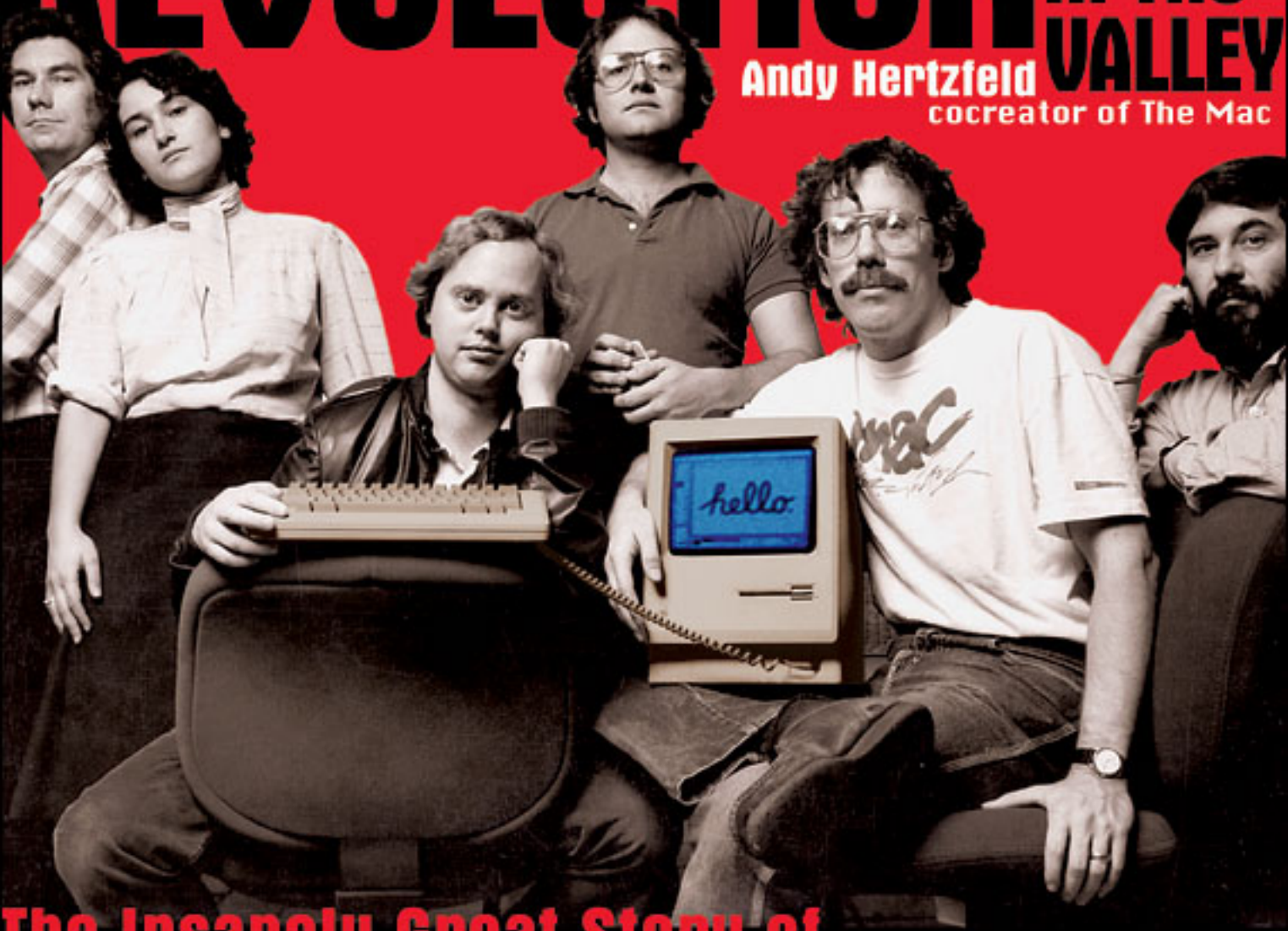
REVOLUTION in The VALLEY

Andy Hertzfeld
cocreator of The Mac



The Insanely Great Story of

How The Mac Was Made

foreword by Steve Wozniak

part four

He can who thinks he can,
and he can't who thinks he can't.

This is an inexorable, indisputable law. Pablo Picasso

Steve Wozniak University

September 1983

Burrell's educational credentials

After numerous delays, the launch of the Macintosh was finally scheduled for January 24, 1984, so we had to start doing publicity for it in the fall of 1983. Steve decided to anoint some of the engineers plus a few others as the official "Macintosh Design Team," which meant we had to prepare to be interviewed by the press. Because some magazines have lead times of more than three months, interviews were scheduled as early as October.

As part of the preparations, our publicity gurus, the Regis McKenna press liaisons (known as the Rejettes), asked each of us to fill out a questionnaire. The standard questions were asked, such as date and place of birth, degrees, etc. Our answers would be used as the basis for a fact sheet that would be handed out to the press.

Burrell, who never attended college, didn't know how to answer the "College Attended" question. But, true to form, it took him only a moment to come up with the perfect answer: "Steve Wozniak University." I think you could say that, in some fashion, we were all graduates of Steve Wozniak University.

The official Macintosh design team. Left to right: George Crow, Joanna Hoffman, Burrell Smith, Andy Hertzfeld, Bill Atkinson, and Jerry Manock.

The Mythical Man-Year October 1983

Steve estimates the effort that went into QuickDraw

In October of 1983, we had our first encounter with the press, in the form of a group interview with *Byte* magazine. The article was set to run concurrently with the launch of the Mac in January of 1984.

Byte was one of the first PC hobbyist magazines, written for a fairly technical audience of computer enthusiasts. Two *Byte* editors were quizzing five or six of us, including Steve Jobs, when one of them asked how long the Mac's graphical user interface software had taken to develop.

"How many man-years did it take to write QuickDraw?" the reporter asked Steve. QuickDraw, the amazing graphics package written entirely by Bill Atkinson, was at the heart of both Lisa and Macintosh.

Steve turned to look at Bill. "Bill, how long did you spend writing QuickDraw?"

"Well, I worked on it on and off for four years," Bill replied.

Steve paused for a beat and then turned back to the reporter. "Twenty-four man-years. We invested twenty-four man-years in QuickDraw."

Obviously, to Steve, one Atkinson year equaled six man-years. I think that was a modest estimate.

1984

September 1983

The famous 1984 commercial is nearly canceled

The folks at Apple always had a flair for marketing. Mike Markkula, Apple's third co-founder and a former Intel marketing executive, believed that a fledgling venture needed to act like a successful company if it wanted to become one, at least in terms of external perception, and Steve Jobs always insisted on the highest possible production values, even while Apple was still in the garage. The Apple II was featured in an expensive, 2-page spread in the September 1977 issue of *Scientific American*, for example, even though Apple had less than 20 employees and minimal sales at the time.

Apple's advertising agency was Chiat-Day, founded by Jay Chiat in 1968. Jay was compulsively innovative, brash, and irreverent, much like an older version of Steve Jobs, and the two hit it off really well when they were introduced in 1981, just before Chiat-Day acquired Regis McKenna's advertising operations. Jay and his talented team, featuring Creative Director Lee Clow and star copywriter Steve Hayden, crafted Apple's first TV commercials, recruiting talk show host Dick Cavett as a spokesperson, and created the campaign that launched the Lisa, including a TV commercial that starred a then-unknown Kevin Costner.

Toward the end of 1982, Chiat-Day's art director Brent Thomas, along with Steve Hayden, came up with the idea of doing an ad campaign based on the timely tagline "Why 1984 won't be like 1984." Chiat-Day shopped it around to a number of clients, including Apple, where it was proposed for a print ad in the *Wall Street Journal* promoting the Apple II. But Apple didn't go for it, and the idea was filed away until the spring of 1983, when they met with the Mac marketing team to start working on the launch, which was scheduled for January 1984.

Steve Jobs wanted to launch the Macintosh with an inspiring commercial that was as revolutionary as the product itself. He loved the Orwellian tagline when it was presented, and he encouraged the Chiat-Day team to pursue it. Steve Hayden and Brent Thomas put together an intriguing storyboard, envisioning a visually striking, highly symbolic, miniature science fiction epic featuring a young female athlete who liberates the subjugated masses from totalitarian domination by throwing a sledgehammer and smashing a huge screen displaying Big Brother.

Macintosh marketing manager Mike Murray and Steve Jobs loved it, but they needed to get new CEO John Sculley's approval for such a large expenditure. Sculley was a bit apprehensive (after all, the commercial hardly mentioned the Macintosh), but he gave his OK for an unprecedented production budget of over $750,000 to make the one-minute commercial.


Chiat-Day hired Ridley Scott, the best science fiction–oriented director they could find, whose previous movie, *Blade Runner*, possessed the visionary dystopian feel for which they were striving. Ridley was based in London, so they decided to shoot it there, at Shepperton Studios. Several Apple and Chiat-Day executives, as well as Mike Murray and Steve Jobs, traveled to London for the week of filming.

Ridley's team had assembled a cast of almost 200 by the time the Apple folks arrived. To play the oppressed, downtrodden workers, his people recruited dozens of authentic British skinheads, paying them $125 dollars a day to participate. It was harder to cast the young heroine because most of the models who tried out had trouble spinning with the heavy sledgehammer. Luckily, a model named Anya Major was an accomplished discus thrower; she could do it faultlessly, so got the part.

When he arrived at the studio, Mike Murray went looking for Jay Chiat. He found him lurking off to one side behind some scenery. Apparently, some of the skinheads were in a nasty mood, and they were looking for trouble during breaks in the filming. Jay thought it was prudent to make sure he stayed out of their way.

While everyone was off in London, I got a call from someone at Chiat-Day asking if I could write an Apple II Basic program to flash impressive looking numbers and graphs on the screen. They wanted to overlay these on the image of Big Brother. I spent an afternoon cooking something up and sent it off to them, although I was never sure if it was used.

Lee Clow and Steve Hayden presented a rough cut of the commercial to the Apple team a few weeks later, and everyone was ecstatic. The commercial was classy, suspenseful, and enigmatic, and seemed certain to garner lots of attention. It was shown for the first time at Apple's October 1983 annual sales conference in Honolulu. Steve preceded the showing with a clever talk positioning Apple as the industry's last alternative to IBM (see "The Times They Are A-Changin'"). The commercial got a rapturous reception. In fact the response was so great that Apple booked two expensive slots, for 60 seconds and 30 seconds, costing over a million dollars, to show it during Super Bowl XVIII, which was just two days before the Mac introduction.

