film to be spooled into a single cartridge while EVR's extremely small frame size made it possible to fit more frames into a single length of film than in traditional film. As a result, EVR machines operated at an increased playback speed of 60 frames per second in NTSC and 50 frames per second in PAL. According to Goldmark, this development enabled a "higher degree of visual integration" or "smearing" of grain during playback.[15] Whether or not this actually generated a better picture is debatable.

Production and Playback of EVR Film

In order to produce EVR film, prerecorded[16] film or television content first had to be prepared for mastering through a separation and pre-correction process. First, in the case of color EVR, signal was split into luminance and chrominance information. During this stage, both signals were enhanced to account for the loss that would occur throughout mastering, duplication, and playback.[17] Next the luminance signal was separated into a direct signal and a signal delayed by one field and both signals were independently run through vertical, horizontal, and gamma

[13] Goldmark, 29.
[14] Goldmark, 25.
[15] Goldmark, 25.
[16] Goldmark states that it is also possible to record EVR from live television, but there is little evidence that this was ever done. Goldmark, 27.
[17] Goldmark, 26.

(contrast) correctors. Then the corrected signals were sampled at a rate of 14 MHz so that both fields could be recombined at 1/60 second for NTSC or 1/50 second for PAL. As a result, information from all 525 lines NTSC / 625 lines PAL was captured in each frame. According to Goldmark, the goal of this process was to produce a frame that was basically identical to a photographic image so that when it was read during playback, the flying spot scanner did not have to track any particular line.[18]

Meanwhile chrominance signal was separated from the luminance signal using a comb filter and then translated from NTSC or PAL to "EVR system values." Then a pilot signal was added as a reference. According to Goldmark, this would safeguard the picture against "scanning non-linearity, raster-size changes, and film shrinkage" because the phase relationship between the pilot and the chroma carrier stayed constant. This combined signal was recorded on the master as a series or bars that deviated horizontally where color changes occurred.[19]

Once the signals were prepared for recording onto the master, they were applied by videoamplifiers to a dual-beam electron beam recorder or EBR.[20]This technology, first developed by Kodak in 1961[21], allowed CBS to print at high speeds and resolutions of up to 400 line-pairs per millimeter. Duplicates were created by contact printing using ultra-violet light in a wet-gate printer specially designed by Ilford for EVR production. This system protected the master while allowing the printing system to run at speeds of up to 60 meters per minute. Masters were printed on strips of film 40mm wide while duplicates were printer on 35mm and

[18] Goldmark, 27.
[19] Goldmark, 26.
[20] Goldmark, 27.
[21] Fisher, "The Quest for home Video: EVR Page 2: Manufacturing".

then cut into four discreet strips. As a result, the EVR printing system could generate 30 minutes of recorded EVR film every 18 seconds for NTSC and 14.5 seconds for PAL.[22]

EVR film was read during playback by a dual optical system very similar to telecine.[23] The optical scan used a flying-spot scanner employing a forward-scan technique which started at the top of the frame and moved towards the bottom at twice the velocity of the moving film. When the scanner sensed the light from the synch "window" at the top of the next frame, it began its retrace. [24] When playing back color EVR, the low-resolution color image produced by the chroma signal was superimposed over the luminance signal to form an accurate color picture.[25] During playback, this signal was converted into a radio frequency signal and transported to the television from the player via a wire connected to the antenna terminal of a television set.

Associated Content and Users

While EVR hoped to capture a wide variety of markets with its programming, its primary target was education. Although some teachers worried that EVR would only promote "passive learning in an age of spectatorship," [26] the success of educational programming like the Children's Television Workshop had triggered wave of enthusiasm for new initiatives for home education via television and other

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[22] Goldmark, 28-29.
[23] Hain, Andy. "EVR and Selectavision" *Total Rewind*, 2010. http://www.totalrewind.org/revolution/R_evrsel.htm (October 2010).
[24] Goldmark, 30.
[25] Goldamrk, 31.
[26] DeMott, Benjamin. "Teacher in a Cartridge." *Change*Vol. 3, No. 1, Learning Today (Jan. - Feb., 1971): 42.

