CHAPTER

19

The Savior of Commodore

1982 - 1985

Commodore failed to capitalize on the unmatched success of the C64, which was a games market. The C128 had virtually no game development and did not transition C64 users into more powerful computers. It was time for Commodore to enter the 16-bit market.

Jay Miner

The man who originated the idea for Commodore's next generation hardware did not work for Commodore. In fact, he was working for Commodore's nemesis, Atari, when he conceived of the revolutionary new computer.

Jay Glenn Miner was born May 31, 1932 in Prescott, Arizona. This made him part of Chuck Peddle and Jack Tramiel's generation, rather than the generation that had created Commodore's most recent hits.

A few years after his birth, Miner's family moved to Southern California. After graduating high school, he signed up for the Coast Guard, which took him to Groton, Connecticut for military training. While there, he met Caroline Poplawski and married her in 1952. Like Tramiel, Miner served in the military during the Korean War.

Miner received his first taste of electronics at Groton in the Coast Guard's *Electronics Technician School*. After completing the six-month course, he joined the *North Atlantic Weather Patrol* where he jumped from island to island by boat and helicopter, repairing damaged radar stations and radio installations. With little to distract him, he immersed his young mind in electronics.

After serving three years in the barren North Atlantic, Miner enrolled at the University of California, Berkeley in engineering. By 1958, Miner

completed his electrical engineering degree, with a Major in the design of generators and servomotors.

Miner performed contract work for several years until he landed permanent employment at *General Micro Electronics* in 1964. At General Micro, Miner pioneered some of the earliest digital voltmeters and helped design the first MOS calculator chip.

By 1975, Jay had helped found chip maker Synertek, which was the second source for MOS Technology's 6502 chip. When Atari used Synertek to create their custom chips for the Atari 2600, they hired Jay Miner to design the Atari 2600 video chipset at Cyan Engineering (Atari's research lab in Grass Valley). He went on to design the impressive Atari 400 and 800 systems, admired by users for their graphics capabilities.

Miner was an interesting sight at the Cyan labs. People who saw him in the halls often had to take a second look because a tiny black shadow seemed to follow his every move. The shadow was actually a little black Cockapoo named Mitchy that followed Miner everywhere. "Mitchy had a long history of being involved in the computer industry because Mitchy used to go to Atari with Jay and helped him design the systems there," says fellow engineer R.J. Mical.

The dog became a fixture at Atari. Miner had a brass nameplate on his door that read, 'J.G. Miner', and just below it was a smaller nameplate, 'Mitchy'. Mitchy even had her own tiny photo-ID badge clipped to her collar as she happily trotted through the halls. While Miner worked on his groundbreaking systems, Mitchy sat on a couch watching with puzzlement as her master slaved over diagrams and schematics.

Jay Miner and Mitchy (Photo courtesy of R.J. Mical).

By the early 1980s, he was brainstorming the possibilities offered by a new 16-bit computer based on the Motorola 68000 microprocessor,

which was not yet commercially available. As an engineer, Miner knew that in order to remain at the forefront of technology, an engineer has to project beyond today's capabilities.

Unfortunately, the naïve Atari management thought they could design tomorrow's computers around today's expectations. They thought the $100 price tag on the 68000 was too much, and apparently could not conceive of a time in the future when the chip would cost less. The management was basking in their present success, unconcerned with the future of technology. It was obvious Miner would not be allowed to advance technology at Atari so he quit.

Miner was now 50 years old and looked like cross between an Amish farmer and Kenny Rogers. He sported a heavy beard on the underside of his jaw and liked to wear pastel blue suits with big collars or loud Hawaiian shirts. With his large frame, Miner was hard to miss.

Though he was always working on a project, Miner spent his free time on other activities. With his wife of 30 years, Caroline, he cultivated bonsai trees and enjoyed square dancing, camping, and backpacking. He even found time to build model airplanes at home.

After Atari, Miner joined a semiconductor startup company named *Xymos* where he designed chips for pacemakers until 1982.

During this time, former Atari co-worker Larry Kaplan contacted him. Kaplan had developed half a dozen games for Atari before starting *Activision* with David Crane, Alan Miller, and Bob Whitehead. At Activision, he designed *Kaboom!*, a bestselling game. However, Kaplan seemed perpetually dissatisfied no matter where he worked and he was unhappy with Activision. Kaplan proposed a new game company to Miner and asked Miner if he knew anyone with money.