Mike Murray and Steve Jobs screened the commercial for Apple's board of directors in December to get final approval for the huge Superbowl expenditure. To their surprise, every

outside board member seemed to despise the commercial. Mike Markkula even suggested that Apple begin a hunt for a new ad agency. One board member remarked it was the worst commercial he had ever seen. Steve and Mike were devastated.

The chilling reception from the board compelled John Sculley to ask Chiat-Day to sell back both of the time slots they had purchased. But Jay Chiat was true to form and sold off only the 30-second slot, telling Apple that he wasn't able to get rid of the longer one at so late a date. Apple considered using the slot for a more conventional commercial, but in the end decided to take a chance and air the 1984 spot.

We were told the commercial would air early in the third quarter, at the first commercial break after the second-half kickoff. Burrell and I wanted to see a real audience's reaction to the commercial more than the commercial itself (since we had already seen it plenty of times), so we watched the Superbowl at a sports bar near Stanford called the Oasis, with some other Mac team friends. The game was boring, but the bar was packed, and the commercial looked great. We thought we heard a small murmur in the bar after the commercial aired, but it was hard to tell if it was really related.

That evening, the commercial ran again on all the evening news shows. Apparently, because it had made such a splash and rumor already had it that it would only air once, the ad became a news item itself. Of course this just increased expectations for the upcoming launch. Ironically, it ran dozens of times on news shows in the next couple of days, gathering Apple over five million dollars worth of free publicity.

A week after the Macintosh launch, Apple held its January board meeting. The Macintosh executive staff was invited to attend but didn't know what to expect. When the Mac people entered the room, everyone on the board rose and gave them a standing ovation, acknowledging they had been wrong about the commercial and congratulating the team for pulling off a fantastic launch.

Chiat-Day wanted the commercial to qualify for upcoming advertising awards, so they ran it once at 1 A.M. at KMVT, a small television station in Twin Falls, Idaho, on December 15, 1983. And sure enough, it won just about every possible award, including best commercial of the decade. Twenty years later it's still considered one of the most memorable television commercials ever made.

Monkey Lives

October 1983

The very first location in low memory

The original Macintosh had only 128K bytes of RAM (that's one eighth of a megabyte), so dealing with memory management was usually the hardest part of writing both the system and applications. We allocated around 16K bytes for system use, and another 22K bytes for the 512 × 342 black-and-white screen, leaving applications with only 90K bytes or so. The bigger ones like MacWrite or MacPaint were bursting at the seams.

By the fall of 1983, MacWrite and MacPaint were pretty much feature-complete but still needed a lot of testing, especially in low-memory conditions. MacPaint needed to allocate three offscreen buffers, each the size of the entire screen. This meant it was always on the verge of running out of memory, especially when you brought up a desk accessory, but the specific sequences that led to crashes were difficult to reproduce.

Steve Capps had been working on a "journaling" feature for the "Guided Tour" tutorial disc that would allow the Macintosh to demo itself by replaying back events that were recorded in a prior session. He realized the so-called "journaling hooks" that were used to feed prerecorded events to the system could also be the basis of a testing tool he called "The Monkey."

The Monkey was a small desk accessory that used the journaling hooks to feed random events to the current application, giving the impression that the Macintosh was being operated by an incredibly fast, somewhat angry monkey who was busy banging away at the mouse and keyboard, generating clicks and drags at random positions with wild abandon. It had great potential as a testing tool, so Capps refined it to generate more semantically rich events, with a certain percentage of the events as menu commands, a certain percentage as window drags, etc.

The Monkey proved to be an excellent testing tool, and a great amusement as well. Its manic activity was sort of hypnotic, and it was interesting to see what kind of MacPaint pictures the Monkey could draw, or if it would ever produce something intelligible in MacWrite. At first it crashed the system fairly easily, but soon we fixed the most obvious bugs. We thought it would be a good test to see if an application could survive the monkey all night, but they usually couldn't run for more than 20 minutes. At that point, even if it didn't crash, the Monkey would invariably select the Quit command.

Bill Atkinson came up with the idea of defining a system flag called "MonkeyLives" (pronounced with a short "i" but often mispronounced with a long one). The flag would indicate when the Monkey was running and allow other applications to test for the presence of the Monkey. If the application found the Monkey running, it could disable the Quit command, as well as other commands it wanted the Monkey to avoid. This allowed the Monkey to run all night, or even longer, driving the application through every possible situation.

We kept our system flags in an area of very low memory reserved for the system globals, starting at address 256 ($100 in hexadecimal), since the first 256 bytes were used as a scratch area. The very first slot in the system globals area, address 256, had just been freed up, so that's where we put the MonkeyLives boolean. The Monkey itself eventually faded into relative obscurity as the 512K Macintosh eased the memory pressure, but it was memorialized by the curious name of the very first value defined in the system globals area.

The Monkey was a small desk accessory that used the journaling hooks to feed random events to the current application, giving the impression that the Macintosh was being operated by an incredibly fast, somewhat angry monkey...

September 1983

The Puzzle desk accessory becomes controversial

The original Macintosh could run only one real application at a time, but it could also concurrently run little programs called "desk accessories" that shared memory with the main application. Like the system itself, most of the desk accessories were written in 68000 assembly language. But in the fall of 1982 I decided to write a small adaptor that allowed desk accessories to be written in Pascal, both as a proof of concept and as a way to show developers how to do it.

Desk accessories like the calculator or the alarm clock were usually utilities, but I thought we should also have a game or two to show that the Macintosh was fun as well. I decided to write a puzzle that had 15 numbered tiles in a 4 × 4 space. The object of the game was to arrange the numbers in sequential order. If you clicked on a tile next to the empty space, it slid into that space. It was a fun way to waste time and build up mouse coordination.
Since the number puzzle was written in Pascal, it had to link with the Pascal runtime, which dragged in lots of extra code that wasn't used. This made the Puzzle desk accessory over 6K bytes, although most of its bulk was just the runtime.

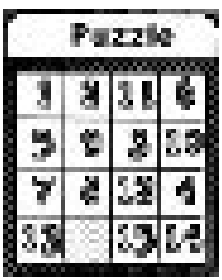
By the fall of 1983, it was time to make decisions about what software to include in the shipping product. We had shown the Mac to a number of industry analysts and, while most were enthusiastic, some didn't really get the graphical user interface and thought it was "game-like" and not suitable for serious computing. This made some of the Macintosh marketing folks a bit leery about the more whimsical aspects of the design, and the puzzle, being an actual game, became somewhat controversial.

Jerome Coonen, the software manager, came by my cubicle one morning to tell me that they had decided to not ship Puzzle, partially because of the game-like perception, but mostly because it was just too big. Applications were very tight on RAM, and Puzzle was one of the biggest desk accessories because it was written in Pascal. At over 6 Kbytes, it also ate into the available disk space.

I liked Puzzle and didn't want to capitulate to the buttoned-down, all-business view of the customer, so I told Jerome, "You know, Puzzle doesn't have to be so big. I bet I could rewrite it and get it to take up less than 1K bytes. Would you keep it if I got it that small, or is it really the other issue?"

Jerome thought about it, and then told me if I could get it down to 600 bytes or so it would be in the release. The only problem was I had to get it done over the weekend, because the documentation group had to send the manuals out to the printer. Besides, there was plenty of other stuff for me to work on.

Of course, I couldn't resist a challenge like that. It took only a few hours on Saturday to recode the puzzle in assembly language and, because it no longer had to link with the bulky Pascal code, get it down to the required 600 bytes. I proudly showed it off to everyone on Monday, and it did make it into the first Mac release and remained as part of the standard system for many years.



We're Not Hackers!

September 1983

We were always dealing with memory limitations

From the beginning, the Macintosh was conceived as a very low-cost, high-volume personal computer. It was important for the design team to keep manufacturing costs as low as possible. Since memory was relatively expensive, we were always dealing with memory limitations.

One of the most clever parts of Burrell Smith's original, 68000-based digital board was the "bus transformer" logic that multiplexed the data bus, allowing him to hook up the 68000—which demanded a 16-bit data bus—to only 8 memory chips. He also included a single, byte-wide 64 kbit ROM chip, so that the first Macintosh, circa January 1981, had a total of 64K bytes of RAM and 8K bytes of ROM.

But as we started to get software running on the prototype, it became increasingly clear that we didn't have enough RAM for the kind of graphic intensive applications we wanted to build; after all, just the frame buffer for the bitmap display took up almost one third of the available memory. And furthermore, Bill Atkinson's graphics routines had recently exceeded the size of the 8K ROM. So, when the digital board was redesigned to incorporate the SCC chip in June 1981, Burrell added another row of 8 memory chips, doubling the RAM size to 128K, and then added another ROM chip as well, doubling the ROM size to 16K. We vowed we would fight hard to make this the last increase (in contrast with the Lisa, whose memory requirements were growing considerably faster than Moore's Law).

Even though the ROM size doubled to 16K, it was barely enough to contain our prototype environment if we included the graphics routines. Burrell figured he could add a third ROM chip, bringing the total to 24K. Two of the ROM chips were hooked up directly to the 68000's 16-bit bus, so code could run faster, while the third chip shared the "bus transformer" circuit with the RAMs.

We built 50 Mac prototypes in the fall of 1981, each containing 24K of ROM, burned into EPROM. Although the system fit readily in 24K, we were still worried that it would soon be an unbearably tight squeeze. On top of that, Burrell never liked the inelegance of three different ROMs.

One day a few months later, Burrell returned from a meeting with a semiconductor company's sales representative. He was really excited and almost ran into my office. "OK, you say that you won't be able to fit in 24K, right? Be honest. How much will we really need?"

“Hey, that’s not the right way to code. What are you guys, a bunch of hackers?”

We always seemed to need just a little more ROM than was available. “I think we’d definitely make it if we had 32K,” I responded.

Burrell laughed. “No, you won’t. It’s clear that won’t be enough, since the software isn’t close to being finished yet. But I just heard that the 256 Kbit ROMs are really close, and they’ll be ready if we ship in early 1983. So I can use two 256 Kbit chips, connected up to the 16-bit bus, and we’ll have 64K bytes of ROM. 64K! ROM is half the price per bit of RAM, so it makes sense to use as much as we can. I know you’ll be asking for even more someday, but that should keep you busy for a while.”

At first, 64K bytes seemed boundless. We were already trying to write the tightest code we could, and it seemed as though it would be plenty because we weren’t even using 32K yet. But sure enough, as the system came together in the spring of 1983, we were beginning to strain against the new size limit.