media sources.[27] Meanwhile the Carnegie Commission had already issued a statement regarding the imperative that television make "a massive contribution to formal education" and indicated that the only barrier to this was the lack of accommodating playback technology which would allow instructors to "select the program, play it at will in whole or in part, interrupt it for comments." [28] EVR's unique ability to fast-forward, rewind, and pause on a single frame for an unlimited time period offered an appealing vehicle for this kind of education. Primary education teachers and home-schooling advocates responded to the introduction of EVR with widespread enthusiasm as they envisioned a new kind of lesson planning in which independently-viewed moving images could be integral to curricula. However, the high-cost and lack of compatibility with other systems was a barrier to educational organizations hoping to invest in the new technology.[29]

The invention held promise for the field of distance education as well,[30] although discourse on this application often relied on the idea that students would have the ability to record their own material and return it to the instructor—this of course was beyond the bounds of EVR's capabilities and would not become a reality until the introduction of U-Matic in 1971.[31] Some unique ideas for the application of EVR included musical instruction, where teachers hoped that the dual technology would allow students to switch at will from a recorded performance of a piece of

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[27] Gordon, Ira J. "Education in the 1970's". *Peabody Journal of Education* Vol. 48, No. 3 (Apr., 1971): 230.
[28] DeMott, 41.
[29]Gilkey, Richard. "Instructional Media: Video Cassettes: Problem or Solution?" *The Clearing House,* Vol. 45, No. 5 (Jan., 1971): 319.
[30] M.A.B. "The Reporter". *Journal of higher Education*. Vol. 39, No. 7 (Oct., 1968): 413.
[31] DeMott, 41.

work to its corresponding sheet music[32] and bilingual education, where students would be able to switch from one language track to another as necessary.

Another sector that saw unique potential in EVR education was the medical field. Medical journals had been experimenting with the idea of using television for medical education programming but were confronted with the problem of privacy—there was not way to limit viewership to medical professionals. This was of particular importance because there was concern about non-professionals attempting medical procedures and patients being deterred by graphic depictions of medical procedures. As one journal put it "the future probably is with the development of the new electronic video-recording replay system. The doctor of the future will be able to slip a cassette into his television apparatus and play back printed and pictorial information at his leisure, perhaps with a programmed learning system to ensure that he has grasped the significance of what he has watched." As with other educational applications, EVR was touted as a good solution for medical professionals because it allowed them to pause, rewind, and consume educational material at their own pace.[33] That said, the high cost of investing in an all-EVR educational system remained a prohibitive factor for doctors as well.[34]

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[32]Skapski, George J. "Electronic Video Recording as a New Resource in Music Education". *Journal of Research in Music Education*, Vol. 19, No. 4 (Winter, 1971): 408-421.

[33]Gilder, Stanley S. B. "Twenty-Third World Medical Assembly, Paris, 22-28 June 1969". *The British Medical Journal* Vol. 3, No. 5662 (Jul. 12, 1969): 111.

[34] Hall, Reginald. "Audio Visual Aids In Medical Education". *The British Medical Journal* Vol. 4, No. 5674 (Oct. 4, 1969): 41.

A final educational application of EVR was popularized by Goldmark himself, who suggested that, in addition to moving images, EVR's small frame size made it a possible to hold thousands of unique frames on a single cartridge, and could thus be used to store large amounts of "pages" of educational material. Many educators and cultural commentators latched upon this concept as a potential media for visual information storage and reference libraries.[35] Goldmark called it "the greatest invention in communications since the book," citing that the contents of an entire Encyclopedia Britannica could be stored on a single cartridge, available for less than $15. In many ways this alternate means of information storage was a precursor to the laser disc and CD-ROM. In fact, Goldmark claimed that as of 1969 he had already perfected a means of providing direct access to any discreet frame on a cartridge.[36]

