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Enter the Fatality

WITH JOHN TOBIAS, MORTAL KOMBAT

By Patrick Hickey Jr.

Finish Him! Two epic words that cemented the work of Ed Boon, John Tobias and the rest of the team behind Williams' *Mortal Kombat* in pop culture lore forever. However, thanks to a plethora of gore and fatalities that provided unparalleled fun—and controversy, the game was nearly taken off of store shelves before it became iconic.

Mortal Kombat isn't all about blood and guts though. A fantastical adventure with unique characters, it was a wild fighting game that gave birth to a new era of visual prowess in the medium. Characters didn't have to look like cartoons anymore. And they certainly didn't have to be tiny. Simply put, if you grew up playing games the likes of *Adventure*, *Haunted House* or even *Super Mario Bros.* in the '80s, the humongous size of the characters alone in *Mortal Kombat* was enough to get you excited. In the end, the team told the world they were ready to get big—or go home.

In *Mortal Kombat*, everything just came together perfectly. Although the blood and guts get all the attention, the attention to visual realism, plot and gameplay innovation is just as important as the vicious fighting that takes place. On its own merits, it's a classic that gobbled up quarters in arcades and sold millions of copies on home consoles. Spawning dozens of sequels, spin-offs, comics and films, it's easily one of the most successful fighting game franchises of all-time.



Boon and Tobias' road to the series was far from straight-ahead, however. Although they both had an affinity for pop culture, this was a time when pitching a one-on-one fighting game was a rarity. Games like *Mortal Kombat* didn't exist. Prior to *Mortal Kombat*, Tobias was known for his work on the *Smash TV* series with Mark Turmell. Boon, on the other hand, was creating pinball games.

"I was 19 when I was hired at Williams/Bally/Midway straight out of art school, but I had worked professionally for a couple of years as a comic book illustrator," Tobias said. "Fortunately, I was a video game junky and arcade rat growing up, so I knew what I liked and what I thought I could provide. I saw some success with *Smash TV*, but it took a few years before we achieved the success that we did with *Mortal Kombat*. At that age, I don't know that many people are ready for that kind of success, but the work involved was so intense that it kept me grounded in the reality of production."

Although in his twenties when *Mortal Kombat* hit the arcades, Tobias was far from a stranger in the industry. Already working with a great the likes of Turmell, Tobias got to rub shoulders with other greats as well. As a result, Tobias sees his time on *Smash TV* as a pivotal one in the development of his career.

"Mark Turmell was heading up a new project that was an update to *Robotron* and was responsible for hiring me," Tobias said. "The great Eugene Jarvis became involved with what became *Smash TV* a little later on during its development. Both of those guys were huge influences on me in terms of their work ethic and passion for games. I still carry those values today.

"I looked at Eugene as this god of the industry, although he never carried himself that way. He always made himself accessible, which was very generous considering I was a 19-year-old kid. The department was so small that management gave us creative freedom to kind of



do whatever we wanted and they obviously had plenty of faith in guys like Mark and Eugene. I think that freedom played a large part in the department's past and future successes."

During the '80s and '90s, you couldn't go to an arcade without seeing a Williams/Bally/Midway machine. From pinball games to classic arcade romps, the company was innovative and successful, to say the least. Their idea of using digitized graphics, rather than pixel-based sprites in the *Mortal Kombat* games was one of the foundations for the visual look of the series, but Boon and Tobias took it to another level with their love of pop culture, particularly film. After the idea of a Jean-Claude Van Damme-licensed fighting game fell through (Van Damme ironically went on to play Guile in the *Street Fighter* film and *Street Fighter: The Movie* video game), the two began to flex their creative muscles.

Going for something completely different than what had been done previously in the fighting genre, Tobias and Boon, ironically created a game that is the polar opposite of Capcom's iconic fighting series. Although loosely inspired by the 1984 arcade game *Karate Champ* and Tobias' love of martial arts flicks the likes of *Big Trouble in Little China* and *Enter the Dragon*, *Mortal Kombat* definitely took

on a life of its own. It's crazy to think that decades later Street Fighter and Mortal Kombat still represent the Yin and Yang of the fighting game genre.

However, the game's aesthetics and almost fantasy plot were just one part of the puzzle. The digitized graphics and Tobias' idea of having the characters in the game be as large as possible was just a starting point for Mortal Kombat. Over time, the gameplay evolved past standard fighting game fare. Developed before Capcom's Street Fighter II hit the arcade scene, Tobias and Boon were working with a blank canvas. Make no mistake, both teams were redefining what a fighting game could or should be. In the case of Mortal Kombat however, they were using an entirely different brush. The combination of realistic graphics and wild attacks like fireballs, lightning and ice shards made it accessible to both kids and adults. At the same time, the team didn't know what they had early on.

"The majority of our development process was spent sitting at a desk in front of a computer for long hours every day. Not too different than it is today," Tobias said. "Even on a game like Mortal Kombat where we captured live actors in a studio, that portion of work was dwarfed by the rest of the software development process. I think it became more exciting once the games were playable and we began to get a sense of what the finished product was going to be like. Certainly, the most excitement came when the games finally made it into the arcade." But way before the game was released in arcades, Boon and Tobias knew that Mortal Kombat was missing something. What it ultimately got to fill the gameplay void not only changed the series but the video game industry as well.

"There was an odd lull at the end of a match in Mortal Kombat and we were looking to give the winning player a chance to kind of put a punctuation on their

victory. That's how it started," Tobias said. "A free shot for the winner as the loser was incapacitated. But, of course, that gave way to the 'What if 's'? We originally had planned for our end boss character, Shang Tsung, to decapitate the player's character in a single player match. But, we ended up using the frames to give the players a chance to do it to each other in a one-on-one match. Once we added that, we knew there was no going back and that was the birth of Mortal Kombat's Fatalities."

While fatalities changed the fate of the series and the fighting genre forever, Mortal Kombat is finely-layered. Although it's not cute like Mario or Sonic, it's got a look and feel that caters to everyone. Kids wanted to play it because it felt naughty and adults loved that it pulled no punches. That's only one part of its allure though. The game's story, in its essence, is about anything but brutality. A wild adventure with the future of the world in the balance, Mortal Kombat is about saving humanity from an insane force of destruction. It's all about the characters involved in the struggle as well. Although the first game only featured seven characters available from the start of the game, they were all memorable and continue to play an important role in the future of the series almost 25 years later. Without this iconic assortment of faces, it's possible Mortal Kombat isn't nearly as successful. Ultimately, it's almost like a Greek myth. From the clear good characters like Raiden, Liu Kang and Sonya Blade and the evil force of Shang Tsung and the virtually indestructible Goro, to the uncertainty of the ninjas Sub-Zero and Scorpion, Mortal Kombat's plot is far from linear. It's so easy to be pulled in a variety of directions.

"I love all my children," Tobias said. "But if I had to pick it would be one of the most visually iconic characters like Scorpion, Sub-Zero, or Goro."

While the violence definitely played a role in its initial success, the attention to character development and the widening of the world in future games made sure the series was here to stay. Now with over 30 characters, the original Mortal Kombat feels like a shell of the bloody soap opera it currently is. A mega-hit in the arcades,



Mortal Kombat was eventually ported to a bevy of systems, including the Sega Genesis and Super Nintendo. Once there, it became a colossal success but drew the ire of the United States government alongside other violent games like Doom, Night Trap and Lethal Enforcers, the other games responsible for the creation of the ESRB rating system. While Night Trap never garnered a sequel and was taken off shelves entirely for a time in the United States, Lethal Enforcers was a success and spawned a sequel, but in no way, shape, or form could be compared to the monster hit that Mortal Kombat and its predecessors became.

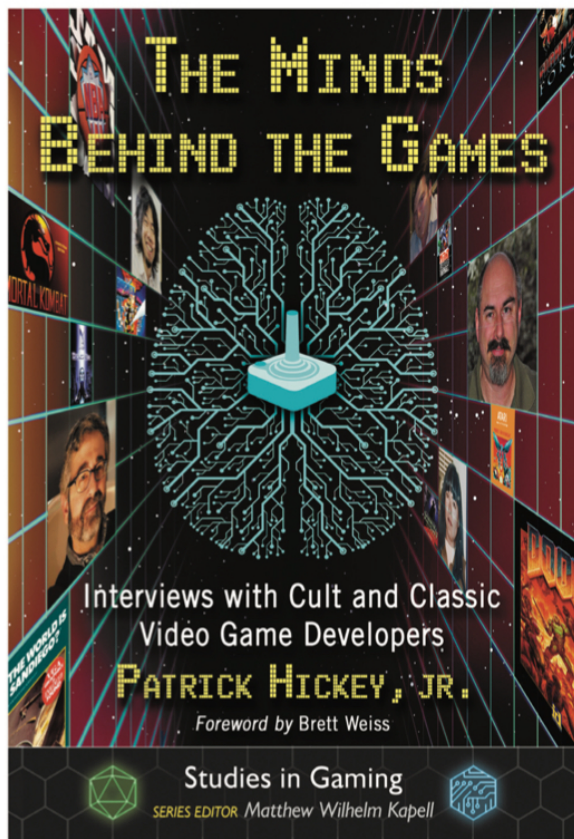
The same can be said for the Doom series, which has sold over 10 million combined units and has its own film. "Mortal Kombat survived because outside of the attention and pop culture hype, it was fun to play and the sequels continued to improve the core of what made the original so much fun," Tobias said.

Unlike Night Trap and even Lethal Enforcers, the Mortal Kombat series also had fans that fought for it. They played it in arcades and on consoles—in droves. Over 20 years after its original release, the game is still one of the most popular video game series of all-time. From the original digitized graphics to crossovers with DC Comics, the series has some of the most dedicated fan bases in all of gaming.

"It's amazing how passionate fans still are about the original arcade games. They've combed through every pixel and

Images provided by John Tobias





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“From arcade rats to indie developers, Hickey gives an intimate look at the personalities behind gaming with the passion of a fanboy and the attention of a scholar.”

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“This is a must-read for classic gaming fans and anyone interested in learning about the thought process of game developers.”

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line of code,” Tobias said. “I think because of that, everything there is to know about the original *Mortal Kombat* games is pretty much known.”

Although Tobias left the series after *Mortal Kombat 4*, he’s gone on to work on a variety of different games including *Tao Feng: Fist of the Lotus* and as an employee of mobile games giant Zynga continues to influence gamers of all shapes and sizes. The fact that he played an influential role in the *Mortal Kombat* series, however, which has sold over 32 million copies as a series, cements his place in video game history. “I was part of something that brought fun and joy to a lot of people,” Tobias said. “That will always feel good.”

