Donna Cameron
Spring 2018
Final Paper
Professor Howard Besser
H72.3049: The Culture of Archives, Museums, and Libraries

THE WORLD ON A SILVER PLATTER

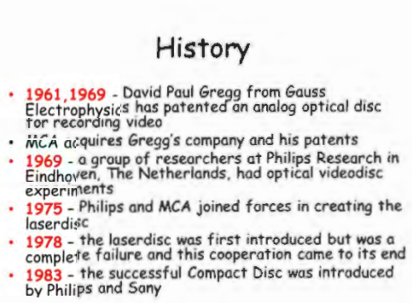
The Story of the Video Laser Disc

Chapter 1. Format Wars.

In today's download & instantly gratify world of the home movie theater, Blu-ray and HD DVD are deadlocked in what may be the last of the Format Wars of competing moving image technologies. This is, of course, an economic commodity's fight to win the hearts and wallets of consumers, to become established as the standard hands-on audiovideo technology of its time.

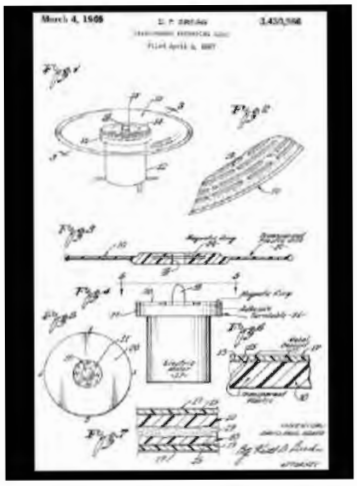
In the history of Format Wars- such as cassette vs. 8-track (1980s-90s), VHS vs. Betamax (1970s-80s), super 8mm vs. regular 8mm (1950s-60s)- the outcome of the Format War between video laser disc (VLD) and digital video disc (DVD) is eerily similar to the others in that the lower grade, less archival, less stable format won. VLD arrived in the late 1970s, and, as an awkward third wheel in the Betamax vs. VHS videotape battle, it had

marketing problems from the start. The VLD medium was eye-catching, even sci-fi, in shape and design. However, despite its dazzle, it wasn't practical enough to supplant the mass consumer's need for the VHS cassette. In the beginning, this remarkably engineered format gained a small following, and this following grew and persisted for more than 20 years. Today, although VLD discs and players are no longer manufactured, both objects are collectables and can be found on eBay. In this essay, I explored its origins to portray its essential material specs and attributes and an argument for its reconsideration as format with serious archive potential for technophiles, technologists, audiovisual authors, collectors and archivists.



Chapter 2. Pioneer Television Engineering & the Invention of the VLD.

VLD was launched in 1958, when American engineer David Paul Gregg, PhD, invented the optical disc at the California electronics company Westrex, a part of Western Electric. Gregg's patent for the 12" aluminum "VIDEODISK" was filed in March 1962 (USPO 3350503) while he was working to advance electron beam recording and reproduction. Later, at 3M's Mincom division, Gregg worked with television videotape engineer Keith Johnson (part of a 1980 team who developed and patented HDCD (High Definition Compatible Digital) technology. Gregg and Johnson co-founded Gauss Electrophysics, but when Mincom contracted Stanford Research Institute (SRI, a nonprofit agency that separated from Stanford University in 1977 to do for profit work for private foundations, corporations and government agencies, which included licensing technologies, selling products and forming spin-off companies), Gauss Electrophysics pitched



(Gregg's patent drawing and a blueprint.) Gregg's patent to manufacturers like Phillips (an electronics giant) and MCA (Music Corporation of America), which had thousands of warehoused films and needed a way to convert them to home videos. It was rejected by both. Six years later, in 1968, the Gregg and Gauss patents were purchased by MCA to further develop video laser disc recording technology for the tech market.

