



II ALIVE

CELEBRATING THE APPLE II



The Apple IIGS

What's Past is Present by Janet Loftis

The computer industry uses the word “obsolete” a lot, particularly when referring to a competitor’s product. The dizzying and ever-increasing speed with which software and hardware are developed illustrates perfectly the phrase, “Innovative today, obsolete tomorrow.” The computer graveyard is littered with examples: the Commodore VIC-20, Commodore 64, Commodore 128, Tandy, Amiga, Atari ST and, sadly, the venerable Apple II, which sparked the home microcomputer revolution. But like the dinosaurs in the blockbuster movie *Jurassic Park*, the Apple II continues to prove it’s not as the industry claims. Still heralded by that loyal base of users whose slogan is “Apple II Forever,” the IIGS has proven itself worthy of its project code-name “Phoenix” by refusing to die.

The last of the Apple II line, the IIGS was introduced in September 1986, with a sticker price of \$999. It was the first Apple II to utilize the 16-bit 65816 microprocessor designed by Western Design Center (the same microprocessor used by Super Nintendo) instead of the 8-bit 6502 and 65c02 processors.

Graphics

The ultimate Apple II, specializing in Graphics (G) and Sound (S), the Apple IIGS had features and capabilities unmatched by its predecessors or—as Apple II fans stress with pride—Macintosh contemporaries.

The Apple IIGS was a technical tour de force... the first to have an “Apple interface” (that is, the Mac-style desktop)... the first to use the Apple Desktop Bus (ADB) keyboard and mouse, the first to include a sound synthesizer, the first Apple-interface computer with expansion slots, the first Apple with video overlay of computer graphics, says GENie subscriber, Ronald Royer

It offered two new color graphics modes, labeled Super Hi-Resolution (320x200; 640x200). As Apple II historian Steven Weyhrich noted, “This gave graphics power that was not even available on a Macintosh.” In his book *Exploring the Apple IIGS*, author and programmer Gary B. Little noted:

“The colors used in super hi-res mode are completely programmable... because 16 shades are available... a total of 4,096 colors can be generated. It is the mode used to display the outstanding graphics images for which the GS has become famous.”

Sound

Rob Moore, the hardware group manager of the Phoenix Project, brought in the device that would make the IIGS first in sound: the Ensoniq chip. This chip can synthesize 15 musical voices simultaneously, which “allows the GS to play as many as 32 independent sound samples simultaneously,” as Nate Trost put it. Compare this to the Macintosh computers of the time, which had just 4 voices and a maximum sampling of 22 kHz. The IIGS has a maximum sampling speed of 50 kHz.

“The GS has the most advanced sound capability of any microcomputer. Tucked away on the motherboard is a powerful device, called an Ensoniq (tm) Digital Oscillator Chip (DOC), which is a professional-quality synthesizer for music, speech and sound.”

—Gary B. Little, *Exploring the Apple IIGS*.

While these graphics and sound graphics capabilities have since been surpassed, these built-in capabilities of the IIGS were the best of any personal computer on the market in 1986.

Programming

Also, unlike its predecessors, the IIGS was designed to be programmed by the buyer, not just programmers. In addition to the built-in Applesoft BASIC and the Introduction to Applesoft BASIC manual included with the machine:

“Apple devised a comprehensive set of programs known as the Apple IIGS Toolbox... to give software developers a standard, programmer-friendly way to create IIGS applications with Mac-like interfaces—windows, menus, icons—while taking advantage of advanced IIGS hardware features, such as the Ensoniq sound chip, without having to learn the intricacies of the hardware.”

—Nate Trost, “ChronOS”, *II Alive*.

Third-party developers, such as The Byte Works, have utilized this set-up by developing an array of programming products like ORCA/M, ORCA/Pascal and ORCA/C, and their programming tutorials. Many GS owners who are not computer professionals do write their own programs, affirming the machine’s unprecedented flexibility. What intrigues the GS’s remaining programmers, according to Michael Lutynski of Animasia, is their belief in the GS’s ability to do everything the other platforms do, and their desire to prove it.