In addition to the educational market, EVR also developed a significant catalogue of entertainment programming. As of 1970 the EVR catalog listed more than 3,000 titles; however, some could only be made available after obtaining appropriate clearance.[37] These titles included programming by the BBC, the National Film Board of Canada, Fox, and many independent producers.[38] EVR was particularly successful in its pursuit of programming contracts because the company offered 15% royalties to programming sources on gross proceeds.[39] A second advantage to releasing content on EVR was that it promised protection against duplication of feature films

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[35] Goldmark, 23.
[36] DeMott, 40.
[37] Fisher. "The Quest for home Video: EVR Page 1: The System".
[38] Weihs, Jean. "Forgotten Media, Part 2: Motion on Film." *Technicalities*, 21.3 (2001): 5.
[39] Kahlenberg, Richard and Chloe Aaron. "The Cartridges Are Coming." *Cinema Journal* Vol. 9, No. 2 (Spring, 1970): 9.

with its complicated recording system. Said Darryl F. Zannuck, of Fox, "the mechanics of this system provide us with a safeguard against the unlawful copying and bootleg sale of prints—something which has plagued film companies for years."[40]

During EVR's brief existence a limited amount of unique programming was slated to be produced as well. These titles catered mostly to niche or minority markets, similar to today's cable television channels. One EVR spokesperson described the company's programming aspirations by boasting that "before that Saturday morning round of golf… the EVR owner can drop a cartridge on the player and get a quick lesson from Jack Nicklaus." Other prospective EVR-specific programming includes instructional programming for gardening and cooking. EVR also imagined a professional service where doctors, lawyers, and engineers could subscribe to have EVR programs on the latest innovations in their field mailed to them automatically. [41]Additionally, a*Billboard* article in 1970 indicated plans to produce other original programming for EVR, including three racing films (in cooperation with STP) and three 25 minute comedy programs: Rowan and Martin "For Medical Purposes Only", George Burns "Exercise—It Couldn't Hurt" and Jack Benny "Work and Stay Young".[42] However, it is unclear how much, if any, of this original EVR programming was actually produced.

Failure

[40] Kahlenberg, 7.
[41] Kahlenberg, 11.
[42] DeMott, 42.

Because the development of EVR required high-cost speculative research, CBS formed a separate company with major stakeholders ICI of Britain and CIBA of Switzerland. At the outset, CBS retained North American rights while the partnership held rights for all other territories.[43] The bulk of production was based in Basildon, Essex, where the consortium's three EBRs were located. From the beginning this created chain of supply problems since all materials had to pass through a single plant.[44] The major corporations and capital backing EVR in its early years garnered significant publicity throughout the developed world but it was particularly potent in the US and UK. Queen Elizabeth even attended the first public demonstration EVR at the Internavex exhibition in London in July 1969.[45] However, this optimistic period was short-lived. The cost of EVR was too high for consumer market upon original release and increasing competition from other home entertainment formats soon drove the project into the ground.[46] During the late sixties and early seventies, the race to capture the home market engendered a proliferation of formats, including 8mm and 16mm film cartridges, RCA Selectavision, Vidicord, and Phillips VCR.[47] While none of these formats enjoyed particular success, each took up a fragment of the market share and made it more difficult for EVR to gain a foothold. Selectavision was particularly problematic because even though it never went into full-scale consumer production, it was very similar in design to EVR and many consumers felt compelled to wait to see which

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[43] Fisher. "The Quest for home Video: EVR Page 1: The System".
[44] Fisher. "The Quest for home Video: EVR Page 2: Manufacturing".
[45] Fisher. "The Quest for home Video: EVR Page 1: The System".
[46] Duffy, Paul. "Turning On EVR". *Industrial Marketing* January 1971: 26-30.
[47] Kahlenberg, 2.

one would become dominant before investing in playback equipment. The final blow came when Sony introduced the moderately priced 60-minute U-matic in 1971. Unlike EVR and Selectavision, the U-matic was recordable and allowed multiple companies to manufacture its playback equipment so that consumers had more options.[48]