Fortunately, we had started to use the Resource Manager to load objects such as fonts and drivers, so we had some flexibility when it came to keeping data on disk instead of the ROM. Jerome and I designed the “PACK” mechanism, which used the Resource Manager to load code for optional packages, such as the floating-point routines. But code on floppy disk is much slower to load and would reduce the effective size of each disk.

Even though we tried to make our code as small as possible initially, the lack of space in the ROM made us work even harder to reduce the footprint. We developed a number of unusual space-saving techniques, some of which were inspired by tricks Woz used in the Apple II ROM. For example, we’d often push parameters on the stack out of order, sometimes four times in a row, because we had a value in a register we would need later and that we didn’t want to fetch again. We knew this made the code harder to maintain, but we thought it was worth it.

As ROM freeze-time approached, the entire team started to focus on code compression. We had a few practice sessions where everyone explained their favorite space-saving techniques, and then we all plowed through the code, saving a dozen bytes here and there. Steve Capps came up with a simple way of compressing the four or five icons that were built into the ROM, saving hundreds of precious bytes in the process.

Technical Details:

Bill didn't like how we made space on the stack for a function result. He was used to doing it with CLR.W -(SP), while Larry and I preferred SUBQ #2, SP. Bill's version required a memory access while ours didn't. Bill didn't like our technique because it essentially pushed a random, unknown value into the stack, which shouldn't have mattered, but he thought it introduced unnecessary indeterminism.

Bill Atkinson didn't participate in the marathon code-crunching and, except in a few cases, wouldn't allow QuickDraw to be subjected to it. He believed that all code should be as simple and clear as possible, and thought, probably correctly, that we'd be better off without the tricks in the long run. In September 1983, just before the ROM was frozen, he found a bug in the Memory Manager that we devised a simple fix for.

I went with Bill to Larry Kenyon's cubicle where he was maintaining the Memory Manager sources. Bill looked over our shoulders as we added a little code to correct the bug. But he objected and became upset when he noticed we used one of our coding tricks.

"Hey, that's not the right way to code. What are you guys, a bunch of hackers? I'm not sure that I want to work with a bunch of hackers."

Both Larry and I cared more about pleasing Bill than saving every possible byte or cycle, so we changed our fix to use the slower, more conservative, Bill-approved technique. We also added a comment to the instruction in the source code to remind us why we did it the slower way in this circumstance. The comment said "We're Not Hackers!"

A Rich Neighbor Named Xerox

November 1983

Steve confronts Bill Gates about copying the Mac

When Steve Jobs recruited Microsoft to be the first third-party applications software developer for the Macintosh, he was already concerned that they might try to copy our ideas into a PC-based user interface. As a condition of getting an early start at Macintosh development, Steve made Microsoft promise not to ship any software that used a mouse until at least one year after the first shipment of the Macintosh.

Microsoft's main systems programmer assigned to the Mac project was Neil Konzen, a brilliant young Apple II hacker who had grown up in their backyard, in the suburbs of Seattle. Neil started working at Microsoft while he was still a high school student and single-handedly implemented the system software for their hit Z80 card, which allowed the Apple II to run CP/M software.

Neil loved Apple, so it was natural for Microsoft to assign him to their new, top-secret Macintosh project. He was responsible for integrating Microsoft's byte code–based interpreted environment (which was actually a copy of a system used at Xerox that favored memory efficiency over execution speed and was appropriate for the Mac's limited memory) with the rapidly evolving Macintosh OS, so he quickly became Microsoft's expert in the technical details of the Mac system.

By the middle of 1983, Microsoft was far enough along to show us working prototypes of their spreadsheet and business graphics programs, Multiplan and Chart (they were also working on a word processor, but they neglected to mention it because it would compete with MacWrite). I would usually talk with Neil on the phone a couple times a week. He would sometimes request features that I would implement for him, or he would perhaps complain about the way something was done. But most of the time I answered his various questions about the intricacies of the still evolving Application Programming Interface (API) I gradually began to notice that Neil often asked questions about implementation details he didn't really need to know about. In particular, he was really curious about how regions were represented and implemented, and would often detail his theories about them to me, hoping for confirmation.

Aside from intellectual curiosity, there was no reason to care about the system internals unless you were trying to implement your own version of it. I told Steve that I suspected Microsoft was going to clone the Mac, but he wasn't worried because he didn't think they were capable of doing a decent implementation, even with the Mac as an example.

Then, in November 1983, Microsoft made a surprising announcement at Comdex, the industry's premier trade show, which was then held twice a year in Las Vegas. Microsoft announced a new, mouse-based system graphical user interface environment called Windows, competing directly with an earlier environment announced by Personal Software called Vision. They also announced a mouse-based option for Microsoft Word. When Steve Jobs found out about Windows, he went ballistic.

"Get Gates down here immediately," he fumed to Mike Boich, Mac's original evangelist who was in charge of our relationships with third-party developers. "He needs to explain this, and it better be good. I want him in this room by tomorrow afternoon, or else!"

To my surprise, I was invited to a meeting in that conference room the next afternoon. Bill Gates had somehow manifested, alone, surrounded by 10 Apple employees. I think Steve wanted me there because I had evidence of Neil asking about the internals. But that never came up. I was just a fascinated observer as Steve started yelling at Bill about violating their agreement.

"You're ripping us off!" Steve shouted. "I trusted you, and now you're stealing from us!"

But Bill Gates just stood there coolly, looking Steve directly in the eye, before starting to speak in his squeaky voice.

"Well, Steve, I think there's more than one way of looking at it. I think it's more like we both had this rich neighbor named Xerox and I broke into his house to steal the TV set only to find that you had already stolen it."

Unfortunately, it turned out, what we had agreed to was only that Microsoft not ship mouse-based software until a year after the Mac introduction, a date defined in the contract as September 1983. Foolishly, we hadn't allowed for a floating ship date, so Microsoft was within their rights to announce Windows when they did. And since Apple still needed Microsoft's apps for the Macintosh, Steve really couldn't cut them off.

In fact it took Microsoft two more years to ship Windows 1.0—in the fall of 1985. It was pretty crude, just as Steve had predicted, with little of the Mac's thoughtful elegance. It didn't even have overlapping windows, preferring a simpler technique called "tiling." When its utter rejection became apparent a few months later, Bill Gates fired the implementation team and started a new version from scratch, led by none other than Neil Konzen.

Neil's version of Windows, released a couple of years later, was good enough that Apple filed a monumental copyright lawsuit against Microsoft in 1988, but they eventually lost on a technicality; the judge ruled that Apple inadvertently gave Microsoft a perpetual license to the Mac user interface in November 1985.

"Well, Steve, I think there's more than one way of looking at it. I think it's more like we both had this rich neighbor named Xerox and I broke into his house to steal the TV set only to find that you had already stolen it."

PRICE FIGHT

October 1983

We feel betrayed by the unexpectedly high price

The plan had always been to have the Macintosh be a very low-cost, high-volume personal computer. We wanted to keep the price as low as possible so ordinary individuals would be able to afford them. The initial target price was $500, less than half the price of an Apple II at the time, but it quickly rose to $1000 after the design team added up the cost of various components.

In early 1981, after switching from the 6809 to the more expensive 68000 microprocessor and doubling the RAM to 128K bytes, we realized we'd have to raise the retail price to $1500 in order for Apple to make its standard profit margin. $1500 was approximately the original price of the Apple II, and that was about as high as we could go while still being affordable to individuals. We worked hard to keep the price from rising further and were able to hold it at $1500 for most of the time the product was under development.

Pricing a brand new computer is tricky because costs are highly dependent on volume: the more units of a component you are willing to order, the lower the price per unit. But how can you predict how well a new type of computer will sell? It's literally a confidence game, and we had no shortage of that. Steve Jobs *knew* we were going to sell Macintoshes by the millions, and he was good at convincing our suppliers to share some of the risk with us via lower initial prices, which would be rewarded as volumes soared in the years ahead. For example, Steve was able to get Motorola to commit to a price of $9.00 for the 68000 microprocessor, which was less than a quarter of what they were quoting at the time.

By the summer of 1983, it was becoming clear that the disk division's Twiggy floppy disk drive wasn't going to make it, and if we weren't careful, it could drag down the Macintosh with it. We had to scurry (see "Quick, Hide In This Closet!"), but we were able to replace Twiggy with the Sony 3.5" drive without slipping the schedule, which was better in every way except one: it cost us an extra $50 or so. When combined with a few other recent splurges, it pushed us over the top, so we grudgingly accepted that the Macintosh would have to debut for $1995.

Meanwhile, Apple hired a new CEO, John Sculley, in April 1983. John was the former CEO of Pepsi and a world-class marketing whiz, having invented the concept of the "Pepsi Generation" and other successful promotions. He was hired by Apple mainly to apply his marketing skills to the personal computer market, and the Macintosh in particular. But big-time marketing costs big-time money.

As plans for the Macintosh launch were being finalized in October 1983, and we were frantically trying to finish the software, Steve Jobs strode into the software area one evening. He looked angry. "You're not going to like this," he told us, "but Sculley is insisting that we charge $2495 for the Mac instead of $1995, and use the extra money for a bigger marketing budget. He figures the early adopters will buy it no matter what the price. He also wants more of a cushion to protect Apple II sales. But don't worry, I'm not going to let him get away with it!"

The design team was horrified. One of the main reasons we were so passionate about the Macintosh was that we thought we were working on something we would use ourselves, along with our friends and relatives. It was crucial that it be affordable to ordinary people. $2500 felt like a betrayal of everything we were trying to accomplish. We had worked so hard to keep the price down in every aspect of the design, and we resented the idea that it was being artificially inflated to cover a glitzy ad campaign. But we believed Steve would be able to convince John that we'd do better at the lower price.

After a week or so of wrangling, much to our surprise and dismay, Steve was the one who gave in. The Mac was launched at $2495, a thousand dollars more than our target. It sold quickly at first, but sales soon bogged down. This was partially due to the lack of available software, but also to the high price. Even after sales picked up in 1986, with the Mac Plus and the proliferation of desktop publishing, Apple continued to overcharge for the Macintosh, preferring huge profit margins to growing their market share, which eventually caused major problems when this practice caught up with them in the 90s.

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90 Hours a Week and loving it

October 1983
Burrell modifies his sweatshirt

Burrell is wearing the sweatshirt in this picture taken at Larry Tesler's birthday party at Caroline Rose's house in Palo Alto in April 1983. Steve Capps is up top, left to right is Burrell Smith, Caroline Rose, Marge Boots (Capps' wife), Andy Hertzfeld, and Larry Tesler. Facing page: Burrell at home in January 1994.