The Apple IIGS

Macintosh Comparison

It was not until the Mac II appeared in March 1987, that color and slots were brought to the Macintosh, "to name only two of the many debts the Mac II owes the Apple II," as *inCider/A+* editor Paul Statt put it. The first low-cost color Mac, the LC, did not appear until 1990. "The LC was eerily familiar to anyone who knew the IIGS. It just cost a little less and had the power of Apple marketing behind it," Statt said. Labeled by some, including Statt, as "what the IIGS should have been", the LC was intended for the same home/education market. It had the speed which Apple had denied IIGS users, forcing IIGS users to buy accelerator cards to match the LC. Multimedia guru Roger Wagner responded to Statt by claiming that, on the contrary, the IIGS was what the Mac LC should have been! A side by side review of the two machines in *inCider/A+*, despite naming the LC winner, had Gregg Keizer remarking "what is surprising is how close the GS comes to the LC in most of the performance tests... [despite being] five year old technology."

In another, more current, comparison, Russ Messana spent approximately \$7,000 on computers (Mac SE, Mac LC III and a Quadra 840av) before "I thought I might be working on my old GS again...[the 840av] was close to my speeded up IIGS." (Gravenstein Apple Users Group Newsletter, May 1995). In his conclusion, he recommended that any IIGS owners who were looking to trade in their Apple IIs for a Mac not do so unless purchasing a Power Mac, because the previous Macintosh computers weren't worth the cost or effort.

Bizarre Marketing

There were three versions of the IIGS: the original (September 1986), now sometimes referred to as "ROM 00"; ROM 01 (September 1987); and ROM 03 (August 1989). No version of the IIGS ever became a top seller and languished in corners or stockrooms of computer stores. Customers who "happened by" the IIGS in that corner

became its buyers. Word of mouth became its primary source of advertisement. Still, one million GSeS found their way into homes and classrooms to join their 8-bit brethren, and many remain. There are an estimated six million Apple IIs around the world.

The IIGS debacle was solely the fault of Apple Computer, Inc. In a move described by Apple vice-president Jean-Louis Gasse as the "'Zen theory of marketing': Build a great computer, toss it in the air, and see who buys it," Apple inexplicably failed to advertise their new achievement in anything other than Apple II publications. In addition, Apple did nothing to encourage third-party software developers and, for a long time, the IIGS was considered to be nothing more than a glorified IIe. (Sadly, even now, word of the 16-bit Apple IIGS has not reached some detractors, who continue to assume the IIGS has only the capabilities they saw on the original Apple II Plus... 40-column upper-case text display and 8-color high-resolution graphics.)

It wasn't until 1990 that Apple introduced MIDI synthesizing software tools, capable of fully exploiting the GS's Ensoniq chip. Further, as Paul Statt noted in *inCider/A+* in June 1991, "Apple hasn't released or encouraged development of Apple IIGS printer drivers for the Stylewriter," leaving laser-quality printers out of reach of IIGS owners until September 1991, with the release of GS/OS 6.0.

The reasons behind this bizarre strategy were never clear. Apple Computer, Inc. did not wish to devote time and resources to two independent platforms. Their quiet burial of the IIGS seemed to be the answer to their dilemma. But why, when the IIGS was clearly the superior machine at the time of its introduction, did Apple choose the Macintosh over it? Apple's refusal to provide straight answers to the Apple II community it was abandoning, further clouded the issue. Apple continually denied the end of the Apple II was imminent and there were false promises of future support.

II ALIVE

Winter 1995
Volume 3 Number 3

A Scantron Quality Computers Publication

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Publication Schedule: // Alive is published on a quarterly schedule, with issues appearing in Spring, Summer, Fall and Winter. Please allow until the 15th of the cover month for delivery (international subscribers allow slightly longer).

Subscription Information: U.S. subscriptions cost \$19.95 (for a four-issue, one-year subscription). In Canada and Mexico, the annual rate is US \$29.95. Outside North America, subscriptions are US \$39.95 (for surface delivery) and US \$49.95 (for airmail delivery). To subscribe, send check, money order, or credit card number (Visa, MasterCard, Discover, or American Express) to // Alive—Subscriptions at the address above. You may also subscribe by credit card by calling our Sales Department at the phone number above.