Looking back on his career, the humble Tobias believes the game’s success had a lot to do with the time it was released. “It was created back in a day when as developers we were able to create something special with a small group of people and no outside interference,” Tobias said. “No one telling us how to do our jobs. No focus groups or marketing departments. Just programmers, artists and a black box that got wheeled into an arcade. There is rarely such a pure connection between developer and player and that being the foundation of the series is one reason why people are still in love with it.

“We were special in what we brought to the game’s development, but certainly we were also lucky for being in the right place at the right time. The technology and hardware we used to develop the original *Mortal Kombat* was a product of the software and mechanical engineers who created it. Ed Boon and I just happened to be wrapping up our previous games and we both had a desire to create a one on one fighting game. I happened to be a kung-fu movie fanatic and Ed was a genius programmer. Management was looking for a new game quickly and we were dumb enough to agree to do it. The rest is history.” With all of the success and controversy behind it over the years, *Mortal Kombat* has a legacy that can never be denied. However, that won’t stop Tobias from having a special and specific way he’d like his time with the franchise to be remembered.

“*Mortal Kombat* was born at a time when games were transitioning from a form of entertainment geared toward kids to one that encompassed older players as well,” Tobias said. “I think we recognized that. People who played the game did so because it was fun to play, but they may have initially been drawn to it because of its pop culture notoriety as being ultra-violent. Even the newer iterations of the game today continue to take advantage of that notoriety by not backing away from the ultra-violent aspect. They just make sure to continue to back it up with a quality game.” 

Patrick Hickey, Jr. is the founder and editor-in-chief of ReviewFix.com and a lecturer of English and journalism at Kingsborough Community College, in Brooklyn, New York. Over the past decade, his video game coverage has been featured in national ad campaigns by top publishers the likes of Nintendo, Deep Silver, Disney and EA Sports. His recently published book, “The Minds Behind the Games: Interviews With Cult and Classic Game Developers,” from McFarland and Company, has already earned praise from Forbes, Huffington Post, The New York Daily News and MSG Networks. He is also a former editor at NBC and National Video Games Writer at the late-Examiner.com. He is currently working on a followup, that already includes the developers of such iconic games as *NFL Blitz*, *Conker’s Bad Fur Day*, *Tony Hawk Pro Skater 3* and *West of Loathing*.

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Sega vs. Nintendo

HISTORIC FIGHTING GAME BATTLE

By Justin Francoeur

Thanks to the popularity of 1991's *Street Fighter II*, fighting games had become a hot property. It was only a matter of time before a savvy game designer would identify what made SFII such a hit, expand on it, and release it as a new best-selling game. Hence, October 1992 saw the release of Midway's *Mortal Kombat* in arcades across North America.

From the very moment it hit arcades, *Mortal Kombat* immediately drew the ire of concerned parents and news media outlets alike. In contrast to *Street Fighter II*'s 'cartoony' aesthetic, *Mortal Kombat* used digitized photos of actors to make the game look realistic. This, combined with excessive in-game gore and bloodshed, helped fuel the case that video games were desensitizing youth to violence and should be monitored. This really was a sign of the times, as the early nineties were best known for its witch hunts to identify and condemn everything and anything that may be corrupting the youth of America (for example, *Beavis and Butthead*, rap music, *Dungeons & Dragons*, heavy metal music, etc).

Had *Mortal Kombat* stayed in the arcades, this probably would've blown over, but when it was revealed that versions of the game would be released for the home console market, moral outrage hit a fever pitch. *Mortal Kombat* was released on both the SNES and SEGA Genesis on Sept 13 1993, and both companies took their own steps to address concerns about the game's violence. Nintendo's solution was to remove all the gratuitous brutality from the game (ex: removing heads mounted on pikes in backgrounds, omitting some of the more graphic fatalities, and recoloring the blood from red to grey. SEGA also made the same changes, but "accidentally" leaked a cheat code that could revert the game back to its original gory glory. Oops. Understandably,



this only made the media livid and sent SEGA's sales of *MK* through the roof (reportedly 5 copies of SEGA's *MK* to every one 1 SNES copy sold).

A Congressional Hearing was held. For anyone who's not familiar with American politics, Congressional Hearings are essentially fact-finding meetings used for legislative policymaking. In short, the results of a Hearing can have a major impact on a policy, which could ultimately become a law.

On December 9 1993, a joint Senate Judiciary and Government Affairs Committee hearing hosted by Senators Joe Lieberman and Herbert Kohl investigated video game violence. The underlying theme of this hearing was that video games were affecting the youth of America by desensitizing them to violence and the consequences of violent acts. The end goal was to urge the video game industry to regulate itself and offer some sort of ratings system. Naturally, *Mortal Kombat* -- the topic du jour -- was front and center on the radar. They zeroed in specifically on Sub-Zero (pulling head off body) and Kano's (rip out heart) fatalities.

Mortal Kombat wasn't the only game being attacked. Also being scrutinized were SEGA's *Night Trap* and *Lethal Enforcers*. Looking back, it seemed like SEGA was the primary developer being investigated.

The first two hours of this Congressional hearing are about as dry as you'd expect them to be: Lieberman and Kohl both make opening statements about the importance of video game content regulation, a panel of academia (mostly experts in the field of child psychology and youth development) are brought in to explain that video games are influential to children and need to be monitored, and then Howard Lincoln (Senior Vice-President



of Nintendo America) and Bill White (Vice-President of Marketing and Communications of SEGA of America) are called in to testify. That's when things got a little 'heated'. There's a bit of history with these two executives. Bill White was Nintendo's former Director of Marketing and Corporate Communications and left for SEGA in the summer of 1993.

Seemingly, Nintendo came in with an agenda -- they touted that, thanks to their strict guidelines, they'd never release a game with excessive violence or sexually suggestive content, but watch out for SEGA (who has exactly zero scruples about this kind of stuff). Notable quote from Howard Lincoln: "For the record, I want to state that Night Trap will NEVER appear on a Nintendo system." (Night Trap is now available as a download on the Nintendo Switch console as of summer of 2018).

SEGA started on the defensive, and opened with a scripted response stating that very few children purchase games for their system, citing that the average SEGA CD player was 22, the average SEGA Genesis player was 19, and fewer than 30% were under the age of 13. SEGA also pointed that they had already taken precautions to rate their games and allow the consumer to be aware of their ratings system.

Nintendo then pointed out that SEGA's Night Trap had no warnings or labels, they only adopted a rating system after they took heat for Night Trap, and that SEGA having such a low percentage of young players is utter BS.

SEGA countered with the idea that Nintendo isn't as innocent as they appeared to be, presenting a few Nintendo games that appeared to have escaped Nintendo's 'strict guidelines'. White then showed clips demonstrating that Nintendo and



SEGA's versions of Street Fighter II are identical (which, if you think about it, fails to prove anything, since SF II is mainly cartoon violence). They also explained that since SEGA has entered the CD ROM market (SEGA CD), and Nintendo hasn't, it only makes sense that SEGA would pursue a more 'adult' audience. White then explains that the SEGA CD market is about 60% adults, which is why they focus on releasing more 'mature content' games.

Nintendo retorts with "I didn't realize that the hearing was focused on market share, I thought we were talking about regulation of violence, but my colleague must think differently". They explained that having a ratings system is nice, but it'll require retailers



to enforce it.

Senator Lieberman confronts SEGA about its choice of releasing a game like Lethal Enforcers, which uses a realistic magnum .45 lightgun prop, considering America's recent climate concerning gun violence.

SEGA attempted to deflect the question by pointing out that Nintendo also used a lightgun-like weapon - the SNES Super Scope.

Lincoln points out that the Super Scope looks nothing like a handgun and further states that SEGA's handgun is called 'The Justifier'. Members in Congress laugh. This pretty much kills any momentum White had been building.

Everything wraps up with a stern warning from Lieberman advising the industry leaders in attendance that they'd better come up with their own rating system that meets everyone's concerns, or else Congress would have to. The ESRB ratings system came into creation shortly thereafter.

WINNERS AND LOSERS:

Well, the big winner here would appear to be Howard Lincoln (former lawyer who was now VP of Nintendo). He spoke confidently with righteous concern, and it appeared that he had won Congress over in believing that Nintendo was harmless and excellent at self-policing themselves. This would've made Bill White the 'loser', however, considering SEGA was the main target in this hearing. White's poorly-prepared defenses could've been attributed to nerves and the "holy crap, I'm testifying in a Congressional hearing" factor (honestly, can you blame him?).

From another perspective, SEGA did sell nearly 2 million copies of a nearly spot-on port of Mortal Kombat (including gore and all), and nary got a slap on the wrist for it. I guess it's just a matter of perspective on who was the true winner this round.



My Experience as an Expert Witness

CAPCOM VS. DATA EAST

By Bill "The Game Doctor" Kunkel

By 1993, the last thing I was looking for was an expert witness gig facing off against yet another of the most popular and powerful software developers in the business. So of course I wound up working the expert witness deal for tiny Data East against the all-powerful Capcom, whose *Street Fighter II* had ignited a revolution which made 2-D fighting games the dominant genre in the electronic gaming world.

I was working in my home office when a gentleman named Michael Hayes called. He was from the law firm of Fenwick & West, a name even I recognized as a heavyweight player. He told me they were defending Data East, which was being sued by Capcom.

"That figures," I remember thinking. Capcom's PR people had always been very good to me, whereas I didn't know anybody at Data East. And, of course, Data East was a relatively small player compared to Capcom, a company so powerful that it tipped the balance of the 16-bit videogame wars when it made a version of *SFII* available on Sega's Genesis after having previously played exclusively with Nintendo.

Michael explained that the games in question were Data East's *Fighter's History* and, of course, Capcom's *SFII*. As it

happened, I had just seen the Data East game at the Kwik-E Mart down the block, so I promised to check it out and get back to him.

About three minutes into playing *Fighter's History* I figured I didn't even have to go home. I phoned Michael from a pay phone outside the convenience store. "I'm sorry," I told him with no small amount of relief. "But if they're going on 'look and feel' I don't think you've got a shot." "Look and feel" was one of the traditional standards by which copyright infringements were obtained and it's pretty much what it sounds like: Does the product look and feel the same as a pre-existing product? In this case, there was no question that *Fighter's History* looked and felt pretty damned much exactly the same as *SFII* - but only in the sense that, to a non-comic book reader, "all these superheroes look the same."