Most Macintosh software team members were between 20 and 30 years old, and with few family obligations to distract us, we were used to working long hours. We were passionate about the project and willing to more or less subordinate to it the rest of our lives, at least for a while. By the fall of 1983, as pressure mounted to meet our January 1984 deadline, we began to work longer and longer hours. It wasn't unusual to find most of the software team in their cubicles on any given evening—weekday or not—still tapping away at their keyboards at 11 P.M. or even later.

The rest of the Macintosh team, which had now swelled to almost a hundred people (nearing the limit Steve Jobs swore we would never exceed), tended to work more traditional hours. But as our deadline loomed, many of them began to stay late as well to help us out. Dinner was brought in for those who stayed late, and we would all put the software through its paces, competing to see who could find the most bugs, of which there were still plenty, even as the weeks wore on.

Earlier in the year, Debi Coleman's finance team decided to commemorate the team's effort in the traditional Silicon Valley manner: they made a T-shirt. Actually, to make it a little more special, they chose a high-quality, gray hooded sweatshirt. Steve Jobs had bragged to *Time* magazine that the Macintosh team was working "90 hours a week." In honor of this exaggerated assertion, they chose the tag line, "90 Hours a Week and Loving It."

The sweatshirt featured the Macintosh name in red letters, purposefully misspelled as "Mackintosh," as it had been in the *Time* article, with a black squiggle crossing out the errant "k." The "90 Hours" tagline was emblazoned in black across the back. The software team wasn't all that pleased with the whole sweatshirt thing because while we really *were* working that hard, and most of the other sweatshirt recipients weren't even coming close to 90-hour work weeks. But it was a pretty nice sweatshirt, and lots of the engineers wore them frequently, including Burrell Smith.

When Burrell finally quit Apple in February 1985, he continued to wear the sweatshirt. But, as soon as he returned home following his resignation, he immediately took some masking tape and made a big "X" across the "9," virtually obliterating it from view. From then on, he wore it nearly every day, proudly displaying the updated motto, which reflected exactly how he felt. It now read "0 Hours A Week And Loving It."


Macintosh

Susan Kare

MacPaint Gallery October 1983

A gallery of Susan Kare's MacPaint art from 1983

Bill Atkinson began writing MacPaint in February 1983, just after Susan Kare joined the Mac team to design bitmaps for fonts and icons. Susan became one of the first and most accomplished users of MacPaint, trying out new features as they were developed and using it for a wide range of practical applications.

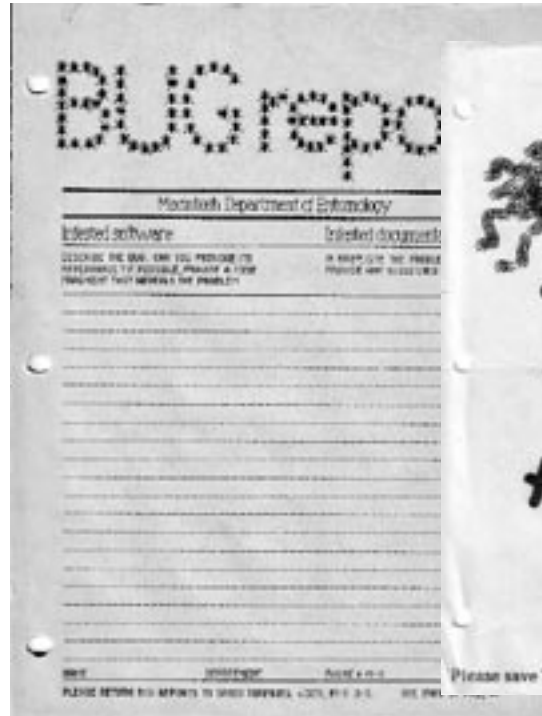
As the Mac team struggled to finish in time for the launch, Susan kept a notebook of many of the MacPaint documents she created. They provide an interesting glimpse of the daily life of the Mac team during that period.

The image on the left is an announcement of a combined birthday party for seven Mac team members whose birthdays fell in early April, including me. I remember how terrified I was of turning 30. As a birthday gift, Susan made me a jersey with a large hexadecimal number "1E" (which is 30 in base 16) on it, so I could still say I was a teenager, at least in hexadecimal.

The image on the right is for a picnic held in July 1983 to celebrate the wedding of two members of the software team: programmer Larry Kenyon and librarian Patti King. Larry and Patti actually eloped in June; the picnic happened after they returned from their honeymoon.

During the last couple of months before shipping, we held some testing marathons where the software team enticed employees from the rest of the division to stay late and help test the software by bribing them with dinner (see "90 Hours A Week And Loving It"). The image on the right is an announcement of another bug hunt, accompanied by the bug report form that was used during the testing.

Below these is an invitation to celebrate a ROM freeze at software manager Jerome Coonen's house. This wasn't the final ROM freeze, which took place in September, but the first of a series that led up to it. We had a party celebrating the final ROM freeze at Woz's house in Scott's Valley.

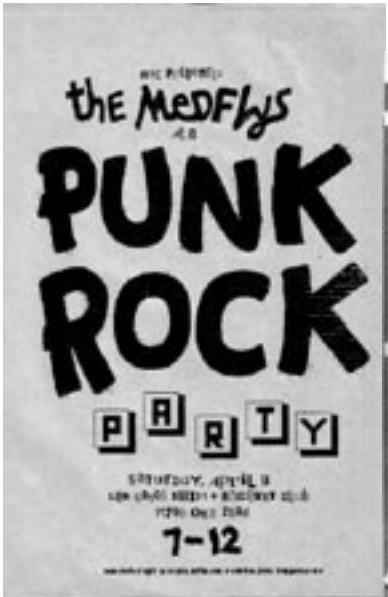

BUGrepo

Macintosh Department of Entomology

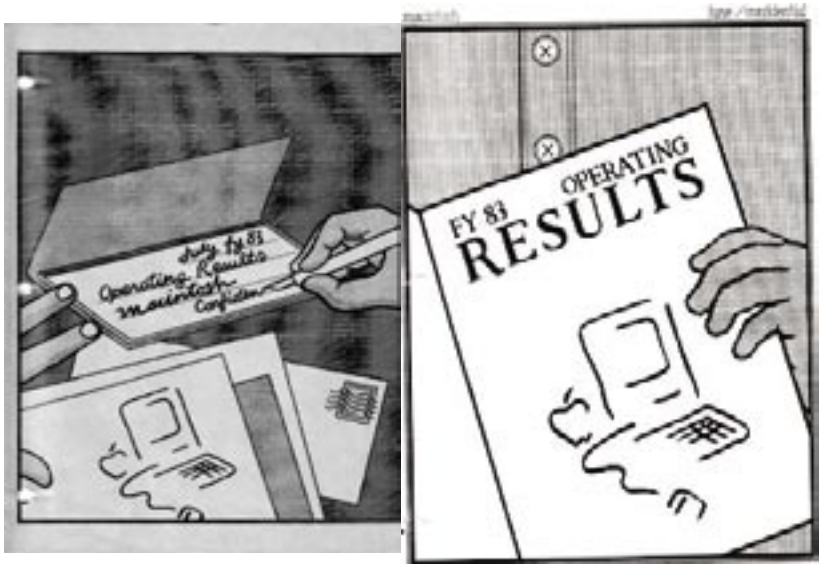
Infested software

Infested documents

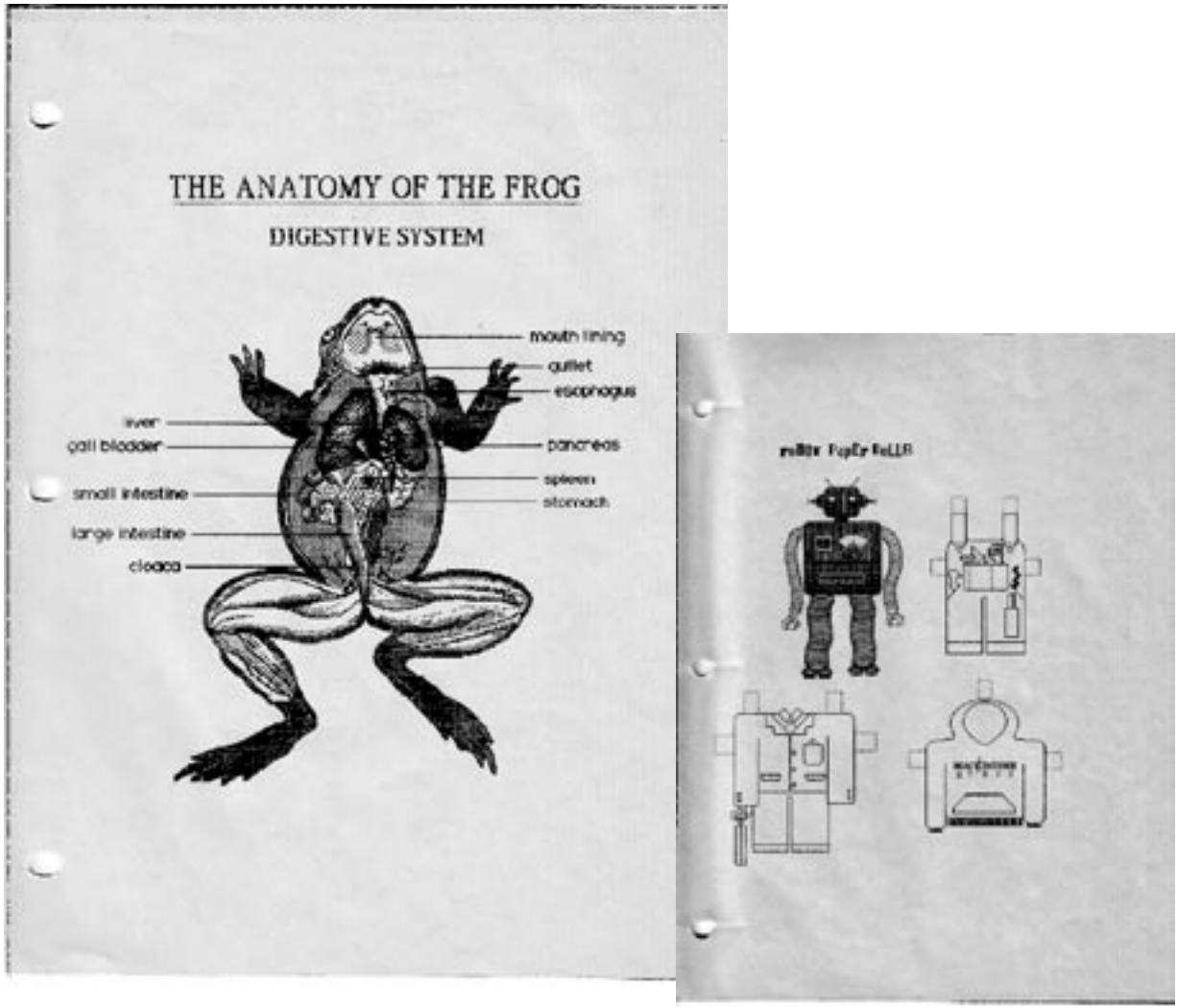
Please save Thursday, December 8, 5-9 p.m. to test software.