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PRINTED IN THE UNITED STATES OF AMERICA

John Sculley, Chairman and Chief Executive Officer of Apple,

in an open letter in *The Apple IIGS Buyer's Guide* (Summer 1990) assured "Apple II customers that their loyalty to Apple and its products aren't unwarranted," and Apple's commitment to its five million Apple II users is to continue to create products that improve the functionality and performance of their computers. Apple will sell, service and support the Apple II line well into the decade of the 1990's.

Typical of Sculley's vague promises was:

"I can assure our Apple II customers that we value the Apple II product family as an asset, which we will continue to nourish. Beyond that, I am not at liberty to disclose future product plans."

The last sentence should have sounded ominous to Apple II owners, for the official end was near. The IIc Plus ended production in December 1990, the IIGS in December 1992, and the IIe in November 1993. The only Apple II still being manufactured is the IIe card for the Macintosh LC series.

There were, however, occasional sparks of hope from Apple... for instance, the release of IIGS System Software version 6.0.1 in June 1993, and the status change of HyperCard IIGS to that of system software in January 1994, which meant it could be distributed without charge by authorized user groups and dealers.

Burned by the company they once had faith in, the Apple II community was much too resilient to accept Apple's "Macintosh evangelism," refusing to change machines. Even when commercial software and support vanished from the stores, Apple II owners turned to a burgeoning number of mail order suppliers, 6, shareware, user groups and on-line services. If Apple would not support them, they would be forced to support themselves.

The Present

To any casual observer, it would appear there has been no new Apple II software in over three years, but this is an incorrect assumption, as *II Alive* readers are well aware. Third-party develop-

ers have continued to bring new capabilities to the GS, making it a match for more modern platforms. Since the introduction of IIGS System 6.0.1 in May/June 1993, the following hardware and software have been released:

July 1993

TypeSet
WestCode

August 1993

Focus hard card
Parson's Engineering

November 1993

Super Menu Pack
Seven Hills Software

AppleWorks 4
Quality Computers

3D Logo,
HyperLogo
ORCA/Modula-2

Byte Works
discQuest
Sequential Systems
Addressed for Success

Econ

January 1994

Spectrum 1.0
Seven Hills Software

July 1994

Quickie-C
Vitesse
Bluedisk
///SHH Systems
Quick Click Calc
Byte Works

September 1994

Ultima GS
Vitesse
System II
Kitchen Sink Software

December 1994

AppleWorks 5
Quality Computers

February 1995

Animasia 3-D
Animasia
FAXination
Vitesse

April 1995

Quick Click Morph
Byte Works

June 1995

SecondSight
Sequential Systems

Byte Works, EGO Systems, Seven Hills Software, Sequential, and Vitesse continue to develop software for the IIGS commercially. With WestCode's TrueType technology software Pointless well established, Animasia releasing animation software, Byte Works releasing morphing software, and Vitesse releasing software for use with a fax-modem, and promises of upgrades and new software to come, the field is still lively. Of course, 6 and shareware from independent programmers continues to thrive in the Apple II world!

Tell a Macintosh or Windows user that you can still get new, innovative hardware for your Apple II, and they'll stare at you in shock. Yet Sequential Systems committed the resources to develop SecondSight, a video card that allows greatly improved graphics, and on a conventional VGA monitor. This comes not long after their release of discQuest, CD-ROM technology for the Apple IIGS. Sequential Systems is not alone in developing hardware for the Apple II. From across the Atlantic, Germany's ///SHH Systems released the Turbo IDE card, allowing IDE hard drive chains to be connected to both the IIe and IIGS, in 1993, and the BlueDisk drive controller card, allowing use of IBM's MFM drives on the same machines, which arrived in 1994. ABC Direct is selling disk drives and RAM cards for use with the Apple II.

Shareware Solutions II (which only began in July 1993!), *GS+ Magazine*, *Softdisk*, *Softdisk G-S*, and *II Alive* continue to be excellent sources of new programs, utilities and nifty little goodies such as fonts, graphics, software tips and games. (Five magazines isn't bad for an "obsolete" computer.)

Apple IIGS users have found that access to Macintosh data is possible thanks to GS/OS 6.0.1's Macintosh disk readers. With an Apple SuperDrive or similar drive, Apple IIGS users can read files from high-density MS-DOS disks using Apple's own file system translator, and even write to them using Peter Watson's shareware MS-DOS Utilities. With Cross-Works software and either a PC clone or an Applied Engineering PC Transporter card right inside your Apple II, files can not only be transferred to and from MS-DOS, they can also be translat-

The Apple IIGS

ed. The Apple II community is far from isolated; it's keeping up with the most popular disk formats quite nicely, thank you.

