

Chapter 15 - The Fairchild Effect

"We started it all"

Fairchild marketing boast from the 70s

Once the first tree takes root, and firmly entrenches itself into the landscape, it does what biology naturally intended, it produces other trees in its vicinity. The same happened with Grass Valley. While the company itself only once formally shed a piece of itself to stand alone, NVISION, it produced many acorns, so-to-speak, that fell out of the company and germinated.

Some were born entrepreneurs, others accidentally became one, and some were forced to due to circumstances. It might be that they see a solution where others don't even see a problem. They see the faintest glow of light at the end of a tunnel, where most see cavernous dark. But thatOnce the first tree takes root, and firmly entrenches itself into the landscape, it does what biology naturally intended, it produces other trees in its vicinity. The same happened with Grass Valley. While the company itself only once formally shed a piece of itself to stand alone, NVISION, it produced many acorns, so-to-speak, that fell out of the company and germinated.

Some were born entrepreneurs, others accidentally become one, and some were forced to due to circumstances. It might be that they see a solution where others don't even see a problem. They see the faintest glow of light at the end of a tunnel, where most see cavernous dark. But that's only part of the necessary attributes to go act upon their insight. They are passionate, but not so blind as to not seek help and guidance when required, and setbacks just creates more zeal for eventual success.

According to Sherman Fairchild, who we looked at briefly earlier, Noyce's impassioned presentation of his vision for a new semiconductor company in 1957 was the reason Fairchild had agreed to create the semiconductor division for the infamous traitorous eight. William Shockley had started Shockley Semiconductor Laboratory in 1956 in Mountain View, California. He was developing faster transistors. He hired a group of newly minted electrical engineers that were considered very bright, after his original plan to entice some of his former colleagues from Bell Labs, but none were willing to move to the West Coast.

Shockley was effective as a recruiter, but the engineering staff he had hired did not like his management style. Eight of those engineers, the traitorous eight, became unhappy with his management of the company. They turned to Fairchild Camera and Instrument, back in New York to fund their ideas. Fairchild set up the Fairchild Semiconductor division. Their big idea was to make silicon transistors at a time when germanium was still the most common material for semiconductor use. Since the silicon used mainly consists of sand and a few fine wires, the major cost would be in the manufacturing process. Noyce believed that transistors would become so cheap that electronic devices would be discarded instead of being repaired if broken. A view a few decades ahead of its time. Noyce would later go on to co-found Intel.

In 1958 they had their first transistor for sale, the \$150 2N697. It was mainly used for defense applications. At the same time, Jean Hoerni, another of the 8, developed the planar process which was a major improvement. Since this process would allow transistors to be made more easily, their cost dropped dramatically, and they had greater performance and reliability. Early on in our story we mentioned that Charles Litton, the genesis of high tech in the Grass Valley area, helped Fairchild with this process.

The planar process made most other transistor processes obsolete. This led to the 2N1613, whose design Fairchild licensed across the industry. While Texas Instruments had created the first germanium based IC in 1958, in 1960 Fairchild had produced the first silicon based IC, which was a four transistor device. In fairly short order the original 12 employees grew to over 12,000, and the company was making north of \$10 million a year.

In the early 60s Fairchild innovated with MOS technology. They also became a major player in analog circuitry, namely with the "op amp." By 1965 Fairchild was the only profitable semiconductor manufacturer in the United States. But when it came to digital circuits they mis-stepped. They were slow to move from RTL, to DTL, to TTL logic devices.

While Fairchild Semiconductor made the majority of money for the parent company, in 1967 profits dropped significantly. Noyce had been made Vice President of the division earlier, effectively running the division. As a result of the financial hit, the parent company was in the market for a new president. It became clear to Noyce that it would not be him. Noyce decided to move on, and discreetly planned a new company with Gordon Moore, the head of R&D. They left Fairchild to found Intel in 1968. They were soon followed by other Fairchild alumni, Andrew Grove and Leslie L. Vadász. Grove and Vadász brought with them the radically new MOS Silicon Gate Technology. This was recently created in the Fairchild R&D Laboratory but did not appreciate the new technology at the time.

Eventually Fairchild hired a president who came from Motorola. Much like when McDonnell Douglas management invaded and took over from Boeing management in 1997 when Boeing was the technically the buyer, Motorola did a similar thing at Fairchild, enticing nearly a hundred to join the ranks. By the end of the 60s most of the original founders had left the company. The company became adrift, and never found its way back to the pioneer it was. In 1979 Fairchild Camera and Instrument was purchased by Schlumberger Limited, an oil field services company, for \$425 million.

Schlumberger sold Fairchild to National Semiconductor in 1987 for \$200 million. In 1997 National spun back out a rebirth of Fairchild, now headquartered in the east, no longer a "Silicon Valley" company, only part of the necessary attributes to go act upon their insight. They are passionate, but not so blind as to not seek help and guidance when required, and setbacks just creates more zeal for eventual success.

Silicon Valley

Places like Silicon Valley loves to shrug off perfectly good reasons why an idea won't succeed. People there often find a premise that on the surface appears unsolvable. Often Startups that find answers to fundamental questions that most see as settled, can shoot out of the gates and scale before others catch on. Once in a while good ideas that look like bad ones often get a head start and end up with a dominant market share.

It is frequently outsiders, those encamped in high tech centers that are willing to challenge assumptions guarded by industry norms. Their naïveté about what cannot be done is an asset. Dominant companies in their industries far from these centers can find that some far away upstart, who was never in their industry, has suddenly "eaten their lunch." Founders of Uber, PayPal and Google were outsiders, but these companies have revolutionized the transportation, payments, and advertisement industries, respectively. Chuck Meyer, long time area insider, said that at one time you could pick an industry in the 80s, take one of its products, add a microprocessor, and voilà, you are in a new market. While that was true in the personal computer era that started in the 70s, and even more so as microprocessors and networking grew ever more sophisticated in the 80s, by the 90s, when the Internet era spanned forth everywhere, the big new "things" in innovation was moving to the "cloud."

Meyer saw that before most, and he has led the Grass Valley Company's efforts in that regard. Today you disrupt an industry by moving it to the web. So since the turn of the century technology moved onto mobile devices, and into the app and social media eras. Exactly what the three big companies mentioned in the previous paragraph did.

Entrepreneurs often must "trust their gut". That means there are true things that cannot be articulated. But the dichotomy of a successful entrepreneur is being skeptical of their biases, which means knowing that they can confidently articulate things that aren't true. A corollary to the last sentence is that being contrarian requires taking a stance most people don't agree with. Being reasonable requires realizing that most people, as a group,

are smarter than you. Many entrepreneurs realize that appearing "smart," does not require the intellect of a rocket scientist. Is the ability to solve problems, and solving problems is the ability to get stuff done.

Way earlier in the book we saw this with the Group. Not to say that Dr. Hare and Bill Rorden were not brilliant, but they went in one week from Hare asking, "what the hell is a proc amp?" to a working model, in a case mind you. They got it done!

In the early days of Silicon Valley, Fairchild Semiconductor engineers would often help former colleagues turned competitors figure out problems. "We are all in it together" was the spirit of the day. Some others believed, "Good karma will come back." That early thought played a large part in what became Silicon Valley. Steve Jobs once said that Robert Noyce helped him understand the "lay of the land" when he was starting Apple.

There are many companies in "Silicon Valley" that can trace its origin back to Fairchild include:

- National Semiconductor 1967 Santa Clara

Originally started by seven engineers from Sperry Rand Corporation in Danbury, Connecticut, in 1959. Peter Sprague purchased the company, and hired Charles Sporck, general manager of Fairchild, and a team of key manufacturing and marketing executives to reestablish the business in Santa Clara in 1967.

- Intel Corporation 1968 Mountain View

By Gordon Moore and Robert Noyce (both from Fairchild and Shockley)

- Advanced Micro devices 1960 Sunnyvale

By eight Fairchild Alumni

- Sequoia Capital 1972 Menlo Park

Founder was Don Valentine (Fairchild, National Semiconductor)

Early venture capital firm which invested in early stage technology companies that have included Apple, Cisco, Google, Nvidia, Oracle, PayPal, Stripe, YouTube, Instagram, Yahoo!, and WhatsApp and today control \$1.4 trillion of combined stock market value.

- LSI Logic 1981 Milpitas

By five Fairchild Alumni, including former Fairchild CEO Wilfred Corrigan

- Linear Technology 1981 Milpitas

By five National Alumni (three of which also came through Fairchild), with funding from Sequoia.

- Altera 1983 San Jose

By three Fairchild Alumni and one from HP

Running a company - staying on top

Even in Silicon Valley many startups are ephemeral. People who create new and better products are often able to do so specifically because their thought process isn't restricted by norms that ground most people. But that same trait can make them counterproductive managers, because the "rules-don't-apply-to-me" mindset that's so effective when building a new product can be disastrous when managing people, especially as a company scales. Very talented engineers, designers, and product people can make very irrational HR and managerial decisions.

Scaling a company requires scaling HR, which is monstrously complex and usually unrelated to their original skill. Designing a device or discovering an investment strategy is a million miles separated from managing 500 or 1,000 people. Managing one-hundred thousand people is a different universe. Even when responsibilities are delegated, creating a culture that promotes trust, creativity, and growth is likely a totally different skill than was required to build your product in the first place. It's common that technical founders assume their ability to design a revolutionary product is linked with their ability to manage hundreds of people, when in fact those

things can be miles apart. It is doubtful that Hare would have been able to manage his company as it grew ever larger.

The ability to learn faster and empathize with customers more than your competition. We saw this earlier with MySpace. The inability to understand how your customers experience your product almost guarantees an eventual drift between the problems a business tries to solve, and the problems customers need solved. Here again, a person with an average IQ who can empathize with customers will almost always beat someone with a higher IQ who can't put themselves in the customers' shoes.

Successful, professional managers of large companies understand they have two diametrically opposed targets. They must give their employees structure and oversight, while at the same time realizing that to keep those employees requires giving them freedom and autonomy. To accomplish this top management must maintain a certain level of paranoia in the company. Early on at the Group they had it in spades. Were they going to make the next payroll? What business should they really be in? That is part of what kept them focused, and eventually successful.

Many companies, like individuals, run their business based on goals. Some make the argument that it is better to manage a business based on systems, not goals. That is because once you reach a goal you tend to stop doing the thing that made achieving the goal possible. "We will always provide the best value to our customers" verses we will sell \$10 million this quarter. Last chapter we looked at what might happen when goals become the target. Also as a company grows, if specific goals and metrics are imposed, they will constantly need to be tweaked.

Video Valley

The Grass Valley area naturally was tagged with the moniker, Video Valley. In this chapter we are going to trace how one video company started an ecosystem that allowed other "trees" to grow around it, and in some cases prompted others to locate into the area. Over 30 companies have sprung up, many by Group alumni. Others moved to the area to take advantage of the talent pool and ecosystem that sprang up. Other's setup outposts for clientele in the area. We will look at many of these companies in this chapter.

Cyan Engineering/Atari

Ampex Connection

An early addition to the tech community in the area was brought by a couple of Ampex Alumni out of the bay area. That was the company that first made video tape recording practicable. Even in the early 70s, the legendary rush hour gridlock in the San Francisco bay area, from San Jose northward, all the way to Santa Rosa, was in full display. Larry Emmons, an engineer for Ampex had had enough. He moved up to an area about 14 miles south of Grass Valley and started a consulting company. He was soon followed by Steve Mayer, who was another Ampex engineer. They started a company called Arvin Engineering in 1972.

They secured a contract with the Department of Defense to develop a video disk recorder. That project was soon canceled, and the two cast about for something else to do. For awhile they simply provided consulting services. Larry and Steve's boss at one time was Nolan Bushnell. Bushnell would go on to start Atari. This connection would forever link the Grass Valley area to video game lore.

At Ampex, Nolan Bushnell met fellow employee Ted Dabney and found they had common interests. Bushnell worked at a gaming arcade in college and developed a fascination with the electro-mechanical games of the time. Bushnell shared his ideas of creating pizza parlors filled with electronic games with Dabney. Bushnell took Dabney to the computing labs at Stanford Artificial Intelligence Laboratory to show him Spacewar!. The game was developed in 1962 at MIT and was written to run on a DEC PDP-1 mini-computer. That computer could have up to 64K of magnetic core memory and a clock speed of around 200K. Quaint by today's standards.

In 1971, Nolan Bushnell and Ted Dabney founded a small engineering company, Syzygy Engineering with the intention of producing a Spacewar clone known as Computer Space, a game where the player shot at UFOs. They designed the game using their knowledge of video circuitry. It was not computer driven. While the first microprocessors were being introduced, the Intel 4004 4-bit microprocessor the year before, they were too expensive and underpowered. The use of analog video circuitry allowed the electronics to be much cheaper and smaller. Dabney built the prototype and Bushnell shopped it around, looking for a manufacturer. They made an agreement with Nutting Associates, a maker of coin-op trivia and shooting games, that produced a fiberglass cabinet for the unit that included a coin-slot mechanism.

Although sales of the game, which consisted of 1500 units totalling \$3 million, it was considered a commercial failure. Bushnell laid the blame on Nutting, as Bushnell thought that they had not marketed the game very well. He decided that his next game would be licensed to a bigger manufacturer. Bushnell and Dabney worked for Nutting during that time, but he got Nutting to put a Syzygy Engineered label on each machine. Bushnell also knew that the next game they developed would need to be simpler and not require users to read instructions on the cabinet, since their target audience would likely be drunken bar patrons.