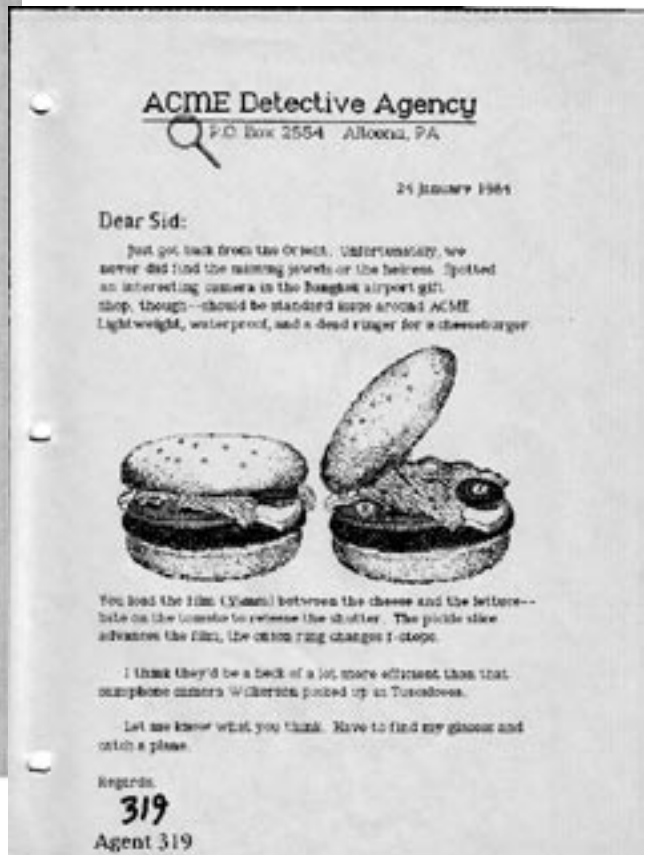
The Mac group worked hard, but Apple would occasionally throw parties for the team, sometimes with unusual themes. The poster on the far left promoted our "Punk Party." Everyone was supposed to attend in "punk" attire and a local band, "The Medflys," was hired to play. The other poster advertised a dance that featured a DJ. Some of us were so disappointed with the music he played that we left and drove to a nearby record store to buy some better music for him to play.



Steve Jobs is very visually oriented and everyone knew he would react more favorably to material presented with nice graphics and high production values. Because of this, the Finance team recruited Susan to use MacPaint to make attractive covers for the monthly financial reports. Here are some covers she made for the June and July 1983 reports.



As we began preparing for the launch in the fall of 1983, Susan was asked to produce art for various marketing materials, to show off the kinds of things you could do with MacPaint. The frog on the left demonstrates how you might use MacPaint in a biology class. Susan also had a fondness for whimsical applications, as demonstrated by the picture on the right.



ACME Detective Agency

P.O. Box 2554 Altoona, PA

24 January 1984

Dear Sid:

Just got back from the Orient. Unfortunately, we never did find the missing jewels or the heiress. Spotted an interesting camera in the Bangkok airport gift shop, though--should be standard issue around ACME. Lightweight, waterproof, and a dead ringer for a cheeseburger.

You load the film (35mm) between the cheese and the lettuce--bite on the tomato to release the shutter. The pickle slice advances the film, the onion ring changes f-stops.

I think they'd be a heck of a lot more efficient than that microphone camera Wilkerson picked up in Tuscaloosa.

Let me know what you think. Have to find my glasses and catch a plane.

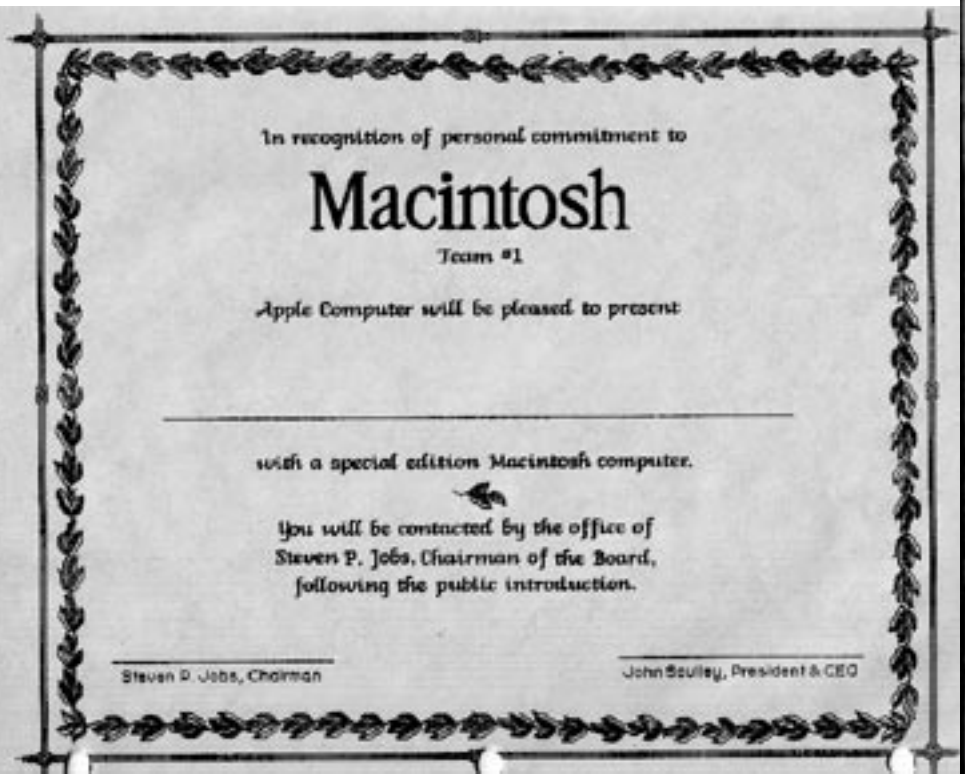
Regards,

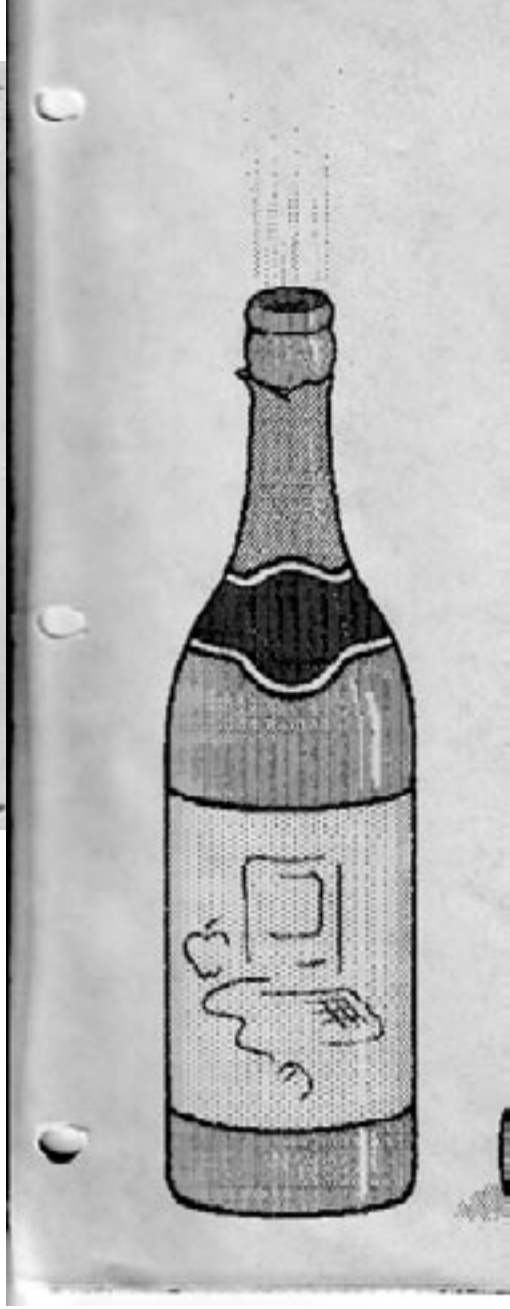
319

Agent 319

Here are some examples that Susan created for marketing. The "Japanese Lady" on the left is pretty famous because it was used in the original brochure. She started with a scan of a fine Japanese woodcut Steve had procured. I think the hilarious detective agency letter on the right was also used in an advertisement.

Sports were another outlet to blow off steam between longs hours of working. In the spring of 1983, we managed to get facilities to install a basketball hoop in the back of Bandley 4 and usually played a half-court game every afternoon. We also had co-ed softball games once per month, which could sometimes get pretty intense.





Apple gave out brand new Macintoshes to everyone on the team right after the launch (see "The Times They Are A-Changin'"). On the left is a certificate that accompanied each machine. On the right is a bottle of champagne, in honor of the launch, to complete the celebration.

Steve Capps Day December 1983

We all dress up in honor of Steve Capps

The Macintosh software was finally coming together as the fall of 1983 wore on. The ROMs containing most of the system software were finished and were more or less holding up. Larry Kenyon devised a clever technique for fixing problems in the ROM by patching the nearest system trap to the problem. The patch code looked back on the stack for the ROM address of the caller, which allowed us to fix problems with tiny, surgical incisions, instead of replacing large chunks of the ROM with precious RAM, as we had originally envisioned.

MacPaint was already stable enough to ship by the middle of November 1983, even though it was always skirting on the edge of running out of memory if we changed something in the system. MacWrite still had lots of bugs, but its core functionality was ready as long as you weren't pushing memory limits. The only vital application that could delay our target date in mid-January was the Finder, which was the shell application responsible for launching other applications and managing files.

Bruce Horn was the only programmer working on the Finder, and he was bogged down with a variety of problems, especially involving fixing file copying in low memory conditions. The Finder was built on top of Bruce's Resource Manager using features that were barely finished before the ROM freeze. It probably should have been at least a two-man project, but Bruce was a brilliant, passionate, independent perfectionist who insisted he could get it done in time on his own.

Jerome Coonen, the Macintosh software manager, was afraid Bruce wasn't going to make it and decided to assign someone else to help. Given Bruce's perfectionism and temperament, it was going to be hard for someone else to dive in, especially this late in the game. Luckily, Steve Capps was the perfect man for the job.

