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IIGS UPDATE

THE APPLE IIGS VS. THE COMPETITION

APPLE IIGS *BY STEVE ROSENTHAL*

HOW WELL DOES THE NEW MACHINE STACK UP?

The new Apple IIGS is almost like a candidate for public office with a famous last name—the name and organization behind it guarantee a certain level of attention, but in the end the machine itself will have to compete on its own merits.

And compete is what it will have to do. Apple's newest machine joins several other quite respectable desktop computers already looking for favor in the school and advanced home markets. Along with Apple's own Macintosh, there's Commodore's Amiga, Atari's ST series, and PC-compatibles from companies such as Tandy (Radio Shack).

Each machine, of course, has its particular strengths and weaknesses (see the chart that accompanies this article) and will appeal more to certain buyers than to others. For the IIGS to survive and prosper, however, it will have to please enough of the people enough of the time.

The biggest advantage that the IIGS has going for it, naturally, *is* that it is an Apple II. Being a member of an already successful line of computers gives the nascent IIGS a base of software, an established dealer network, a known and stable support organization, and a community of users and developers who already like working with this series of machines.

In comparison, the Amiga and the Atari ST both represent sharp departures from their producers' previous offerings, and even the Macintosh was originally created outside of the existing Apple organization. As a result, those machines all took quite a while to define their markets and accumulate software, and all have suffered from several zigzags in their marketing.

For personal-computer users, stability is important not only because it protects our investment and ensures that we can find parts and repair, but also because it attracts software developers. The more stable a computer appears to be, the more willing developers will be to spend the time and effort to create powerful and nifty software for it. The IIGS and its producer, developers know, are not likely to vanish in the immediate future.

The II and the Mac

The second big advantage the IIGS provides is that it blends what Apple has learned from the Apple II series with its experience with the Macintosh. Like the other II-series computers (other than the IIc), it is an open-ended, expandable machine. Like the Mac, it has a user-oriented pictorial interface.

Actually, both the lessons of the slot-oriented Apple II, II Plus, and IIe and the comprehensive design of the IIc affected the design of the new machine. The seven main slots on the IIGS accept ordinary II-series boards. The provision of that kind of backward hardware compatibility certainly is a welcome approach.

From the IIc side of the family, the IIGS includes two built-in serial ports and a new disk-drive interface. Both can serve as alternatives to cards that provide those functions, freeing up slots for other functions and bringing the cost of the basic system down. You can't use the new built-in serial ports with unmodified existing communications programs, though, because the IIGS uses a serial controller chip that you'll find in the Macintosh but that's new to the Apple II.

From the Macintosh, the IIGS inherits a software approach that includes the obvious mouse-and-windows user interface, plus an internal toolbox that other programs can call on to provide a user interface similar to that of the Macintosh. The presence of the toolbox will serve as a strong incentive for developers to provide their programs with a consistent look and feel, which in turn will make it easier for users to learn different programs.

The Mac design is also where the IIGS gets its serial chip. Apple brought the Zilog SCC chip of the Mac over to the new machine because that chip allows the IIGS to work with AppleTalk. A IIGS, just like a Macintosh, needs only some inexpensive software, cabling, and a

PHOTOGRAPHY BY CARTER DOW

junction box in order to link up with the LaserWriter and other AppleTalk-equipped computers and peripherals.

Personal computers from other companies have also learned from the success of prior Apple machines. The IBM PC probably owes its slotted design to the Apple II, and much of the original PC software was based on prior packages for Apple machines.

The visual style of the Macintosh has also influenced competing machines. The Amiga has its Intuition visual user interface, the Atari and some PC-compatibles have GEM, and programs for dozens of other machines use a mouse-and-windows approach. Even though Apple didn't invent the mouse-and-windows method but picked it up from the Xerox Star computer, most personal computers that use this approach seem to owe more to the Mac than they do to any other prior machine.

Chip Controversy

The choice of processor chip of the IIGS may prove to be controversial. The 65C816 chip, with its combination of virtually perfect emulation of the 8-bit 6502 processor of previous Apple II computers and a new 16-bit mode, does provide several advantages over the 6502, but some developers wish that Apple had taken a slightly different approach.

On the plus side, having the 6502 mode and the electrical similarity to the 6502 even in the 16-bit mode is what made it practical for Apple to design a new, more powerful machine that also ran previous software and worked with existing hardware.

