A history of the Amiga, part 2: The birth of Amiga

by Jeremy Reimer

Version 1.0 – August 12, 2007

A history of the Amiga, part 2: The birth of Amiga

By Jeremy Reimer

The Amiga: born as a console, but with the heart of a computer

Continued from Part 1: Genesis

Game consoles and personal computers are not all that different on the inside. Both use a central processing unit as their main engine (the Apple][, Commodore 64, and the Atari 400/800 all used the same 6502 CPU that powered the original Nintendo and Sega consoles). Both allow user input (keyboards and mice on computers, joysticks and game pads on consoles) and both output to a graphical display device (either a monitor or a TV). The main difference is in user interaction. Gaming consoles do one thing only—play games—whereas personal computers also allow users to write letters, balance finances and even enter their own customized programs. Computers cost more, but they also do more. It was not too much of a stretch to imagine the new Hi-Toro console being optionally expandable to a full computer.

However, the investors weren't likely to see things that way. They wanted to make money, and at the time the money in video games dwarfed the money in personal computers. Jay and his colleagues agreed that they would design the new piece of hardware to look like a games unit, with the option of expansion into a full computer cleverly hidden.

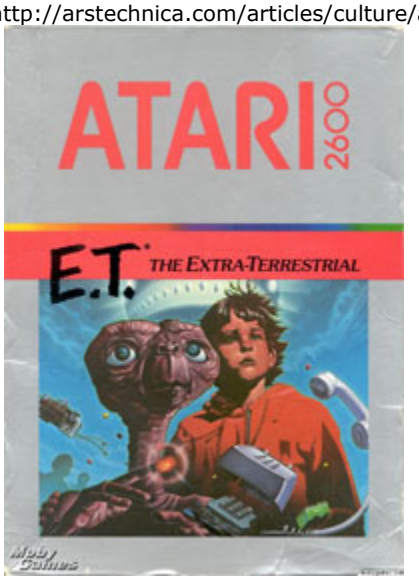
This was one of those decisions that, in retrospect, seems incredibly prescient. At the time, it was merely practical—the investors wanted a game console, the new company needed Jay Miner, and Jay wanted to design a new computer. This compromise allowed everyone to get what they wanted. But events were transpiring that would make this decision not only beneficial, but necessary for the survival of the company.

The video game crash

The great video game crash of 1983, was, like all great crashes, easy to predict after it had already happened. With sales of home consoles and video games rising exponentially, companies started to think that the potential for earning money was unlimited. Marketing executives at Atari bragged that they could "shit in a box and sell it." And inevitably, that's exactly what happened.

There were too many software companies producing too many games for the Atari VCS and other competing consoles. The quality of games began to suffer, and the technological limitations of the first generation of video game machines were starting to become insurmountable. Clever programming could only take you so far. Today, it is understood that each new generation of game consoles has a limited lifecycle, and new hardware platforms are scheduled for release just as the old ones are starting to wane. Back then, however, the industry was so new that the sinusoidal-like demand for a game platform was not understood at all. People just expected sales to keep going up forever.

Just like the dotcom bubble in the late 1990s, a point was reached where the initial enthusiasm was left behind and replaced with sheer insanity. This point can be traced precisely to the release of a new game for the Atari VCS in late 1982, timed to coincide with the release of a new blockbuster movie: *E.T. The Extra Terrestrial.*



The game that ended it all.

Atari paid millions of dollars for the license to make the game, but marketing executives demanded that it be developed and sent to manufacturing in six weeks. Good software is like good wine—it cannot be rushed. The game that Atari programmers managed to produce turned out to be a very nasty bottle of vinegar. It was repetitive, frustrating, and not much fun. Atari executives, however, did not realize this. They compounded their mistake by ordering the manufacture of five million cartridges, which was nearly the number of VCS consoles existing at the time. But the insanity didn't stop there. For the release of the game *Pac-Man*, Atari actually manufactured more cartridges than there were VCS consoles to run them!

An Atari marketing manager was actually asked about this disparity, and his response clearly expressed his total disconnect from reality. He said that people might like to buy two copies: one for home, and one for a vacation cottage!

Instead of two copies, most people decided to buy zero. Atari (and thus Warner) posted huge losses for the year and were forced to write off most of its unsold inventory of VCS cartridges. In a famous ceremony, tens of thousands of *E.T.*, *Pac-Man*, and other carts were buried and bulldozed in an industrial waste dump.