Stockily built, with long brown hair and a bushy beard, Capps was an extraordinarily talented, creative, and prolific programmer. He had transferred over to the Mac team from the Lisa printing group in January 1983, giving us a new burst of energy just as we entered our sprint to the finish. Capps was one of the few people who Bruce respected enough to really listen to. And best of all, he possessed a cheerful, easygoing disposition that was the perfect complement to Bruce's high-strung intensity.

Everyone dressed up for Steve Capps day.

To minimize distractions, which were mounting as Apple's marketing machine kicked into high gear for the launch, Jerome arranged for Bruce and Capps to move into a small office a few blocks away, on Bubb Road. Capps dove in quickly and took over a bunch of tasks from Bruce. It wasn't always easy, but by the end of December it looked as though the Finder was getting more or less back on track.

Jerome thought of a unique way for the software team to show our appreciation for Capps' heroic effort. Like many hackers, Capps dressed idiosyncratically, almost always wearing a long-sleeved, white dress shirt with cut-off denim shorts, white socks, and a distinctive type of checkered sneakers called Vans. In fact, Capps had just given everybody on the team a pair of Vans as Christmas presents. Jerome had the idea to pay homage to Capps by declaring the next day "Steve Capps Day" and cooked up a scheme in which we'd all come in to work dressed exactly like Steve.

I had to go to Macy's to buy myself a white dress shirt, but I managed to come up with a reasonable fascimile of Capps' attire. It was hilarious to see everyone as we gathered in our "fishbowl" office in Bandley 3 the next morning, all dressed in our white shirts, denim shorts, and Vans. Even the French and German translators who were visiting us for the month joined in. The funniest sight, though, had to have been Patti Kenyon, who was over eight months pregnant at the time. Her extra large white shirt added just the right comic touch.

Once we had all assembled, Jerome went to get Capps and Bruce from their enclave, telling them there was an important meeting that required their attendance. We could hardly hold back the laughter as an unsuspecting Capps walked in. We all cracked up and gave him a round of applause when he realized what was going on.

A Mac for Mick

January 1984

We present a Mac to Mick Jagger

The last weeks before the Macintosh unveiling on January 24th were extremely hectic. The software still wasn't finished, and it wasn't clear if there was enough time left to get it into adequate shape. Meanwhile, the Apple PR machine was revved up to full speed, so there were also plenty of unusual diversions, such as being interviewed and photographed for the national press.

The absolute deadline for finishing the software was 6 A.M. on Monday, January 16th, eight days before the introduction. When I came into work on Friday, January 13th, I knew I would probably stay there all weekend, along with the rest of the team, working as hard as possible to shake out the remaining bugs before Monday. Steve Jobs, Mike Murray, Bob Belleville, and others were in New York City doing a press tour, so I thought we would be relatively free of distractions and able to focus on bug fixing.

I came into work later than usual, around noon, since I had been at Apple until 3 A.M. the previous evening, and I wanted to get one decent night's sleep before the final push. As I went to sit down, I noticed that a handwritten note had been placed on my chair. It was from our software librarian, Patti King, who had taken a message from Steve Jobs' secretary, Lynn Takahashi.

"Andy—Steve J. called—we can deliver a Mac to Mick Jagger tomorrow. You can fly out to meet them by tomorrow noon and bring lots of neat software. If you can come, make arrangements for the trip through Lynn. Steve will call back in a couple of hours, also, he'll be at the Carlyle Hotel tomorrow."

A chance to meet Mick Jagger was a once-in-a-lifetime opportunity, but we still had three more days before the deadline. If I flew to New York I would be absent for at least 30 hours, plus I knew I would be relatively useless from all that flying. I called Lynn to have her tell Steve I couldn't make it. But of course I was dying to know Mick's reaction, not to mention how all this had come about.

When Bill Atkinson returned from the East Coast on Sunday afternoon, he filled me in. I then got more details from Steve and Mike Murray a bit later. Apparently Steve had gone to a party on Thursday evening and was introduced to Andy Warhol. Andy got really excited about the Macintosh when Steve demoed it, and said, "You must show it to Mick." Warhol then arranged for Steve and the Apple crew to go to Mick Jagger's townhouse on Saturday afternoon to present him with a Macintosh.

Steve, Mike, and Bill then showed up at the address they were given and knocked on the door, but there was no response for several minutes. Finally, two huge guys opened it up, but they didn't seem all that impressed to be face-to-face with the co-founder of Apple Computer and his entourage.

The Apple folks were led upstairs into an elegantly furnished room to wait for Mick. Bill set up the Mac, launched MacPaint, and started to fool around with it. Then, abruptly, Mick Jagger strode into the room, dressed casually in a t-shirt and blue jeans.

Mick was polite, but he didn't seem to have heard of Apple Computer, Steve Jobs, or the Macintosh. Steve tried to strike up a conversation, but he wasn't very successful. He later told me Mick couldn't seem to put together a coherent sentence. "His speech was slurred and very slow," Steve described it later. "I think he was on drugs. Either that or he's brain-damaged." After a few minutes, it was clear Mick had absolutely no interest whatsoever in Apple or the Macintosh, and an awkward silence ensued.

Fortunately, Mick's 12-year-old daughter Jade had followed Mick into the room, and her eyes lit up when she saw MacPaint. Bill began to teach her how to use it, and pretty soon she was happily mousing away, fascinated by what she could do with MacPaint. Mick drifted off to another room, but the Apple contingent stayed with Jade for another half hour or so, showing off the Macintosh and answering her questions. They ended up leaving the machine behind. There was no way she was going to part with it.

Facing page:
Mick Jagger performing on stage at Byrne Arena during Rolling Stones concert.

Real Artists Ship

January 1984
The final push to finish the software

With the deadline for finishing the software less than a week away, it seemed obvious that there were still too many bugs to ship it. Late on Friday evening, we convinced ourselves we needed an extra week or two to fix the remaining problems. Steve Jobs was on the East Coast, along with Bob Belleville and Mike Murray, doing press for the introduction, so we arranged for a conference call early Sunday morning to tell him about the slip.

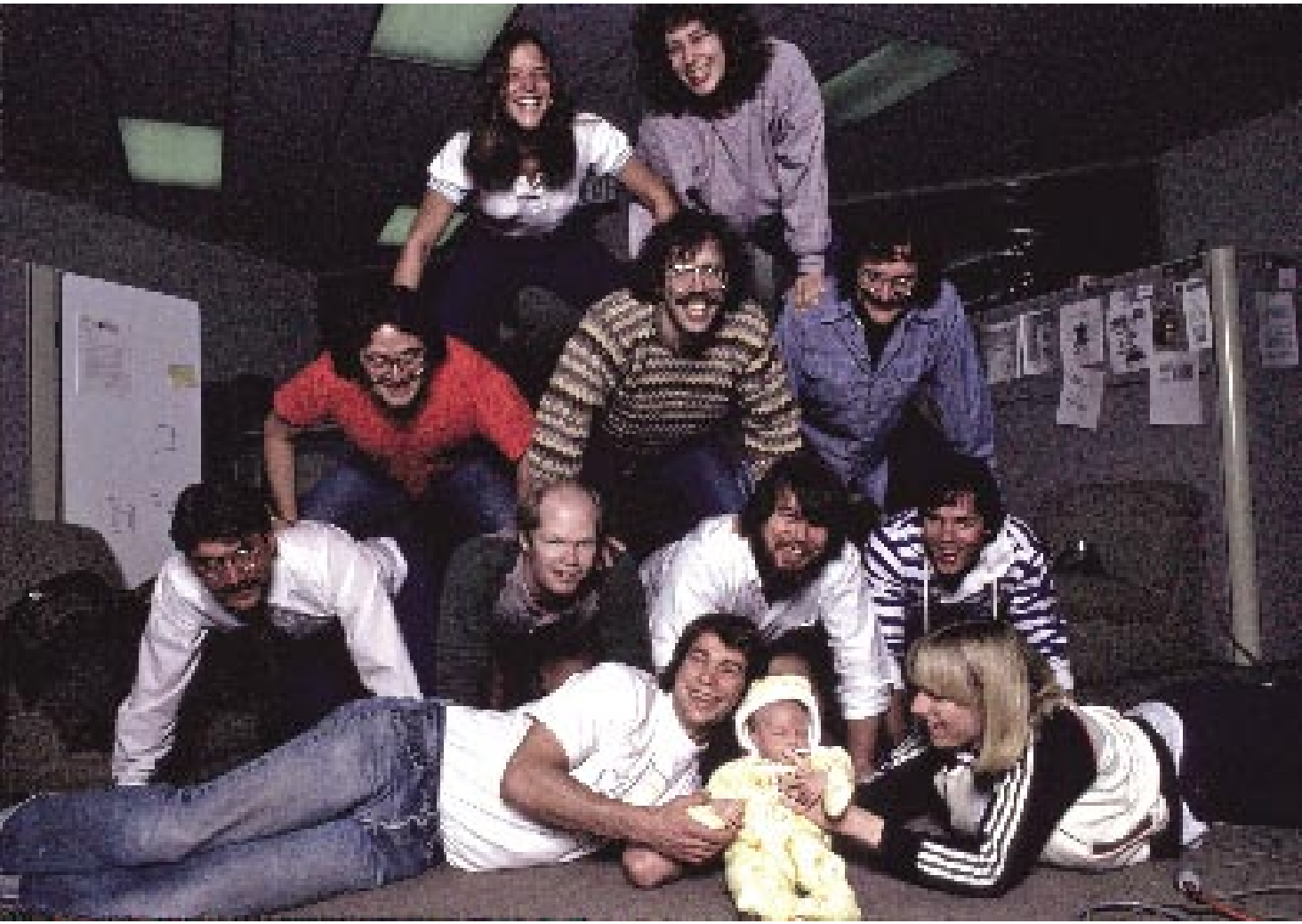
Jerome Coonen, our software manager, spoke for the team, as we sat around the speakerphone. We were exhausted and progress was slow. There were still bugs that we hadn't gotten to the bottom of yet, and it didn't seem possible that we could make it in the time remaining. Jerome proposed that we ship "demo" software to the dealers for the introduction, and update all the customers with final software a few weeks later. We thought Jerome was pretty persuasive as we held our breath waiting for Steve to respond.

"No way, there's no way we're slipping!" Steve responded. The room let out a collective gasp. "You guys have been working on this stuff for months now, another couple weeks isn't going to make that much of a difference. You may as well get it over with. Just make it as good as you can. You better get back to work!"