"Look and feel's not the issue," he assured me. Capcom was basically claiming that all of the "realistic" 2-D fighters from companies such as Data East and SNK were infringements on its own *SFII*. I put the word "realistic" in quotes because the *Mortal Kombat* games, which were almost as popular as the *SFII* franchise, were considered exempt from copyright infringement by Capcom.

The reason given by Capcom for Midway's clearance was that the fighters in the *MK* games were "fantasy characters," unlike the real world fighters in its franchise. Of course, hard as I thought about it, I could never recall seeing a real world martial artist

levitate into the air, turn themselves upside down, then whirl their legs like helicopter blades in order to rocket across the fighting surface to deliver a knockout blow to an opponent.

The fact was that most of the *Street Fighter* characters were about as realistic as the fighters in a thousand Hong Kong martial arts movies. The so-called "chop socky" film explosion in the '70s following the international success of Bruce Lee was hardly producing tutorials in the execution of legitimate karate, kung fu, judo, etc. Like contemporary neo-classic martial arts films such as *House of Flying Daggers* and *Crouching Tiger, Hidden Dragon*, these early films were more fairy tales than gritty unarmed combat films such as the later "Bloodsport" series,



which didn't come along until 1988.

I have always believed that the real reason Capcom gave *Mortal Kombat* a bye, however, was its unwillingness to face the legal guns which Midway (owners of the original arcade license) and Acclaim (holders of the home gaming rights) would surely bring to bear in such a case.

There were, of course, other players in the woodpile as well. Several smaller companies in the coin-op business were also making 2-D fighting games like Data East and felt either immediately or imminently threatened by Capcom's attempt to pre-empt the field. Then there was the rumored personal animosity which, at the time, often played a large part in dealings among Japanese companies. And, as it happened, Capcom's Japanese executives were said to be furious over the fact that the *Street Fighter* development team had recently defected to SNK.

But the bottom line was the same as it had been in the Magnavox vs. Atari case - Capcom was trying to lock up a genre. I may be a fool, but I'm a stubborn fool, and the issue of genre plundering always gets my hackles up.

I signed on and immediately went to work, researching the various legal points that would be used in Data East's defense. First, we attacked the idea that the characters in the *Street Fighter* pantheon were original creations which should belong solely to Capcom. A mature Internet would have been a big help, but I did have a rather large library of anime and manga, Japanese animated films and comic books. One by one, the characters that populated SFII were revealed as types rather than archetypes. I recommended the lawyers read the book *Manga! Manga! The World of Japanese Comics* by Frederik L. Schodt, then the leading English language work on the subject (it also contained a drawing of an old manga character who looked uncannily like Bison). The lawyers liked the book enough to hire Schodt himself as an expert witness. Capcom's lawyers maintained that specific characters in *Fighter's History* were doppelgangers for *Street Fighter II* combatants, but we were able to dig up a considerable body of evidence to prove that the characters Capcom was claiming as its own creations were in fact icons, plucked from the grab bag of Japanese culture and literature.

Another issue involved the use of play mechanics. Capcom maintained that certain moves in *Fighter's History* duplicated specific fight sequences, known as "combos," in SFII. Now this was an important issue since it implied that Data East was drawing unfair advantage in terms of player familiarity on the back of their game. This was an especially tough nut to crack, in that it was pretty obvious that Data East had probably done just that.

I argued, however, that there was a certain ergonomic logic to these moves that placed them beyond the realm of individual ownership. If, for example, you wish your fighter (who is on the



left side of the screen) to execute a forward flip, it only made sense that the button mashing and controller shifting duplicated the motion desired of the surrogate fighter. A forward flip from the left side of the screen should obviously be executed by hitting the directional controller in a rapid left-up-right fashion. A right-up-left sequence would be anti-intuitive and unplayable. The fact that other companies' games were duplicating SFII's command system mostly demonstrated that it was a sensible system - that and the fact that there were a lot fewer buttons on coin-ops and home games in the early-'90s, thereby limiting the possible number of combination moves.

I think I was an important witness in the Pac-Man trial and I probably earned Galoob a few bucks in that litigation. But this trial was my shining hour. I got to participate in numerous skull sessions with the excellent lawyers at Fenwick & West, breaking down the arguments of the Capcom lawyers and offering insights into the game business that very few people could have provided. I was also solid on the stand through several rounds of cross-examination, unlike the poor kid who wrote the *How-to-Play* strategy guide for SFII. He was Capcom's big expert witness and fatherly Bill Fenwick gutted him like a fish. It was so bad that the Capcom legal posse requested a recess and retreated into a room with the hapless witness in tow.

We speculated on whether he was getting worked over as we ate lunch during the break

In retrospect, however, all my articulate testimony and straight edge logic almost got shut down before I could deliver it. Apparently the judge had seen the games and, being an elderly gentleman, must have thought the case was a slam dunk. Indeed, the games must have appeared identical to someone not versed in videogames - they had, after all, appeared almost identical to me at first glance.

His Honor walked into the courtroom with a look on his face that said: "This one is over." He announced he was prepared

to rule immediately and sweat broke out on the faces of the Fenwick & West lawyers. "Mr. Kunkel has been brought here at great expense," they pleaded, putting me over as the last word in the games business, selling me hard. And I didn't blame them;



I was with KKW when this case came along and they were paying us massive bucks on an hourly basis for research, analysis and testimony.

I wondered if I was going home early, but the judge looked irritated then gave in, allowing that they would hear my testimony. My first appearance was good enough that the judge, to his credit, reconsidered his position. He noted that there were obviously more facets to this case than he had initially realized and so we all sat down to play for several days of testimony and deliberation.

Fenwick and West seemed very well pleased with my performance, but there was one thing about me that scared the hell out of them - I absolutely sucked at 2-D fighting games. To be honest, I pretty much hated them and this period of dominance by the 2-D fighters was tough for me to deal with. The idea that I would practice these elaborate moves for hours was about as exciting to me as watching grass grow.

Somewhere, in their heart of hearts, I know that my lawyers had a terrible fear that, unable to dent my rep as an Expert, the Capcom lawyers would try a desperate gambit.

"You are such an ... 'expert' at these games, Mr. Kunkel," they might say, "why don't you come over here and show us how well you play the game itself, hmmm?"

Of course, Fenwick & West wasn't spending its own money - the bucks came from Data East, which was not only fighting for its life, but for the lives of several other companies. Millions were spent solely to produce elaborate split screen animations comparing and contrasting the "original" characters from SFII with the supposed copies in Fighter's History. Every day the trial continued, the billings continued to swell.

So what were a few thousand bucks to teach Bill Kunkel to become a top notch SFII player?

Their solution: bring in a SFII gunslinger to tutor me. He spent two days, somewhere in the neighborhood of a \$5,000 billing, teaching me to play the game at an acceptable level. I was better than he expected, but my lack of combo knowledge appalled my sensei. So hour after hour, a mental meter ticking away in my head, I learned how to execute every character's special moves. By the end of this grueling training period, I was good enough that my mentor described me as "not awful anymore."

Of course, I was never



called upon to go anywhere near either of the games in court. Everything went like a dream and, in the end, Capcom's case was kicked out of court, based on the arguments we had developed. It felt good-and prosperous.

Unfortunately, I guess Fenwick & West may have been a little too liberal in their willingness to spend Data East's money as that venerable game company basically went out of business shortly thereafter, despite the win.

I think the most ironic thing about the whole deal was the fact that Data East had actually invented the martial arts genre with its '80s arcade game, Karate Champ. When another company (Epyx) copied Karate Champ down to the last pixel, Data East sued them.

They lost when the Ninth Circuit Court ruled that all karate games would be more or less the same, just as all baseball, football, basketball and other sports games would inevitably share common characteristics. In fact, it was that very ruling that led Data East to believe it would have no trouble producing a SFII type game, since all 2-D fighting games would be "more or less the same."

CODA: On the way home, my flight was delayed and I decided to kill some time in the airport arcade. Bursting with about 8 hours worth of personal tutelage at the hands of an absolute



friggin' street fighting beast, I felt like Luke Skywalker after Yoda taught him to levitate the spaceship out of that swamp.

I walked up to the latest SFII incarnation (probably Championship Edition) and plunked down my token on the control board since a young kid was already playing. He offered to go two-player and, of course, he cleaned my expensively-trained clock.

The worst thing was the way he would giggle every time he landed a blow, the little snort. Naturally, he was on my flight and the whole ride back to Vegas from California he would nudge his parents, point at me and crow ("THAT'S the guy I beat at Street Fighter 2, mom! Dad! Man, I wiped him OUT!"). 🎮

Bill Kunkel helped invent video game journalism when he and his friend Arnie Katz published the first gaming column "Arcade Alley" within the pages of Video Magazine in 1978. Teaming up with Joyce Worley, the trio launched the wildly popular Electronic Games, a monthly magazine that still sets the standard and had a circulation of more than 250,000 during its peak. Within those pages, the "Game Doctor" emerged, becoming one of the most iconic alter-egos within the video game industry.

Before his foray into video games, Bill wrote for Pro Wrestling Torch and multiple comic books for Marvel, Harvey, and DC Comics. The EGM trio also formed Subway Software, which developed Batman Returns and The Simpsons: Bart's Nightmare for major publishers. Kunkel authored his memoir, "Confessions of the Game Doctor," covering his early days in the gaming industry. Until his demise in 2011, he wrote articles for J2 Games and Good Deal Games.



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The Untold Story of Highlander: The Video Game

(NO, NOT THE ONE YOU'RE THINKING OF)

By Warren Davis

If ever there was a licensed property that would lend itself to becoming a video game, Highlander was it! You've got a collection of immortals who challenge each other to sword fights to the death (by beheading, no less!), over the course of centuries, until there can be only one. What more could you ask for?

The original film came out in 1986 and told the story of Connor MacLeod (played by Christopher Lambert). While it didn't do very well in its initial release, it slowly developed a cult following. And it managed to inspire a sequel in 1991, *Highlander 2: The Quickening*. A TV series followed in 1992, starring Adrian Paul as Duncan MacLeod, a fellow clansman to Connor, who makes an appearance in the pilot. The series was pretty popular and lasted for six seasons. Its last episode aired in May 1998.

Meanwhile, the film series continued Connor's story with a third entry, *Highlander: The Final Dimension* in 1994. Then Connor and Duncan both appeared in the film *Highlander: Endgame* (2000) and Duncan got his own TV movie in 2007 with *Highlander: The Source*. There was also an anime movie in 2007, *Highlander: The Search for Vengeance*. It's probably best not to mention *Highlander: The Raven*, a short lived series that ran one season after *Highlander: The Series* was over.