The *E.T.* debacle was the exact moment when the bubble burst. Millions of kids around the world decided that Atari and, by extension, all console video games weren't "cool" anymore. Sales of all game systems and software plummeted. Suddenly, venture funding for new game companies vanished.

Personal computer sales, however, were still climbing steadily. Systems like the Apple][, the Commodore 64, and even the new IBM PC were becoming more popular in the home. Parents could justify paying a little more money for a system that was educational, while the kids rejoiced in the fact that these little computers could also play games.

This set the stage for a fateful meeting. The nervous Hi-Toro investors, watching the video game market crumble before their eyes, anxiously asked Jay Miner if it might be possible to convert the new console into a full-blown personal computer. Imagine their relief as he told them he had been planning this all along!

There was only one problem remaining: the company's name. Someone had done a cursory check and found out that the name Hi-Toro was already owned by a Japanese lawnmower company. Jay wanted his new computer to both friendly and sexy. He suggested "Amiga," the Spanish word for female friend. Perhaps not coincidentally, Amiga would also come before Atari in the phone book! Jay wasn't terribly pleased with the name initially. However, as none of the other employees could think of anything better, the name stuck.

Now everything was in place. The players were set; the game was under way.

The dream was becoming a reality.

Early days at Amiga

Jay Miner once described the feeling of being involved in the young Amiga company as being like Mickey Mouse in the movie *Fantasia*, creating magical broomsticks to help carry buckets of water, then being unable to stop his runaway creations as they multiplied beyond control. He immediately hired four engineers to help him with the hardware design, and a chief of software design, Bob Pariseau. Bob then quickly hired four more software engineers to help him. The young company quickly became an unruly beast, devouring money at an insatiable pace. But it was necessary.

In high technology, even more so than in other industries, speed is always important, and there is never enough time. Things change so quickly that this year's hot new design looks stale and dated next year. The only way to overcome this problem is to apply massive amounts of concentrated brainpower and come up with a very clever design, then rush as quickly as possible to get the design through the initial prototype and into an actual product. Even the inelegant, unimaginative and graphically inept IBM PC, introduced in 1981, was the result of an unprecedented one-year crash building program. Not even the mighty IBM, with resources greater than those of small nations, was immune to the pressures of time.

A tiny company like Amiga had even greater problems. On top of the maddening rush to ramp up staffing and develop a new product, Jay and his team had to worry about much larger corporations and their industrial espionage teams stealing their new ideas and applying much greater resources to beat them to market. Nobody knew what Amiga, Inc. was up to, and the company's founders liked it that way. So an elaborate two-pronged attack was devised to ensure that nobody got wise to Amiga's ambitions before they were ready to show them to the world.

Firstly, the company would create a deceptive business front. This had to be something simple enough that it would not take away too many resources from the actual work, yet still deliver actual products and generate some revenue. The company decided to stick to its videogame roots and produce hardware and software add-ons for the Atari VCS. One of the first products, a collector's item today, was the Amiga Joyboard, a kind of joystick that was used by sitting or standing on top of it and leaning back and forth, left and right. The company also wrote some simple games for it that involved skiing and skateboarding. While income from these games and peripherals helped sustain the company in its early days, it was also affected by the video game crash of '83 and sales quickly dwindled.

The Amiga Joyboard. Note the small Amiga logo at bottom.

This short-lived era of the young company's history had one long-lasting impact on the Amiga computer. RJ Mical, a programmer writing some of the complicated routines that would bring the Amiga to life, developed a

simple game that used the Joyboard and was designed to try and help him to relax. The game was called "Zen Meditation" and the object was to try and sit absolutely still. The game was a kind of running joke in the Amiga offices, and when the time came to write the text for a serious error message for the Amiga operating system, a programmer came up with the term "Guru Meditation Error." This would remain in the operating system for years to come, until a nameless and unimaginative Commodore executive insisted on removing the Guru and making the message into "Software Failure."

The second front of deception against industrial espionage involved codenames for the powerful new custom chips the team was designing for the Amiga computer. Dave Morse decided that henceforth all these chips would be referred to by women's names. The idea was that if anyone intercepted telephone conversations between Amiga people, they would be unable to figure out that they were discussing parts of a computer. The idea of "Agnes" being temperamental or "Denise" not living up to expectations also appealed to the engineers' sense of humor. The computer itself was codenamed "Lorraine," the name of Dave's wife.