We did manage to wrangle an extra couple of days, by virtue of working the weekend and moving the deadline to 6 A.M. Monday morning, when the Macintosh factory (where the disks would be duplicated) opened, instead of Friday afternoon. We agreed to go home and rest before returning to work on Monday for the final push.

The final week was one of the most intense I ever experienced. Steve wanted Bill Atkinson and me to fly to New York to present a Mac to Mick Jagger, but I decided I needed to stay in Cupertino to help with the bug fixing (see "A Mac for Mick"). Some of us were pausing work to get photographed for magazines like *Newsweek* and *Rolling Stone*, which made others on the team feel terrible that they were being left out. At times, the atmosphere got pretty tense.

When Friday finally rolled around, it was clear that there were still too many bugs in both the Finder and MacWrite. Randy Wigginton brought in a gigantic bag of chocolate-covered espresso beans, which, along with medicinal quantities of caffeinated beverages, helped us forgo sleep entirely for the last couple of days. We started doing release cycles that were only a few hours apart, re-releasing every time we fixed a significant problem.



When a new release was ready, we would all grab it and start testing again. At one point, around 2 A.M. on Sunday night, I stumbled across a bug in the Clipboard code. I thought I knew what it might be, but I was too tired to deal with it. I tried to pretend I didn't see the problem, but Steve Capps was watching my expression and knew there was something wrong. He grilled me about the problem and then helped me craft a fix since I was too tired to do it on my own.

Top: Rony Sebok, Susan Kare.
Middle : Andy Hertzfeld,
Bill Atkinson, Owen Densmore.
Bottom: Jerome Coonen,
Bruce Horn, Steve Capps,
Larry Kenyon.
Front: Donn Denman,
Tracy Kenyon, Patti Kenyon.

Around 4 A.M., we had a release where everything seemed to go wrong—even MacPaint, which was usually rock solid, was crashing. But our final release around 5:30 A.M. seemed to be much better; the worst problems seemed to have receded and we thought we might actually have a decent release candidate.

That last half hour was devoted to testing the final release as much as we could. It looked pretty good, but then someone found a potential showstopper: the system seemed to hang when a blank disk was inserted while running MacWrite and the disk didn't start formatting as it should. I realized that it was probably hung up waiting for an event, so I reached out and tapped on the space bar, and formatting commenced. Jerome thought the bug was bad enough to hold up the release, but he left to drive it to the factory anyway, figuring they needed to start duplication even if it was just going to be a demo release.

The sun had already risen and the software team finally began to scatter and go home to collapse. We weren't sure if we were finished or not, and it felt really strange to have nothing to do after working so hard for so long. Instead of going home, Donn Denman and I sat on a couch in the lobby in a daze and watched the accounting and marketing people start trickling into work around 7:30 A.M. or so. We must have been quite a sight; everybody could tell we had been there all night (actually, I hadn't been home or showered for three days).

Finally, around 8:30 Steve Jobs arrived, and as soon as he saw us he asked if we had made it. I explained the formatting bug to him, and he thought it wasn't a showstopper, which meant we were actually finished. When I finally got home around 9 A.M., I collapsed on my bed, thinking I'd sleep for at least the next day or two.

Disk Swapper's Elbow January 1984

A last-minute bug causes some problems

contributed by Steve Capps

One of the more common afflictions of early Macintosh users was the dreaded "Disk Swapper's Elbow," which was caused by a disk-copying operation run amok. Disk swapping was a necessary evil caused by having 400 KB floppy disks, 128 KB of RAM, and a single floppy drive. If a user wanted to make a backup of a disk, she had to eject the source disk, insert a blank one, format it, and then drag the source disk over the new disk. The Finder would then copy data piece by piece with the necessary swapping.

A typical application on a 128K Mac had about 85K of memory available; the rest was used by the system, mostly for the bitmap display. A simple calculation shows that copying a 400K disk should have involved about 5 or 6 swaps. Five disk swaps was barely tolerable. However, as early Finder users will remember, it would occasionally take well over 20 disk swaps.

You'd start a disk copy and hold your breath during the fifth, and hopefully, final swap. If the Mac dutifully disgorged the floppy the sixth time, you'd convince yourself you miscounted, cross your fingers, and hope for the best. By the seventh swap you started cursing because you knew you were trapped and you started wondering about investing in an external drive.

Even though the whole Finder was only 46K of code and had about 10K of overhead, the remaining 30K of memory space was too small for practical copying. So, I had to break up the code into two chunks: the bare minimum for copying and all the rest. Then, I had to carefully flush out all data that was cached in memory°, preload the small disk-copying chunk of code, and coalesce the balance of RAM. Usually, the Finder ended up with 75K of free memory and things worked as planned. But, sometimes the system would mysteriously reload the larger chunk of the Finder code, fragment the free memory, and cause another case of Disk Swapper's Elbow.

It took me a long time to figure out what happened because we had rarely seen this in testing. There were a few bug reports of this problem that were never reproducible. The bug reports went like this: "Copied a disk, it took 20+ swaps! Tried a second time, it was fine." The reason this was not reproducible was because we were all expert mouse users and usually skipped the crucial misstep.

When anybody first starts using a mouse, dragging is one of the more difficult things to do. It's actually quite awkward to click down, move the mouse while holding down the button, and then release. Beginners very

often accidentally release the mouse button while dragging. In the Finder, this means you could "drop" an icon you were dragging. You rarely thought about this (unless you happened to drop it over a folder and it disappeared); you'd immediately pick the icon up and continue the drag. It turned out if you dropped the disk icon during a disk copy, you'd induce the bug. Since all of the team members had been using the mouse for years by this time we rarely dropped icons, which is why we could never reproduce the problem.

To support the user's spatial memory, the Finder always remembered where icons were located on the desktop. When you dropped the icon—even for a half a second—the Finder would dutifully record its location. The routine to save the icon's location was, as you probably guessed, in the big portion of the Finder's code. When this bug occurred, the Finder would carefully massage the memory for copying and then belatedly discover the icon's location hadn't been flushed out. It would blindly call the routine to flush it and you now know what would happen....

I introduced this bug about 2 A.M. the morning we built the final disks. This bug was caused by a fix to a much more egregious bug, so it was definitely the lesser of two evils...really!

It Sure Is Great to Get Out of That Bag!

January 1984
We need a demo for the intro

It took a monumental effort, fueled by inordinate amounts of chocolate-covered espresso beans (see "Real Artists Ship"), to finally finish the first release of the Macintosh software in time for the introduction. We finished with literally no time to spare, shipping the "golden master" of the Write/Paint disk to the factory at 6 A.M. on Monday morning January 16th, just a week before the introduction. By that point, most of the software team hadn't slept for days, so we all went home to collapse.

I thought I would need to sleep for at least 24 hours, but I woke up after 6 hours with a desire to go back to Apple to see if the release held up and to see how everyone else was feeling. By 5 P.M., most of the software team had dragged themselves back for the same reason. We were lounging around in a tired daze, happy we had finally shipped the software but still not quite believing it, when Steve Jobs strode into the software area.

"Hey, pick yourselves up off the floor. You're not done yet!"

Uh-oh, I thought. Someone must have found a showstopper in the release and we're going to have to track it down. But that wasn't what he meant.

"We need a demo for the intro! The Mac deserves to have a great demo for its first public showing. I want the Mac to play the theme from *Chariots of Fire* while it's showing a slideshow of the apps. Plus lots of other cool stuff, whatever you can come up with. And it needs to be done by the weekend, to be ready for the rehearsals."

We moaned and groaned about being tired, but as we talked we realized it would be fun to cook up something impressive. We were too tired to think about it right away, but when we came back the next day, a plan started to emerge.

Capps had an idea to use a gigantic font to scroll "Macintosh" across the screen, one letter at a time, to start the demo, so he worked on that, as well as the slideshow. Bruce Horn wanted to do a starry night with twinkling stars, and a skywriter writing "Macintosh" in cursive across the night sky. Susan worked on an intro graphic of the Mac sitting in its canvas carrying bag, as well as some of the other graphics for the slideshow part. I integrated all the pieces and also signed up for the *Chariots of Fire* music part since no one else wanted to do it.

It's hard to write a music editor/player in two days. I managed to put something together that could actually play the *Chariots of Fire* theme, but it didn't sound very good, and Steve immediately rejected it and opted for using a CD of the *Chariots of Fire* song to play in the background instead.

Meanwhile, as we were working on the demo, Mike Boich came by with Mark Barton, a third-party developer who we seeded with an early Mac because he had written an impressive program for the Apple II called SAM the Software Automatic Mouth. SAM was a speech generator that converted text to speech with a distinctive, winning personality. I had helped Mark with sound driver issues as he developed it, and now it had finally made it to fruition. SAM sounded even better on the Mac because we had 8 bits per sample and a higher sampling rate.

When Steve heard SAM talk, he immediately decreed we had to incorporate SAM in the intro demo. "I want the Macintosh to be the first computer to introduce itself!" he insisted. He told Mike Boich to quickly cut a deal with Mark so Apple could bundle the speech generator (rechristened Macintalk) and use it in the intro.

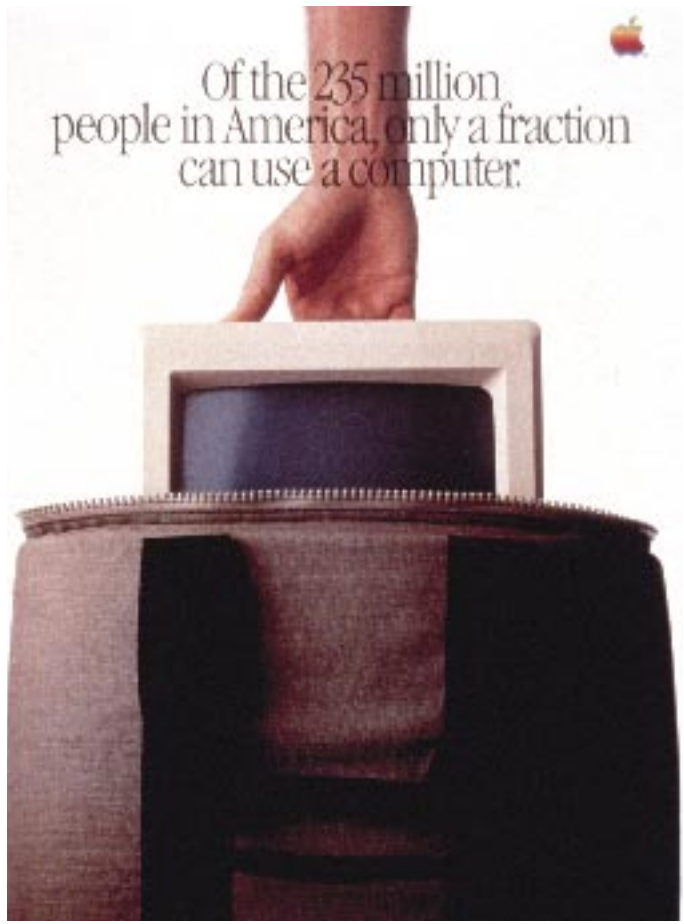
Since my music generator fell through, I got to do the speech part, using Mark Barton's libraries. I knew I wasn't clever enough to be the Mac's speechwriter. I think Susan had the idea of asking Steve Hayden, Chiat-Day's head writer, to do it. Steve was the guy who conceived the 1984 commercial (see "1984") and was as clever as they come. He was excited about helping out and got it done overnight.