The 65C816 can also run 6502 code at a faster rate than the 6502 can—in the IIGS about 2.5 times as fast as an Apple IIc or IIe can, in fact. So even programs that have not been rewritten will show a performance increase. That factor is important mainly for the prior generation of software, however, since most developers of school and home software that are preparing new products for the IIGS say they'll be taking advantage of the 16-bit mode.

The new chip does indeed address much more memory than does the 6502 (up to eight megabytes on the IIGS), which facilitates development of more powerful software. Paradoxically, it also enables programmers to write software that is

OTHER COMPANIES HAVE LEARNED FROM APPLE'S SUCCESSES.

easier to use—the more convenient the software the more complex the program code needs to be.

Some programmers (and the 65C816's designers) also claim that in the 16-bit mode this chip is particularly fast and efficient compared to other chips, but programmers are notorious for their highly polarized and inexplicable devotion to their own personal choice of chips. The chip does perform certain operations in fewer cycles than either the 6502 or even the 68000 on the Macintosh, Atari, and Amiga do, but other operations run much more slowly than analogous ones on other advanced chips.

The 65C816 is a new chip, which means a potential for bugs or at least unexpected effects in certain applications. New chips always bring a mixture of increased power and increased uncertainty.

Because the 65C816 is a new chip, programmers have needed to specially create all the software-development tools that they need for writing software for the Apple IIGS. Although Apple generally wins praise from developers for the overall quality of its support, the company took longer than predicted to produce development tools for the IIGS, so third-party software developers had to start with minimal aids or create their own.

Along with the organizational delays, programmers also had to add the extra mental-preparation time for using a new chip. Programmers who were familiar with the 6502 and the 68000 had to learn a new chip architecture, a new way of thinking, and a new set of chip strengths and weaknesses. The lack of early availability of any high-level language exacerbated this problem.

Even for assembly-language programmers, who were able to adapt existing routines fairly quickly, using a new chip meant that they couldn't simply recycle stock routines developed for other machines. The 68000-based Atari and Amiga, in contrast, have often benefited from existing software because developers for those machines could reuse routines for the 68000 chip that originally were written for the Macintosh. Likewise, PC-compatibles for the home and school markets can draw on a legion of tools created for business applications.

Enhancing the Video

With the video capability of the new machine, on the other hand, Apple has struck a path closer to the standard practice of the industry. The IIGS offers a maximum resolution of 640 horizontal by 200 vertical pixels, with up to 16 colors available on each line.

A 640 × 200 color screen brings the Apple up to the capabilities of the Atari, Amiga (the Amiga also has a 640 × 400 color mode, but that mode is rarely used because it requires a very expensive monitor with special long-persistence phosphors), and the stock PC with a Color Graphics Adapter. For text, the 640 × 200 screen allows a full 25 lines of 80 characters, based on an 8 × 8-character cell.

The use of a 640 × 200 screen also hints at Apple's plans for flat screens. Already, 640 × 200 flat-panel displays are available from other manufacturers. Apple is known to be interested in flat-screen technology for the Mac and is also committed to greater sharing of peripherals across its product lines, so a flat screen for the Mac might also work with the II series. An even higher resolution might work best for the Mac, since it already offers a vertical resolution of more than 200 lines. A 640 × 400 screen could serve both machines well, however.

The color palette on the new IIGS extends to 4096 possibilities (all the combinations of 16 levels of 3 primary colors), which puts it at the top end of the range for machines in this class—the Atari ST has 512, the Amiga 4096, and the stock PC or compatible 16. As with the ST and the Amiga, the IIGS can access only a limited number of those colors at a time.

In the IIGS's new video modes, each pixel is represented by 2 to 4 bits of memory that give each dot

one of 4 or 16 possible values. These screen bit values then serve as pointers to a color palette, which in turn holds selected tints and hues from the 4096 possible color values.

The new video design is also a regularized approach that lets the computer set any bit to any color, rather than to the "artifact" color of the 8-bit Apple II computers that restricted certain pixel positions to certain color possibilities. Since the price of memory has decreased, the IIGS designers could afford to use several bits of memory for every pixel position. That extra memory means a lot less effort on the programming end to get color right and a lot better color on the viewing end because the quality of the video image isn't limited by color-placement idiosyncrasies.

Comparing the IIGS's video to that of other machines, we see that the Atari likewise has 4 colors per line available at 640 × 400, with 16 similarly available at 320 × 200. The Amiga can give you a full 16 colors on each 640 × 200 line and can go to 32 at 320 × 200. IBM PCs and compatibles with stock video can produce only one color without dropping down in resolution.