Arcade Games

They left Nutting and got funding from Bally Manufacturing to develop a new game. Bushnell and Dabney decided it was time to incorporate. Amazingly, Syzygy, an astronomical term, was already taken in the state of California. Bushnell was a fan of the board game "Go," and a term in the game was "Atari," which essentially in the context of the game meant what "check" meant in chess. On June 27, 1972, the two incorporated Atari, Inc. It actually means "to hit a target" in Japanese.

They hired their first design engineer, Al Alcorn, who was another Ampex alumni. At Cal Berkeley he participated in a work-study program that brought him to Ampex, where he worked under Bushnell. He graduated just as Bushnell was forming Atari.

After Bushnell attended a Burlingame, California demonstration of the Magnavox Odyssey, he gave the task of making the Magnavox tennis game into a coin-op version to Alcorn as a test project. He told Alcorn that he was making the game for General Electric, in order to motivate him, but in actuality he planned to simply dispose of the game, using it as a training episode for Alcorn. Bushnell's initial intention was to then move on to a car racing game, which would have been a tougher engineering design project. Bushnell thought that game would be more appealing than spaceship navigation to beer drinkers in a workingman's bar.

But the "warm up" project when completed seemed that it might have some appeal. Bushnell offered the finished design to Bally, who rejected it because the game required two players. Bushnell decided to build a prototype anyway and place it in a bar near them. That game was Pong. Atari released several sequels to Pong that built upon the originals game-play by adding new features. Not long after Pong's release Bushnell and Dabney had a falling-out. Bushnell ended up purchasing Dabney's share of Atari for \$250,000 in 1973.

Atari was in the arcade gaming business, but they faced a problem with how that business operated. Local distributors of the games insisted on exclusive deals with suppliers. So in 1973, Atari secretly spawned a competitor called Kee Games, headed by Nolan's next door neighbor Joe Keenan, to sidestep pinball distributors' insistence on exclusive distribution deals. So both Atari and Kee could market virtually the same game to different distributors, each thinking they had an "exclusive" deal. Joe Keenan's management of the subsidiary led to him being promoted president of Atari that same year.

Soon after Pong's release, several companies began producing games that closely mimicked its game-play. Eventually, Atari's competitors released new types of video games that deviated from Pong's original format to varying degrees, and this, in turn, led Atari to encourage its small staff to move beyond Pong and produce more innovative games themselves. Bushnell knew that with Magnavox's Odyssey game taking off with consumers,

he needed to move beyond arcade games. 'Screen Games' as Time magazine called them at the time, estimated that it was going to be a \$900 Million a year business.

Bushnell discovered that his former colleagues at Cyan Engineering were looking for work, so in 1973 he offered Larry and Steve a contract to help Atari develop what eventually became known as the Atari VCS console. The company changed its name to Cyan Engineering. Interestingly it had relocated to the Litton building. Where the Grass Valley Company had gotten its start.

Bushnell knew he had to start moving in a new direction swiftly. Atari sold 8500 Pong machines and bought in \$14 Million in 1974, but at the same time Pong sales were slowing. The company was growing too fast and had missteps with a couple new games. Also it opened a subsidiary in Japan that turned out to be a financial disaster. In May of 1974 Atari reported a \$500,000 loss, and they laid off half the staff. Some were saying that the company looked like a one-trick pony. To help right the ship Atari and Kee merged at the end of 1974, and Joe Keenan became the president of Atari, while Bushnell kept the CEO title, Steve Bristow became head of Engineering, and Al Alcorn became head of R&D.

The company recovered the next year during the 1975 Christmas season, by releasing a home version of Pong exclusively through Sears retail stores. The home version was a commercial success. But soon it was competing with clones. Bushnell start relying heavily on Cyan Engineering.

Video Console System

By 1975, Ron Milner and Steve Mayer of Cyan Engineering had developed the first prototype of the Atari VCS. Joe Decuir was hired later that year to help with debugging the prototype and to help with building the first gate-level prototype. Decuir was a recent graduate from University of California, Berkeley. He had been interested in the 6502 microprocessor chip, which would become central to the VCS.

At this point in time Atari purchased Cyan Engineering and renamed it the Grass Valley Research Center.

The VCS was to be centered around two things, a MOS Technologies 6507 microprocessor, part of their 6502 series and an IC known as the Television Interface Adapter (TIA). The person instrumental in tying those two components together was Jay Miner. An accomplished microprocessor IC designer, he had co-founded Synertek in 1973, where he served as the company's primary chip designer. One of the company's earliest contracts were to create CMOS chips for the Bulova Watch Company. The company quickly became a second source manufacturer for chips designed by other firms such as Intel, Rockwell, and MOS Technology.

Programmable microprocessors would enable a console design significantly simpler and more powerful than any dedicated single-game unit. At the time microprocessors were expensive, \$100–300 each, pricing most of them far outside the range of what the VCS market would pay.

Atari had opened negotiations to use Motorola's new 6800. But in September 1975, MOS Technology debuted the 6502 microprocessor for \$25 at the Wescon trade show in San Francisco. Mayer and Milner attended and met with the leader of the team that created the chip, Chuck Peddle. Peddle proposed using the 6502 in a game console and offered to discuss it further at Cyan's facilities after the show.

Chuck Peddle was an electrical engineer, and while at Motorola recognized a market for a very low price microprocessor and began to champion such a design to complement the \$300 Motorola 6800. His efforts were frustrated by Motorola management, and he was told to drop the project. He then left for MOS Technology, where he headed the design of the 6502 family of processors. Peddle was best known as the main designer of the MOS Technology 6502 microprocessor. It was introduced in 1975, and was priced at 15% of the cost of an Intel 8080. It was the 6502 that was subsequently used the Apple II, Commodore PET and Commodore VIC-20.

The MOS 6502 used a new manufacturing process that produced a much higher yield rate than previous

methods, which generally saw a low percentage of ICs that worked. The 6502 was so cheap that many people believed it was a scam when MOS first showed it at a 1975 trade show. Soon both Intel and Motorola were forced to dramatically lower their prices.

At about the same time the 6502 was being released, MOS's entire calculator IC market collapsed, and its prior existing products stopped shipping. Soon they were in serious financial trouble. Another company, Commodore Business Machines, had invested heavily in the calculator market and was also nearly wiped out by TI's entry into the market.

A fresh injection of capital saved Commodore, and allowed it to invest in company suppliers in order to help ensure their IC supply would not be upset in this fashion again. In late 1976, Commodore, publicly traded on the NYSE with a market capitalization around US\$60 million, purchased MOS Technologies (whose market cap was around US\$12 million) in an all-stock deal.

Back at Cyan, over the course of two days, MOS and Cyan engineers sketched out a 6502-based console design based on Meyer and Milner's specifications. Financial models showed that even at \$25, the 6502 would be too expensive. Peddle then offered the 6507 microprocessor, a cost-reduced version of the 6502. Cyan and MOS negotiated the 6507 and its accompanying IO chip at \$12 a pair.

MOS introduced Cyan to Microcomputer Associates, who had separately developed debugging software and hardware for MOS microprocessors, and had developed the JOLT Computer for testing the 6502. Jolt was the first 6502 single board computer. Jolt sold the board as both a kit for \$249, or fully assembled and tested for \$348.

Milner was able to demonstrate a proof-of-concept for a programmable console by implementing Tank, an arcade game by Atari's subsidiary Kee Games, on the JOLT.

Atari wanted a second source of the chip set. Peddle suggested Synertek whose co-founder, Bob Schreiner, was a friend of Peddle. In October 1975, Atari informed the market that it was moving forward with MOS.

Due to its manufacturing of the MOS Technology 65xx series of chips, Synertek was recommended as a partner to Atari, Inc. after it had been decided to use the MOS 6507 for the VCS console. One of Atari's engineers, Harold Lee, had worked with Miner at Standard MicroSystems and suggested him as the designer for a custom chip which would power Atari's new console. Through an arrangement with Synertek, Atari hired Miner in late 1975 to lead the chip design for the Atari VCS, primarily that of the display hardware, the TIA. The TIA sent graphics and audio to a television through via RF into a TV sets antenna connector.

By March 1976 with the help of Miner, the group in Grass Valley had a prototype that included included a TIA, a 6507 microprocessor, and a ROM cartridge slot and adapter. Decuir who was working with Miner on the design had apprenticed for Miner.

Atari also sent up Ted Hoth, who had been involved with the developing the Intel 4004, the very first microprocessor. Ted Hoth was a imposing guy at 6'4", who also had a background in nuclear metallurgy. Also on the team was hire Jim Heb, George Foster, John Sperry, and Herb Foster, who eventually started Viking Video, which made video disc recorders. Ironically back to Cyan's roots. Another young engineer working on the project was Chuck Meyer, today still a prominent player with the Grass Valley Company. He was doing doing development in 6502 assembly language for the 6507 the VCS was using.

The 6502 MOS Technologies salesman was aggressive and generous in handing out samples as the microprocessor business had become very competitive at that time. He seemed to have had a jewel case with "chemicals" he gave away along with the chips. That was when the 8-bit Intel 8080 was \$1000 each.

While the base 6502 microprocessor was a more capable IC than the 6507 that was decided on, the 6507 was much cheaper. There were significant limitations in the 6507, which would run at 1.19 MHz in the VCS, which

would be named the 2600, which while not lightning fast, it was fast enough. The 6507 was cheaper than the 6502 because its package included fewer memory address pins—13 instead of 16, reducing the already limited addressable memory to 4 KB. This was believed to be sufficient as Combat is itself only 2 KB. Later games circumvented this limitation with memory bank switching. This is where blocks of memory are switched between as needed.

As the VCS design became more refined, in 1977 Al Alcorn brought in Atari's game developers to provide input on features, as they had to modify their games to be ported to the VCS.

Never-the-less Atari was beat to market in November 1976 by The Fairchild Channel F, short for "Channel Fun." It was the first video game console to use ROM cartridges, instead of having games built-in, and the first console to use a microprocessor. It had a retail price of US\$169.95. Equivalent to \$772.92 in 2020.

Bushnell brought in Gene Landrum, a consultant who had consulted for Fairchild on its Channel F, to determine the consumer requirements for the console. Landrum suggested the following:

- A living room aesthetic, with a wood grain finish
- The cartridges must be "idiot proof, child proof and effective in resisting potential static [electricity] problems in a living room environment."
- Recommended it include four to five dedicated games in addition to the cartridges, which was ignored.
- The cartridge design was done by James Asher and Douglas Hardy. Hardy had been an engineer for Fairchild and helped in the initial design of the Channel F cartridges, but he quit to join Atari in 1976.

The interior of the cartridge that Asher and Hardy designed was sufficiently different to avoid patent conflicts, but the exterior components were directly influenced by the Channel F to help work around the static electricity concerns. Atari encountered production problems during its first batch, and its testing was complicated by the use of cartridges.

Warner

Bushnell knew he had another potential hit on his hands but bringing the machine to market would be extremely expensive. Atari was still recovering from its 1974 financial woes and needed additional capital to fully enter the home console market, though Bushnell was wary of being beholden to outside financial sources. Atari obtained smaller investments through 1975, but not at the scale it needed, and began considering a sale to a larger firm by early 1976. Looking for outside investors, Bushnell sold Atari to Warner Communications in October 1976 for an estimated \$28–32 million. Atari revenue at that time was around \$30 million/year.

Warner saw the potential for the growing video game industry to help offset declining profits from its film and music divisions. Negotiations took place during 1976, during which Atari had to clear itself of some liabilities. Those included settling a patent infringement lawsuit with Magnavox over Ralph H. Baer's patents that were the basis for the Magnavox Odyssey.

Ralph Henry Baer was a German-American inventor, game developer, and engineer. Baer's family fled Germany just before World War II, and Baer served the American war effort, gaining an interest in electronics. After several jobs in the electronics industry, he was working as an engineer at Sanders Associates (now BAE Systems) in Nashua, NH. There, around 1966, he conceived the idea of playing games on a television screen. With support of his employers, he worked through several prototypes until he arrived at a "Brown Box." That box would later become the blueprint for the first home video game console, licensed by Magnavox as the Magnavox Odyssey.

Warner provided an additional \$120 million which allowed the project to be fast-tracked. The Atari VCS console was finally released in 1977. The unit was showcased on June 4, 1977 at the Summer Consumer Electronics Show with plans for retail release in October. The announcement was purportedly delayed to wait out the terms of the Magnavox patent lawsuit settlement, which would have given Magnavox all technical information on any

of Atari's products announced between June 1, 1976 and June 1, 1977. The introductory price of \$199 (equivalent to \$894 in 2019) included a console, two joysticks, a pair of paddles, and the Combat game cartridge.

Warner was a traditional, proper normal business. In Silicon Valley, Atari was not normal business. It was a very hit-driven technology business. It was an industry where you had to eat your own young because if you didn't, somebody else would. Warner management team did not understand this. Instead they ran Atari like a big, bureaucratic organization that supported its current products.

Atari created unique products and had played a big part in starting a whole new industry. Sony's founder Akio Morita, once came to Silicon Valley to see Atari. He said they don't plan; they just build it.

An interesting aside during VCS development

Steve Wozniak wanted a Pong game badly enough that he designed and built his own version. He gave the board to Steve Jobs, who took it to Atari. Atari mistakenly thought that Jobs had designed the board and hired him as a technician. But Jobs only stayed at Atari for a few months and left for India in search of spiritual enlightenment. He returned back to the States and Atari in mid-75. The company assigned him to design a new game, which became Breakout. Bushnell and company, knew by then of Wozniak's design prowess, and Jobs' friendship with him, and believed he would take the task to Wozniak. Jobs was considered, at the time, a low-level Atari technician with huge potential. Jobs and Wozniak had been working on the Apple 1 development for some time at that point.