Faced with mounting competition, poor prospects, and significant accounting problems (it was discovered that in order to make a profit, cartridges would have to be priced at $50 instead of the original $14.40)[49]CBS withdrew from partnership on December 23 1971, and shut down its manufacturing plant in New Jersey at a loss of $20 million. Motorola stopped production of players at its Chicago plant the following year. Similarly, the one million pound Rank Bush Murphy EVR plant in England shut down after only a year of operation (1971-1972). Production of players never exceeded 20 units per week, far short of the original target of 500. Later in 1972 a new consortium, called New International Electronic Videocassette Company Nippon EVR, was formed in Japan, including Teijin, ICI, Ciba-Geigy, Hitachi, Mitsubishi, and Mainichi Broadcasting, with a starting investment of one billion yen. The new company successfully captured a meager portion of the Asian business market and continued production through 1975. In an attempt to diversify its base,

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[48]Kahlenberg, 2.

[49]Howe, Tom. "1969: CBS EVR or Electronic Video Recording System Prototype". *CED Magic*, 2010. http://www.cedmagic.com/history/cbs-evr.html (November 2010).

Teijin attempted to develop a video game application for EVR, but by the end of the year, the company was no longer in existence.[50] In summary, the EVR was a failure.

Preservation

Preservation of EVR is complicated by a number of factors. First of all, limited (if any) unique material was produced on EVR during its brief existence. While it remains an important part of media history, whether individual EVR recordings are worth seeking out and preserving is questionable. That said, even if one chose to take on the task of preserving EVR, the process would be hampered by the scarcity of playback equipment and instability of the media. Currently very few working EVRs remain in existence, but many of those that remain have been reconstructed by electronics enthusiasts and therefore are not entirely analogous to the original models. The situation is further complicated by the film stock itself. Because EVR was printed on an acetate base, it is subject to shrinkage and vinegar syndrome. Although the video-like spool transport of the EVR player might put less stress on the film, making playback of shrunken film more feasible than with a film projector, this remains to be seen. Finally, the Diazo print system brings another layer of preservation problems. While contemporary vintages of Diazo film stock are extremely stable and often used for preservation purposes,[51]earlier stocks, specifically those made until about 1970, have a terrible reputation in the preservation world. Not only do these older films tend to fade rapidly with prolonged exposure to light but it was discovered that as it deteriorates over time,

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[50] Fisher. "The Quest for home Video: EVR Page 1: The System".

[51]"Archiving Community Focuses on Renaissance of Microfilm". *Newsfox*. http://www.newsfox.com/pte.mc?pte=070312031 (November 2010).

older Diazo film produces harmful hydrogen chloride gas that can cause health problems and destroy storage boxes as well other types of film.[52] While these problems were discovered with a different brand of Diazo (Kalvar), it is possible that the Ilford stock produced for EVR might be subject to the same hazards.

[52] "Material Name: Kalvar microfilm". *Museum of Fine Arts Boston.* http://cameo.mfa.org/browse/record.asp?key=2171&subkey=5071&materialname=k&browse=1(November 2010).

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"Archiving Community Focuses on Renaissance in Microfilm." *NewsFox Press Distribution*, 2007. http://www.newsfox.com/pte.mc?pte=070312031 (November 2010).

This press release mentions the use of current stock of Ilford Diazo film for preservation projects, indicating that it no longer suffers from the same poor reputation that it did in the late 1970s.

"CBS Joins ICI and CIBA to Make and Market Revolutionary New TV Teaching Aid Attachment Will Play Films Through Normal TV Sets." *British Kinematography, Sound & Television*, 49.10 (1967): 228.

This press release contemporary with the announcement of EVR captures the original marketing discourse surrounding the device and provides useful information regarding its original distribution plan.

"First Demonstration of EVR." *British Kinematography, Sound & Television*, 51.2 (1969): 50.

This press release contemporary with the first market release of EVR includes information regarding the business and manufacturing background of the device.

"Material Name: Kalvar microfilm". *Museum of Fine Arts, Boston*, 2010. http://cameo.mfa.org/browse/record.asp?key=2171&subkey=5071&materialname=k&browse=1 (November 2010).