Much inexpensive software can be found online and, often more important, so can support for the Apple II user. GENie and Delphi are the only commercial services that still support the Apple II actively and aggressively, although CompuServe still has its MAUG forums for the Apple II. Even America Online, which locked out Apple II owners in November 1994, still maintains a small, token Apple II area for messages and files. In contrast, GENie, has demonstrated its continued willingness to provide access to Apple II owners by welcoming those abandoned by America Online with special discounts and trial offers. Like those already on GENie, the former AOLers have discovered the helpful family atmosphere which abounds in the two Apple II roundtables: A2 (for users) and A2Pro (for programmers of any skill level). It is also possible for Apple II users to connect with many free, local BBSes regardless of the technology platform that they are currently using.

The Next Generation

A second generation of Apple II owners are discovering these same sources. Spurred by the increase of remarketing companies in recent years, used Apple IIs are seeing a resurgence in popularity. Individuals and families on limited budgets can acquire a complete IIGS system, with extra goodies such as a hard drive, accelerator card, and a huge library of software, for as little as \$1000. When the software library includes a vast array of the educational software for which the Apple II is famous, it becomes an especially good purchase for families with young children. As "nothing in education is ever obsolete" (Gregg Keizer, "Connecting in the '90s," *inCider/A+*, December 1990), these original Apple II programs successfully continue to serve their purpose.

In the foreign market, used Apple IIs are also seeing new life and interest. They are becoming the computer of choice. The GravenStein Apple Users Group (GSAUG), Petaluma, California, is actively engaged in assisting a group of Brazilians who have requested help in acquiring Apple related news and products.

Second generation buyers, like those

who have never stopped relying on their Apple IIs, have discovered a simple truth: unless you're fixated on the hottest new game software and fancy utilities, five-to-ten-year-old technology is quite sufficient. Besides games, the average use of a computer centers on word processing, spreadsheets, databases, and telecommunication. The average user wants to write letters (or a novel), manage the family finances, inventory valuables or personal records, use a graphics program to make greeting cards or garage sale flyers, and talk to others on a bulletin board system. All these tasks can be achieved as easily on a nine-year-old IIGS as on the newest Macintosh and IBM clone. Those who have realized this have turned their backs on the computer industry's insatiable greed for their dollar. They can do what they need to do and they can do it much cheaper. As Andy

*My IIGS provided
me with a job and a
college degree.
Is it [any] wonder
that people
still love their machines?*

Middleton put in in the June 1994 newsletter of the GravenStein Apple Users Group, "If you're not planning on changing the purpose of your computer, there's no sense in changing your computer."

In 1996, the IIGS will celebrate its tenth birthday. While some owners have moved on to new platforms (often purchasing IBM-compatible machines rather than support Apple Computer by buying a Mac), the core of the faithful remain true to their Apple II. The frenetic pace of technology can create as many problems as it solves. The renowned dependability of Apple IIs translates into machines that are ten years or older that have never needed servicing and are still running as well as the day they were purchased. Owners fail to see the point of spending \$2,000 to \$3,000 (or more) for the latest and greatest when it, too, will soon be obsolete. The Apple IIs currently occupying desks will last several

more years. Only when they have finally died of natural causes will these owners move on to the next level. Just because a good friend gets a little old and is slower than the fastest is no reason to sever all ties with him, her... or it.

Interviewing Apple II owners about their loyalty brought a variety of responses and a common theme. Ronald Wilson says "the machine does everything I want it to do. It has never failed me." Cindy Adams, who teaches in a computer lab with GSeS, commented on its "ease of use." Stephen E. Cavanaugh, the computer coordinator at St. Hedwig School in Wilmington, Delaware, likes the built-in BASIC to write a new program whenever he needs one. Ronald Royer was surprised that purchasing a 486 laptop did not make him want to sell his GS; his online connections are still easier on the GS and it "still does what it needs to do." Richard A. Bard said his GS "still surprises others with its versatility... is much easier to use than a PC and there have been enough developments to enable the IIGS to remain remarkably current." William A. George told how he used his GS at work for better organization, subsequently receiving a promotion: "My machine was able to expand with my needs. It provided me with a job and a college degree. Is it [any] wonder that people still love their machines?" Ryan Suenaga said, "...it's hard to explain...the GS really has soul" and Michael Lutynski of Animasia agreed: "The IIGS has a character all it's own."