Jobs told Wozniak that the design had to be done in only four days, when the time frame was actually a month. Jobs self-imposed deadline was that he was involved with an apple harvest up in Oregon and wanted to go soon. The other major part of the contract that Jobs had with Atari was that a bonus of \$100 for every chip fewer than 80 in the design would be paid, in addition to a base of \$700. Jobs told Wozniak only about the \$700 base pay, which Jobs said he would split with Wozniak. Wozniak proceeded to produce a final design using only 45 chips.

Wozniak saw \$350 out of his efforts. Jobs saw \$4300. It is reported the Wozniak cried when he discovered the disparity years later. Wozniak worked nights for four days to finish the game as quickly as he could, while holding down his day job at HP.

The game was released in May of 1976 and was highly successful and was among the top five highest-grossing arcade video games of 1976 in both the United States and Japan and moving up to the top three in 77. In 1978 it was ported to an Atari VCS (Video Computer System) cartridge. While the arcade version was monochrome the VCS used color graphics. It was included with the console with the next generation VCS, the Atari 5200 console in 1982.

Bushnell's exit

In 1978, Atari sold only 550,000 of the 800,000 systems manufactured. This required further financial support from Warner to cover losses. After a couple of years Warner decided that Atari had to run like a normal business, so Warner installed their professional managers, who came out of traditional management where they're used to having products that don't have short life cycles.

Al Alcorn stated that "When companies take over another company, they often fail, because these fat, gray-haired men on the board don't understand culture, and they just see the business relationship. They try to merge two companies together and if the cultures don't work, it's never going to work. And this happens time and time again. It seems great on the spreadsheet or paper." Warner had bought Atari and treated it as a cash cow. There were no long-term plans.

In February 1978 Ray Kassar was hired as president of Atari Inc.'s consumer division by Warner Communications. He had previously been executive vice-president of Burlington Industries, the world's largest textile company at the time, and president of its Burlington House division. A member of the Board of Directors, Kassar had spent over thirty years at Burlington.

During the Kassar years, Atari Inc.'s sales grew from \$75 million in 1977 to over \$2.2 billion just three years later. Though Atari enjoyed some of its greatest success during this period, the stifling atmosphere and lack of royalties or recognition to the individual game designers angered employees, many of whom quit. During this period, nearly all members of the original Atari Inc. staff, including Al Alcorn, quit, or were fired. Rifts had begun to develop between the original Atari Inc. staff, most of whom had engineering backgrounds, and the new hires brought in by Warner, who, like Kassar, mostly had business backgrounds. Atari Inc. upper management also suffered severe turnover rates. Many blamed Ray Kassar's autocratic management style.

In December 1978 Nolan Bushnell was fired following an argument with Manny Gerard. Bushnell said that Warner claim they fired me, I say I quit. It was a mutual separation. Gerard was a member of the Office of the President for Warner during the Atari days from 1976, when they acquired Atari, to 1984 when it sold to the Atari. He was a key person in the decision for Warner to acquire Atari.

Bushnell had concerns on Kassar's plans and feared they would produced too many units to be sold, and at a board meeting with Warner near the end of the year, reiterated this position. Bushnell's concerns never materialized as a combination of Kassar's marketing and the popularity of game licensed from a Japanese company, Space Invaders drove Atari VCS sales. Both Warner Communications and Bushnell commonly recognized he was no longer a good leader for the company, removing him as CEO and Chairman in early 1979.

Warner did offer Bushnell the opportunity to stay as a director and creative consultant, but Bushnell refused. Before leaving, Bushnell negotiated the rights to Pizza Time Theater from Atari for \$500,000. It had been created by Bushnell, originally as a place where kids could go and eat pizza and play video games, which would therefore function as a distribution channel for Atari games. Chuck E. Cheese's Pizza Time Theater also had animatronic animals that played music as entertainment. It was known that Bushnell had always wanted to work for Walt Disney but was continually turned down for employment when he was first starting out after graduation; Chuck E. Cheese was his homage to Disney and the technology developed there. In 1981 Bushnell turned over day-to-day food operations of Chuck E. Cheese's to a newly hired restaurant executive and focused on Catalyst Technologies.

Keenan replaced Bushnell but left a few months later, with Kassar being named as Atari's CEO by mid-1979

Atari sold more than 1 million consoles over the 1979 holiday season, but there was new competition from the Mattel Electronics Intellivision and Magnavox Odyssey, which also used swappable ROM cartridges.

At one point four game programmers wanted a small commission, but when they asked Kassar about that, David Crane recalls that Kassar responded, "You are no more important to that game than the guy on the assembly line who puts it together." So Crane and three others resigned from Atari and formed their own company: Activision, which became the first ever third party game developer. The new company formed by Crane, Whitehead, and Miller in 1979, started developing third-party VCS games using their knowledge of VCS design and programming tricks, and began releasing games in 1980.

In 1980, Atari attempted to block the sale of the Activision cartridges, accusing the four of intellectual property infringement. The two companies settled out of court, with Activision agreeing to pay Atari a licensing fee for their games. Kaboom! (1981) and Pitfall! (1982) are among the most successful with at least one and four million copies sold, respectively.

As soon as the 2600 started shipping, Atari started development on its replacement, and halfway into the development the home computer business exploded so that replacement became a full computer, the Atari 800. It sold from 1979 to 1992. It had a MOS technology 6502. At the height of its run between 1979 and 1985 the 800

sold 2 million units.

In 1980 the Commodore 64 debuts. At the time Guinness world records claims it was the highest selling single computer model of all time. At its height it was selling 2 million units per year. A number of months they were building 400,000 64s a month.

In addition to third-party game development, Atari also received the first major threat to its hardware dominance from "Colecovision." Coleco had a license from Nintendo to develop a version of the smash hit arcade game Donkey Kong (1981), which was bundled with every Colecovision console. Coleco sales then doubled again for the next two years; by 1982, 10 million consoles had been sold, while its best-selling game was Pac-Man at over 7.9 million copies sold by 1983. Coleco gained a 17% share of the hardware market in 1982 compared to Atari's 58%. With third parties competing for market share also increasingly competing for market share.

In 1982, the 2600 cost Atari only about \$40 to make and was sold for an average of \$125, equivalent to \$340 in 2020. In 1982, Atari launched its second programmable console, the Atari 5200. The company spent \$4.50 to \$6 to manufacture each cartridge, plus \$1 to \$2 for advertising, wholesaling for \$18.95, equivalent to \$50 in 2020. Atari worked to maintain dominance in the market by acquiring licenses for popular arcade games and other properties to make games from.

Video Game Crash

Heading into the 1982 holiday shopping season, Atari had placed high sales expectations on "E.T. the Extra-Terrestrial," a game programmed in about six weeks. Atari produced an estimated four million cartridges, but the game was poorly reviewed, and only about 1.5 million units were sold.

Warner Communications reported weaker results than expected in December 1982 to its shareholders, having expected a 50% year-to-year growth but only obtaining 10–15% due to declining sales at Atari. Atari's major competition at the time was the Commodore 64. Coupled with the over-saturated home game market, Atari's weakened position led investors to start pulling funds out of video games, beginning a cascade of disastrous effects known as the video game crash of 1983.

Many of the third-party developers formed prior to 1983 were closed. In September 1983, Atari sent 14 truckloads of unsold Atari 2600 cartridges and other equipment to a landfill in the New Mexico desert, later labeled the "Atari video game burial." Long considered an urban legend that claimed the burial contained millions of unsold cartridges, the site was excavated in 2014, confirming reports from former Atari executives that only about 700,000 cartridges had actually been buried.

Atari reported a \$536 million loss for 1983 as a whole. In July 1983, Kassar was fired due to continuing massive losses at Atari. In December 1982, Kassar had sold 5,000 shares of stock in Warner Communications only 23 minutes before a much lower than expected fourth quarter earnings report would cause Warner stock to drop nearly 40% in value in the following days. The Securities and Exchange Commission accused Kassar and then Atari Inc. vice-president Dennis Groth of trading stock with illegal insider knowledge. Kassar settled, returning his profits without acknowledging guilt or innocence.

Atari had invested heavily in games for the 2600, that became commercial failures and contributed to the video game crash of 1983 which ended the market relevance of the 2600. Some of the crash is attributed to saturation of the market for video games, standalone that is, and the rise of home computers.

Atari continued to lose money into 1984, with a \$425 million loss reported in the second quarter. Coleco's success with Donkey Kong greatly hurt Atari that year. By mid-1984, third party software development for the 2600 had essentially stopped except by Atari and Activision. By 1984 games for the 2600 were using more than four times the ROM of the initially launch games.

Fire Sale

Warner, wary of supporting its failing Atari division, started looking for buyers in 1984. Warner sold most of Atari to Jack Tramiel, the founder of Commodore International, in July 1984 for about \$240 million. Interestingly it was Tramiel who rescued MOS Technologies, preserving the microprocessor that his computers, and that Atari's VCS ran on. Warner retained Atari's arcade business and Ataritel, who we will look at shortly.

Tramiel was a proponent of personal computers, and de-prioritized further Atari console development following the sale. Tramiel's offer to Atari was to do a debt swap. He said it was worth more than Atari was. Taking advantage of Warner Communication's financial situation, the neighboring company of Time Inc. announced on March 4, 1989, that the two companies were to merge

Both Mattel and Coleco left the video game market by 1985. The North American video game market did not recover until about 1986, after Nintendo's 1985 launch of the Nintendo Entertainment System in North America. Video game revenues went from 3.2 billion in 1983 and fell to around 100 million in 1985, a drop of almost 97%.

Tramiel' Atari released a redesigned model of the 5200 in 1986, supported by an ad campaign touting a price of "under 50 bucks," but it wasn't what led the recovery of the industry, it was Nintendo. With a large library of cartridges and a low price point, the 5200 continued to sell into the late 1980s. Atari released the last batch of games in 1989–90. After more than 14 years on the market, the 5200 line was formally discontinued on January 1, 1992, along with the Atari 8-bit family of home computers.

AtariTel

While not an Atari initiated project, in 1981 the Cyan group started on a "skunk works" type project. The genesis of this were a number of court cases starting in the 50s that forced AT&T to relinquish its iron grip on its phone network.

In 1956 the court had ruled that Hush-A-Phone Corporation could sell a small, cup-like device which mounted on the speaking party's handset microphone, reducing the risk of conversations being overheard and increasing sound fidelity for the listening party. AT&T claimed that was not allowed. The court ruled differently stating that devices could mechanically connect to a phone-company-owned telephone without the permission of AT&T.

With the rise of corporate computer use in the 60s and into the 70s many customers and computer manufacturers wanted to be able to connect peripherals to main frames over phone lines. The FCC looked into a lawsuit that Carterfone had filed against AT&T. In 1968, the Federal Communications Commission extended this privilege by allowing the Carterfone and other devices to also be mechanically connected to the AT&T network, as long as they did not cause harm to the system. This device was acoustically, but not electrically, connected to the a telephone. It was electrically connected to a base station of the mobile radio system, and got its power from the base station. When someone on a two-way radio wished to speak to someone on a "landline" the radio station operator at the base would dial the requested telephone number. When the call was connected the handset of the operator's telephone was placed on a cradle built into the Carterfone device. A voice-operated switch in the Carterfone automatically switched on the radio transmitter when the telephone caller was speaking, and the radio was returned to a receiving condition when the person on the phone was silent.

Then in 1974 the Justice filed anti-trust against AT&T. The suit came to trial in 1981 trial. AT&T settled. On January 1st, 1984 the regional phone companies under AT&T control, the "baby bells," were divested and split into seven smaller regional bells, while AT&T kept the long lines.



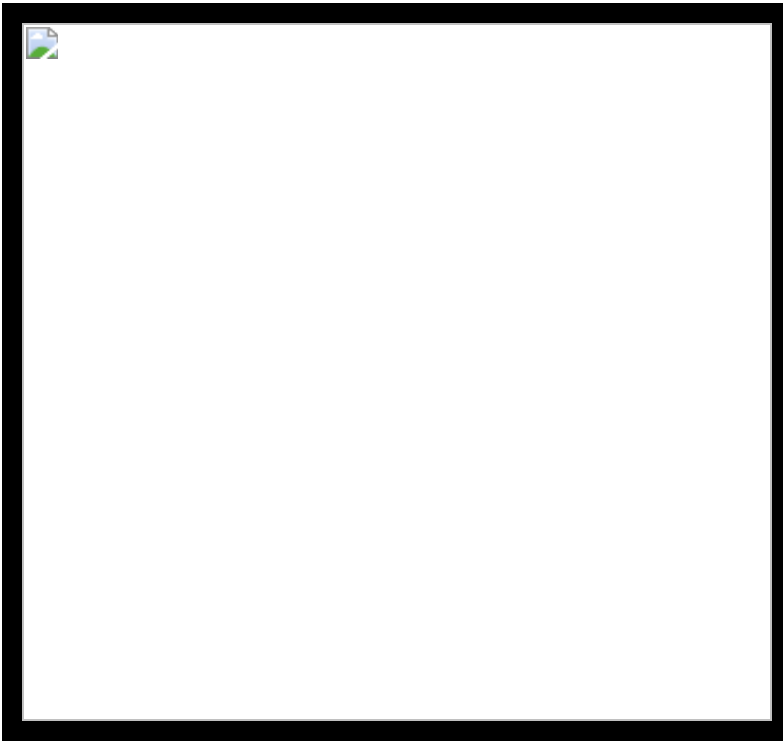
When it became obvious that phone deregulation was going to happen the Cyan folks went to work. Larry Emmons always wanted to do a picture phone. Development commenced, while it would be black & white, and it only periodically sent video snapshots, it would still be groundbreaking. The project, known as Falcon, was headed up by Steve Bristow. David Stokes designed video refresh hardware. Emmons designed the echo canceling electronics, as he was purely an analog guy. Chuck Meyer did the modem.