So where were all the Highlander video games during this time? Well, few and far between. In 1986, right on the coattails of the original film, Ocean Software released a Highlander video game for the Commodore 64, Amstrad CPC and ZX Spectrum home computers. It was roundly panned.

In 1995, *Highlander: Last of the MacLeods* was released for the Atari Jaguar system. It was based on an animated Highlander Series that ran between September 1994 and January 1996, while the live action Highlander series was at its highest popularity. *Last of the MacLeods* was more of an adventure game than an action game, and although it used motion capture and full motion animated video sequences, the graphics were considered crude and the combat controls left much to be desired.

Much later, in 2005, there was a slightly higher profile game announced. Eidos Interactive was to publish *Highlander: The Game* for PS3, Xbox 360 and Windows. Grand in scope, and taking advantage of the many improvements in video game technology through the years, this was believed by many to be the Highlander game that everyone had been waiting for. But, other than a teaser trailer released in 2008, nothing came of it. Square Enix, which acquired Eidos Interactive in 2009, announced in 2010 that the game was officially canceled.

But there's another story that has never been told until now. It's about a proposed Highlander game intended for the arcades. This game was to be developed by Williams/Bally/Midway at the height of their success in the 1990s after releasing a string of hits including *Terminator 2*, *Mortal Kombat*, *NBA Jam* and *Revolution*

X. I know about this game because I was the one who was going to lead the project.

Some backstory: Most people know of me as the designer/programmer of *Q*bert*, which was manufactured by Gottlieb and released in 1982. After Gottlieb closed its doors in 1984, I took a job outside the industry for a short while, but was contacted by Williams in 1986 and without hesitation, I came back to the video game world. I helped develop the software for Williams' new 256 color hardware, and also created a system for incorporating digitized images into their games. NARC was the first game to use that system, followed by *Trog* and *High Impact Football*. I left Williams for a couple of years, only to return when they lost a programmer in the middle of the development of *T2: Judgment Day* in 1991. *T2* was a huge success and our team (led by George Petro and Jack Haegar) largely stayed intact to develop *Revolution X* featuring Aerosmith. During this time, I continued to improve my digitizing system (which I called WTARG) to take advantage of faster processors and lower memory costs. Our video game hardware system improved over the years as well, adding features like hardware scaling and the ability to have multiple 256 color palettes. *Mortal Kombat* and *NBA Jam* both used WTARG for image creation.

After *Revolution X* wrapped in 1994, the question became (as was the case after every project) "What's next?"

Having spent the last 3 years working as a senior programmer on *T2* and *Revolution X*, making some design decisions but really not having responsibility for the overall game, I thought it was about time I headed up a project on my own, something I'd done at Gottlieb but never at Williams. I pitched a monster-themed game to management, but they passed. Not long after that, management pitched an idea to me. They'd been in contact with the owners of a property who wanted to turn that property into a video game.

In fact, it was the producers of the Highlander TV series that were talking to Williams! At the time of these negotiations, the show was doing well and about to enter its third season. In addition, the third film in the series, *Highlander: The Final Dimension*, was about to be released in theaters. So, the hope was that there was enough interest in Highlander that this project could actually fly.

As a Highlander fan, I was on board. Management, though, had some doubts. For one thing, the movie and film franchises were produced by different entities, so we wouldn't be able to use anything from the films, just the TV show. Also, management wasn't sure how much life the TV show had left. We needed about a year lead time before a game could realistically be done. What if the show got canceled in that year? It was a risk. Finally, to take advantage of our digitized graphics, we'd want access to the actual actors from the series. The producers couldn't guarantee us their participation. My assumption was that it came down to money - how much they'd be paid and who would pay for it;



although that's just a guess on my part since I wasn't involved in the negotiations in any way.

In its earliest stages, while the idea of a Highlander game was intriguing, it was far from a done deal. To be honest, I had some concerns about it myself, mostly due to the nature of the mythology. After all, it's a story about people who have to CUT EACH OTHER'S HEADS OFF. It's all about the swordplay in Highlander, and that's what I'd have to bring to the game. Technical challenges aside, my feelings were mixed.

Once, many years earlier, I got into a blisteringly heated discussion about the wisdom of having exploding body parts in NARC. It's not that I'm a prude, but photo-realistic images were a new thing at the time, and I thought maybe, since young children spend time in arcades, we should just consider the effects of potentially exposing them to those images. Some years later, T2: Judgment Day was attacked in a piece on Entertainment Tonight for encouraging kids to shoot cops. In our defense, that's

what the Terminator did in the movie. He never killed a cop, just shot them, most notably in the knee. So that's what he does in the game. Mortal Kombat pushed the limits of gory graphics even further. In fact, you could argue that Mortal Kombat created a new standard for what kind of graphics were acceptable in an arcade game.

Now here I was, considering programming a game where you cut someone's head off with a sword. I was conflicted, but I thought, "Well, at least I have management on my side." After all, they didn't seem to have any problem with the graphics in NARC, T2 or Mortal Kombat. For my part, I justified it the same way I was able to justify shooting cops in the knee in T2 - the game is based on an existing story, and if we're adapting it into a game, we need to tell that story. I also decided to make the beheadings bloodless, so as to render them (hopefully) unrealistic. I wasn't looking to push the graphic envelope further, but to take a step back from it.

While management continued talking with the producers, I set my sights on figuring out the technical elements of the game, specifically the sword battles.

The display system I used was the same one I'd developed for Revolution X. It was a pseudo-3D system (meaning it was actually a 2D system which couldn't do all the math required for a true 3D polygon system, so I took some shortcuts and played some tricks to give a limited version of a 3D polygon system). It had a virtual camera that could dolly in and out, side to side, and up and down. However, it couldn't pan, tilt or rotate in any way. All the visual elements were essentially billboards. And it took advantage of the scaling hardware in our proprietary graphics chip, so images would grow as you got closer and shrink as you moved farther from them.

As it turns out, our own programmer, Jake Simpson, was a bit of a swordsman, so he became the actor for my experiments. I digitized him in a variety of poses, performing a variety of both offensive and defensive moves, at enough angles to allow for smooth turning motions. I also wrote some code to have a player control one instance of him while playing against a computer-controlled instance of him. It was crude, but watching him circle around himself, then attack himself, was both comical and satisfying. I felt pretty confident I could get the look and "feel" of combat working the way I wanted.

Just as things seemed to be picking up steam, management started to push back on the violent nature of the game. They'd say, "Do you have to cut your enemy's head off? Isn't there something a little less extreme we could do?" And I'd respond, "Um.... no! It's part of the mythology. It's what makes this Highlander and not a bunch of random guys trying to kill each other with swords." After T2 and Mortal Kombats I and II, this sudden squeamishness confused me. But as it turns out, the controversies attached to both T2 and Mortal Kombat regarding violence were finally wearing management down. They were looking to distance themselves from any trouble. I began to worry that I would lose their support and the deal would fall through.

Another source of anxiety was the fact that weeks were going by and we still couldn't get a deal locked down with the producers. I started to become discouraged, thinking either Williams or the producers would back out any day. Or possibly both would just get bored at the lack of progress and throw in the towel.

Around this time, some friends of mine had planted a seed in my head about moving to Los Angeles. I really hadn't entertained that notion when it was first brought up, because I was pretty happy in Chicago and the idea of uprooting my family to move that far wasn't a pleasant one. But I began to hear from more and more friends – mostly actor friends – that they were planning to move to LA soon.

It also didn't help that I had doubts about the longevity of the arcade industry. This was late in 1994. Sega Saturn and Sony Playstation had just come out and were pushing the envelope of what home systems could do. Graphics cards for PCs were improving

to the point where it became clear they would soon surpass the capabilities of arcade systems. I started to believe that the arcade industry might really be over. Home systems were the wave of the future. Maybe I should get out before things get ugly.

These were the thoughts in my head as Christmas of 1994 approached. I felt as if I was being tugged in too many directions. It seems strange to admit, but I decided to hang my future on an audition for a play. I'd been part of the theater community in Chicago for years – it was mostly a nights and weekends pastime for me. I told myself that if I got the part in this particular play, I would stay in Chicago. If not, I would quit my job and go on an exploratory trip to LA for a few months. If things worked out there, then I'd come back and make the arrangements to move my family out west.


Long story short – the audition did not go well, and the next day I walked into Williams and gave my two weeks' notice. I think they were shocked. I was kind of shocked myself. This was all very sudden, but I had to admit, I got a real feeling of peace having made the decision. Strangely, the story doesn't quite end there. Just after I quit, I found out that I had actually been cast in the play! I was stunned to hear this. I was so certain my audition didn't go over well. Regardless, deciding to move to LA just felt right. So, I stuck to my guns and turned down the role.

The next day, I arrived at work to find Neil Nicastro waiting in my office. Neil was the President and CEO of Williams, and though of course I knew him, my interactions with him were kind of rare. And in my nearly ten-year history with Williams, he had never, ever, not once, come to my office.

He said, "Warren, you'll never guess what's happened. I have a signed agreement with the producers of Highlander. Not only that, they've given us everything we asked for, including shooting time with the actors. All you have to do is say yes, and we'll sign it, and it's a go."

Uhhhh... what???

I had something like an out-of-body experience. It was like the universe was messing with me. Saying "Are you REALLY sure you want to go to LA? Let me dangle these carrots in front of you just to make sure." Eventually, clarity and sanity returned and I said, "I'm sorry, Neil. I really am. But I'm committed to going to LA." He took it pretty well. Maybe he was relieved that now he wouldn't have to defend a game where players are beheading each other. At any rate, I stayed on for a couple of weeks, then left for LA. I went back and forth for a year and a half before my family and I made the move permanent.

I kind of hoped someone else at Williams might take on the Highlander project, because I believed in the concept, but no one else was interested. And so, unceremoniously, that was the end of the Highlander video arcade game. It never really got past the proof-of-concept stage. I still think about how that game might have turned out if I'd stayed and finished it. And I still hope that someday, the Highlander franchise will get the video game it deserves. 