Mark Kline told of his

friends who have Macintosh and PC computers, and find that they spend *much* more than I do on trying to stay current. They need *huge* hard drives and memory upgrades to hold the bloated programs that are becoming typical of these computers. They *need* CD-ROM drives just to install software. They *need* tape drives to do backups, I can get those things because I want them; they have to get them because they need them... [With] inexpensive memory upgrades... color scanning... background music players, animated cursors, high-speed modems, color inkjet printers... publish and subscribe [features], improved graphics resolution, extremely high-speed

SCSI capability, IDE device usage... read/write Macintosh and PC disks [capability], fax software, animation software, high-end math software... [I can] make this machine do something that no one thought it could do! What a sense of accomplishment...

Blind users like Brent Bacome have achieved the independence they never had before with software developments especially for the blind, and doesn't understand why anyone would abandon the machine which pioneered such desperately-needed assistance. Other disabled users have found similar independence with products designed with their needs in mind, making Apple one of the more "disabled-friendly" platforms available.

To add to the Apple IIs list of accomplishments, one should be sure to include Tom Clancy's best-selling novels, *The Hunt for Red October*, *Red Storm Rising* and *Patriot Games*. Clancy loved the Apple II and used them exclusively on his first few novels, and was still using his Apple II as late as 1992, when he mentioned them in a speech he made to the U.S. Department of Justice.

Harold E. Hislop,

hardware coordinator of GENie's A2 RoundTable, explained the Apple II's unfading allure this way:

The Apple II family of machines is what brought computing out of the Ivory Towers of the "Systems Administrators" and put serious computing into the hands of the average person. It was designed in such a manner that the casual user could make it roll over, beg, and sit up... while the advanced user could make it dance a jig and the hardcore hacker types could not only make it dance a jig, but sing and chew gum all at the same time... It is simply *the* most flexible and useful piece of computer hardware ever manufactured by any company in the world... its production run, over eighteen years, was a length of time *unknown* in the electronics industry, let alone the computer industry!

"There has never been another personal computer that has lived as long or as successfully as the Apple II computer." These words, written in 1992 in *The Apple II Guide*, an Apple Computer publication, bring pride and satisfaction to the hearts of

Apple II owners as they turn on the power switch, even if they have to wait a few more seconds than a Power Mac owner before their GS comes to life. John Sculley and the mighty Macintosh have tried and failed to kill the foundation upon which the Macintosh was built. Pardon the Apple II owners as they put their thumbs in their

ears, not to shut out the modern world, but to waggle their fingers and stick out their tongues, then quote Mark Twain's famous cable, "Report of my death greatly have been exaggerated."

Apple II infinitum! ■

Comparing the Macintosh and IIGS Finders

While your Mac friends are still reeling on the ropes from the thought that the Macintosh owes *anything* to the Apple IIGS, bring up the fact that the IIGS version of the Finder has things the Mac version doesn't. Here's a comparison:

Things the Mac Finder has that the IIGS Finder does not:

- Customizable labels
- Hierarchical folder views (triangles in list views)
- Mostly-functional desktop database with public Applications Programming Interface (the IIGS one is private)
- Apple Menu Items folder
- Startup Items folder (IIGS is one-application system excluding hacks)
- Full alias support (IIGS has alias support only in the Finder)
- Trash folder that persists until emptied
- Integrated font family management (IIGS has a fonts folder, but doesn't resolve ID conflicts within it)
- Capability to print any Finder window
- Verifies disk space for copies before starting them (not possible in the GS/OS multiple file system environment without new GS/OS Applications Programming Interfaces)

Things the IIGS Finder has that the Mac Finder does not:

- Differentiation between "Initializing" and "Erasing" disks so you don't have to do a low-level format when you just want to wipe the file system
- Public Applications Programming Interface so folks other than Apple can write Finder extensions (with the Mac, officially unsupported)
- "Icon Info" that puts multiple things in limited resolution by using an index card metaphor
- "Windows" menu to sort through Finder windows.
- Commands to verify that files and disks can be read without error
- Icons larger than 32x32 (not necessarily an advantage, but still a difference)
- Ability to Quit as well as Restart and Shut down
- User-configurable sounds for most events
- Support for filenames legal in one file system but not another
- Option to skip duplicate files when copying files

This list was suggested by one written by Matt Deatherage. Thanks to Udo Huth, J. Nathaniel Sloan, and Eric Shepherd for suggested revisions. The responsibility for any errors or omissions remains ours.-Ed.