Once we integrated all the pieces together, the demo didn't come close to being able to run on a standard Macintosh. Fortunately, we had a prototype of a 512K Mac in the lab, so we decided to cheat a little (there were only two in existence at the time) and use that for the demo, which made things fit.

The demo started out with Susan's graphic of the Mac hidden in its carrying bag on a curtained stage. Suddenly, the music swelled (from a CD, not generated by the Mac) and Capp's big letters scrolled nimbly across the screen, spelling out "Macintosh." Then we transitioned to Bruce's skywriter, and then to various screenshots of applications, including third-party applications like Microsoft's Multiplan and Chart. Finally, the music

stopped, the screen went blank, and we waited for Steve to press the mouse button. When he did, the Mac started to speak in strange but somehow endearing tones:

> "Hello, I am Macintosh. It sure is great to get out of that bag!
>
> Unaccustomed as I am to public speaking, I'd like to share with you a maxim I thought of the first time I met an IBM mainframe: Never trust a computer that you can't lift!
>
> Obviously, I can talk, but right now I'd like to sit back and listen. So it is with considerable pride that I introduce a man who has been like a father to me … Steve Jobs!"



"Hello, I am Macintosh. It sure is great to get out of that bag!

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Obviously, I can talk, but right now I'd like to sit back and listen. So it is with considerable pride that I introduce a man who has been like a father to me ... Steve Jobs!"

The Times They Are A-Changin'

January 1984
The big day finally arrives

January 24, 1984—the big day had finally arrived. We had looked forward to this date for so long that it didn't seem that real to be actually experiencing the long-awaited public unveiling of the Macintosh at Apple's 1984 annual shareholder's meeting. We were excited, of course, but also nervous about our hastily contrived demo software, and still exhausted from the final push to finish the system software in time (see "Real Artists Ship").

I had attended one of the rehearsals over the weekend, to help set up the demo, and it was fraught with problems. Apple rented a powerful video projector called a LightValve that could project the Macintosh display larger and brighter than I thought possible. The Mac had to be connected to the projector through a special board cooked up by Burrell to compensate for the Mac's unique video timings. The LightValve was quite temperamental, taking eons to warm up and then sometimes shutting down inexplicably. Plus, Steve wasn't into rehearsing very much and could barely force himself into doing a single, complete run-through.

Most of the software team usually didn't come to work until after 10 A.M., but on this morning we gathered in our fishbowl office in Bandley 3 at 7:30, so we could walk over together to the big auditorium at Flint Center, which was a half-mile away. We got to the cavernous room (which seated 2,500) early, but it was already filling up, and soon it was packed tight, with standing room only. The software team sat up close in the second row, in a section reserved for Macintosh division employees.

Finally, the lights dimmed, and Steve Jobs appeared at a podium on the left side of the stage. He was resplendent in a finely tailored black suit complete with a prominent bow tie, looking more like a Las Vegas impresario than a computer industry executive. You could tell he was nervous, too, as he quieted the rousing applause and began to speak.

"Welcome to Apple's 1984 Annual Shareholders meeting. I'd like to begin by reading part of an old poem by Dylan—that's Bob Dylan." Steve flashed a big smile as he started to recite the second verse of "The Times They Are A-Changin'," stretching an occasional vowel in a Dylanesque fashion.

Come writers and critics
Who prophesize with your pen
And keep your eyes wide,
The chance won't come again
And don't speak too soon
For the wheel's still in spin
And there's no tellin' who that it's namin'.
For the loser now
Will be later to win
For the times they are a-changin'

Steve thanked Apple's board of directors individually by name for their support in a turbulent year and then turned the meeting over to Apple's chief counsel, Al Eisenstadt, to run the formal part of the meeting. Al ran through some procedural stuff and then introduced Apple's CEO, John Sculley, who had been hired nine months earlier, for a report on the business.

John reported on Apple's latest quarter, which saw disappointing Lisa sales balanced by a fantastic Christmas for the Apple IIe, whose sales had more than doubled from the previous year. But the crowd seemed distracted, impatiently waiting for the Main Event. John sensed this and hurried through the bulk of his presentation. Finally he concluded by thanking Mike Markkula and the executive staff for supporting him during his first few months at Apple, thanking one individual in particular.

"The most important thing that has happened to me in the last nine months at Apple has been a chance to develop a friendship with Steve Jobs. Steve is a co-founder of Apple, and a product visionary for this industry, and it's my pleasure now to reintroduce Steve Jobs."

Steve reappeared on the left side of the stage as the lights dimmed again. "It is 1958," he began, speaking slowly and dramatically. "IBM passes up a chance to buy a young fledgling company that has invented a new technology called xerography. Two years later, Xerox was born, and IBM has been kicking themselves ever since." The crowd laughed, as Steve paused.

MACWORLD

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The Macintosh Magazine

Macintosh

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Steven Jobs, Chairman of the Board, Apple Computer

Investing with Multiplan
A Tour of the Mac Desktop
Programming Preview
Macintosh Art Gallery
The Making of the Macintosh

Steve had cooked up this spiel for the sales meeting in Hawaii the previous fall to introduce the 1984 commercial. I had seen him do it a few times by now, but never with as much passion, intensity, and emotion dripping from his voice.

"It is 10 years later, the late 60s," he continued, speaking faster now. "Digital Equipment Corporation and others invent the minicomputer. IBM dismisses the minicomputer as too small to do serious computing, and therefore unimportant to their business. DEC grows to be a multi-hundred million dollar company before IBM enters the minicomputer market." Steve paused again.

"It is now 10 years later, the late 70s. In 1977, Apple Computer, a young fledgling company on the West Coast, introduces the Apple II, the first personal computer, as we know it today. IBM dismisses the personal computer as too small to do serious computing, and therefore unimportant to their business," Steve intoned sarcastically, and the crowd applauded.

"The early 1980s. 1981—Apple II has become the world's most popular computer, and Apple has grown to a 300 million dollar corporation, becoming the fastest growing company in American business history. With over 50 companies vying for a share, IBM enters the personal computer market in November of 1981, with the IBM PC." Steve spoke very quickly at this point, picking up momentum.

"1983. Apple and IBM emerge as the industry's strongest competitors, with each selling approximately one billion dollars worth of personal computers in 1983. The shakeout is in full swing. The first major personal computer firm goes bankrupt, with others teetering on the brink. Total industry losses for 1983 overshadow even the combined profits of Apple and IBM."

He slowed down, speaking emphatically. "It is now 1984. It appears that IBM wants it all. Apple is perceived to be the only hope to offer IBM a run for its money. Dealers, after initially welcoming IBM with open arms, now fear an IBM dominated and controlled future and are turning back to Apple as the only force who can ensure their future freedom."

Steve paused even longer, as the crowd's cheering swelled. He had them on the edge of their seats. "IBM wants it all and is aiming its guns at its last obstacle to industry control, Apple. Will Big Blue dominate the entire computer industry? The entire information age? Was George Orwell right?"

“IBM wants it all and is aiming its guns at its last obstacle to industry control, Apple. Will Big Blue dominate the entire computer industry? The entire information age? Was George Orwell right?”

The crowd was in a frenzy now, as the already famous 1984 commercial (see "1984"), which was shown for the first and only time during the Superbowl two days before, filled the screen, featuring a beautiful young woman athlete storming into a meeting of futuristic skinheads, throwing a sledge-hammer at Big Brother, imploding the screen in a burst of apocalyptic light. By the time the commercial finished, everyone in the auditorium was standing and cheering.

Steve then went on to describe the Macintosh as the third industry milestone product, after the Apple II and the IBM PC. "Some of us have been working on Macintosh for more than two years now, and it has turned out insanely great!"

All this time, a lone Macintosh had sat in its canvas carrying case near the center of the stage. Steve walked over to the bag and opened it up, unveiling the Mac to the world for the very first time. He pulled it out and plugged it in, inserting a floppy, and the demo began to run, flawlessly (see "It Sure Is Great to Get Out of That Bag!"). The Macintosh became the first computer to introduce itself, speaking in a tremulous voice:

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>
> Unaccustomed as I am to public speaking, I'd like to share with you a maxim I thought of the first time I met an IBM mainframe: Never trust a computer that you can't lift!
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Pandemonium reigned. Steve had the biggest smile I'd ever seen on his face and was obviously holding back tears as he was overwhelmed by the moment. The ovation continued for at least five minutes before he quieted the crowd down.

The rest of the meeting was an anticlimactic blur as Steve ran through some marketing material and introduced new versions of the Lisa. He showed a slide-show tribute to the Mac team, with voiceovers from the most important contributors. Finally, he turned the

meeting back to Al Eisenstadt to announce the shareholder tallies and complete the formal portion of the shareholders' meeting.

Every member of the audience was given a copy of the first issue of MacWorld magazine, with Steve on the cover, as they departed. Most of the Mac team hung around near the stage, congratulating each other and waiting for the crowd to disperse.

A little later, after we had returned to Bandley 3, we were surprised to see a large Apple truck pulling up in the parking lot near the back of the building. It contained 100 brand new Macintoshes, one for each member of the team, each one personalized with a little plaque on the back. Steve presented them one at a time to each team member with a handshake and a smile as the rest of us stood around cheering.

We were so keyed up it was impossible to get back to work that afternoon, but most of us didn't want to go back home, either. The Macs were supposed to go on sale that very day, immediately following the introduction. I thought it would make it more real to me if I actually could go out and buy one, so five or six of us walked to the nearest Apple dealer to see if that was possible. The first, closest dealer didn't have any units in stock and told us they weren't for sale yet, but we didn't give up. The next dealer was willing to sell me one, even though he didn't have any units in yet either.

Thanks to Scott Knaster, who had a videotape of the 1984 introduction, which allowed me to quote so much of Steve's presentation—my memory isn't that good!