Jay Miner may have been leading the team, but the details of the new computer were hammered out at team design meetings, held in a seminar-like room that had whiteboards covering the walls. Everyone could pitch for inclusion in the machine, and the small group would have to come to a consensus about which features to include and which to leave out. Engineering is all about tradeoffs, and you can't just decide to include "the best of everything" and have it all work. Cost, speed, time to develop, and complexity are just some of the factors that must be taken into account at this crucial stage of a new computer. The way the Amiga team came to a consensus was with foam rubber baseball bats.

It isn't known who first came up with the idea, but the foam bats became an essential part of all design meetings. A person would pitch an idea, and if other engineers felt they were stupid or unnecessary, they would hit the person over the head with a bat. As Jay said, "it didn't hurt, but the humiliation of being beaten with the bat was unbearable." It was a lighthearted yet still serious approach, and it worked. Slowly the Amiga design began to take shape.

Hold and modify

Jay had always had a passion for flight simulators, and it was something that would stay with him for the rest of his life. A friend of his took him on a field trip to Link, a company that made multimillion-dollar flight simulators for the military. Jay was enthralled by the realistic sights and sounds and vowed that he would make the Amiga computer capable of playing the best flight simulators possible.

Two major design decisions came out of this trip: the blitter and HAM mode. Jay had already read about blitters in electronic design magazines and had taken a course at Stanford on their use, so they were not a new idea for him. However, the flight simulator experience had made him determined to create the best possible blitter for the Amiga.

A blitter is a dedicated chip that can move large chunks of graphics around on the screen around very quickly without having to involve the CPU. All modern video cards have what is essentially an advanced descendent of a blitter inside them. Again, Jay was ahead of his time.

HAM mode, which stood for Hold And Modify, was a way of getting more colors to display on the screen than could normally fit into the display memory. At the time, memory chips were very expensive, and the cost for displaying millions of colors at once was too high even for military applications like the Link simulator. So instead of storing all the color information for each dot (or pixel) on the display, the hardware could be programmed to start with one color and then change only one component of it (Hue, Saturation or Luminosity) for each subsequent pixel along each line. Jay decided to put this into the Amiga.

Later on in the design process, Jay would become concerned that HAM mode was too slow and even asked his chip layout artist if he could take it out. The chip designer replied that it would take many months and leave an aesthetically unappealing "hole" in the middle of the chip. Jay decided to keep the feature in, and later admitted that this was a good decision. The Amiga shipped with the ability to display 4096 colors in this mode, far more than any of its competitors, with clever programmers squeezing even more colors out of future Amiga chipset revisions. Despite HAM being suitable only for displaying pre-calculated images, a software company would even develop a graphics editor that operated in HAM mode. Like the chess game on the Atari 2600 before it, programmers would make the impossible possible on the Amiga.

Screens like no other

Another new invention for the Amiga computer was the "copper" chip. This was essentially a special-purpose CPU designed specifically for direct manipulation of the display. It had only three instructions, but it could directly access any part of the other display chips at any time. What's more, it could turn amazing tricks in the fraction of a second that it took for the monitor to refresh the display. This allowed a trick that no other computer has ever reproduced: the ability to view multiple different screens, opened at different resolutions, at the same time. These "pull-down" screens would amaze anyone who saw them. Modern computers can open different screens at different resolutions (say, for example, to open a full-screen game at a lower resolution than the desktop is displaying, in order to play the game faster or at a higher frame rate) but they can only switch between these modes, not display multiple modes at once.

The design eventually coalesced down to three chips named Agnes, Denise, and Paula. Agnes handled direct access to memory and contained both the blitter and copper chips. Denise ran the display and supported "sprites," or graphical objects that could be displayed and moved over a complex background without having to redraw it. Finally, Paula handled sound generation using digitally-sampled waveforms and was capable of playing back four channels at once: two on the left stereo channel and two on the right. It would be years before competing computer sound capabilities came anywhere close to this ability. Paula also controlled the Amiga's floppy disk drive.

These chips formed the core of what would be referred to as the Amiga's "custom chipset." However, they did not yet exist, except on paper. While the software development team was able to get started planning and writing programs that would support the chipset's features, the hardware team needed some way to test that their chips would actually work before committing to the expense of manufacturing them. In addition, the operating software could not be fully tested without having real Amiga hardware to run it on.

Come back next week for Part 3: The first prototype.