Miner talked to his boss at Xymos, Bert Braddock, and they found a group of dentists to invest in the new venture. The dentists noticed the video game craze and wanted to benefit financially. Future employee R.J. Mical believes the dentists were naïve. "These guys were a bunch of dentists in Florida who were just splashing a bunch of money around," says Mical. "They didn't know what was going on, they didn't know the business, and they didn't do all their homework."

Many investors in the early eighties had similar ambitions. "When video games were hot in the early eighties, it was easier to get people excited about video games," says Dave Haynie.

Braddock leased an office space at building number 7, 3350 Scott Boulevard, Santa Clara. Dave Morse, who was previously the vice president of marketing with Tonka Toys, became CEO and president of the company. The entrepreneurs dubbed their video game company *Hi-Toro* in 1982.

The structure of Hi-Toro was simple. Larry Kaplan would design games for the Atari 2600 and other systems, Jay Miner would design chips for cartridges and other hardware, and Xymos would fabricate the chips and cartridges. The dream did not last long. Sometime in 1982, the perpetually dissatisfied Kaplan quit because he felt things were moving too slowly. “He was gone by the time I got there,” says Mical.

With their Vice President gone, Dave Morse asked Jay Miner to take Kaplan’s place. Miner made sure to add a clause to his contract that said he could bring his dog Mitchy into work everyday. Morse had no objections, so Miner quit his job at Xymos and began working at Hi-Toro full time. Secretly, Miner still harbored the dream of building a 68000 machine. Despite the expectations and desires of their financial backers, Miner would now attempt to steer things his way.

Amiga Corporation

With Larry Kaplan out of the picture, Jay Miner was the only person left with technical knowledge and vision. The financing had been raised for the creation of a video game company, but Hi-Toro was about to embark in a different direction. Miner proposed building a game console to the dentists, who considered pulling out and investing in an ice cream chain. “They weren’t sure which they wanted to do,” says Mical. “These guys were faced with a laughable choice that I find so amusing. ‘Are we going to invest in an ice cream company or will we invest in a new computer?’”

The dentists decided to invest in the game console. If the dentists truly understood the time and expense of designing a console, plus the manufacturing and marketing costs, and the low probability of success, they probably would have balked. However, they knew enamel, not silicon. To them, owning part of a console company for a mere $7 million investment probably sounded good.

Hi-Toro was divided into two parts: the Atari game/peripheral section and the console development section. The games and peripherals would act as a diversion to keep others from guessing what Hi-Toro was really working on.

Jay turned to his old friend from the Atari days, Joe Decuir, to help develop the new computer. Hi-Toro hired Decuir on a contract through his design company, *Standard Technologies*, in October of 1982. The two system architects began working on the concept for their console. It was to be a game machine, yet with a 3.5" floppy drive and a keyboard. This was to be a platform so powerful that game designers could do game development on it directly.

Some time after, the investors decided they did not like the company name, which Larry Kaplan originated. They thought Hi-Toro sounded too much like the Japanese lawn-mower manufacturer, Toro. The group decided to rename the company.

Everyone wanted a name that would come before Apple and Atari in the telephone directory, so they took out a dictionary, turned to Apple, and started browsing backwards. Everyone agreed that the name should sound friendly. Amigo, as it turns out, is one of the few Spanish words in the English dictionary. More importantly, it exuded friendliness, since Amigo means friend in Spanish. However, it was not quite sexy enough, so someone suggested Amiga, the feminine form of Amigo.

Jay Miner did not want a Spanish name for the company. According to Miner, "I didn't like it much. I thought using a Spanish name wasn't such a good move."[1] With time, Miner began to appreciate the name. Dave Morse soon incorporated the company under the new name.

Through the rest of 1982 and early 1983, Dave Morse developed the business while Miner and Decuir developed the technology for the game console. The company now had a clear goal.

Lorraine

When Miner worked for Atari, it was tradition to name prototype systems after wives and girlfriends. Pong was codenamed Darlene, the Atari 2600 was codenamed Stella, the Atari 400 was Candy, and the Atari 800 was Colleen. At Amiga, CEO and President Dave Morse continued the tradition by naming the prototype *Lorraine* after his wife.

Lorraine would feature up to 4096 colors in the most advanced graphics mode, resolutions up to 640 by 480 while in 16-color mode, and an 80-column display. However, the advanced graphics modes would not work on a television set, so users would have to get used to purchasing a monitor with their computer.