Early prototype

Soon Atari did embrace the project. In a 1981 Atari business plan for AtariTel, as the concept became known as, it was observed that there were 166 million telephones in the US in 1980, compared to approximately 270 million in all other countries of the world combined. In 1980 Americans use the telephone to place an average of 475 million local and over 40 million long distance calls every day.

The project was announced to the public in 1983 at the Consumer Electronics Show after nearly 2 years of working in secret. Atari had applied for trademark protection of AtariTel right before the show. The press release stated that Atari engineers had created a whole new line of consumer-electronics, which incorporates new technology and features not available in other residential telecommunications products. The release did foresee the possibility of "dramatically capable home network for voice communications, communications management, appliance control, security and environmental control." While in this age of zoom calls it hard to remember that then, this was to use plain old dial-up voice lines, which usually did not have the fidelity of AM radio. Cell phone communications was in its infancy then, and it was only analog. The digital cell network was still over a decade out.

Atari commissioned two of the world's leading industrial designers, Porsche Design and Morrison Cousins associates to develop the product's exterior design.



The AtariTel phone as marketed by Mitsubishi in 1986

The End

At its peak Cyan engineering had 30 employees. Cyan's decent started in 1983-84 when stand-alone gaming crashes and burns. Throughout the 80s Atari really had no video game success. Plus its computers were proprietary and slowly lost out to Wintel. Atari's sale to Tramiel did not include AtariTel as he did not want it. For a short while AtariTel was still intended to move forward as a separate division. Manny Gerard then decided to try and to sell AtariTel to Mitsubishi. AtariTel during that time went to Warner and tried to buy AtariTel. Warner said no to the offer as it was believed that a better Mitsubishi deal was close. In a case where one hand did not know what the other was doing, right before the deal happened, someone in HR showed up and shut the Cyan down. But Larry Emmons managed to hold enough of the operation together and Mitsubishi goes through with the deal. A number of Cyan employees went with the sale to Mitsubishi.

Mitsubishi re-branded AteriTel and sold the picture phones for a few years, at which point technology, and plain old marketing forces made the picture phone platform obsolete.

After the sale of the consumer games to Tramiel, with Warner keeping the arcade division, both pieces from there out continued to be bought and sold, merged, re-organized, etc. Much like the story of Grass Valley Company. At the beginning of 1999 the company Atari merged with Hasbro. Atari's intellectual property was sold to Hasbro interactive for only 5 million in cash. The name had already been sold to another company for home use.

Atari might have been the fastest zero to making millions to back to zero maybe ever.

Applied Design Labs

The surviving group up in Grass Valley re-constituted Cyan Engineering as Applied Design Labs (ADL). Cyan had carried out some robotics research and development work on behalf of Atari, including the Kermit mobile robot, originally intended as a stand-alone product intended to bring a beer. The company also programmed the original animatronics for Chuck E. Cheese's Pizza Time Theater pizza chain in 1977.

After Atari, as ADL is continued research work on small portable "briefcase sized" computers along with pointing devices (mice) & touch screens, before these devices became commonplace. They also continued to work with Nolan Bushnell who wanted an innovative stuffed animal, a "recording teddy bear" that could play back brief sentences spoken to it. He had just started a toy company, Axlon, and had lots of ideas but no electronics design department.

Bushnell gave ADL two tough requirements for the bear's voice:

- The voice box has to cost less than \$2.50 to build
- And it had to be ready for the International Toy Fair, only two months out!"

They delivered.

ADL also hooked up with Ultra-marathon runner Jim Walker, who was frustrated with the absence of a reliable way to measure distance so he could get off the track for his workouts.

ADL combined his expertise in the field with Ron Milner's ultrasonic distance measuring technique and ADL's electronics and design experience to build an advanced pedometer. It became known as the Monitor. The concept was accepted by Nike.

ADL also developed HOT LIXX Guitar, which was voted a top boys' toy. ADL idea: combine interesting variations of music in an instrument such as a guitar for listening and performing pleasure by people without musical training.

Other Early players

There were a number companies that were started by people who had left the Grass Valley Company. The companies covered here have come and went, but many still had big effect on the area, and the television industry.

Graham-Patton

This was a well known company locally, and survived for quite along time, eventually being bought out a couple times. It was a very early pioneer in digital audio. While people who dealt mainly in audio, started thinking about digital audio in the 80s, people on the video side paid no attention to it. In fact most video technical types

did not even think about digital video until the 90s. Contrary to what you might think, just because analog audio was generally easier to deal with than analog video, the opposite was true when it came to digital audio. There was generally much more mis-understanding when it came to digital audio then on the video side.

Marv Graham and Mike Patton worked on video switchers at Grass Valley. They were forced out when they decided they could not honestly commit to the ship date of an important switcher in development in 1979. ABC wanted it for the 1980 Winter Olympics, and Graham and Patton both knew that it could not be fully functional in time for that event. When they stood up to management they were showed the door. While the switcher did show up for use at the Olympics, it was no where close to the external specs that was quoted to ABC. This is a story we covered earlier.

Marv Graham worked for Los Angeles TV station KCOP in the 60s, and also was a freelancer with remote production company, VTE. He moved up to Grass Valley to go to work for the company.

Merv background?

After a few weeks of licking their wounds they wound up getting a contract with ABC to help with audio for the Winter Olympics. It was in conjunction with a digital audio project that Grass Valley was also working on. They had been toying with the idea of starting an audio company. They looked at their potential competition, and thought they could out engineer them, but could they make a living in the audio world?

When the company was still quit young, Jim Michener interviewed with Graham Patton. We saw Michener in a couple earlier chapters. Jim Michener came to Grass Valley from Harris Broadcast Products Division in Quincy. He knew the folks there making audio products and realized that they never made a profit. He decided not to join the two. But Graham Patton Systems soon developed a reputation for many great audio products, enough for them to make payroll. They developed a niche in the edit suite audio mixer market. This was a segment of the industry more likely to embrace the higher quality of digital audio mixing. But profits and revenue were extremely volatile, and eventually the company sold out to Klotz Digital America in 2001. The economic downturn in 2001 did not help the combined companies prospects.

In 2004 Klotz was forced to sell or close its Graham-Patten products division by mid-October and move its digital broadcast division from California to a facility outside of Atlanta. On October 25, 2004 Graham-Patten was bought by the ISIS Group, also in Grass Valley, was moved and co-located with the new owners. The sale saved the eight employees that still worked at Graham-Patton. ISIS had plans to expand Graham-Patton's product line to produce not only its then existing range of products, but to also expand into . conversion, and distribution products.

The Isis Group

When Grass Valley Group downsized in 1997, three former GVG employees founded The ISIS Group. Bob Stillwaugh, Len Dole, and Mike Schatz were the founders. The company set about offering routing switchers, signal processing, and conversion equipment. In October 2004, The ISIS Group acquired Graham-Patten Systems, adding digital audio mixing, conversion, and distribution equipment for the post-production industries. Unfortunately, the company was never a dominant player in the core Isis product lines, and total sales never went much above \$1 million a year. In 2014 Isis decided to close up shop, file chapter 7 and liquidate. RJM and Associates, LLC, another small Grass Valley company bought up Isis assets, and intellectual property.. Bob Stillwaugh and Mike Schatz joined RJM. Coincidentally, RJM started the same year as Isis.

IMMIX

Data points gathered

- Friday, November 16, 1990, Dave Mayfield, CFO Don McCauley, PSD GM Randy Hood, and PSD Engineer

Dick Jackson, resigned from GVG "to pursue other interests outside of the Grass Valley Group."

- Letters of resignations tendered via letters FedEx'ed to Larry Kaplan, who had replaced Wright as VP of the Communications Division.
- All but Mayfield left to start Imix
- IMIX was founded in 1993. What happened between 1990 and 1993?
- Imix produced a desktop editing system called VideoCube which would compete with the Group in that arena.
- Carlton Communications financed the new venture. Carlton also owned video equipment vendors Abekas and Quantel. Both competed against the Group in DVEs, and Quantel also competed in routers.
- Mayfield was not part of the Imix group, but joined Abekas as V.P. of Operations. Did Carlton have anything to do with that?
- Mayfield would eventually end up at BTS in Salt Lake City.
- Myers was considered evil by the Imix group. Randy Hood and his group saw this and left.
- Randy Hood a most competitive person. Sole founder of Imix?
- When Randy resigned he was the GM of production systems division.
- Another of the three was Dick Jackson, was head of engineering for a production systems division.
- Dave Mayfield, he was the successor of Dan Wright as president of Grass Valley group.
- The third guy was Don McCouley was the CFO of Grass Valley group.
- The then current president of Grass Valley Group, might've been Larry Kaplan, gets four FedEx packages each containing a letters of resignation.
- There was no mention of what they were going to do.
- Tek was facing serious financial issues at the time.
- Main product: Non-linear editor – Video Cube. Anything unique about it?
- Any other products?
- 1/2 of the folks who worked there, 11, went to work for Telestream.
- What was Coco de Mere - IMIX project?
- Why did IMIX shut down?
- Why did they fail?

Sierra Video

Data points gathered

- Larry Artz got fired from the group for throwing a chair through his office window. He did this on a project he was working on got canceled.

Which project that was?

- Artz starts company - when?
- Artz, along with Bob Grant, who eventually went off and started Lighthouse Digital, started the company?
- Any background on the a third person?
- These guys were engineers and not marketers. Plus Bob and Rick soon realize they couldn't work with Larry. Why?
- Sierra Videos first product was VDAs, which they sold to a guy making porno flicks in San Francisco. Why that customer? Because they were cheap?
- Originally GVG pubs were on the first floor of the Sierra video building. Larry kicked him out in the late 90s. Any more info?
- In 1994 Mike Morgan went to work for Sierra video.
- In 1998 Mike went to IBC, and was talking to a UK rep. The rep asked what Sierra video was doing about CE, which is the European version of UL.
- A German guy came up to Larry asking the same question.
- Artz said he wouldn't comply, and Mike asked how they were going to sell in Europe then.
- All Larry did was raise Mike's quota 20%. And he eventually fired Mike.
- He fired other sales folks as well.
- Sierra video went broke, and he had to sell it to Connor Dog, INC.
- Connors Dog Bought Sierra Video in 1999 and hired Mike back. He was gone 1 to 2 years.
- The principal financier for this acquisition was Gordon Getty, of the Getty family. The company was named after Eric Carter's dog. (Who's Eric Carter?)
- The Getty's had a box at AT&T Park and Mike once invited a number of Sony SIC guys to a game.
- The primary product at that point was routers?
- Mike got in contact with McDonald Douglas, who used Sierra Video routers in their simulator systems used for Apache helicopters.
- Mike also sold stuff to the Yuma Proving Grounds.
- Sierra video routers also went into AMC Theaters for pre-feature entertainment systems.(When?)
- At that point everything was wide band RGB analog HD with a bandwidth of about 200 MHz.

- The company found a niche outside of broadcast in the presentation arena. Selling what exactly? They tripled their business in three years.
- Sierra video started to OEM their routers through Kramer. (When?)
- Andrew Getty was the President of A. Rork Investment Inc., an investment vehicle.
- He was also the manager of Rork Productions, a production company. Connection to Sierra?
- Andrew's lawyer was Sierra Videos president. His name Eric Berliner. Is that the connection?
- Getty was educated at Town School for Boys in San Francisco and the Dunn School, a prep school in California.
- He then attended the University of Southern California and New York University. When?
- In 2002, Getty started filming The Storyteller starring Frederick Koehler, Sean Patrick Flanery, Brianna Brown, Dina Meyer and others.
- The film was eventually released under the title The Evil Within in 2017, 15 years after the project started and two years after Getty's death
- 11-2003 Company sold to Kramer. Andrew sold the company to finance a film he was making. Why? was the family cutting off support?
- Eric Berliner, president of Sierra Video Systems, remained in that position and the company is a subsidiary of Kramer Electronics US.
- Sierra video had been selling only direct to companies or OEMs. Kramer was a distributor.
- Kramer sold only to dealers.
- The military doesn't deal with dealers.
- Mike's final straw with Kramer was when he had a deal with a company called Washington Professional, who was a Kramer dealer that also had a prior relationship with Sierra Video.
- He had \$100,000 deal going into a DC museum. Kramer decided to have the dealer deal directly with Kramer, and bypass Sierra video. It was because the Kramer sales guy wanted the deal. Confused?
- Kramer didn't really understand Sierra's business and it is now closed.
- Mike worked for Sierra Video for 13 years as a VP of sales.
- Larry lost his house in the 49er fire. Larry Artz is retired. Need contact info
- Hugh Wilcox-he was the second to the last president at Sierra video.