Baird & TV

“Stooky Bill”

The recording of video on a disc dates to the early days of broadcast television. Scottish inventor John Logie Baird (who is credited as the inventor of television) invented “Phonovision” in a proof of concept (PoC) format in 1927. “Phonovision” was partially inspired by the experiments of Alexander Graham Bell, who is credited with the first recorded historical use of an optical disc in 1884, when he recorded sound on a glass disc using a beam of light. Since the photoelectric TV cells of the time had low sensitivity and there was not enough contrast in a human face to record Baird used two ventriloquist doll heads, James and “Stooky Bill” to make the first television PoC of a “talking head”. (“Wally Fowles”, the first human face on TV, was produced in 1928.) Baird tried to record his weak mechanical television signal synchronously on a gramophone record, with the intention of publishing it as a “phonovisor”, which, he envisioned, like the music record, could be issued as inexpensive device for video playback in the home. In

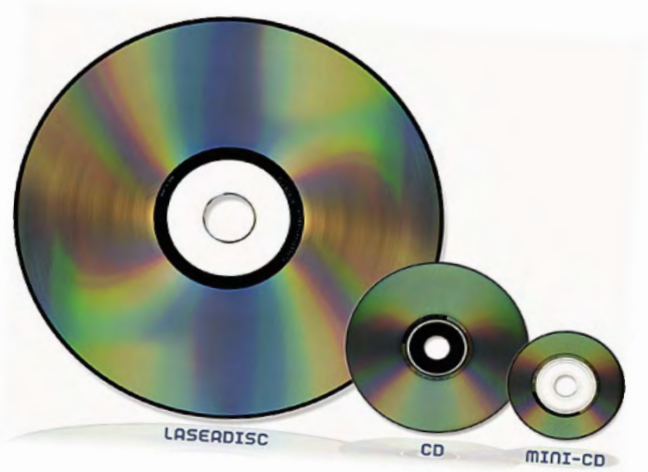
April 1933, an anonymous inventor used a Silvatone home recording device to indent a signal-modulated groove into a bare aluminum disc that was intended for recording sound, to capture the early video signal from an actual BBC 30-line, 12.5 frames per second live broadcast. The only known surviving silver disc preserved about four minutes of that video without the corresponding

audio, and It has been digitally restored. Despite its technical problems, “Phonovision” was the first method of recording a television signal, and the invention of television is the progenesis of VLD and other stylus and optical disc-based systems, such as the 8-inch European TelDec (TED)

system of the early 1970s and RCA's Capacitance Electronic Disc (CED), a 12-inch disc, both made of black PCB (polychlorinated biphenyl) cut with carbon to make it conductant. From an archival perspective, the changeover traded long-term stability for superior sound quality. A bare aluminum disc can remain unchanged indefinitely if carefully stored. However, the black plastic disc materials were not stable- lacquer shrinks and PCB deteriorates.

Chapter 3. Early VLD Market Strategy

Once Gregg had improvised his invention, he imagined himself as his own product consumer. He anticipated that the laserdisc *“had to be of extremely low cost, which implied the utmost simplicity, lowest material and processing costs, and user friendliness”*. Gregg had the right idea, but it was implemented too late. The VLD unfortunately spawned its nemesis, the CD, and too quickly. CDs arrived on the market in 1982, only four years later, and DVDs appeared in the mid 1990s. The CD, DVD, and all subsequent developments of the disc technologies factored into the failed mass marketing of VLD. Although Gregg’s patent for a video disc was awarded in 1962, and he re-patented it in 1969, the multi-corporate market team did not launch their VLD campaign until 1978. Held up by the bureaucratic politics of two giant companies trying to market VLD systems was a setback. Successful marketing includes winning a place in the daily habits of the consumer, and most folks were comfortable with their VHS videocassettes at that point.