Warren Davis is a classic videogame creator best known as the designer and programmer of the original O*bert arcade game. He also co-designed and programmed *Us. Vs. Them*, an innovative laserdisc title featuring scenes with live actors interspersed with sci-fi combat gameplay composited over actual flying footage. His other titles in the arcade industry include *Joust 2* (for Williams), *T2: Judgement Day* and *Revolution X* (for Williams/Bally/Midway). He was a pioneer in the use of digitized video. His WTARG system was used in many of Williams' most successful games, including *NARC*, *Hi Impact Football*, the *Mortal Kombat* and *NBA Jam* series', *T2*, *Revolution X*, and more. In 1995, Warren moved to Los Angeles to work for Disney Interactive on a variety of home titles. For a short time, he was an Imagineer with Walt Disney Imagineering. After Disney, he worked as a senior programmer on the console game *Spyro: Enter the Dragonfly*, and programmed an edutainment title, *The Lunar Explorer*, and spent some time at *Industrial Light and Magic*.



Hopping Zombie Vampires

AND THE LAST APOSTLE PUPPET SHOW

By Michael Thomasson

Many video game fans believe that 1992's *Mortal Kombat* was the first fighting game to use digitized sprite graphics. Others recognize Atari's 1990 hit *Pit-Fighter* as the premiere beat 'em up boasting the technology. The truth is that a rather obscure title, released mostly in Japan, beat them both to the punch! *Reikai Doshi: Chinese Exorcist*, which translates roughly to 'Priest of the Spirit World', launched in September of 1988 to little fanfare, despite being rather unique and fresh. The game was later released stateside as *The Last Apostle Puppet Show*, but its distribution was so poor and limited, it is doubtful that you encountered a unit.

Not only was it the first fighting game to use digitized graphics, it was also the first one-on-one combat game to make use of motion capture animation. Furthermore, it was the debut video game to feature claymation and puppets. Not hand puppets mind you, but more like marionettes dangling from strings, reminiscent of the stop motion animation. Compare them to bobble headed wooden puppets often seen in children's programming such as the famous Rankin Bass Christmas specials. Is it possible that the game's claymation inspired the Goro character in *Mortal Kombat*?

More fascinating is the back story of the game. In this far east fighter, you play as a Chinese exorcist battling your way up a mountain against an army of oriental demons known as Kyonshi, the Japanese equivalent of the Chinese Jiangshi. These demons are reanimated corpses that have frightened Chinese children for generations through lore and legend. The character for "jiang" translates to "stiff" implying that rigor mortis, or postmortem rigidity, caused the limbs of the corpse to stiffen, resulting in zombie-like creatures that have to hop about with their arms outstretched to maintain simple mobility. Ancient folklore



decrees that when such dire creatures happen upon the living, they kill and absorb the "qi", or life force. Hence, the term hopping vampire.


Such stories are thought to have resulted from tales of Taoist priests who would conduct a ritual to reanimate a cadaver and teach it to hop home so that it could be buried among family and friends. In truth, corpses were arranged in single file and upright, tied to long bamboo rods, and carried long distances on the shoulders of the living. However, when the bamboo expanded and contracted while in motion, it gave the impression that the corpses were hopping when viewed from a distance.

This unique angle allowed *The Last Apostle Puppet Show* to boast varied and novel character designs in a genre that is usually fairly stale and full of clichés. Regardless of the history, Home Data published a beautiful and technologically advanced title – especially considering that the company had only published a series of Mahjong and Shogi titles prior. That latter fact could

help explain the game's clunky controls. The moves are very vanilla, implementing only three buttons to jump, punch, and kick. It does allow for high kicks, ducking, and leg sweeps, as well as the unique ability to perform multiple attacks while airborne! Defeating your opponent makes your foe's head launch from its body as if foreshadowing the violence to come when *Mortal*



Kombat is eventually released. Unlike *MK*, no blood squirts... as puppets don't bleed. This game also served as a precursor for future fighters in other ways. For instance, a stork flies overhead dropping hazards and powerups, a system adopted later by SNK's *Samurai Shodown* series.

Even though *The Last Apostle Puppet Show* is not a household name, it was groundbreaking for its time and warrants recognition. *Old School Gamer* is dedicated to preserving video game history and wishes you only the best with your hopping zombie vampire encounters. 

Michael Thomasson is one of the most widely respected videogame historians in the field today. He teaches multiple college level videogame courses, and has contributed to dozens of gaming texts and television shows including MTV's *Video MODS* and the highly-rated book *Downright Bizarre Games*. He has written business plans, managed a multiple game-related retail stores, and consults for multiple video game and computer museums. Michael has helped publish 100s of games on Atari, Sega and other console platforms. In 2014, *The Guinness Book of World Records* declared that Thomasson had "The Largest Videogame Collection" in the world. Visit www.GoodDealGames.com.

Requiem for Game Room

MICROSOFT'S ARCADE REVIVAL AND ITS LOST POTENTIAL

By Ken Horowitz

The death of the American Arcade has been somewhat overstated, I think. Given the rise in barcades and the growing popularity of classic arcades like Chicago's Galloping Ghosts, Mark Twain would likely chuckle at pronouncements of the industry's demise. People have been warning of the impending end of arcades for two decades now, but here we are. In 1998, former Sega Enterprises USA head Alan Stone said that the industry was in a state of constant evolution, and each "death" was in fact one of its many lulls. 20 years later, it seems that Stone's prediction has rung true.

In 2010, we seemed to be experiencing one of those lulls, and arcade fans had to turn elsewhere for their arcade fix. Game compilations and mini arcade replicas of classic titles have helped somewhat, but neither have managed to recapture the sense of interaction and competition of the arcades of old. Microsoft seemed to understand how important these elements were to the classic gaming experience, and the publisher pressed down hard on our nostalgia nerve with the release of Game Room for the Xbox 360 and PC in 2010. The innovative concept allowed gamers to create their own customized, multi-floor arcade and stock it with classic titles from major publisher like Konami, Atari, and Activision. Each of the three floors had four separate rooms that held up to eight cabinets, a decent number of machines. One would download free packs that included six different games (each game was \$3, or \$5 for use on Xbox 360 and PC). Arcade, Atari 2600, and Intellivision games were included in each pack, which also came with themed decorations like outer space and the Old West, as well as game avatars that wandered the complex. My Atari 2600 room had a cool pirate theme to it, and the dragon from Adventure intimidated the guests. It was glorious.

As someone who lives in an area sorely lacking in coin-operated entertainment, I found Game Room to be a welcome gift. Each game supported online leaderboards, and through Xbox Live, players could visit their friends' arcades and try to take down their high scores. They could even issue direct challenges, giving them a specific amount of time to put up or shut up. People could even enter their friends' arcades and use virtual tokens to

try out cabinets there that they didn't yet own. It was a lot of fun to log in every couple of days and see how my rivals were doing, retake a lost high score, continue my dominance among friends by taking theirs, or just wander around the different floors and enjoy all the classic titles. Heck, I could spend a good deal of time just gazing at those beautiful Atari arcade cabs alone.

Lamentably, what started out with so much potential soon withered on the vine. People began to leave the service within a few months, leaving many Xbox digital arcades an ironic reflection of the bare and dying game centers so often talked about. Before it could really catch on, Game Room stalled hard. The problem was not in the design or the concept. Much of the blame for the tepid interest Game Room generated over the few short months since it was launched lay with Microsoft itself. The company seemed to do just about everything to ensure that as few people as possible cared about what could otherwise have been an awesome concept. Slow releases (including games with specialized controllers that are now nearly unplayable), the actual dearth of arcade games in each pack (packs often included Atari 2600 and Intellivision titles), the annoying pauses while playing, the lack of publisher support, the generic design of the Konami cabs, etc. – all contributed to killing off Game Room. MS remained mostly silent, sputtering out a few updates on the official Game Room Facebook page, but nothing appeared on the Xbox 360 dashboard.

Many people were frustrated with how the service was handled. When MS boasted in March 2010 that there would be a thousand games, people got excited. They imagined Capcom, Namco, Data East, and a slew of other arcade stalwarts offering up their best wares for 240 Microsoft points. I, myself, envisioned an entire floor of my game room stocked solely with deluxe Sega cabinets like Galaxy Force and OutRun. None of that came to pass, however, and it seemed like Game Room was a throwaway idea rather than a budding and persistent means to relive the glory of the arcade's golden era.

The next few years saw sporadic releases and lots of delays, and by March 2015, the ride was over. All the game packs were pulled from the Xbox Marketplace. Just like that, 188 games were gone. Considering just how many titles were still waiting to be added (I wanted Food Fight!), it was a lamentable turn. Konami vanished from the list, leaving shattered dreams of high score



Dr. Kenneth Horowitz is an English professor who has taught research and writing for 20 years. He is the author of "Playing at the Next Level: A History of American Sega Games" and "The Sega Arcade Revolution: A History in 62 games," and his work has been featured in numerous video game publications like GamesTM and Hardcore Gamer Magazine. Ken has also published academic articles in professional publications, such as Language Magazine and the Hispanic Educational Technology Services Journal.



and those beautiful Atari cabinets. It was as close to the real thing as could be had for many people. I remember logging in almost every day to see if any of my high scores had been broken. Those that had became an immediate priority. The gauntlet had been thrown! There was simply no way I could log out and leave those challenges unanswered. Most of the games took little time to play, so it was convenient to check back a few times per week.


Today's arcades pretty much reflect Stone's assessment from 20 years ago. They have evolved, and their status as arenas of competition have given way to redemption cards and kiddie rides. It

battles in titles like Jackal, Circus Charlie, Gradius, and Devastators. Microsoft promised over 1,000 titles but fell far short of the goal, ultimately delivering less than 20% of the promised total.

That's what makes Game Room such a tragic part of video game history. It held the promise of bringing that feeling of the old arcade back in a way that modern gamers could appreciate and adopt quickly. It could have been a modern spin on the classic arcade, bringing the sense of practice and competition that fueled so many high score challenges back in



would have been nice to see Game Room endure, battling with my kids and friends for arcade dominance. In hindsight, one must question just how long Microsoft planned to support the service. All those company licenses cost money, and while it's unknown if there was sufficient consumer support to justify the expense, it likely would have taken more than Microsoft was willing to pay to make Game Room a long-term investment.

The lost potential is saddening, but I still have hope. Maybe the concept of a persistent online arcade service will evolve, much as the actual industry has, and another company will take a chance at an upgraded version of Game Room. Until then, we'll just have to settle for memories of better days. 

the day. It could have once more made the arcade a social hub where people could gather and talk about games and how to master them. Moreover, it would have served as a means by which younger players could have tasted what arcades used to be like, fostering a

new interest in legendary coin-ops and bringing fresh exposure to those that were less known.