Continental

Data points gathered

Continental Electronics was founded in Dallas in 1946

- In 1953, when Western Electric's radio equipment business was broken up by Federal antitrust regulators, Continental acquired the AM transmitter business
- Up to 2005 the Company was merged and sold through these various companies: Ling-Temco-Vought, E-Systems, Varian Associates, Integrated Defense Technologies, DRS Technologies, Veritas Capital. Veritas, a private equity firm acquired the company in 2005.
- In 1980, Continental purchased the Collins Radio line of broadcast transmitters from Rockwell International.
- **Time frames?**
- Also at that time Pugh, Hershberger, and Michener were at Wavelink.
- The last thing that Hershberger did while at Grass Valley Group was their SDI chipset. Hershberger pointed out to SMPTE that there was a pathological problem in 259 that Sony either didn't know about or chose to ignore. He proposed a solution that Sony vetoed, and the problem was dealt with in other places. Analog sources will have enough noise in them that you will never hit the sequence that will cause the pathological problem.
- In 1985 six of those transmitters/receivers were put together and made a 1.2 Gb fiber link and it was sold to Los Alamo Labs. The six were each on a different fiber. Those days there were 12 fibers in a ribbon. They hooked it up to a Cray and within two hours found a pathological error.
Was this at Grass Valley? Part of Wavelength? The pathological error testing, was this in conjunction with SDI chipsets for copper, fiber, both?
- In a meeting at the Northern Queen Caboose with the three mentioned and possibly Howard Butler and two other engineers from Telefunken in Germany, which was owned by Continental at the time, also Dan Dickie was there. Dan Dickie was the head of engineering for continental. He had worked with Hershberger at Harris in Quincy Illinois as well as Sandra Hershberger and Jim Michener.
- For two days they sat in the restaurant and architect-ed an ATSC exciter.
- Michener was involved in the architecture but in the end didn't join the others as he thought it wouldn't be a worthwhile endeavor. Michener ended up working for DIRECTV. He set up the original facility in Castlerock. But he stayed local.
- Continental had gotten out of the TV business in the late 40s.
- But when a ATSC rolled out they decided to get back in.
- They needed to design an exciter. For the ATSC exciter project - At the time Continental knew that they would have a hard time recruiting the right talent to Dallas
- Continental had a digital FM exciter, the 802D, based on a board called a Shark Card. (FM or ATSC?), The Shark card was used do with the ATSC exciter development, right?
- Continental was trying to build a digital TV exciter where none already existed. Not yet. anyway
- They were trying to figure out the least expensive way to do that. The shark card uses a DSP chip much like an AMD floating point DSP chip. Two filter cards in the exciter make a revised cosine filter.
- Hershberger developed a RRC (??)brick wall filter for the skirts. Used a 512 tap off the shelf ASIC DSP IC. Michener was still involved, and he recommended their use.
- Back then it took a whole board to implement the filters. Today a single Xilinx part could be program to do the

same thing and be programmed in 25 minutes.

- Hershberger was an expert on 8VSB versus COFDM. COFDM has a very high peak the average value versus 8VSB, around four times. COFDM had 8000 carriers and would be much more demanding on the linearity of the amplifiers. COFDM was worse in the presence of impulse noise.
- Hershberger concluded that in the US high power TV transmission would be used. And Europe not so much. COFDM won over there and 8VSB here.

• Hershberger and Pugh and that group weren't on the standards committee - they were just trying to implement them.

• Channel coders job - the 8VSB encoders job was to do the bit shuffling the randomization and the ECC stuff. (?????)

• RC filter was a brick wall filter to implement the mask.

• Pugh talked to Fred Harris at San Diego State, he said there was three methods of making eight VSB.

• Harris wrote a paper on windowing. He worked for QUALCOMM (????)

• Pugh told Hershberger and he decided to do the Weaver method. Which uses I and Q carriers offset in frequency slightly which gives the side bands. If they're the same frequency there's no side bands. It's done digitally and then the last step is D/A conversion.

• So there's no analog mask filter. Always done in the digital signal domain.

• Continental got a patent on the Weaver method. You can find a patent under Hershberger's name.

Very confused here. Sidebands just wide enough (staying in the channel allotment) needed to convey the 8-vsbs info, then hard mask for the skirt?

• What was new and unique in the implementation of the weaver method?

• Hershberger 2021 Engineering Achievement Award for Radio.

• At 13 got ham radio license, 16 got FCC First Phone commercial license, 17 got first radio job at what was then WCLR in Crystal Lake, Ill.

• Retired as Continental Electronics' senior scientist

• Grew up in Sycamore, Ill., just west of Chicago • Over his career worked for Harris Broadcast, Grass Valley Group and Axcera,

• He focused on exciters and modulators for transmitters, and low-level signal processing.

• In 1977 co-developed the world's first digital FM exciter as an experimental prototype.

• Holds 21 U.S. patents.

• Nobody's buying TV transmitter's now. Today Continental makes high powered RF transmitters for the New Horizons spacecraft journey to Pluto. Late in his career worked on X-band uplink transmitters for the JPL/NASA Deep Space Network. They generate up to 80 kW in the 7 GHz range. JPL wanted very low phase noise — not for communications, but so they could also use the transmitters for science experiments. required attention to low noise performance. RF amplifiers, the klystron beam supply, focus magnet supply and filament supply, and even the water cooling system all needed to be very low noise. required attention to low noise performance. RF amplifiers, the klystron beam supply, focus magnet supply and filament supply, and even the water cooling system all needed to be very low noise.

• What happened to Continental - One branch of ADC bought NV and another branch bought Continental's hi power TV transmitters, and another companies low power TV transmitters. It combined them together as a single company in Pittsburgh Pennsylvania. It became known as ADC TV. Then during the .com crash they decided to close it. Management brought it back out. Dave Neff and Dan Dickie were running it and got an investor to buy it. Eventually the key people left as a Russian bought the company and drove it into the ground.

• Another engineer on the project is still in the area, and is a one man company. Michael owns Digital Acoustics, a consulting company. He came from San Diego where he worked for a fiber optics developer. While there he

worked on a serial to parallel conversion IC.

- Dan Wright wanted Bernie Dayton out of his hair, but didn't want to give up too much power so he came up with the Telcom spinoff that was called a group instead of a division, Wavelength. So it was known as the Telcom systems group.
- He came up and worked for Grass Valley Group as he was recruited by the Telcom group. He was recruited in 1989 but actually started in June 1990. Dayton had just left to start NVISION. When he first came up and worked for the group he worked there for about six months and left and then came back later as the engineering manager of the group. Jim Michener was the lead engineer. They were both involved in something called the Excalibur project. Michael was eased out because people were uncomfortable with him being in charge of engineering, and Anna Greco, his wife, being in charge of marketing, and so after another year left again. John Glass was his replacement.
- After GV he then consulted with a company called Virtual Vision and he was hired to do some chip design. He did some work for Schelling robotics in Davis they were makers of underwater cameras that attach to remote vehicles.
- He then went to work for Mark Friedman and also Don Dione. This was a spinoff from AMCC, a SIC manufacturer in San Diego. Friedman merged Daisy and CADmetrics which were workstation companies. In the 1980s various workstation companies were Daisy, CADmetrics, mentor, and silicon graphics. He was the representative on the fiber channel a/V committee. Fiber channel was serialized SCSI.

DirecTV

Data points gathered

- Michener was involved in the ATSC architecture but in the end didn't join the others as he thought it wouldn't be a worthwhile endeavor.
- Michener ended up working for DIRECTV. He set up the original facility in Castle Rock. But he stayed local.
- About 1984 Tektronix was approached by Comsat General out of Maryland.
- They wanted Tektronix to make satellite receivers and ground equipment because Comsat was trying to become a Direct Broadcast Satellite company.
- Tom Long really wanted this to go.
- Tek had spent millions on the Wim Velsink (sp) memorial, this large IC fab that had no business, that could do high speed bipolar ICs.
- The folks at Tek and Comsat thought that it would be great to transmit component video and do it through the use of multiplexed analog components.
- Tom Long put together a tiger team of Larry Kaplan, Leon Stanger and Jim Michener to get this done.
- JM did an analysis of multiplex analog component and saw absolutely no advantage for satellite broadcast. He was also instructed to build a prototype of an encoder and decoder for the encryption system, which he did.
- Meanwhile, Larry, Leon and JM were trying to also figure out a business plan.
- JM estimate was that it would take at least a billion dollars to get this thing going, and they were at least 800 million underfunded.
- Larry thought they could do it for less, but he thought we could raise more money.
- They approached Hughes to see if they would be willing to join in and supply the satellites.
- They shared the business plan with Eddie Hartenstein who was very interest to the business plan, but he was not willing to join in.
- The problem was using analog technology would only enable perhaps a 20 to 30 channel DBS service.
- Comsat General went Chapter 11 and they had to explain to Tom Long why this business venture would not get off the ground.
- Larry, Leon and JM all thought that they were going to be fired.
- Fortunately, they were able to convince Tom Long that the technology was not yet here, and that it would take funding of at least a billion to get it off the ground.
- This was the first of several projects JM did with Larry Kaplan. Over several decades and several companies.

- Fast forward nearly 10 years.
- Eddie Hartenstein was still at Hughes, and was friends with the folks down at CLI (Compression Labs) in San Diego.
- Hartenstein still had a copy of Tek's business plan.
- CLI were working on what became MPEG, and were doing this for HDTV.
- Hartenstein asked if they could use MPEG to do standard definition TV. The answer was yes.
- This was after the USSR had fallen and military budgets were being cut, and Hughes was looking for a consumer project. So Hartenstein pitched the idea of DirecTV to Hughes.

- JM left Grass Valley in 1994.
- Hartenstein was working with a bunch of rocket scientists and lawyers and needed someone who knew something about television.
- So it wound up that Stanger and JM worked for DirecTV for the next 20 years.
- By the way, it took Hughes over 3 billion to start DirecTV.

•Also, JM never moved to El Segundo, and he was essentially a design house in Grass Valley and did several very large projects for DirecTV. There were many years his net sales beat out most of the other small startups in Grass Valley, and he was totally off the radar screen.

Ensemble Designs

Know essentially nothing about this company. If I am not able to gleam anymore I will move it into the next section as sort of an honorable mention.

- John Wood-founder and sole owner of ensemble design. John is a technologist.
- Some consider this a "e;lifestyle" with no growth strategy.
- 27-50 employees.
- Started in 1989, incorporated in 1993
- From the company's linkedin profile: "In 1989, a former television station engineer who loved designing and building video equipment, decided to start a new company. He relished the idea of taking an existing group of equipment and adding a few special pieces in order to create an even more elegant ensemble. So, he designed and built his first product and the company was born."
- Most of the companies up in the area don't have real CEOs.

Others taking advantage of the food chain

Cable Data

**Bob Crowley told Chuck about the book. Chuck had hired some gvg employees
Anyone able to identify Chuck's last name in this context. Lost all my original notes for him**

- Company provided software billing services. At one time had 750 customers.
- **Timeframe?** When Chuck started their customers had less than 5 million subs.
- Crowley started as marketing manager
- Company setup to actually send bills to the customer. That way cable companies that used the software had to pay them.
- Started in an abandoned white front store on Arden Way in Sacramento
- Company claimed that it first devised the electronic program guide.
- Also worked on the cable computer, which became the set top box. Was it a first? When?
- One goal was to allow subs to pay their bill via the STB. Also subs could buy video games. Part of the STB project was to port their services to the STB.
- Company now seems to have a complicated and convoluted structure:

- Output Technology Solutions, a Kansas City company employs more than 1,600 people in the Sacramento area, has changed its name to DST Output. The "re-branding" is designed to pull all of its affiliated companies under one name. It was formed in 1999 by the integration of International Billing Services and Output Technologies. Formerly, the company was US Computer Services. Those affiliates include Marketing Services Group, YourAccounts.Com and Corporate Document Systems. Locally, Output Technology Solutions provides electronic billing statements and other documents for client companies. Which itself grew out of Cable Data Corp. in El Dorado Hills. Before that it was in Rancho Cordova, after it had moved from the Arden site. It is now wholly owned by DST Systems Inc. which had more than \$1.4 billion in revenue last year.
- What's not integrated is the old CableData, It's standing by itself. ???
- The company's cable operations software unit, formerly known as CableData and now called DST Innovis, took a broadside in recent years when it lost its biggest customer, Denver cable giant Tele-Communications Inc., now owned by ATT.
- Now, because the domestic cable TV software market is mature and saturated, DST Innovis' best chances for growth are in developing international cable markets
- The old CableData had a reputation for being arrogant
- DST supplies video and data billing services to Cable One Inc., Cablevision Systems Corp., half of Adelphia Communications Corp., DirecTV Inc. and 90% of the pre-AT&T Broadband merger Comcast systems, adding up to a 35% market share, according to company estimates.
- Overall, it counts 40 million subscribers worldwide and 2002 sales of \$2.38 billion. It produces 1.8 million??? statements per year.

Cineplex

- General Dynamics owned Cineplex.
- Mike Morgan went to work for them in 2011 for two years.
- Cineplex intellectual property was gimbals and gyros.
- They bought the camera from Sony.
- Their system was used by the BBC for the making of Planet Earth.
- The gimbal and gyro technology was advanced enough that the DOD required an export license.
- Systems cost around \$500,000. Aerial Filmworks was a big customer.
- General Dynamics decided to close the product partially because it wasn't military spec.
- Mike got let go when 37 others got let go at three sites.
- He was one of four sales managers. The general manager who hired Mike got fired first.

Hedco

- Peter Hughes came out of Grass Valley and started HEDCO
- HEDCO started making 75 ohm terminations and sold them for \$5 a pop.
- Tek made them but they were about \$7 a pop.
- Peter had this idea that one could build a non-blocking multistage router that was much cheaper than a full NxN crosspoint array.

Not sure I understand what this means.

Was this referring to multi-level routers with tie lines?

- From Jim Michener :
- Rorden, Birney and Kuca came across a Bell Labs article that addressed the general design restrictions of multistage routers, a telephone exchange is a multi-stage router, and came up with a pathological set of cases that

would break it.