Contains a description of the issues inherent in Kalvar microfilm excerpted from the December 1991 issue of the *Abbey Newsletter*. While EVR was printed on Ilford Diazo film, it is unclear whether this stock may be affected by some of the same problems as its Kalvar counterpart.

"What Went Wrong? Anatomy of Failures". *Science News* Vol. 110, No. 22 (Nov. 27, 1976): 343.

This article contextualizes the failure of EVR within a larger history of other unanticipated investment-heavy technological failures. Includes a several quotations by Goldmark on the failure of EVR.

Barrow, Roscoe L. and Daniel J. Manelli. "Communications Technology. A Forecast of Change (Part I)". *Law and Contemporary Problems*Vol. 34, No. 2, Communications: Part 1 (Spring, 1969): 235.

This article provides extensive legal context for the introduction of EVR, concentrating on regulatory control and the widespread concern on the part of the broadcast television industry that this new technology would "siphon off" viewers.

Bartlett, Mark. "Strategic Canonization and the Audio-Vision-ary Pragmatics of Stan VanDerBeek's Culture: Intercom." *Animation*, 5 (2010): 149-172.

While this article has little to do with EVR, one of its footnotes provides a useful quote from an unpublished manuscript by Stan VanDerBeek regarding the potential artistic implications of EVR.

Clausen, Carl. "Concurrent Conference '69: A Mixed Bag". *Journal of the University Film Association* Vol. 21, No. 3 (1969): 67.

This conference review includes a brief reference to EVR, evidencing that this new technology was the subject of academic interest as soon as it was released.

DeMott, Benjamin. "Teacher in a Cartridge." *Change*Vol. 3, No. 1, Learning Today (Jan. - Feb., 1971): 40-43.

This article provides extensive cultural context to the introduction of EVR. Although the author's main focus is the educational use of EVR, he offers reactions from the cultural commentators and artists as well. The article also contains useful information on available content on EVR. Like many of his contemporaries, the author mistakenly assumes that EVR has recording as well as playback capabilities.

Diehl, Richard. "1968 Motorola EVR". Labguy's World, 1997.http://www.labguysworld.com/Motorola_EVR.htm (October 2010).

This website offers a brief and informal description of EVR along with a long excerpt from a press release published in the November 1967 issue of *Electronics World* magazine. The excerpt, which I was unable to locate elsewhere, provides necessary historical context to the original marketing EVR, especially its claim of having superior resolution to videotape and projected price of prototype player ($270).

--- "The Time Line of Extinct Video Tape Recorders". Labguy's World, 1997. http://www.labguysworld.com/VTR_TimeLine.htm (October 2010).

This timeline contextualizes the development of EVR among contemporary technologies and provides a brief description of the rise and fall of EVR.

Dawson, Max. 536-546. "Home Video and the "TV Problem": Cultural Critics and TechnologicalChange." *Technology and Culture*, Vol. 48, Number 3 (July 2007):536-546.

This article provides a detailed historical look at the critical debate surrounding the introduction of home entertainment formats, including EVR and its competitors such as Selectavision and Vidicord. It also contains important information about the programming strategies embraced by consumption-only home playback technologies versus recordable formats.

Duffy, Paul. "Turning on to EVR." *Industrial Marketing* (January 1971): 26-30.

This marketing case study examines how EVR attempted to itself within the marketplace, highlighting its inability to capture the consumer market.

Fisher, David. "Chronology of Media Formats". Terra Media, 2010. http://www.terramedia.co.uk/media/video/video_chronology.htm (October 2010).
This timeline chronologically contextualizes the proliferation of home media formats in the late sixties and early seventies resulting in the dominance of Betamax and VHS.

--- "The Quest for home Video: EVR Page 1: The System". Terra Media, 2004. http://www.terramedia.co.uk/media/video/evr.htm (October 2010).
This webpage's description of EVR offers helpful information regarding the complicated corporate backdrop to the development of EVR.