The IIGS produces an analog video signal, rather than digital output. Analog RGB is the type you find in high-quality home video-component systems and videotape playback and is more readily available and less expensive than the digital RGB video the IBM PC uses. The analog monitors also respond better to the large IIGS color range.

For the IIGS, color fidelity is particularly important because of its anticipated role as an educational machine. Although simple, bright colors may be quite acceptable for action games or word-oriented productivity tools, more realistic color and images can be central to the effective presentation of many types of tutorial material.

On the less sparkling side of the ledger, the IIGS lacks some video features that game writers and players would probably have asked for. As with the prior designs from Apple, the IIGS video is purely bit-mapped memory. It lacks special graphics chips and coprocessors. The CPU chip itself has to do all the intelligent video work, which is particularly difficult for a chip that's running at only 1 or 2.5 MHz and

THE IIGS SOUND IS A DECIDED STEP UP.

complicates the writing of fast graphics programs.

The IIGS also lacks hardware dedicated to writing "sprites" and "playfields," which can simplify the programming of some types of games. In contrast, the Amiga, which specializes in on-screen graphics, has dual playfields and eight hardware sprites.

Sound to Shout About

Although the color-output capability of the IIGS is good but hardly unique, the sound is a decided step up from what other popular machines currently provide. The IIGS includes a fairly complete music-synthesizer chip from Ensoniq that goes far beyond the minimal audio output of prior Apple products.

The Ensoniq sound chip brings to the IIGS 15 separate voices of sound, each of which you can independently control or blend together. Each voice is controlled by two oscillators, so you can vary both volume and pitch.

That enhanced sound capability lets you add movie-quality music to adventure games or a full melodic range to a theme song. It can also furnish realistic sound for educational applications.

Initially, we'll see mostly snippets of these complex sounds in IIGS programs, because sound still takes up a good deal of memory. Even though the Ensoniq chip rates its own 64K of dedicated memory in the IIGS design, it can run through as much as 10K of memory a second—a standard IIGS with 265K of memory won't be much for lengthy performances.

You can, of course, load a IIGS with up to eight megabytes of memory, which gives you more than a minute of high-quality audio and even more if you compress the data before you store it in memory. I suspect, though, that Apple is also looking forward to better ways to store sounds, especially CD-ROM optical disks that store 600 megabytes each.

One question is whether Apple or other vendors will assume that IIGS owners have a stereo card in their computer. Even though the IIGS can produce stereo output, only a single channel currently comes through the case to an external connector. The other channel, available inside the IIGS case, requires an added card.

The Atari ST series also has a sound chip, although one that Apple partisans will call considerably less powerful. Providing 3 voices instead of the 15 on the IIGS, the Atari sound chip runs independently and therefore doesn't tie up the processor, as the Apple chip does. Whereas the IIGS must alternate between musical applications and other tasks, the Atari can do both at once.

On the Amiga and the Mac, sound is mostly a function of software. The Amiga includes four digital-to-analog converters (DACs) that run together to produce two stereo channels, the Mac's single DAC producing a monophonic result. The PC uses a simple counter chip, meant mostly for producing a beep on its internal speaker.

The Atari ST series has MIDI (Musical Instrument Digital Interface) connections built in instead of requiring an extra board to provide this link for hooking up MIDI instruments. MIDI boards should be forthcoming for the IIGS, but they will require an extra purchase.

The Keyboard's Wired

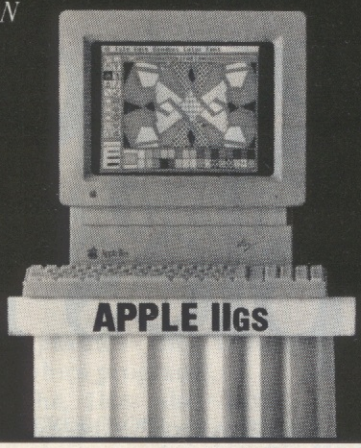
With the IIGS, Apple introduces a new connection scheme for use between the central processor and input devices such as the keyboard, mouse, and joysticks. This Apple Desktop Bus is mechanically convenient—the IIGS has a detachable keyboard, and the mouse can go on either the left or right side—and it also provides a logical way of connecting a multitude of possible input devices to the computer.

This scheme creates the obvious advantage of configurability. Just about everyone agrees these days that a detachable keyboard is a plus, and third-party developers are already working on alternative keyboards, mice, and other devices to supplement the standard input complement.