- What I remember, was that at the 82 NAB show, HEDCO was offering such a router, but Kuca talked to the buyer and in the contract was that if at final acceptance they could get it to block, the sale would not go through.
- So at final acceptance, Kuca went over and blocked the router. **How?**
- HEDCO was out of the router business.
- While I am not sure, I think HEDCO sold their modular products off to Leitch, but they kept the termination business.
- Kuca knows more about this I, as I was only in the peanut gallery.... he was directly in this fight.

Lighthouse Digital

- Bob Grant started Lighthouse Digital. The company built audio TDM routers.
- Eventually Pesa bought lighthouse digital.
- From an article in TV tech October 2, 2002 said that PESA acquired OZ TDM routing technology from Lighthouse Design Systems to complement its own Cheetah router.
- Pesa was based in Huntsville Alabama.

Silicon Systems

Also lost Buck's contact info. He worked for an audio company up near Shingle Spring/Placerville.

- Company started May 17, 1972
- Grew to 146 employees and \$10.5 million in revenue in 1980.
- Silicon Systems founder. Way back when IC software didn't require high bandwidth so you could work remotely.
- The founders came from Scientific Data Systems. Company was a supplier of ICs for disk drives, touch tone receivers, vehicle loop detectors, garage door openers, satellite signal de-scramblers, among others.
- Initial public offering beginning of 1981
- Looking for a market for their modem technology they got into set top boxes. Also did power line stuff, and remotely read power meters.
- Working in Irving. Most didn't like it. One manager lived in the bay area, and wouldn't move south.
- At that time there was only a few thousand people worldwide who could design ICs, with 20-30 of them at Silicon Systems.
- George Landsberg an IC designer came to work for Grass Valley, he came from Silicon Systems. After a while he had a Silicon Valley offer so he leaves GV. A while after that, since he has a girlfriend in Grass Valley he was determined to get back. He suggested that Silicon Systems go check out the area.
- At the time there was only one other company that had engineers working remotely, California Micro devices, in south lake Tahoe. One of the company's founders, Gene Potter checked them out and gave the go ahead
- Oct 1980 moved into 544 Searlesave in Nevada City. Took over 3 of the 5 suites in the building. Eventually had all 5.
- They were known as the remote design group.
- Others followed. These companies opened up remote design centers - Atmel, TI, Analog Devices, National. • Their ended up being Silicon System alumni spread among those companies. At that time Nevada County was still a draw.
- About half the design group in the company moved up to the area.
- Of the 10 engineers that came up to the area, six stayed after the company had left. • The lab eventually becomes modern design house on Mohawk Drive.
- John Huggins, an ex-Intel guy also goes to work for silicon systems as does Larry or Lance Kilstrom.
- 1996 \$400 mil revenue, owned fab plants in Tustin, and Santa Cruz, assembly and test fac in Singapore, and design facilities in Tustin, and Nevada City.
- After Japanese-owned TDK Corp. bought Silicon Systems in 1989, the company started TDK Systems, which designed modem cards for laptop computers and networks, Next door, TDK Semiconductors, formerly the

Silicon Systems unit, continued to design integrated circuits.

- In 2002 TDK closed the design center which had 49 employees at the time. Most employees had lined up work before the facility closed. Grant Shatto was the engineering director at the time.

Time domain corp of huntsville, al, and sliceX of salt lake city opened design centers in their absence, and each hired approximately 12-14 TDK employees each. 4 employees took jobs with TDK Semiconductors in Mountain View and Tustin, the company's headquarters. TDK employed about 220 people at the time. sliceX had helped TDK design a modem chip. sliceX developed ICs. Time Domain developed communications technology.

- Buck - worked for them right out of high school in 73 to 2001. started at bottom and eventually ended up as manager of the systems group.

How did he end up in the area. Don't think he worked at their design center up here

- U.S. Robotics: • Silicon systems had a background in building modems so somehow they were involved with the US robotics efforts up in Grass Valley.

• Originally Andy Morell came out to work with Silicon Systems to help them design modem chips as U.S. Robotics was a customer. He liked the area and quit U.S. Robotics and went to work for Silicon Systems. U.S. robotics lured him back.

- Morell goes to work for US robotics in the Litton Building somehow Gary Landsberg is instrumental in setting up the US robotics facility in the building. **Need more info**

- Silicon Graphics made a business decision not to invest in modems with faster speeds than 2400 baud. So Andy and his group designed them themselves.

• Central to their modem was a TI chip.

• Most of the Silicon System start up guys ended up working for TI.

Are these two data points related?

- After 3com buys US robotics, it shuts down their Grass Valley operations. **Why?**

Any background on any of this?

- Company was saved by Howard Hughes. Company was in trouble.
- Someone who knew Hughes drove to Vegas and said to him to keep these guys in business.
- He wrote a check on the spot. Could have gotten a piece of the business but didn't ask for it.
- Hughes gave Silicon Systems a few IC projects to work on.

Spice

- 1st company to make custom analog ICs. used pspice.
- Berkeley spice fore runner of micro sim pspice. Originally a bunch of grad students wrote it and was running it on a Xerox Sigma 7. Originally written in Fortran 4. people who turned it into microsimspice were involved with the supporting pspice at Silicon Systems. Berkeley spice was open source. Wolfen Bloom converted it to Intel assembly language and then ported it to DOS. That group went off and started Microsim.
- MicroSim Corporation spun off from Silicon Systems in 1984. In 1998 MicroSim was acquired by OrCAD Systems Corporation.

Black Magic

- Grant Petty was the founder of Black Magic.
- That company got the telecine Business from Technicolor which was about 100 machines. • He gets his hands on a transport and replaces the optics with a 4K full frame sensor as used in his cameras. You can now transfer film faster than real time.

- Petty who founded Black Magic worked for Jon Apt at AJA before.

- He then left and sold a version of the Kona card.
- Abt claims that Petty stole from him.
- Grant Petty hired Fred Diminasis who had worked for GVG in desktop editing.
- Chuck Meyer used to play indoor soccer with him.
- At black magic his goal was to open a development group in Grass Valley and steel folks from AJA.
- That never worked out.

What's Left of the Geneses

NVISION 2.0

As we pointed out at the very beginning of this book, the only physical presence left as this book is written, but it too will be gone when you read this, is what was once the NVISION building in Grass Valley. That building has been sold. But let's take a look as to how that building stayed part of the industry for as long as it did.

When we left the NVISION tale last in chapter 8 it had been sold to ADC, and in short order ADC was seriously considering just turning off the lights and walking away. On the bright side digital television transmission was now a reality, and HD television was starting to find some legs, albeit extremely wobbly, but at least it was trying to stand. But would NVISION be around to cash in?

In 2002 ADC was going broke, and they had been on a buying spree up to and including NVISION. Some of those acquisitions were not working out. The dot.com crash didn't help. On top of that, ADC's main market, telcos, was undergoing a severe downturn. They even had built a million plus square foot building in their home city of Eden Prairie, Minnesota, a southwest suburb of Minneapolis, that sat vacant due to the downturn in business. They approached Miranda; a company you saw in the last chapter that had a large effect on the Grass Valley story. But before that part of the story, a decade prior NVISION was in short, slow dance with them at this time. Miranda expressed interest. NVISION went to NAB in 2002 and was in the Miranda Booth in anticipation of a proposed sale. ADC had gotten rid of NVISION's sales force and had theirs trying to sell NVISION products. This was the exact opposite of the Wavelink problem Birney saw at GV. At GV they were TV folks trying to sell into telcos. At ADC it was telcos trying to sell into television. At this point NVISION had no market presence. ADC by itself had a very small television footprint.

But as things unfolded ADC finally figured out that Miranda didn't have any money at the time and was just trying to get a freebie. ADC then came to an improbable solution. Simply shut down the NVISION operation and walk away. Birney pointed out to ADC the warranty commitments that would be unfulfilled, this gave ADC pause. At that point, Dayton called Jim Meadlock and told him he thought ADC would take a low ball offer and he said to go for it. They made ADC a \$1 million offer and they took it. Meadlock added some capital, and in June of 2002 the company under new control officially restarted.

Meadlock invested about another 2 to 2 and one-half million dollars to get marketing back up and to get back into new product development. ADC had paid the NVISION building off, so that came back technically for free. The NVISION building was originally a Blue Cross data center. The building was bought for about \$750,000 and had \$200,000 in improvements made. Since NVISION got a full restart, everybody got founders stock. This was a good thing because part of the deal for everyone with stock in NVISION when it was sold to ADC, with the exception of Meadlock, got ADC stock, which at this point was pretty worthless. Chuck Meyer was the president, and Birney had the title of chairman. It was NV 2.0.

At the time of the buyback Dayton said that NVISION is in the business of exporting intellectual property and importing dollars. He added that NVISION is the type of high-tech company that can make a substantial contribution to the local economy. With what was going on in the local area economically at the time it was reassuring when he added, "We buy things from the outside, but we add a lot of value to the product before we ship it out and bring in substantially more (money) than we send out." The company had 65 employees at the restart.

Jay Kuca said that "We're the only company here in town that can, on a volume basis, take raw PC boards, run them through our production line, and come out with a finished product on the end." That was an ability that was becoming in short supply in Grass Valley at that time.

The HD transition started in earnest in late 2002 with ESPN's and Turner's decision to launch HD cable channels. At that time ESPN also required any vendors producing their games to do it in 720p HD. By the fall of 2003, CBS and FOX joined in the fray with all the NFL rights holders producing at least their A game in HD. Once the NFL season was over, those facilities became available for spring sports and the damn burst in terms of demand for HD facilities.

The remote truck vendors faced a dilemma. Complicating this was that the networks insisted that cameras work in their chosen HD format, and not undergo conversion from the other format to their chosen format. That meant these vendors would have to have two sets of cameras, ones for ABC, ESPN, Fox, and another set for CBS, NBC, and PBS.

Technology, and a camera company that eventually saw its video operations become part of Grass Valley Company, Philips, derived a solution, that was really a compromise, but close enough to the native format requirement to be accepted. CCD Sensor density had finally got to a point where you could pack enough pixels into a 2/3 inch image real estate to sub-sample out a number of formats, vertically, from a single imager array. Simple math offered a solution; the answer was prime numbers.

A prime number is a number that can only be divided by 1 or itself. The first eight prime numbers are 2, 3, 5, 7, 11, 13, 17, and 23. If you could find a set of different row numbers that reduces to a combination of prime numbers, then no vertical interpolation is needed, simple sub-sampling would do the trick. One other requirement—you want to use the smallest prime numbers that you can, as the largest prime number used sets the overall size of the complete array.

As it turns out, the first three prime numbers are all that are needed. Pick any format's line count, and start dividing by two until you can't, then divide by three until you can't, then you'll find you need to divide once by five to end up with only prime numbers. Or start by dividing by 5 once, and then three, and then finish with 2. It doesn't matter which order you use in division. In all cases, you will arrive at the same factored result.

To hit all the required line rates, it works out that the sensor needs 4320 lines. Armed with that number of lines, you can subsample out 1080, 720, and 540, and 480 lines, the ones required. 1080, for 1080p; sample every 4 lines; 720p every 6 lines; 540, for 1080i, every 8 lines. So no conversion for the vertical line rate, but interpolation is still needed for horizontal resolution. The consensus was "close-enough." HD really took off after that.

It helped that relatively inexpensive flat panel TVs, which became as important as HD itself. They rapidly were finding homes as wives liked the look of flat panels and husbands craved big TVs, so permission to acquire was granted and the TV market grew.

But back to NVISION's first product. NVISION had a number of things that made it an early bet in the HD equipment marketplace. Besides HD being in the company's DNA, they often described themselves, and approached their designs as a RF company. From the git-go unlike other AES audio routers where the input undergoes serial to parallel conversion, then goes to processing, has the reverse parallel to serial conversion done and then out, the NV router was serial all the way through. Their solution was to buy the fastest RF parts for the output logic regeneration.

The company also always took an interest in new parts, often allowing vendors to use their facilities to test new parts. Paul Ferguson, with Analog Devices, had an Analog to Digital IC with no way to test it. He came out to NVISION as Dayton and Meyer knew ICs. A number of chip vendors came up to NVISION to test their products. So they would work with the chip vendors and get early samples and amazing pricing. Another benefit

was that the company could build product faster than anyone.

Why? Did having the fab equipment help?



Sometimes being cutting edge did not always work smoothly. Early on a special IC that NVISION was counting on was discontinued. So the company had to implement an early instance of a Gate Array, with the delay in having to program the device.

Bob Adams, an AES fellow, designed sample rate conversion that would put a NV product out of business. He came out to NV for advice. **What happened?**



This experience helped ready the company to be the pioneer in HD that it had originally set out to be. In 98 HD router design was an art. Devices were barely working at the 1.2 GB telco rate, let alone the 1.5 GB HD speed. Printed Circuit Boards, along with connector dielectric made for very unreliable operation. HD equipment to support the HD clock rate had to be able to pass frequencies of well over 4 GHz (1.5Gb third harmonic). Early on, until a company called Gennum produced ICs that could clean up HD serial streams by a process called re-clocking, the only other way was through a process called equalization, at a devices input and outputs. Simply put, the high frequencies were extremely emphasized at the expense of the low frequencies, knowing that for every millimeter that signal traveled it was those high frequencies that were getting clobbered. HD was a very local affair where you did not push signals any distance.

Please clarify: Bruce Regesmy, in NVISIONs test, shows a bulkhead connector blindly meets connector boards with the motherboard that greatly decreasing return loss. They called it a snap on guide, and NV got a patent for it. At the time this first router is being worked on nobody wanted active assemblies on the back plane, now it's OK.