Microsoft certainly gave Game Room all the elements to meet those goals: cool decorations, people strolling around and playing, authentic arcade sounds,

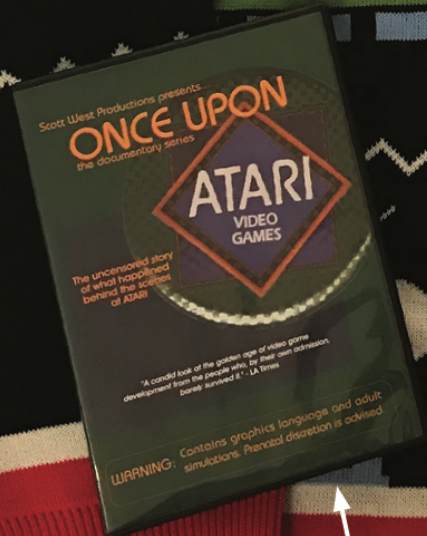
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A great movie with some great people in it. I got my copy from Howard Scott Warshaw at PGRE; you can get yours at the website below.

onceuponatari.com



These books are part of a series of quick reads by Michael Salzman that I really enjoy the releases of every month or so. All available through Amazon both in print and digital form!

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Shareware

INFLUENTIAL ORIGINS OF SHAREWARE IN GAMING

By Robert Seale

If you were playing PC games, or even just using PC software in general, at any point throughout the 90s, you almost certainly saw or heard the term “shareware”. Not quite a demo, not quite freeware, shareware was a revolution in software distribution. It was crucial in helping then-small teams such as Apogee Software/3D Realms, id Software, and Epic MegaGames (now simply Epic Games) become the iconic developers they were destined to be.

The concept of shareware is simple, yet effective. Developers got their product out there through any channel possible at the time, be it a website or BBS, a promotional floppy disk or CD-ROM, or a copy from a friend. That's right, do copy that floppy, and copy it as much as you can. This made putting money into marketing and publishing far less crucial, as they let the gaming community and the internet do that gruntwork for them. Once the developers got people using their software, they used a number of incentives to get users to register their shareware and upgrade to the full, paid release. Some would offer the full or near-full product as their shareware release. Many of the shareware releases came with built-in timers that would automatically lock out or disable elements of functionality after a predetermined amount of time, unless you paid for a key. Others would use “nag screens” to hopefully annoy the user into buying a key, making them wait or click through screens of text pitching the full product to them. Famously, WinRAR still uses a version of this method. Still others would simply give out the full, unrestricted program for free, asking only that you give copies to everyone you can and send a small bit of money the developers' way if you like and continue to use it.

Shareware can be traced back to a developer named Bob Wallace, whose 1983-word processor PC-Write was the first software to use the model and the name. While earlier software used elements of what would

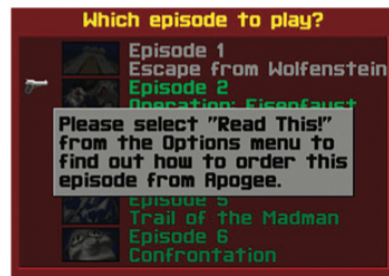
eventually become shareware, like the works of Jim Knopf and Andrew Fluegelman, PC-Write set the trend, and developers took notice as Wallace's company, Quicksoft, boomed.

In gaming, the most popular incentive method was to split the game into episodes, offering the first episode as a freely distributable shareware release. Upon finishing the first episode or exiting the game, you'd be presented with a nag screen describing or presenting screenshots of all that awaits players who register. This was known as the “Apogee Model”, named after Apogee Software. Their founder, Scott Miller, pioneered this method with 1987's Kingdom of Kroz. Apogee would go on to use this strategy for all of their games to great success, and other small developers quickly followed suit. Major companies had less need for the Apogee Model, and never really jumped into the trend. Miller himself had this to say in a 1997 interview:

“The reason few developers have copied Apogee's shareware marketing and direct sales methods is because most publishers do not allow developers to do what we do, because it cuts the publisher out of a good portion of the game's revenue.” (<http://www.simoncarless.com/2013/04/dukin-it-out-a-1997-interview-with-apogee3d-realms-scott-miller/>)

What separated the average shareware game from a demo was the sheer amount of the game offered for free. Where a demo would offer a level or two, usually with greatly reduced options or even unfinished assets and code, a shareware game might offer up to a third of the full game exactly as it was presented on shelves. This did have an interesting side effect once games were developed with shareware in mind: the first episode of a game would often showcase more varied or intricate level design than the registered ones, and would feature reduced number of enemies and/or weapons, making it stand out from the other episodes. After all, the shareware version had the task of hooking players, so if the first episode didn't put the game's best foot forward, it didn't matter how good episodes two and three were.

Thankfully for both developers and players, the folks behind Apogee, id, and Epic were plenty




capable of delivering registered games that fulfilled the promises made by their shareware. DOOM, Wolfenstein 3D, Commander Keen, Jazz Jackrabbit, were all beloved shareware mainstays that not only rocketed these scrappy teams to the top, but paved the way for every garage programmer to get their names and games onto people's computers.

This minor gaming gold rush wasn't underway long before the next big step in distribution came, often against the wishes of the developers. Compilation CD-ROMs, touting hundreds and eventually thousands of shareware games per disc, were the new hot thing. Get a handful of the must-haves like DOOM, then scrape FTP servers to fill the disc with everything from pirated software to college student game projects to incomplete installers that just happen to have been on the server for whatever reason. Sort them, often inaccurately, into genres and folders, and sell the package for ten bucks at various stores or computer shows.

Despite their slapdash nature and questionable methods, these CD-ROMs got shareware into even more hands, and was far more cost-effective than the individually sold hard copies of shareware titles that otherwise provided an alternative way to obtain these games in a time when a potential customer's internet connection was far from guaranteed. One could argue that compilation CDs made unlikely hits out of games that would otherwise have faded into obscurity as well. PC gamers of a certain age likely remember David P. Gray's Hugo's House of Horrors, for example, even with it never having been advertised or widely distributed at that point outside of compilation CDs.

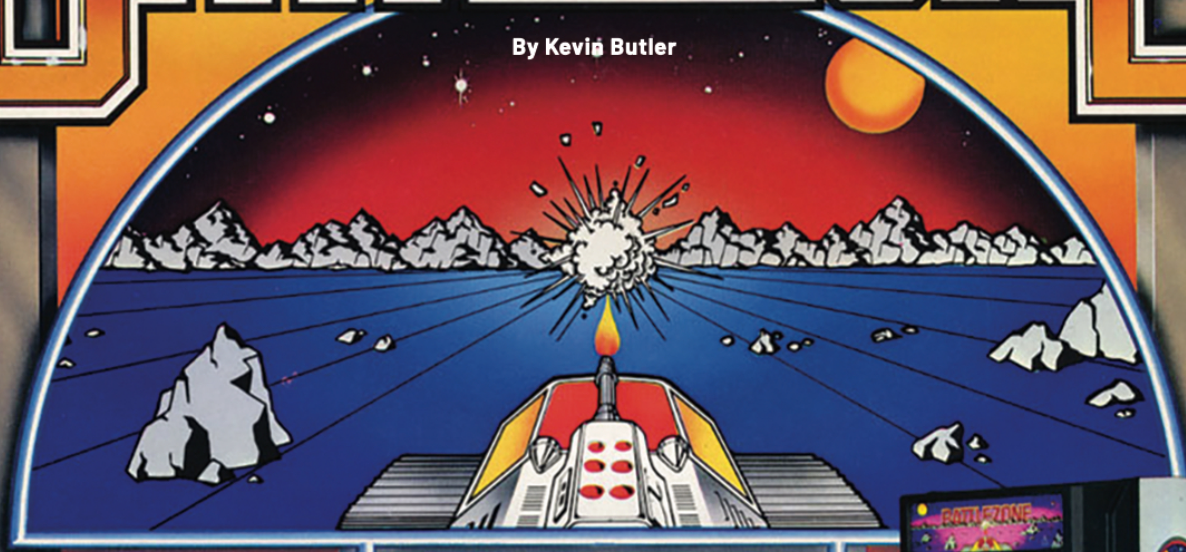
As the 90s were winding down and PC games were becoming larger, more complex, and too big to easily spread around or download on dial-up connections, shareware's heyday was coming to an end. While it's still used in various forms to this day in productivity and other non-gaming software, the modern gaming landscape has little use for the Apogee Model. Even the stalwart demo has become less common in the era of open betas, freemium games and free weekends.

Yet, as we get in our pre-orders for DOOM Eternal, we can see the shadow of shareware's legacy all over the gaming landscape. 

Robert Seale – Robert Seale has been a PC gaming enthusiast since 1993. His love of the medium has instilled a lifelong passion for sharing his fascination with the PC gaming culture (as well as the general pop culture) of the 90s.

BATTLEZONE™

By Kevin Butler



The time of vector-generated arcade games was coming of age. Although Atari refined the technique, the honor of the first vector-based arcade game goes to Cinematronics. That game was Space Wars, and it was also the basis for Star Castle and Tail Gunner. Atari realized it was falling behind, so it enlisted the services of Howard Delman to create their own vector generator. What they got was the digital vector generator. The first game, created by Howard and Rich Moore (as programmer) was Lunar Lander. This was followed closely by Asteroids and Asteroid Deluxe. Atari soon realized that if it could create two-dimensional vector-based games, it could try for three-dimensions. After a brainstorming session, it was realized that a three-dimensional game could be created using specific processes. When the game was released, it would become the first environmental three-dimensional, vector (wire-frame) generated

arcade game. This game would pave the way for future vector-generated games as well as paving the way for first-person 3D games in general. The history of those who contributed to the game is no less fascinating. These interviews aren't so much to rehash the history of Battlezone as to get into the "nuts and bolts" and to "nerd out" if you will.

For my first interview, I had the privilege to do a phone interview with Mr. Ed Rotberg, programmer of the Atari videogame Battlezone. This interview gives more detail as to what went into the game as well as how all the parts integrated together.

ER: I was wanting to get my degree in biochemistry since that was an area I was sure I could start a career. Since I did so well at chemistry, I tested out of my freshman year and advanced straight to organic chemistry along with a lot of medical majors. After finding the course to be an extreme challenge to keep my grades at least at a "C", I looked to other avenues. I had also taken a computer

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programming course in ALGOL and really enjoyed it. I transferred to the University of Michigan to go into computers but did so as an Electrical Engineering (EE) major. By my junior year, they had created the Electrical and Computer Engineering major which fit my curriculum and intent perfectly so I transitioned to that receiving my BSEE.