In 1968, when MCA purchased the Gauss patents from Gregg, it was a massive music conglomerate, the equivalent of today's Sony and Universal Media Groups. Gregg's designs and patents were used for laserdiscs and issued four years later, in 1972, under his own choice of product brand name: "DiscoVision". No market research was done on branding the new product, and it proved to be an unappealing name. MCA had the technology pitch narrowed down, and changed the name to Laser Disc, but they had neither the resources nor the experience to build the actual VLD players or the hardware for the laserdisc product. The manufacture of the VLD players was then, as it is to this day, a problem. Phillips, a company that Gregg had approached two years earlier, was responsible for slowing things down. In addition to making their own video disc product after first passing on his initial pitch (insisting that Gregg's invention not designed well for the mass market), Phillips managed to produce excellent player hardware on the sly, but could not manufacture playable video discs because Gregg's original designs advocated for a malleable disc rather than the rigid disc it needed to become. MCA and Phillips tried to team up but failed to negotiate a successful partnership.

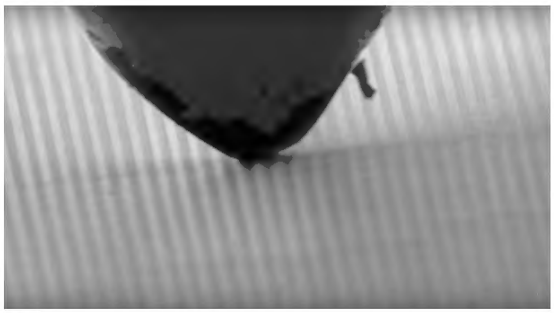
Then, in the early 1980s, a third party, the Japanese company Pioneer, jumped in the game and developed an industrial VLD player designed for the Japanese education market. At the time, Pioneer was a local focus manufacturer and did not do much business outside of Japan. But it was Pioneer and Japanese market wizardry that got the American VLD format off the ground. Not only did they manufacture the player hardware in Japan at a lower production cost, but the Pioneer players were superior to anything that Phillips had previously made. Pioneer also manufactured the physical discs, which were, also, much higher quality than anything that MCA made. Parochial Pioneer was the company that modified and improved Gregg's original design (which was, as Phillips' market analysts had said, imperfect for the mass consumer market) and launched it successfully on the world tech market.

Chapter 4. The VLD Discs

VLD disks are 12 inches in diameter, the same size as a phonograph record. Like the early LPs, they were issued in both single sided and double-sided format. Single sided discs were white on one side, double sided discs were silver on both sides. VLD technology works very similarly to that of a CD. The base is a very thin layer of metal (usually aluminum) and into the base aluminum metal surface bumps, known as pits, are created.

Unlike an audio vinyl, on which a stylus with a needle spins a spiral, and- as it hits the edges of the trenches that are cut into the disc creates a vibration that make a

corresponding sound- as a CD spins, the diamond stylus also spirals but from the inside out, and the surface doesn't have the same uneven grooves as a sound vinyl does. There are peaks and troughs under the smooth upper visible surface- but unlike the vinyl record, those invisible grooves vary, and, as the trough goes up and down, they produce the video signal.



The surface of the laserdisc looks smooth to the human eye, but it rises and falls in regulated intervals. This surface modulation is only viewable on a microscopic level- one that a laser can read. This minute modulation is the difference between the original laser disc versus newer technologies like CD and DVD and the source of its superior stability. It was this initial design of Dolby audio recording for a VLD sound track, steered by the need to keep the video analog, which required that the playback decks be redesigned to accommodate the audio format change. VLD players in the 1990s and 2000s needed an optical reader for the digital Dolby audio and an analog reader for the video image. To preserve quality, the VLD disk was coated with a special mar resistant shell that left the encoded pits and lands of the recording impervious to smudges and fingerprints. It was designed so that consumers could handle it- put it on the disc player and take it off- without harming it. As a vintage 1980s sales pitch said, "Even a child can use this. LaserDisc is hands on!"