Careful mechanical design had to be used. The mechanical packaging was paramount. The slightest change in connector alignment would render the router unreliable. The Amp Connector Company had what it called Micro Z connectors that worked at 10 GHz. But the connectors had to align within a mil of each other. Higher frequencies also equal higher heat which leads to thermal expansion, misaligning connections. **Anyone care to elaborate?**

NVISION used aluminum in the frame as it had a similar expansion coefficient to match the expansion of the print circuit boards as things heated up. This devotion to mechanical detail allowed the company to build HD routers before others. As mentioned, NVISION also determined that the semiconductor chip manufacturers specs weren't as good as billed. As already mentioned the chips were originally designed for 1.2 GHz telco use, and not 1.5 GB/s video use. Getting the mechanics right was so hard that as we saw in the last chapter, the NVISION router, once refined, stayed the standard for how HD routers were constructed. And as NVISION was handed off to Miranda, and then one of a number that also brought routers to the gala that Belden concocted, it faced competition in routers locally and globally, all under the same tent. A couple NVISION designed routers are still sold by the Grass Valley Company to this day. Dayton thinks that is probably the case since there is no one around today that still has mastered the art of building HD router frames. This is not a trivial problem. They would require new IO printed circuit boards, requiring hard to implement connectors, and the real hard part, a new motherboard. The motherboard is a quarter inch thick, and it has 38 layers. To make a new frame reliable requires 5/1000th of an inch tolerances across the entire frame.

Miranda Sale

Like many industries the one that this book is about, tend to take on an astrophysics bent to them. Either you accumulate enough mass to reach critical mass, with the resultant gravitational pull to have enough sway in the

marketplace to sweep up sales and revenue that you wouldn't if your "star" wasn't so bright. Taking that analogy forward in evolutionary terms. You're either a large dinosaur at the top of the food chain, or you're a small mammal hiding in the underbrush, not needing much to consist on. Your advantage, if you do not get crushed, is you're nimble and much more adaptable. The problem for the giant is, back to nuclear fusion, often you construct your star, and it becomes so massive it goes supernova, and spews all your collected mass back out into the universe.

We saw it with RCA, who laid a good part of the technological foundations for the industry, become so massive that its accumulated momentum allowed Grass Valley, when it was small and nimble, along with Sony in the 80s and 90s, make the founding juggernaut irrelevant. But none-the-less, even though scaling hasn't lasted eternally yet, the desire to try again is always present. Besides Sony, other notable contestants have been Harris, and now what use to be Grass Valley, and is mostly now an international company with the name of a town that most of its current employees have never been to, and now really will have no reason to ever visit.

Grass Valley on its way to being the company it is today, came together as we saw from a number of directions. The two paths germane to the local story being the namesake company itself, and NVISION. The NVISION path finally ended up going through Miranda. Miranda decided to move up the food chain. An impetus for Miranda's move was partially due to their main investor, Société générale de financement (SGF) was a holding company owned by the Government of Quebec. One of their stated goals is to bring jobs to Canada, more exactly Quebec. In December 2010, a merger of the SGF into Investissement Québec received royal assent.

With SGF's financial backing, Miranda was serious this time about acquiring NVISION. The financial backing came with a price. Dayton felt the in dealings with Miranda it always seemed that there was no one in the company that could make a final decision, and he thought there was a puppet master. In a premonition of things to come, it was briefly discussed whether Belden should be approached as they were on a buying spree at the time. Having been bought by a similar company, ADC, once before Birney Dayton wouldn't have considered a Belden offer. Chuck Meyer wished they had shopped NVISION to others, but Meadlock wasn't a fan of that idea. He was ready to cash out. So at the beginning of 2009 NVISION sold itself for Miranda for \$40m.

Miranda had sales of \$37.6 million for the quarter ending Sept. 30, 2008, up 19 percent from the previous year. NVISION, reported revenues of around \$34 million over 12 months to the same date. Both companies had comparative gross margins of about 60%. While Miranda was about three times the revenue of NVISION, NVISION was a powerhouse in routers, an area where Miranda needed some help. NVISION' marquee products at the time were the 8500, the 7212 routers, and a master control switcher.

Miranda's CTO, Michel Proulx, summed the acquisition up, "It's pretty clear that our product lines are very complementary. We're building all the infrastructure equipment but didn't have a router line. They have a router line." Miranda was big on interface products, and often they are needed with new routers, and visa-versa. While both sold master control, again, new master controls often require new routers. Finally Miranda was big on multi-viewers, which, again, often at the time needed new routers.

NVISION had about 100 employees in their building at the time of the sale. The headcount almost immediately started dropping as manufacturing was moved to Montreal, even though the Miranda President said router manufacturing would stay in Grass Valley at the time of the sale. Next they then moved test out of the building. Soon there was nothing left in the building except engineering. After the sale to Miranda Chuck Meyer had some title but essentially was the site manager. Part of the sale required Birney to stay a year. He recalls that Miranda never asked him a single question. Birney retired at the beginning of 2010. Chuck recalls that from an engineering perspective they managed to keep him busy.

As we saw in the last chapter, Belden then buys Miranda, and then Belden also buys GVG. This was a classic market consolidation game, buying companies up and reducing the players in the market, so you can try to control prices on your own, at least some of it. Management usually looks at a merger like it is one plus one equals three, with a longer reach, and a larger and stronger package of solutions. From the other end, accounting and almost always the people in the trenches see it as one plus one equals 1.5. The goal is always lower costs,

which usually means fewer people.

The Current Big Two

Telestream

Starting the company

As we saw earlier, Dan Castles was named President of Grass Valley Group in 1994, following a sixteen year career at Tektronix, where he had served as Controller and then as Vice President of the Television Division. Castles received a B.A. in Business from Washington State University and an MBA from the University of Portland.

After his run in with Lucie J. Fjeldstad, which we saw in chapter 12, he resigned. He took some time off and sometime after Fjeldstad was gone Tektronix came back and said they liked what he had done before and offered to move him to Canada or Korea, two hotspots at the time, or anywhere else for that matter. Even back then most GV managers didn't want to live in Grass Valley or Nevada City. No he said, he was happy in Grass Valley. When he said no to the offer, that signaled to Tektronix that he was going to form a startup. He had no such plans. While he initially said no a couple times to a year's severance if he signed a non-compete clause, his wife eventually convinced him to accept the offer. For nine months he became dad to his daughter who was starting kindergarten.

Rex Forbush(sp?), kind of a TV tech planning guy. Was he instrumental in the founding of Telestream. (How?)



In 1997 Steve Tilly, Sean Cartier and Shawn Carnahan approached Dan and said they wanted to do something new. Their ideas coalesced around the idea of using MPEG, a recently standardized video and audio compression process to allow broadcasters to transmit video and audio over the Internet. Up until then broadcasters used dedicated paths, such as microwave, satellite, or telco. Or they simply Fed Ex'ed a package between locations. When they were starting Telestream, Dan said investors worried that there would be a single standard settled on. Dan replied that competition to get a leg up would prevent that. He turned out to be very right because within a dozen years of starting the company, there were over 200 flavors of MPEG.

Dan being a finance guy, was able to raise \$20 million to start, the only local company that did that. Most companies in the area are lifestyle companies as we have mentioned earlier. Usually small investors want limited exposure to a first investment cycle, which is usually a few million at most. When they initially sought the \$20 million in venture capital funding, Castles said, they realized they were going to the wrong trough.

He realized that the money he was looking for would be found down in the bay area. Bay Area Venture Capitalists (VC) dealt in those sums of startup money. They didn't like to invest in small amounts because they would have to sit on the boards of too many startups. VC investments in the bay area are usually larger than \$20 million. So Castle' goal was way too big for local VCs and investors, but not quite large enough for those in the bay area. A few told Castles that they might make an exception for his new company if the founders would move the company to the Bay Area.

But all of Telestream's initial founders lived in Nevada County, loved the lifestyle, and didn't want to move westward. Carnahan, who became the new company's CTO argued that Nevada County was the birthplace of the Grass Valley Group, the company that had gained the worldwide recognition by broadcasters for vastly improving the technology of television transmission. Consequently, he said, television executives and job seekers equated the area with their industry.

Castles was tenacious in his quest. In total, he spoke with 31 venture capital firms before finding two willing to invest in Telestream. After nine months, he inked deals worth a combined \$5 million from Shaw Venture Partners of Portland, Ore., and Sacramento's Hallador Venture Partners. Other funding came from Intel Capital and 55 angel investors.

Total first round funding? Shaw and connection to Tektronix, why Hallador - local? How did you arrange for 55 separate investors - wouldn't that have complicated your corporate setup?



So in 1998 Telestream opened for business. When Telestream started they competed against no one, and from day one they would not be a lifestyle company, they were in business as an investment, and it was profitable almost from day one. At first it employed 11 people. They started seven years before the birth of YouTube, which was a harbinger of things to come. Netflix had begun shipping DVDs to U.S. households in little red envelopes the year before. It took about 18 months for Carnahan and Tilly to develop Telestream's proprietary technology, but it would take the three partners even longer to gain broad industry acceptance and awareness. It wasn't long before they could start to see their way forward would be to become a provider of digital media tools and workflows solutions. But where to start?

Early Products

Clip & Flip Mail

Telestream's original product was designed for a military spec that's said it had to survive a parachute drop. That resulted in Clip Mail. The small unit, one of the few pieces of hardware the company produced, once on the ground, Clip Mail with a satellite phone could send 30 to 60 seconds of video via mail email. Even back then the hardware was small compared to the software side, which required 90% of the employees working on the product.

Before broadcasters, advertising and entertainment companies widely adopted Telestream's products, but to begin with the company's biggest and most reliable customer was the federal government. The company's ClipMail Pro allowed military officials to transmit video via the Web, making feeds from surveillance videos much easier to see and assess. The U.S. Defense Department placed the devices on Air Force One, aircraft carriers and in other spaces where critical mission decisions had to be made. At the time the Pentagon had much faster and more accessible Internet connections than TV stations. When television or advertising agencies wanted to share film or video with colleagues or clients in other locales, they copied tapes and shipped them overnight around the world or across the country.

Back when Telestream was getting started, Internet to the broadcaster meant email, and maybe a station website. Anything Internet then was totally divorced from anything broadcast related. Telestream would show up and say, "We're going to put this piece of gear in your TV facility, but we're going to get this guy over there to plug it into the Internet." Carnahan said, ClipMail Pro quickly changed the production process once companies installed it: "I was at a studio in L.A., and they were doing a lot of shoots at the time in Australia. They had ClipMail in Australia, and every day after they'd do the shoots, they'd do the dailies, probably two or three hours' worth of dailies, and they'd send it back to Los Angeles through ClipMail. Instead of a three-day turnaround to get dailies from Australia to L.A. With ClipMail Pro, the L.A. studio had the dailies overnight."

Difference between Clip and Flip mail?

- Flip Mail, was another TS early product. It was not for production but for transport. •It was introduced in 1998.
- Shawn worked out and refined Rex's concept. (Shawn? Rex's concept?)
- Flip mail was used to replace shipped dailies.
- Allowed almost instant checks on the status of production.
- The military realized if they had flip mail the highway of death could've been avoided.

•Clip Mail used SMTP, Flip mail used main concept (MPEG transport stream?). Telestream had to learn from scratch?

**•Clip Express, another TS product that sold for \$5000, was a lower quality version of the \$13,000 Flip Mail. On navy ships and Air Force One.
Need help sorting this out!**



"When we launched at a trade show, we probably had more people come by than we do now ... because it was such a learning curve," said Castles a few years ago. "They weren't going to buy the product, but it was just, 'You're going to do what? I don't get it.'" He and others would spend an hour in a theoretical discussion about how the product worked, then realize the prospects didn't plan to buy anything. They had to learn how to better assess potential customers, he said.

To overcome this in 2001 Anna Greco was brought in as a consultant on clip mail. She was tasked with helping to overcome the "I don't get it" mentality. MPEG and lossy video and audio compression were new to most in the industry. Anna and others soon were making headway and soon major broadcast, entertainment and technology companies called the engineers at Telestream for assistance with video transmission or formatting challenges. New, more elaborate products started to take shape. Products that did not do a single function but ones that did a combination of tasks and organized it into a workflow that managed entire processes.

Flip Factory

In 2002 flip factory launched. It was what Telestream came to call their first "Enterprise" product. Its germination came about when Carnahan and Castles noted on client visits that people were making copies of video in different formats because various executives used different equipment to view the programs. So they created a centralized data center where videos could be sent, converted to the necessary format, and transmitted to each user. Soon they also noticed that clients had banks of VCRs making copies in various formats for end-users.

While early on Flip Factory had some hardware, soon the product totally became software-based. In 2004 Anna Greco took over flip factory support to help clients realize its full potential. Today she is responsible for Client Services across all Telestream Business Units. Flip Factory, along with the enterprise products that followed was primed to spring into action on its own. Its simplest duty was to watch a folder and when a new file showed up it then transcoded and delivered it to a specified location. The Telestream team continually worked to improve their product and make it more indispensable. Soon it would not only transcode a file, but it could process, that is modify and make changes to the audio and video and deliver that file with differing parameters to multiple locations. The system was even able to run QA checks on the media it was processing.

More flexibility added to a product usually begets request for even more. So Telestream launched its next generation of enterprise product, Vantage.

I know I'm selling Vantage short. Please pass along some non-marketing verbiage to describe it in more detail.



Technological Bridges

I've got two diametrically opposed versions of the Apple Microsoft story. Which one, or parts of each are true?