The team went through at least seven different concept sketches trying to perfect a unique look for the computer. The computer system would be modular and stackable, like stereo equipment. Early sketches show a base unit, which slid open like a drawer for storing the keyboard. The next unit contained a cartridge port and connectors for other devices. The

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[1] *Amiga User International* magazine (September 1992), interview by Mike Nelson. All succeeding quotes from Miner are from the same source.

top unit shows two floppy disk-drives side by side. It was a radically different approach to computer design.

The Lorraine was powered by the 16-bit 68000 microprocessor; part of the same family of chips Chuck Peddle pioneered while working for Motorola. According to Motorola documentation, they designed the chip for 'household appliances'. Motorola unveiled the chip in 1980, but samples were not publicly available until 1982.

The sights and sounds of the Lorraine came from the custom chips. "We needed ways to refer to the chips, and I believe it started with Jane," recalls Mical. "The names were supposed to be roughly in the ballpark of the function of the chip. To know the name gave you a sense of what was going on in the chip."

In keeping with the female theme of Amiga Corporation and Lorraine, the engineers used female names for their main chips. "*Portia* was the chip where we had all of the I/O ports," says Mical. The chip produced incredible four channel stereo sound that was much cleaner than the SID chip. Sounds contained no background noise and the chip could play clear digitized sounds and music. A third hire, Dave Needle, concentrated his efforts on Portia.

The engineers appropriately named the Display Adapter *Daphne*. Miner was the chief designer of Daphne. His main inspiration came from his love of airplanes. Miner had recently visited a military flight simulator company called *Singer-Link*, which had innovative display technology for the time. Miner saw the technology and instantly wanted to duplicate it in his machine. As Miner explains, "I had a kind of idea about a primitive type of virtual reality."

Daphne had four different graphics modes, which could display 320 x 200 and 320 x 400 using 32 colors or 640 x 200 and 640 x 400 using 16 colors. This was impressive, especially compared to IBM PC's, which could only display eight colors at once.

The final chip in the Amiga was Agnus, which was effectively a Memory Management Unit (MMU). Agnus was also the *bit blitter*, a mechanism used for producing high-speed animation.

Each of these chips was, in effect, a microprocessor. Many call the Amiga a multiprocessor system, since each chip handles its own load of processing tasks in a specific domain. This meant the 68000 processor was free much of the time, making the computer one of the fastest machines of the time. The 7.16 MHz processor speed did little to describe the actual speed compared to others.

R.J. Mical credits Jay Miner with the vision for the system. "Jay was the whole hardware side of the system," says Mical.

It took the three engineers, Dave Needle, Joe Decuir, and Jay Miner, almost two years to design the custom chips. During this time, little Mitchy patiently watched every move. “I don’t know if you know, but Mitchy did most of the design on the system; much more than Jay did,” reveals Mical. “She would sit on Jay’s lap, and Jay would draw gates, and he would look down at Mitchy and Mitchy would shake her head. Jay would erase it and draw it upside down, and try it a different way and look down and Mitchy would pant. He did design by dog.”

In 1983, Joe Decuir’s work on the Agnus chip was complete. He left Amiga and returned to Standard Technologies where he would go on to design devices for the upcoming computer.

Once the engineers completed the schematics, they had no way to fabricate the chips. Unlike Commodore, with their built-in semiconductor plant, Amiga Corporation had no access to chip manufacturing. The engineers would have to find another way to test their chips.

Instead of miniaturizing the circuits, they built them full sized using regular components on breadboards. It was as though the engineers used an enlarging ray on their silicon chips. As can be expected, these ‘chips’ took up a lot of space.

To build Agnus, a technician named Glenn Keller inserted IC chips on a board and wired them together according to the schematic. When the breadboard ran out of room, Keller connected the breadboard to another breadboard around a central core, like a book spine. Each breadboard had up to 250 IC chips on it, with eight breadboards in total, all bundled together with multicolored spaghetti wire. That was just for Agnus.

All three chips were simulated on breadboards and working by September 1983. However, because of the many connections and tangled wires, they were highly error prone, often causing the engineers to search for loose connections or short circuits. According to Miner, “Those were a nightmare to keep running with all the connections breaking down.”

According to R.J. Mical, the engineers constructed a special area for the massive chips using anti-static flooring and anti-static walls. The room was just wide enough for one person to fit through, much like a confessional booth. Mical claims they also placed signs saying, ‘Ground Thyself’, which gave him the impression he was entering an altar to a technology God.