Test Drives

Product Reviews

II ALIVE Ratings

- ★★★★ Excellent
- ★★★ Very Good
- ★★ Good
- ★ Fair
- × Poor

Animasia 3-D

★★★
Animasia

Apple IIGS with 2MB RAM, one 3.5" drive, System 6.0.1 (accelerator board, 4MB RAM, and hard disk *strongly* recommended)
\$99.00

Reviewed by Colin Williamson

Thanks to motion picture releases such as *Terminator 2* and *StarGate*, computer-generated graphics have been getting a lot of media attention. Unfortunately, most home users have been left out of the picture because sophisticated animation software has been too expensive... or, for GS users, not available. Until now! Enter *Animasia 3-D*.

At its roots, Animasia is a desktop based 3-D rendering program, similar to PC programs like Autocad and 3D Studio. When you create Animasia animations, you're creating virtual 3-D worlds that can be resized, reshaped, colored, squashed, and edited to your heart's content.

Instead of being limited to a flat page, the program lets you go into your creations, rotate around them to work on detail, and zoom in and out with ease. When you're done, Animasia makes it a snap to drop animations into HyperStudio or HyperCard to add that 3-D punch to your multimedia presentations.

Like the popular (but aging) Fantavision animation package, *Animasia 3-D* does a lot of "tweening": if you draw a sphere on the right side of the screen, advance the timer, and move the sphere to the left side, Animasia will smoothly draw and animate all of the frames between. Easy! One of my first animations was a slowly rotating

Apple logo. Now I've moved on to making an animation of a 3-D Pac-Man racing around the screen, eating 3-D ghosts and zooming off into the distance.

All Animasia objects begin as rather chunky-looking line drawings which may discourage prospective users. However, anyone who's seen the arcade game *Virtua Fighter* will attest to the fact that smoothly moving polygonal objects can be absolutely stunning. One Animasia demo, a sequence about a robotoid user and his IIGS, is little short of spectacular. The IIGS's fill mode lets animations play at 30 frames per second on an unaccelerated machine. With my TransWarp board, I could get up to 60 frames per second without any jerkiness or slowdown.

Once you've laid out your animation and put it all together with the timeline, you're ready to give your creation life. Once you choose Animate to Disk, you basically have two choices: animate "wireframe" (lines only) objects, or animate objects which are solid and for which there is a light source. Wireframes are easier to set up and give you a general idea of how the solid version will look.

Solid animations take much more time for Animasia to calculate (that is, do the tweening, and so on). For a moderately complex 30-frame animation of a rotating checkerboard with bouncing balls, you can run out for a taco dinner, take a nap, and still find the IIGS crunching away when you get back to work.

One pre-drawn image, a little cartoon character named Bud, took around twenty seconds to produce on my GS—and I have a TransWarp accelerator. I was horrified at the amount of time it took to build a basic animation of Bud waving at the camera. Animasia's creator, Michael Lutynski, assures me that the next version will contain the much-needed speed increase. For now, you'll just have to set up any large, solid animation before bed and let it the computer animation "perk" overnight.

Missing from *Animasia 3-D* are Gouraud shading and texture mapping. Still, you can do a lot with polygons, and Animasia's dither option generates a simu-

lated sixty-four colors on screen at any time.

Animasia's manual and tutorial are well-written and easy to understand. I just wish there were an index! Besides on-disk tutorial support, the package includes several demos and models, and the interface is graceful and user-friendly—more friendly, in fact, than 3D Studio's. Another plus: Animasia will happily import .DXF files, the 3D Studio/Autocad standard. I wasn't able to test many .DXFs, but the ones I tried came through without a hitch.