VLD image clarity and audio fidelity for its time were outstanding. For image, lines of video resolution on VHS tape was 250, laser vision at 330 lines was a 30% sharper picture with a higher signal-to-noise ratio. Audio specs boasted a sound rating at 70 dB; even with the CX noise reduction system engaged, a turntable system was only 25-30 dB, the ratio on a hi-fi turntable was 55 dB That meant nearly three times less stereophonic distortion: VLD laser vision boasted 20,000 Hertz, equal to or better than the hi-fi turntable system. Two discreet audio channels, Channel 1 and Channel 2, added stereophonic play on stereo video movie discs or two soundtracks, and the VLD system could offer two separate sources of information on educational and instruction discs. Advanced deck design allowed for user access with the remote or the player panel. The user could press the numbered audio control button to turn off one channel if

(for example) one track held recording and one held an intermittent commentary, and press again to resume play, referring to an indicator light that showed which audio channel was on.

Chapter 6. The Player *and* the Wand.

The act of turning on the power and pressing the stop eject release, opening the lid so the disc could be placed on the turntable, then closing the lid was like putting a phonograph record on a changer. The player operated simply. Also, with the option of being controlled either at the master unit or by remote control, the laser vision disc offered the customer both continuous play and frame by frame advance. The user could stop the movie action by pressing

the still or step control on the remote, or on the player itself.  Moving to the left moved the picture backward one frame at a time and moving to the right side moved it forward frame by frame. A user could also move through at any speed in either direction.

Today, that is not such a big deal- it just sounds like a normal TV remote wand. In the 1980s, however, it was a revolutionary design. The VLD player design gave users even more options, one could listen to music files-sold on VLD albums, and, for photography collections, frame-by-frame control on the VLD player gave user had 54 thousand picture choices per side- and each picture loaded clean, sharp (for the time), quick and steady- no lamp wobble (slide projector) or head pulse bounce (videotape) or lamp burn (film). It was the best medium on the consumer market for variable speed referencing, which is a practical tool for educators and students. Chapter markers, like those found later in DVD menus, were a new option in late 1980s playback units. Other consumer bonuses included the CAV action movie feature for personal viewing options on an interactive music/picture disc. Another new, exciting feature was the now ordinary option of programming and recording shows to watch- like sports or music concerts.

(Extended Play Sides)

For playback, pre-recorded VLDs had two interfacing choices: CAV (*constant angular velocity*) and CLV (*constant linear velocity*). Simply stated, CLV is an extended play disc with 60 minutes per side (this playtime capacity applies to USA electric standards; European VLDs, for

example, held up to 75 minutes per side, because of the difference in electric current rate). On a VLD, the label "Extended Play CLV" meant the user could only pause, search and scan and play the disc. The "Extended Play CAV" label gave the user a full interactive programming choice. The downside was that, to accommodate the encoded choice of playback style, CAV discs could hold only 30 minutes (37.5 minutes, Europe) of standard multi-functional play per side.

Chapter 7. The VLDs Collections Access.

VLDs can be found in many major audio visual libraries and collections worldwide. Most collections managers agree that the format, with the exception, of celluloid film, is the most stable analog/digital video format yet invented. It also has a look and a beauty all its own.

"Later laser disc technology offers a way to access the same faultless breathtaking quality on the first play as on the 5000th play," says Michael Gaffney, Video Collections & Reference Associate at NYU Bobst Library.

In a recent interview, Gaffney said that The Avery Fisher Center for Music and Media in NYU's Elmer Bobst Library has over 500 VLDs in its collection, and all are in excellent shape. The VLDs are from the Criterion Collection, a publishing and distribution company co-founded by New York media archivist Bob Stein with his former wife, Aleen Stein and two others. Criterion launched its laserdisc films collection in 1984 with a transfer from source negatives of *Citizen Kane* (Dir. Orson Welles, 1941) and *King Kong* (Dir. Edgar Wallace and Merian C. Cooper, 1933), the latter having been found in the Library of Congress. Stein also said that the VLD is a "solid format. But it's dead. We unfortunately must move on- unless we can drum up some funding to resurrect it. That would mean finding someone to back the manufacturing of the playback decks, which are now next to impossible to find," he said.