OSG: After you got your degree, what jobs did you have before you joined Atari in 1978?

ER: I started working for TI out of Austin, Texas. I was part of the team that programmed the operating system on their supercomputer. Not wanting to travel as much, I left there and headed to Rockwell where I did programming for MGD Graphics on photo typesetting machines. I then went to GD Searle Pharmaceuticals, the HUGE pharmaceutical corporation, as the database administrator. I was then transferred to the Science/Research division where I programmed the hardware in assembly on an SBC 80s (single board computer) to interface lab equipment for real-time data collection on a Xerox Sigma 7 computer.

OSG: Since Howard Delman developed the Vector Generator, it seems that Atari was ready to utilize it. How did they settle upon a tank game?

ER: Since I was new at Atari, I didn't attend any of these "brainstorming" sessions. What I did contribute to was to choose a game from those that were suggested, and I chose to work on Battlezone.

OSG: It seems, though, that 3D vector graphics weren't really a new thing. Didn't Cinematronics develop their own 3D vector generator?

ER: Yes they did. Our Vector Generator was created as a direct response to theirs since they got theirs out first.

OSG: What was your primary responsibility during this project?

ER: I was in charge of programming the 6502. This was the main CPU that controlled how the other components would behave. All this programming was done in assembly.

OSG: Why did you use the 6502? Wasn't the Motorola 68000 and the Intel 8086 or 8088 available at that time? Plus, didn't they have a bit more horsepower?

ER: The 6502 was more than adequate to handle this game. In addition, those chips you mentioned were significantly more expensive than the 6502 and the big thing we always wanted to do was keep the cost of the components as low as possible.

OSG: Can you expand a bit on the components and how they all worked together?

ER: Sure. The 6502 processor was the main processor that ran things. Game data, which consisted of the vertices of the various objects, was contained in the ROM chips. The main processor would send this data to the mathbox. The mathbox consisted of four or eight, I don't remember, AMD 2901 ALU processors that took this information to transform the 3D space coordinates of a series of points into screen space from the viewers perspective (NOTE: Further information confirms that it is four processors). Mike Albaugh was the one who programmed the processors while Jed Margolin was the one who created the 3D math that allowed the transforms. In addition, Jed came up with the idea of changing the coordinates from a 3 x 3 to a 2 x 2 array for greater speed. This transform information was sent back to the main processor which then used a jump (JMP) instruction to the Analog Vector Generator which, by using double buffering, displayed the beams on the screen.

(A brief explanation of double buffering. This is a method whereby one set of display memory instructions is drawn on the screen while a new set of instructions is being written to a second display memory. The beam displays the instructions that are in one memory while the game is writing instructions into the other memory so that the next screen can be displayed as soon as the current one is complete. Like a movie which uses separate frames, these screens go back and forth rapidly enough to simulate movement and motion. Instead of screens, the game uses the beam to display on one screen while writing on the next screen to be displayed.)

OSG: When the shapes were displayed on the screen, was some sort of shape table

utilized or something else that allowed scaling of the objects to achieve the 3D effect?

ER: No, the mathbox was what allowed the already defined vertices to be transformed. In addition, information was passed back to the main processor in regard to varying the intensity of the beam to give the illusion of whether an object was near or far away. Although rotation was achieved by rotating on a Y axis, it was still done on the X axis. This was necessary due to using 2x2 transforms as opposed to 3x3 and 4x4 transforms.

OSG: Was the missile hard to do? Was the collision detection easy or hard?

ER: The missile itself wasn't that hard to do. All that was required was putting in the coordinates of movement. The tougher part was doing the collision detection. This was not limited to the missile but also to hits on other objects like enemy tanks. Sometimes the collision detection would fall behind to a point where an apparent shot went through the enemy because the next screen was already drawn but not shown yet making the shot a miss according to the program. It didn't happen often and sometimes it was frustrating trying to tweak the collision detection. We actually had to address this issue and fix it so it would NOT happen. Having a shot go through a tank was not acceptable.

OSG: How many objects were you able to display on the screen at one time before any lag started to occur?

ER: Don't think about this in terms of objects being displayed. Instead, we measure the amount we can display by how many inches/meters of beam being displayed at one time on the screen. As for that answer, I don't know off-hand as to what that length would be.

OSG: For the background, was that also created using data and the mathbox?

ER: No, I was able to program the background directly into the 6502 processor.

OSG: Of course we know the story of the exploding volcano and Owen Rubin. Where was this extra code added?

ER: Yeah, Owen would come by my office daily and nag me about making the volcano explode. One day when he came by I told him if he wanted the damn thing to erupt, he needed to give me the code to do it. The next morning, there was a page with the code on it. I entered the code on the 6502 and the volcano was now erupting.

OSG: Overall, how much coding went into this project?

ER: It was under 4K of code for both the data and the programming itself (referring only to the 6502 code. The mathbox code was smaller than the 6502 code due to smaller requirements).

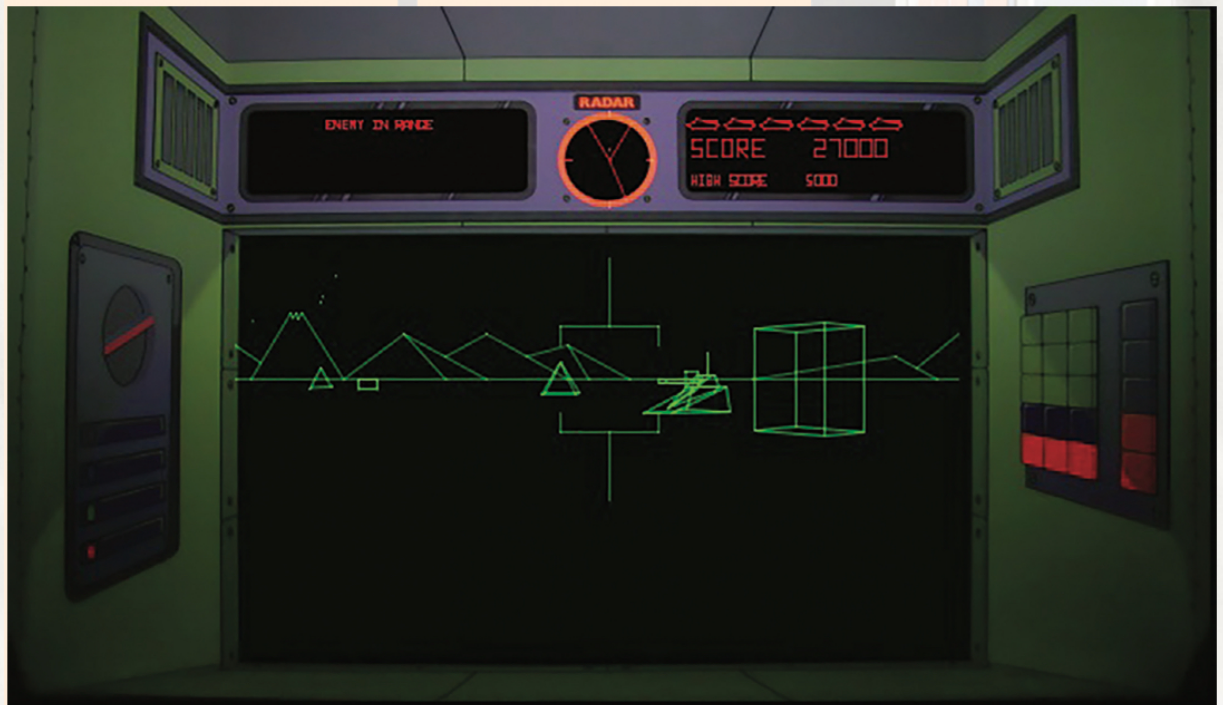
```
8AC1 99 71 02 STA $0271,Y
8AC4 A5 D5 LDA $D5
8AC6 8D 68 18 STA $1868
8AC9 A5 D6 LDA $D6
8ACB 8D 69 18 STA $1869
8ACE A5 D7 LDA $D7
8AD0 8D 6A 18 STA $186A
```

OSG: I saw pictures of the boards that were used for the prototype Bradley simulators. How involved were you with those?

ER: Well, you can see from the pictures all the jumpers going from the chips plus an extra board for their specifications.

Mr. Rotberg's passion toward this project was very evident by the way he spoke so proudly about it, and he also iterated that this was a team effort, and he was only one of the members who made this happen. I learned a lot from this interview and hopefully I will get to chat again with Mr. Rotberg on other projects on which he previously worked.

I then contacted Mr. Owen Rubin (of Major Havoc fame and "volcano eruptor" creator) to see if he happened to have a copy of the code for the volcano erupting. This culminated in a phone interview with Mr. Owen after he asked if I wanted to know about things that weren't put into the game.



Again, the least amount of code and chips used, the cheaper it was to manufacture.

Below, is a snippet of code from the main 6502 processor that ran everything:

```
8AB4 10 B8 BPL $8A6E
8AB6 A5 DE LDA $DE
8AB8 F0 32 BEQ $8AEC
8ABA A9 20 LDA #$20
8ABC 99 70 02 STA $0270,Y
8ABF A5 D9 LDA $D9
```

It was a contractor that wanted us to try this. Only two systems were ever created and they were both prototypes, and this project was never put into production.

After a little bit of chatting about his knowing Nolan Bushnell and other Atari members, we concluded the interview. I thanked Mr. Rotberg profusely for the time he gave to me and answering my questions. He did state that I managed to ask a few questions that he had never been asked before, which was very kind.

Before we talked about that, I asked him about how he got involved with computers.

OSG: When did you first get involved with computers?

OR: It would have been in 10th or 11th grade. I worked on a Bendix G15. It was a first-generation computer running on tubes and the memory was actually a magnetic drum that had 1800 memory locations on it. Its output was a typewriter which wasn't that fast. It was

on this system I wrote my first computer game, Tic-Tac-Toe, which was probably as complex a game as this computer could accomplish.

OSG: *Where did you go to college and did you major in computers?*

OR: I went to the University of California in Berkley. It was there that I majored in computers. I got to work with the IBM 1620, CDC 6600 (upgrade from the CDC 6400), Xerox XDS 920, DEC 1145, and DEC 1170 (both time share systems) to name a few. I also worked on a Meta-4, which emulated other systems. I designed several different programs, either through punchcards or through the use of emulators of other systems. I graduated in 1976 with my BS in Electrical Engineering Computer Science (EECS).