In summary, it's nice to see a powerful program both the professional and casual user can access. *Animasia 3-D* is an affordable, versatile, and an easy to learn program, making it a welcome addition to any GS artist's library. As soon as an update is released—fixing the speed problem and adding some shading features—there's no doubt that *Animasia 3-D* will rank among the top creativity products available on any platform.

Amazing Arithmetricks

★★★★
MECC

128K Apple II
\$59.00

Reviewed by Susan Bruton

MECC, the same folks that made history entertaining via "Oregon Trail" and other educational offerings have again won the blue ribbon with their bag of "Arithmetricks". Targeting grades 5-12, the package aims to support both enrichment and remediation, learning and practice.

The setting is a carnival where the student is beckoned to try his/her luck in one of several tents. In the Number Challenge tent, players practice using signs and parentheses to combine four or more numbers to obtain a pre-set result. Math-o-Grams requires filling in both the top and bottom parts of addition and subtraction, problems. In Magic Shapes, the aim is to complete number square-style grids. Twisted Tables requires placing the out-

side parts of each addition or multiplication table to match answers in the table.

Every puzzle is different and each tent offers three configurable difficulty settings to move the player from single-digit, mainly addition/subtraction challenges, up through decimals with multiplication and division. Therefore, the student can work at his/her own ability level. Built-in aids—like showing current sums in the Shapes portion—eliminate any need for pencil, paper or calculators.

Readily-accessible directions help the student get used to the various game formats. Each tent also supplies several Clue Coins which can be spent to obtain partial solutions. There are usually not enough coins to solve a complete puzzle. This helps guide and build confidence in the student as he/she tries new strategies for problem solving.

Featuring crisp, colorful hi-res graphics, *Amazing Arithmetricks* can be fun; but it does not qualify as “fun entertainment”. Clear, intuitive menus do smooth the way for users; and, to hook student interest, there’s a Puzzle Pros High Scores roster and on-screen Certificate of Achievement. Unfortunately, you cannot print out the Certificate of Achievement, but there is a blank certificate in the manual which can be copied and filled in.

Students can also win entry to the Master Tent. Pressing “P” displays the student’s Master Tent entry pass, showing how many puzzles must be solved in each tent. This number is pre-set to 5 but can be changed by the teacher. (Completing up to 20 puzzles may take several sessions; the program permits saving and restoring student status on disk.) When the entry pass is fully “punched”, the student is allowed entry into the Master Tent to take on one of the carnival characters in a game of Nine Men’s Morris. Also called Mill, this strategy board game is entertaining and also a good brain-stretcher.

The *Amazing Arithmetricks* package includes an attractive loose-leaf binder with pockets for the diskettes (3.5” and 5.25”) and 71 pages of directions, activities, teaching tips, lesson guides, and resource sheets that are ready for photocopying. All menus and puzzle screens are faithfully reproduced as clear-cut, concise instructions take the teacher, step by step, through program use.

I like MECC’s inductive approach and actually enjoyed the puzzles. (So, don’t be shocked if some students spend “too much time” with the Practice Puzzles option.) A fine addition to any classroom resource center and an excellent choice for parents doing home schooling, *Arithmetricks* is guaranteed to stimulate both the children who have mastered grade level content and the ones who have fallen behind. If you’re looking for solid math learning results, then step right up! Get *Amazing Arithmetricks* working for you!

Focus “Hard Card” Drives

★★★★

Parson’s Engineering
(distributed by Alltech)

Apple IIe/IIGS

\$89.00 (20 MB); \$189.00 (170 MB)

Reviewed by Jeff Hurlburt

As everyone knows, the IIGS is an electronic Barbie Doll *par excellence*. Ours had scarcely arrived, back in 1986, when a 1MB RAM board and System Saver IIGS were *de rigueur* to remain stylish. Soon there followed a stereo board, modem, and extra 3.5” drive. In just the last couple of years, Barbie has acquired a new modem, sound digitizer board, Zip accelerator card, and 4MB of extra RAM. Heck, we even found Ken (a PC) to keep her company!

It was not enough. Using AppleWorks GS proved impossibly cumbersome and even a large RAM disk couldn’t smooth out access problems running HyperStudio and programming in the ever-expanding ORCA languages. System 6 was the last straw. Obviously, IIGS applications are only going to increase in size. These and the data blocks they handle are becoming massive. Our IIGS truly needed the space for mass storage.