V1: At one point, Telestream's prowess at transcoding caught the eye of Microsoft, who wanted a system to convert Microsoft media to Apples Quicktime. The two juggernauts would not talk to each other. Apple at the time claimed they didn't see any use for it. Microsoft saw the benefit, but they didn't want to do it,

so they pointed folks to Telestream. This led to Telestream launching Flip for Mac. To stop any legal entanglements with Apple, Telestream gave it away. But then many of the extra features that were found on enterprise products could be upsold as extras on the basic Flip-for-Mac software. Today Flip for Mac is about 1/3 of the business Telestream does. Telestream has found that while its enterprise business faces many of the cyclic spending nature that other television equipment vendors do, the desktop business is a fairly steady. A big reason for that is today many in all walks of business have to deal in video.

V2: When the team at Apple Computer was struggling to compete with the Windows Media Player, Carnahan said, they asked Telestream to figure out how to make video formatted for that Microsoft program play on Mac computers. Telestream bridged the two technologies so successfully that Microsoft asked whether it could distribute Telestream's Flip4Mac product to consumers.



In 2011, NASCAR officials approached Telestream and asked whether it could create a high-definition instant replay system for its race officials. The Telestream system debuted at the Daytona 500 in 2012. Time-stamped images from multiple cameras were available for immediate playback, allowing officials to do things like check the order of cars, assess whether penalties are needed and even review action in the pits.

In 2015 the National Academy of Television Arts and Sciences awarded Telestream an Emmy for technology that solves many challenges of transcribing and editing closed captions for programming transmitted via television or Internet.

Telestream came along at a time when "broadcast quality" at all costs was no longer paramount. Since the dawn of broadcasting, as "professionals" in video and audio that mantra was only the best quality, and only that which didn't break any of the FCC's rules could go to air. The title technical director, early on meant not the person who only enacts the director's commands on a video switcher, but he was the person who was the gatekeeper; the one who would have final say as to if something was allowed to go to air. Early on TV receivers were not as robust and forgiving if a signal had a few issues. Many technical issues in a few instances could actually cause damage to equipment downstream from the switcher if a signal had egregious errors. Technology has rendered almost all those concerns inert today.

20 years and handing over the reins

Telestream's original investors held on to their interest until 2012, when they and employee shareholders opted to sell to San Francisco-based private equity firm Thoma Bravo. The firm's partners had set high expectations on financial performance, Castles said, and Telestream was able to meet those benchmarks in just three years. Then in 2015, private equity firm Genstar Capital acquired Telestream.

After running Telestream for 20 years, Castles gave them 18 months' notice of his plan to step away and retire in October 2017.

Castle and the company did a search for newly created post, Kyle Ford was hired in January 2017 as president and COO. Ford was to expand the company's market penetration and help establish the new live streaming products that Telestream introduced in 2016. He was tasked with directing the tactical implementation of operational strategies. He was a Stanford alumni and went to the Air Force Academy. He reported directly to Telestream CEO Dan Castles. Telestream had been in discussions with Ford for a few months. Telestream had hoped that Ford would bring a fresh perspective to Telestream's go-to-market strategy and customer relationships.

Castles deliberately chose to pick someone from outside the traditional broadcast sector. Castles at the time said, "we've launched some live products that go beyond the broadcast and cable market that we know." But as had Grass Valley Company's experience Ford was living in Silicon Valley and wouldn't move up to the area. None of the candidates would that Telestream talked to. So Ford commuted from the bay area. In reality he wanted to work remotely. He started by spending four days a week up in Grass Valley, and then gradually shrunk it down to

two days a week. His life had swallowed him up where he couldn't be here 4 days a week. He had kids that were 10 and 12 years old. After six months it wasn't working to anyone's satisfaction, and he was fired.

When Telestream went looking again for a replacements it got zero applicants locally. They looked in Sacramento, but they found that most local entrepreneurs were happy just to meet payroll. A problem with getting qualified managers equipped to handle a high tech company with worldwide operations is that if they live in the area they don't have a peer group locally. The company eventually settled on Scott Puopolo. He lived in New York City. Again no one would live here.

A problem with the Grass Valley area is hard to scale a business from here and it's too expensive to move here. So the area recycles a lot of the locals.

The dilemma Castles faced was he felt it was time to retire and he naturally was compelled to leave the company he grew and nurtured in good hands. "Knowing the right time to retire is not easy," he said. He added at the time, "However, I am confident that Scott is the right man to take this business to the next level. We have achieved a lot over the last 20 years, growing from a small team of 11 to over 400 bright and dedicated employees all over the world. I look forward to working with Scott, the board and the rest of the executive team on a transition which ensures that the next 20 years are our most successful ever." This time a bit more hopeful in October 2018 Dan stepped down as CEO also.

But Poupolo also couldn't pull it off from the east coast. In 2017 Telestream bought a company in Boston to give Scott an East Coast base. That greatly shifted Telestream's center of gravity to the Northeast. The company was IneoQuest, which billed itself as a video quality monitoring and analytics solutions for content distribution company. When it acquired IneoQuest, Telestream used the IneoQuest name as a product brand for a short time before re-branding the products as "Telestream IQ Solutions."

After all that in February 2020 Poupolo decided to step down as CEO anyway.

After spending time with his wife and daughters, doing some fly fishing, exercising, volunteering at Sammie's Nifty Thrift Shop and traveling during his retirement, while still serving on the company's board, Castles said he decided to take on the role of CEO once again when the company board suggested he take it. He said "This is just another chapter. I feel fortunate to be in a situation where I've had a taste of retirement for a couple years," he said, acknowledging that he will someday return to that space. "I'll get there again." Castles said his role will be much more operational this time around as CEO.

There were a couple of reasons for this. The company had reformed its business structure, organizing its functions into separate business units. A big reason for this was the July 2019 Telestream acquisition of the Tektronix Video Test Group. Yes, that is the same group that Castles used to run. The group that made monitors and video test equipment. Charles Dunn was running the division. He goes way back with Tek, as he was involved with launching Tek's Profile server. Tek has engineering talent in both Beaverton and Bangalore India. When the acquisition happened Puopolo was still head of the company, and since Tek didn't know Puopolo, Castle was asked to go up and meet with the employees as the face of Telestream.

Are the Fortive/Tektronix or Telestream employees, or stand alone Tektronix employees from the Fortive carve out?



Under the terms of the deal Tektronix's parent company Fortive and private equity firm Genstar Capital, which acquired Telestream from Thoma-Bravo in January 2015, entered into a "co-ownership arrangement" of the combined and enlarged company. Presumably this co-ownership arrangement lets Genstar spread its risk, while allowing Fortive to participate in any potential future upside. The tie-up with Tektronix was Telestream's third broadcast test and measurement-related merger and acquisition deal. Castle said that the main reason for the Fortive acquisition was to get their Sentry monitoring product, which competed against their IneoQuest product.

Less in NC, but the industry influence increases

While Telestream continues to strengthen its position as the dominant industry leader, with all the company's acquisitions Telestream's Nevada City employees now feel like their facility is now an outpost, even with Dan back,

Over the last few years the company has acquired Popwire, Vara Software, Anystream, CPC, Panda Stream, Vidcheck, Eco Digital, and Masstech. While the company was able to self-finance every one of those purchases, which bodes well for the future of the company, there is a lot of company "mass" not in the local area. To acquire enough services of programmers the company ten years ago opened a satellite office in Oakland.

A big reason for that is that while only 120 (verses 165 in Nevada City) of the 500 total Telestream employees are at IneoQuest the company's CFO and HR department is there. In addition 50% of the company's total engineering effort is done away from Nevada City. The concern that the area will hold on the Telestream operation is on a lot of people's minds. Over the years Castles has had three of the company's boards concerned about their location here. California is a tough business climate and it's overtaxed.

Landscape today

Telestream is a different company than it was 10 years ago, as traditional TV clients are less than 50% of the customer base for Telestream. Products used to be file-based, now they're increasingly streaming based. Even a traditional client like NBC, which is still one of the company's biggest customers are doing things quite differently

The looming 800 pound gorilla is a model that is rapidly replacing how television and media production is done; Software As A Service (SAAS). We will look at that in the next chapter. Telestream as a company has played closer to that realm, long before it became the new business model craze. But Telestream's board thinks they are not enough into SAAS yet. Most sales are still perpetual licenses on clients' machines. SAAS is about 40% of their business today. They are trying to get to 70% in the next few years. While the Grass Valley Company is heavily rushing into SAAS, there are those who think that Telestream is better positioned to thrive in the SAAS universe than Grass Valley.

While SAAS is geared towards the creation and transport ends of video production, Telestream's native habitat, the receiving and viewing end is growing also. While more and more content are being created people want to view all that on more devices and the number of viewing formats is getting more and more complicated.

I know the saga continues; any updates?

AJA Video Systems

- John Abt grew up in Colfax. Also saw Grass Valley?
- Holds BS and MS degrees in Electrical Engineering from California State University Sacramento.
- Went to UC Davis also?
- Upon graduating from college, he spent eight years working for KXTV, the Sacramento CBS affiliate. He worked in master control and that is where he met his wife Darlene, also a broadcast engineer at KXTV.
- Got a job at Eigen but didn't like it. (When?)
- He got a job with GV working on switchers.
- Abt spent eight years working at Grass Valley Group just as the digital revolution in broadcast was taking off.
- Engineer on 1600?
- He then left to start AJA.
- John Abt started AJA Video Systems with his wife Darlene in 1993
- To develop simple digital parallel to serial and serial to parallel converters.
- Many of AJA's products at their core continue to bridge connectivity and simplify pro video workflows through video up, down, cross format conversion.

- Son's name Abe Abt (supposedly namesake of company)

- John Abt said, "You really have to look into the future when you're building a long lead product. Launching a new line can take two to three years of development, and you hope that by the time you hit the market, you've hit the right timing. We know we've hit the right note when we continue building on a family of products, and thankfully we have done that with our Ki Pro, KONA, FS, Io, KUMO, Minis and several other lines. You've got to find the right balance of form factor, functionality, feature support, ease of use, price, and performance—and sometimes a bit of luck too. Having many years of experience in the business makes this balance and timing easier to predict, but it's never an exact science." One advantage to being in Grass Valley is access to great engineers, thanks to deep historical roots in engineering innovation.

- The Kona card is what made AJA.

- The next turning point for AJA came in 2003 when a collaboration with Apple led to the debut of the IO.
- AJA developed the hardware and Apple developed the software. Several successful collaborations with Apple followed, including the Io HD which was the first hardware product to natively support ProRes.
- It offered desktop power in a mobile video I/O device.
- The Io XT was AJA's first Thunderbolt device.
- The Ki Pro was the first affordable HD ProRes digital recorder and player.

- Pinnacle had a branch up in grass Valley for a while.
- They had a half a dozen folks up there.
- Dar Sarazi worked on a switcher for Bob Wilson.
- Another guy who was with pinnacle up in grass Valley was Dick Jackson.
- That office gets shut down and some of the guys go back down to Silicon Valley.
- One guy ends up at Apple which needs a conversion card for their system.
- They didn't want anyone who would compete with them.
- Except that the pinnacle guy tells Apple that Abt already has the Kona card.
- The card was the only Apple compatible card for years.

- Still a hands-on engineer in product development, he designed the two 12G-SDI KUMO routers announced at NAB 2018.

- Bill Bowen was the first software engineer and joined AJA in 1998.
- "I had worked together with John at Grass Valley Group, and when I left to do consulting, I rented a desk in AJA's office in the old Litton Building. I knew I wanted to work with AJA, and once they needed software development, I was able to get in on the ground floor.

- Jason McLachlan, Electronic Engineer in Hardware Design. Started at AJA in 2000. "The company has grown 10x since I first started working at AJA in the year 2000. Finishing my engineering degree at the time, I wore two hats as a combination hardware engineer and IT administrator.

- Grown from a small company where everyone did a little bit of everything, to a
- 200-person company with a lot of very highly specialized engineers on staff.

- AJA remains actively involved with industry standards organizations like AIMS (The Alliance for IP Media Solutions.)
- AJA recently announced SMPTE ST 2110 support for KONA IP and 10GigE support for 2K/HD video and audio over IP using the Io IP or Avid DNxIP, as well as new IP Mini-Converters for HDMI display at point-of-use.

- BD - I frankly think Telestream is better positioned to move to SAAS than GV, but only time will tell.
- I would agree that AJA is the strongest and most diverse in hardware.

- Cameras, however, may not be the winner for them as Canon seems to be very serious in that market and they have enormous resources.
- AJA has a mix of video products, but they also take on projects for others.

Branching Away from TV

- Video is now done by everybody.
- But Cinemagraphy is a different business using the same technology as the broadcasters, but it has the potential of multiple showings.
- The primary difference between cinematography and television is that primetime feature shows are really a cinema product using traditional TV for distribution.
- this means the traditional Nets might have a life in the Cinema biz without their traditional distribution channels, therefore bye-bye affiliates.
- NAB has not been about TV in about 20 years NAB is not the industrial CES.
- The difference between baseband, broadcast, cinema is to look at the real time element.
- Broadcast used to all be live-need wide base band to be at its best.
- Sports keeps the old model, now a hybrid, alive.
- But will the politics now in sports kill it?
- The working class and patriotic are the vast number of viewers. The wine and cheese viewers are much less passionate.
- At one point GV became the de facto master control switcher in China.
- With the recent pandemic workers are relocating in record numbers. Democratizing the talent pool will create a network effect by spreading Silicon Valley-like innovation in new geographies.
- The end result might be a redistribution of the Valley's influence benefitting other regions while the former adjusts to a new reality.
- The diffusion of Silicon Valley's innovation culture will also make it less unique unless it learns from other ecosystems as well.
- At the same time, the Covid-induced "pause" has given the world an opportunity to weigh the momentous impact of Big Tech on democracy, privacy and freedom of speech.
- Large technology companies are increasingly coming under scrutiny

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