OSG: *What did you do after you graduated from college?*

OR: I was one of the first five programmers hired by Atari. I was interviewed for a hardware engineering position. When I was turned down, I explained that I was interviewing for a Software Engineer position. I was interviewed again and I was hired as a programmer and game designer. At Atari, although we may have been hired for something specific, we still assisted in other areas.

Mr. Rubin stated that he shared a lab with Mr. Rotberg and that their chairs were almost back to back. He recalled many people coming in to play Battlezone as it was being developed. He also stated that he did nag Mr. Rotberg about making the volcano explode. In very colorful language, according to Mr. Rubin, Mr. Rotberg told him if he wanted the volcano to explode, give him the code to do it.

Now, on to what wasn't included in the game. Mr. Rubin stated that he had an idea for Battlezone to not only be for daytime but also for nighttime warfare. His idea was this: As the game progressed, the Earth would set behind the horizon. This would progressively make the playing field look like night to make the game harder for people who played too long. In this dark environment, Mr. Rubin had an idea for making the vectors dim out as nighttime approached. The only things the player would see would be the shots, the missile's shadow, and the volcano in the background, to name

a few of the features. It was decided, at the time, that adding this feature would be considered as "cheating" by the game. Years later, Mr. Rubin stated that he and Mr. Rotberg agreed that this feature should have been added and it would have been possible without adding any real overhead to the game.

To get a better understanding of the mathematics behind the mathbox, I contacted Mr. Jed Margolin via e-mail and he was kind enough to give me some articles he had written on the subject. The articles are located here: <http://www.jmargolin.com/vgens/vgens.htm> and <http://www.jmargolin.com/uvmath/uvmenu.htm>. On Battlezone, he did the mathematical formulas for the mathbox. Later, he would be heavily involved in the next generation of XY arcade games, including Star Wars and the unreleased Tomcat. In addition, he also submitted several patents as an independent inventor for various things, all of which can be found on his site www.jmargolin.com. He stated, "my most favorite patent is: U.S. Patent 9,784,449 Flame Sensing System issued 10/10/2017 to Margolin. <http://www.jmargolin.com/flame/flamepat.htm>. This is for a new and improved flame sensing system for gas furnaces and the like. I became interested in gas furnaces because the propane furnace in my attic started having problems. I discovered how the flame sensing system worked and was greatly offended by how primitive it was."

Another interesting tidbit of information Mr. Margolin provided was that he and Mr. Rotberg were students together. According to Mr. Margolin, "I first met Ed Rotberg at the University of Michigan where we both went. We had a class together in Classical and Statistical Thermodynamics. On my first day at Atari (several years after Michigan), imagine my surprise at seeing Ed again, who had started working at Atari only a week or two before."

The next person I did a phone interview with was Michael Albaugh, one of the designers of the mathbox.

OSG: *When did you first get interested in programming?*

MA: The summer between 11th and 12th grade, I took a class at the local community college. Computers were something I had read about, but never touched. My first computer was an

IBM 1440, the "little brother" of the IBM 1401, and ours was later upgraded to a real 1401. They were similar from a programmer's point of view, but had different I/O. I later attended U.C. Berkeley and got my bachelor's in Computer Science.

OSG: *When did you first start working for Atari?*

MA: In March 1976, I went to work for Atari and worked on various projects which included Drag Race. On Drag Race, hardware quirks made it impossible to set the "Christmas Tree" countdown vertically. I later discovered that other racing games, later on, imitated my horizontal lights.

OSG: *Since Cinematronics created their vector generator in 1978, it seems the push was on for Atari. Did you have any part of that?*

MA: No, Howard Delman was the one who took care of the vector generator. The first two games that used it were Lunar Lander, programmed by Rich Moore and Asteroids, programmed by Ed Logg.

OSG: *When did you first become involved with Battlezone?*

MA: I was approached to work on a math-coprocessor that would use formulas created by Jed Margolin that would create a 3D, wire-frame environment onto a 2D screen. This would involve mostly drawing on the X axis with not much rotation on the Y axis. In essence, the 6502 didn't have a strong enough math processor, so the "mathbox" would supplement the 6502 in generating the vectors needed for the vector generator.

OSG: *How did the "mathbox" do the calculations?*

MA: It was essentially a 16-bit processor made of four 4-bit "slices" (AMD 2901). The 6502 would store data by writing to one of 32 addresses which would start at a specific instruction. Many of these simply stored the incoming data in a given register, but some would start more complex calculations like a 2x2 matrix multiply. When it finished, it halted and the 6502 could notice

that and "unload" the registers that had the result. It wasn't a full-on computer and could not do I/O of its own. The instructions were 24 bits wide, more like microcode, and there were 256 of them, including a small self-test. Most of the code, of course, was to implement Jed Margolin's algorithm. It helps, when trying to understand the code, that X and Y were from what I would call an "architect's perspective", with X going left to right, Y going towards or away from the viewer, as a 2D map would have it, and Z was height. Today's conventions are different.

Below, is a snippet of code from the "mathbox" that did the vector calculations:

```
654 66F8 BE 12 1D SUBS RZH,X3,JPL ;IF
```

```
665 6748 F5 C0 30 ADD ZA,Y3,Y2,RAMF
666 6750 E5 00 94 JMP 11$
```

Mr. Albaugh and I discussed him being one of the first programmers at Atari and what it was like as new people came aboard. Mr. Albaugh said that the atmosphere was very much geared toward being creative, but only to the point of not costing too much. The engineers, programmers, and other staff had to learn to milk the most out of the hardware they could since more hardware was equal to more money spent per unit. I thanked Mr. Albaugh for his time and I definitely want to speak with him again about other projects in which he was involved. According to Mr.

response to Cinematronics Vector Generator created the year prior. Atari had a development group in Grass Valley, California that had laid out the design of a vector generator. Howard turned their design into a manufacturable product, and it became the platform for all of the vector graphics games to follow. The first game, created by Mr. Delman, using this new technology, was Lunar Lander. Lunar Lander sold a respectable number of units, so a new project was planned. Asteroids, created by Ed Logg, became a monster hit for Atari. The Vector Generator (both digital and analog) would play a big part in many of the wireframe games that Atari launched, and the design would be improved upon as time went on to include color and

BATTLEZONE

Project Leader: Morgan Hoff

Programmer: Ed Rotberg (Game Play, also the tank treads)

Hardware Engineer: Jed Margolin (3D algorithms, Object Digitization, Hardware Sounds, "Moon")

Technician: Doug Snyder (also hardware design)

Bit Slice Math Box: Michael Albaugh and Dan Pliskin (For his work Mr. Albaugh received U.S. Patent 4,404,629 issued 9/13/83 Data Processing System With Latch For Sharing Instruction Fields)

Analog Vector Generator Design: Howard Delman

Design of 3D Objects: Roger Hector

Volcano: Owen Rubin

Moon: Jed Margolin. (At the time, the game was going to be called Moon Tank, which meant that the object in the sky would be the Earth, so I looked in my Almanac and used the East coast of Australia as a model. -JM)

Radar: (At one of the early game reviews, Gene Lipkin objected to the

radar because it looked like the radar in Subs. Since Subs had not been a successful game, Gene was afraid people would associate the radar with Subs, thereby dooming Battlezone. To give it a different appearance, Ed changed the radar so that it scanned from side to side. It looked so dumb that Gene relented and allowed us to restore the original radar. -JM)

Engine Sound: Jed Margolin. (I used two counters with slightly different counting periods and summed several outputs to produce a somewhat disreputable waveform. Since the counters had different periods they produced a beat note when summed. As the frequency of the counters was increased, the beat note also increased. This is what makes the engine throb. The clock was generated by a 555 and had only two frequencies. To control the frequencies I used a circuit to shift the 555's threshold voltage. This was done with a slow ramp so that the engine sound changed smoothly as it changed speeds. -JM)


Source for above: "The Secret Life of Vector Generators" (2003). Retrieved from <http://www.jmargolin.com/vgens/vgens.htm>

```
X=<=ZH THEN (X3,Y3)NOT IN WINDOW
655 6700 FE 12 1D SUBS Y3,X3,JPL ;IF
X=<=Y THEN (X3,Y3)NOT IN WINDOW
656 6708 EF 10 00 ADD X3,Y3,OREG ;IF
-X >= Y THEN (X3,Y3)NOT IN WINDOW
657 6710 00 22 1D SUBS Z,0,JPL
658 6718 E7 C0 30 ADD ZA,X3,X1,RAMF
;X1=X3, Y1=Y3
659 6720 F8 C0 30 ADD ZA,Y3,Y1,RAMF
660 6728 DA 00 90 11$: LJT CLIP ;N=N-1
661 6730 06 11 3C DEC RN,RAMF,JPL
;LOOP TIL N=-1
662 6738 08 18 10 ADD Z,Y1,STALL ;STOP
663
664 6740 E4 C0 30 14$: ADD
ZA,X3,X2,RAMF ;X2=X3,Y2=Y3
```

Margolin, Atari's only patent resulting from Battlezone was Michael Albaugh's U.S. Patent 4,404,629. You can see it here: <http://www.jmargolin.com/patents/ataripats/pat4404629.pdf>

Howard Delman was the creator of the vector generator that would be the beginning of Atari's foray into the vector arcade world. Mr. Delman didn't do much with computers in high school. He attended Rensselaer Polytechnic Institute (RPI) and received a bachelor's in chemistry where he worked on the IBM 360. He then obtained his masters in instrumentation from the University of California in Santa Barbara. After graduation, he went to Atari and worked on various projects until he was tasked with creating a Vector Generator in

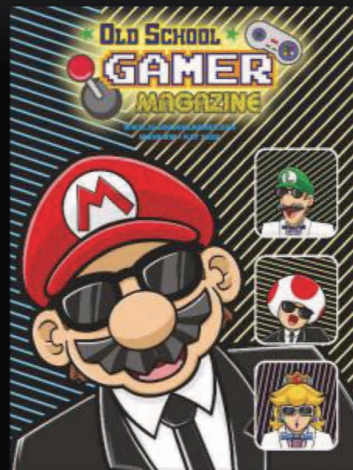
better 3D math crunching. The Vector Generator worked on the principle that it shared RAM with the 6502 and it used basic instructions to execute the command to draw the vectors.

I would again like to express my deepest, and most profound thank you to Ed Rotberg, Michael Albaugh, Jed Margolin, and Owen Rubin for taking the time from their busy schedules to sit down with me and get "nerdy" with regards to Battlezone. I know I learned a lot, and it seems that my other interviewees learned a bit more about each other. This was a fun project and I look forward to the next arcade game! 

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