Stein's *Criterion Collection* was a seminal film to VLD publications and distribution company, which was later sold by Stein and then was merged into the *Criterion–Voyager* distribution label. The company was a design groundbreaker. Among its contributions to home theater playback design was the letterbox for widescreen films and the addition of commentary tracks on the VLD's second channel- offering rare (and now unique and inaccessible to wider audiences) on the titles published. The concept of creating Special Editions, the idea to market restorations of art, genre and mainstream films, the addition of bonus materials- all were

premiered to the home screen through the Criterion catalogue. Some discs contain film-cleaning and restoration demonstrations, comparing the restored/unrestored versions of the same film.

"On a Criterion/Voyager VLD both the extended play disc movies and the standard intermittent commentary audio is well preserved," said Gaffney.

"Those commentaries were carefully created and unique, but not transferred to later distribution formats, like [CDs, DVDs], because the new technology did not have the [double track capacity] of VLD design" Stein said, when asked about the disc transfer options. "It is really too bad, CD and DVD players and the discs do not have the [interactive encoding that VLD did], or contain both analog and digital data on the same disc. With no viable market, that history is lost."

Criterion Collection VLDs especially also went out of the way to offer collectors a CAV disc on the third disc of a set of most titles. The design was to enable the user to play that final dramatic scene at any speed they wanted. Some films came in sets of 6 discs- the first three (CLV) for the movie play and the second three (CAV) with the option to freeze frame, slo-mo, forward, reverse or re-chapter the picture at any stage.

Pioneer manufactured a hybrid laser disc that carried analog video and digital sound and then issued a special playback unit for the new hybrid disk. This meant that digital audio could be carried on the analog disc itself and only one design of playback deck could run it. In 1995, if a movie came out with surround sound they were they able to carry multiple channel sound in high bit rates. Laserdiscs with album audio files for music listening were released, and until the invention of the super audio CD in the mid 2000s, laserdisc was preferred because the pressing

quality of CDs and DVDs was less than that of VLDs. As a still pictures archive, VLD offered users access to over 54,000 pictures or frames on each side of a disc, and many noted libraries, such as the J. Paul Getty Museum in Los Angeles, archived their collections on VLDs.

"That's more than enough capacity to hold the entire displayed collection of the National Gallery of Art and the full written plays of Shakespeare" a vintage sales pitch drummed. "As Shakespeare said, the plays the thing- with the laser vision the play is an incomparable picture!"

Another laser vision player special feature was a numbered, interactive menu designed so that the numbers were left invisible until the user pressed the frame time control button. (The design ancestor of Apple Computer's "dock" menu.) Identification numbers displayed precise

locations on the CLV or on the CAV discs, with an option to control display of elapsed time readout at the current position and/or a chapter display so that the user could see exactly what disc segments were being played. A VLD player could be wired to a high quality stereo system through a TV speaker, or interfaced with a home computer. Connection cables were analog, so the Dolby audio signal required transforming.

From the onset, VLD was a marketed as a clean handling format for moving image display. VLD resisted decay- no magnetic emulsion flaking off tapes, no fading image burnoff on DVDs and CDs, no dried-out tape or cement splice or broken, shrinking sprockets holes on films. Film lovers still argue that VLD images look more "film-like", just as audiophiles prefer music on an LP to sounds on a digital disc. VLD was a brave new world.

Chapter 8. Why the Market Failure?

One reason that VLD market sales failed was that, although laserdisc was a superior format that you did not have to rewind like you did a VHS, and you didn't have to take it back to Blockbuster and get fined for forgetting to rewind, it was not ubiquitous, VHS was. Interestingly, statistics show that although most purchasers of laser vision already owned a VCR and were familiar with and accepting of the VHS videotape picture and sound limitations, they did not build extensive VLD collections. Lo-fi quality VHS was something they'd learned to live with.

According to both Gaffney and Stein, the cessation of production of the laser disc players is instrumental in bringing the laser disc technology to a halt. Companies stopped manufacturing VLD players when the consumer market embraced the smaller optical reader technologies of the CDs and DVDs that followed.