For classroom use, you'll even be able to hook up multiple keyboards to a single IIGS machine, with the software able to distinguish which

BY STEVE ROSENTHAL AND CHIP CARMAN

How The Competition Stacks Up

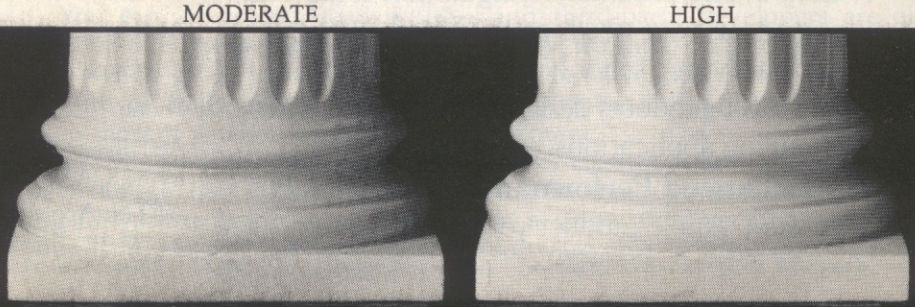


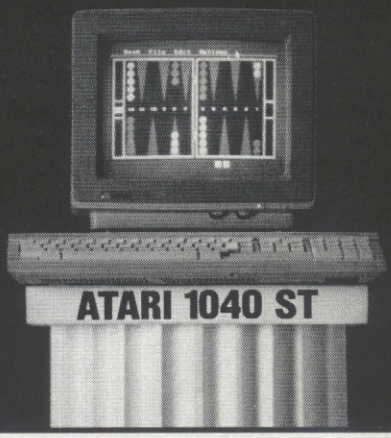
	APPLE IIGS	MACINTOSH PLUS
EASE OF USE	VERY GOOD	VERY GOOD
SYSTEM INTERFACE	MOUSE AND WINDOWS	MOUSE AND WINDOWS
TOOLBOX FOR PROGRAMS	YES	YES
HARDWARE SETUP	EASY–FAIR	EASY–FAIR
NUMBER OF AVAILABLE PROGRAMS	LOW–VERY HIGH	HIGH
DESK ACCESSORIES	YES	YES
MULTITASKING	NO	NO
CONFIGURATION ABILITY	GOOD	FAIR
EXPANSION METHODS	SLOTS	NONE
DESKTOP SPACE	MODERATE	SMALL
PROCESSING POWER	FAIR	GOOD
PROCESSOR TYPE	65816 + SOUND	68000
CLOCK SPEED	1/2.5 MHz	7.83 MHz
MEMORY RESOURCES	FAIR	FAIR
STANDARD MEMORY	256K	1024K
MAXIMUM MEMORY	8 MEGABYTES	4 MEGABYTES
DISKETTE CAPACITY	800K	800K
VIDEO DISPLAY	GOOD	MODERATE
COLOR DISPLAY	640 × 200 PIXELS	—
COLORS PER LINE	16	1
COLORS PER PALETTE	4096	1
MONITOR TYPE	ANALOG	—
HARDWARE SPRITES	NO	NO
GRAPHICS CHIP	NO	NO
MONOCHROME	640 × 200 PIXELS	512 × 342 PIXELS
SOUND QUALITY	VERY GOOD	FAIR
SOUND CHIP	YES	NO, DAC*
MAXIMUM VOICES	15	4
STEREO OUTPUT	ADD-ON*	NO
MIDI INTERFACE	ADD-ON*	ADD-ON*
INPUT/OUTPUT CAPACITY	MODERATE	MODERATE
NUMBER OF KEYBOARD KEYS	80	78
DETACHED KEYBOARD	YES	YES
INPUT BUS	YES	NO
HARD-DISK PORT	ADD-ON*	VIA SCSI
MOUSE	YES	YES
SERIAL PORT	YES	YES
INPUT BUS	YES	NO
COST	MODERATE	HIGH