--- "The Quest for home Video: EVR Page 2: Manufacturing". Terra Media, 2004. http://www.terramedia.co.uk/media/video/evr2.htm (October 2010).
This webpage contains hard-to-find information on the manufacturing history of EVR; however, sources are not cited.

Gilder, Stanley S. B. "Twenty-Third World Medical Assembly, Paris, 22-28 June 1969". *The British Medical Journal* Vol. 3, No. 5662 (Jul. 12, 1969): 111.
This article evidences the interest in EVR as a tool of medical education. The author points to EVR as a good solution for medical professionals because its variable playback allows learners to consume educational material privately and at their own pace. He also describes recent attempts to create media-based education for doctors and explains why they were unsuccessful.

Gilkey, Richard. "Instructional Media: Video Cassettes: Problem or Solution?" *The Clearing House,* Vol. 45, No. 5 (Jan., 1971): 319.
In addition to providing evidence of contemporary attitudes about the applications of EVR in primary and secondary education, this article offers insight into the specific barriers to its incorporation into curricula, including the weight of educational community's investment in 16mm, concerns about interoperability, and cost.

Goldmark, P. "Color Electronic Video Recording." *IEEE Spectrum V. 7 (September 1970) P. 22-33*, 7 (1970): 22-33.
This article is one of several by Goldmark explaining the technological underpinnings and possible applications of EVR. While this article concentrates on color EVR, it provides useful information on the system as a whole, as the technology employed by both color and black and white EVR is very similar. The author goes into great detail describing the design and operation of the film, manufacturing process, and playback, concentrating on the format's ability to produce high quality extended-play moving images at a

low cost. This is the only one of the articles by Goldmark that I was able to locate.

Goldstein, Paul. "Review: Information Systems and the Role of Law: Some Prospects". *Stanford Law Review* Vol. 25, No. 3 (Feb., 1973): 451.

Describes contemporary legal discourse surrounding EVR, as it was a representative part of a large sweep of innovations (such as cable television) that significantly changed the way that information was consumed in the US. The changing information landscape had particularly strong implications for the realms of free speech and copyright.

Gordon, Ira J. "Education in the 1970's". *Peabody Journal of Education* Vol. 48, No. 3 (Apr., 1971): 230.

This article describes how the success of educational programming like the Children's Television Workshop had triggered wave of enthusiasm for new initiatives for home education via television and other media sources in the 1970s. Includes mention of EVR as a viable teaching tool.

Hain, David and Andy Brown. "EVR and Selectavision". *Total Rewind*, 2010. http://www.totalrewind.org/revolution/R_evrsel.htm (October 2010).

Website offers a brief description of EVR in the context of its erstwhile competitor, Selectavision. Contains a brief note on the negative response to EVR's inability to record, including a quote from Micheal Shamberg's *Guerilla Television* in which he refers to the device as an "Extremely Vile Rip-Off".

Hall, Reginald. "Audio Visual Aids In Medical Education". *The British Medical Journal* Vol. 4, No. 5674 (Oct. 4, 1969): 41.

This article elaborates on the potential use of EVR in medical education and points out that its high cost is a barrier to adoption, even for the medical community.

Howe, Tom. "1969: CBS EVR or Electronic Video Recording System Prototype". *CED Magic*, 2010. http://www.cedmagic.com/history/cbs-evr.html (November 2010).

This website provides a concise description of EVR, concentrating on the factors (cost, inability to record media) that led to its failure.

Johnson, A.W. "John Donald Rose. 2 January – 1 October 1976". *Biographical Memoirs of Fellows of the Royal Society,* Vol. 23, (Nov., 1977): 458.

This obituary of one of the executives that oversaw the EVR consortium provides useful information about the corporate background of this group, including specifics of the relationship between EVR and Ilford.

Kahlenberg, Richard and Chloe Aaron. "The Cartridges Are Coming." *Cinema Journal* Vol. 9, No. 2 (Spring, 1970): 2.

This article provides essential contextualization of the introduction of EVR. The author describes the onslaught of cartridge-based home media formats

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