"One would have to design a strategy for grant funding or find a way to make VLDs bring in some revenue to support its presence on the market," Stein observed.

In the world of media technology and consumer electronics, VLD is an influential American design, a part of our global heritage. Although it was an American invention, it failed on the U.S. market in the 1990s and 2000s. However, VLD was wildly successful in Japan, especially since Pioneer had subsidized the price of VLDs to match the cost of VHS. But in the United States that wasn't the case. Pioneer did not subsidize the American market, and VLDs were not market competitive. Market records show that, in the early 1990s, VHS only cost one

dollar to manufacture and sold anywhere from $10 to $15 a movie, but laserdiscs cost over $5 a disc to make and often sold for more than $30 a movie. Also, size was a problem, but that wasn't the only problem. Compared to VHS tapes, VLDs were big and bulky. A VHS tape that one could just drop off in the neighborhood Blockbuster bin, although left subject to high temperatures and careless handling, survived the moment without damage. A VLD, like a CD and DVD, was more fragile. Unless rental customers held them carefully and distributors had extra cash to pay staff to care for them, they were not efficient (they damaged quickly).

Also, there was consumer playback discomfort. In the early days, a VLD could only hold up to 60 video minutes on each side and the playback units only played one side at a time, so the viewer would have to stand up halfway through the movie and flip the disc over. For features over two hours long, that meant that two or three discs needed to be changed and reloaded. The inconvenience of multi-disc play was a problem solved in the late 1980s and the early 1990s, with the manufacture of laserdisc players that had a moveable laser head on a special track so that, while there was still a 30 second pause halfway through the movie, the laser head would move automatically to the other side of the disk without the viewer having to get up and physically eject and flip it over. This issuance of the new VLD players, much like the VLD product launch in 1978, came too late and didn’t save the VLD from tanking on the tech market. In retrospect, VLD was unfortunately just two steps ahead of its market time and two steps behind its market timing.

Although all audiovisual media discs share in its eclectic history, they do so without inheriting its one redeeming trait. This includes the recent breakthrough of a 16 layer, 400 gigabyte Blu-ray optical read only disc Pioneer launched in 2007, cited as “Capable of storing much more data than the conventional discs on one disc, (an invention that) will greatly reduce the number of discs to be used and therefore contribute to the conservation of resources.”

The definition of “conservation” varies. The CD and its scions are corporate designs for mass consumption and profit. Quality came second to philosophy, and where quality is compromised for profit, integrity is challenged. An ethical issue arises here. The later issue disc formats are transient operators, not stable solutions for carrying data, and data records hold our very special history as a people and as a time. History has shown that, in the array of disc formats, VLD alone has the potential to endure.

Bibliography

Dudley, Brier *(November 29, 2004), "Scientist's invention was let go for a song". The Seattle Times. Ret 2007-07-13.*

Gregg, D. P. (1997), *Patents and inventorship issues over the last thirty years of optical storage*. Paper presented at the 3109(1) doi:10.1117/12.280678

O'Kelly, Terence, "Reference Guide for Optical Media"

University of Texas at San Antonio, *"Know Your Digital Storage Media: a guide to the most common types of digital storage media found in archives". USA:*

Museum of Obsolete Media *http://www.obsoletemedia.org/laserdisc/*

Byers, Fred R. *(2003), "Care and Handling of CDs and DVDs — A Guide for Librarians and Archivists"* (PDF). National Institute of Standards and Technology.

"Pioneer Succeeds in Developing World's First 16-Layer Optical Disc". Pioneer.jp (Press release). Tokyo: Pioneer Corporation. 7 July 2008. Retrieved 25 August 2015

Memories of VideoDisc - Milestones - The Last Production CED Title", CEDMagic.com. Ret 2007-03-14.

J.K.Clemens and E.O.Keizer, *"The early days"*, "Electronic Servicing & Technology" Magazine, 1982 May.

Donna Cameron, *"Interviews with Robert Stein and Michael Gaffney"*, transcribed by Donna Cameron.