*DAC =
DIGITAL-TO-ANALOG CONVERTER

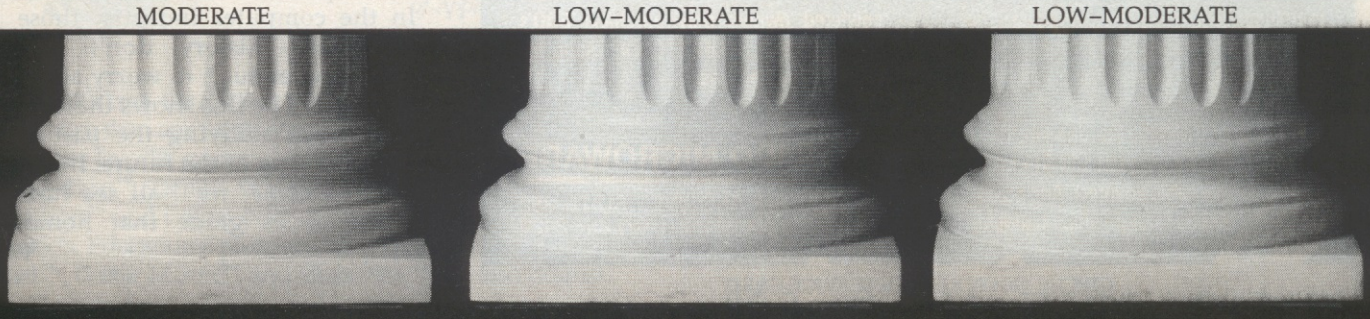
*DMA =
DIRECT MEMORY ACCESS

*ADD-ON =
OPTIONAL PERIPHERAL CARD





AMIGA	ATARI 1040 ST	PC & COMPATIBLES
VERY GOOD	VERY GOOD	POOR–GOOD
MOUSE AND WINDOWS	MOUSE AND WINDOWS	COMMAND LINE
YES	YES	NO
FAIR	FAIR	POOR–FAIR
LOW–MODERATE	MODERATE	VERY HIGH
YES	YES	YES
YES	ADD-ON*	ADD-ON*
GOOD	FAIR	GOOD
SIDECARS	SIDECARS	SLOTS
MODERATE	LARGE	LARGE
GOOD	GOOD	FAIR
68000 + COPROCESSOR	68000	8088 + COPROCESSOR
7.18 MHz	8 MHz	4.77 MHz
FAIR	GOOD	POOR–GOOD
256K	1024K	256–640K
8.5 MEGABYTES	4 MEGABYTES+	1 MEGABYTE+
880K	720K	230K
GOOD–EXCELLENT	GOOD	FAIR–EXCELLENT
640 × 200 PIXELS	640 × 200 PIXELS	640 × 200 PIXELS
32	16	4
4096	512	4
ANALOG	ANALOG	DIGITAL
YES	NO	NO
YES	NO	ADD-ON*
640 × 200 PIXELS	640 × 400 PIXELS	720 × 350 PIXELS
GOOD	GOOD	POOR–EXCELLENT
NO, DAC*	YES	ADD-ON*
4	3	1
YES	NO	ADD-ON*
ADD-ON*	YES	ADD-ON*
MODERATE	MODERATE	FAIR–MODERATE
89	95	95
YES	NO	YES
NO	NO	NO
ADD-ON*	VIA DMA*	ADD-ON*
YES	YES	NO
YES	YES	YES/ADD-ON*
NO	NO	NO
MODERATE	LOW–MODERATE	LOW–MODERATE



THE APPLE IIGS REPRESENTS ACCESSIBILITY.

keystroke came from which user. That, in turn, would allow the development of group-activity software, countering in part the criticism that computerized instruction shortchanges students in the learning of essential social skills.

Keyboard preferences among users are as personal and inexplicable as choice of language or CPU chip among developers. Many people will like the IIGS keyboard, and some will not. It sports 80 keys in an office-typewriter layout, plus a 10-key numeric pad.

By contrast, none of the other competing machines have a general-purpose method of connecting input devices, although all accept a range of input devices. The Atari ST has a built-in (nondetachable) keyboard, and the PC and many compatibles need an extra adapter card to let you use joysticks or other supplementary input devices.

Taking the Sum

In the end, even the most fierce IIGS partisans at Apple will probably admit that in most ways this machine is neither a breakthrough product nor even in all ways the best of the current state of the art. On the other hand, it should do well for the reasons that the Apple II family has traditionally succeeded in the past.

The IIGS represents *accessibility* rather than new capability, and a continuation and extension of an enviable record in the past. By providing a smooth upgrade path from previous II-series machines, the IIGS rewards our loyalty and builds on what both we and Apple have learned up to now.

In the computer industry, those who ignore history don't stay around long enough to worry about repeating it. The IIGS shows that Apple has been studying the past as well as thinking of the future. In the months to come, we'll all see how the rest of us grade that homework. +