Hard disk vendors are not difficult to find... in fact, today’s IIGS user can choose from among several good looking models at unusually reasonable prices. So, I dived in... and quickly discovered a daunting barrage of features choices. Did I want an internal or external drive? Should it come with a power supply, a plastic or metal case (with or without cooling fan), a fast or really fast interface (and what kind)... and what brand of mechanism, capacity, and access speed would be satis-

factory? Still, no problem. I was just beginning the hunt when Parsons Engineering shipped me their Focus 80 Hard Card for review.

I’ve seen pictures of “disks on a card”; still the Focus 80 was a bit of a shock. Including IDE controller and drive, the card’s length and weight slightly exceed an old Apple 1MB RAM expansion card. The Connors drive mechanism looks more like a fat microprocessor IC than a hard disk. (Where, on such a skimpy unit, could all those mega-bytes fit?) As for fancy cables, adapters, power supplies, and fans—there aren’t any, not even a DIP switch.

Manual directions suggest you plug the card into slot number 7, turn on your computer, set the Control Panel boot slot to “scan,” and boot. One problem: slot 7 placement will, most likely, produce a momentary scare. The drive module is just fat enough so that it gets nudged a bit by any card in the RAM expansion slot. Fortunately, the Focus card is flexible enough to permit a fit anyway.

I followed directions; and, after about 20 seconds, the familiar Desktop appeared—only, now there were three new disks (named Conner80.1 through Conner80.3). These “virtual drives” are created by partitioning. They look and work just like separate drives. For my (recently discontinued) Focus 80, each partition is about 27MB; Alltech ships the new Focus 170 set up as six 28MB disks.

Alltech includes a utilities diskette with software to change partitioning and, in emergencies, to do a low-level format. As explained in the 29-page manual, you can have up to eight partitions... but a partitioning change erases all data on the drive. So, it’s a good idea to decide how you want things arranged early. Since adding AppleWorks, ORCA/C, and other major applications involves set-ups and log-ins for which disk names are required, this is also the time to settle upon permanent names for the new disks.

If slot number 7 is unavailable, as might be the case for a networking system, you can put the hard card into any slot except slot number 3. In fact, you can plug in and work among two or more Focus cards. This makes it easy to update several Focus drives in an office, school, and other multi-machine setting. Nor do the machines need to be in the same building. To share sever-

Test Drives

al megabytes of programs and data with a number of remote sites, you might duplicate a set of 20MB hard cards and send them out in the mail!

Smaller may or may not be better; but certainly, a "hard card" inside the computer is safer. No one is going to yank a cable, bonk your drive during a file read, or knock it off a table. This small internal drive also makes for nearly silent operation of your computer!

Small is, definitely, quick—quicker, in fact, than much of the competition. To put Focus performance in perspective, I timed a number of tasks using the Focus hard card and a RAM Disk:

Focus 80 RAM Disk

Start System 6.0.1 from "Welcome"

0:19.4 —

Copy 57 files (794K) from diskette

1:09.7 1:04.3

GS Shrink all files (794K) from diskette

2:09.7 2:04.7

Start Platinum Paint

0:06.3 0:05.8

Open a 46K Teach document

0:01.9 0:01.8

(Both the 27 MB Focus partition and the 800 /RAM5 RAM disk were empty except for test files. The "Save Finder Information" option was on and the test machine was a IIGS with 9MHz/32K-cache Zip card. Timings are in the usual minutes/seconds/tenths of seconds format.)

Note: System 6 start-up time can vary by a few seconds depending upon how much of the OS is included. I loaded a fairly typical configuration including the usual AppleDisk, ImageWriter, etc. drivers and most of the Control Panels. A check of the "About this IIGS" info showed total in-memory system size to be about 1.8MB.

Focus delivers speed and space. Still, like many prospective hard disk buyers, I was also concerned about reliability. Would the unit overload my standard IIGS power supply? Would it overheat? Would it crash if I did an Open-Apple-Control-Reset boot? Would it do weird things to my files? The answer is no!

Just in case, Focus does add a CDev to your Control Panel, which permits setting

a time-out value—that is, a time in minutes after which the drive will turn off if it is not accessed. (There will be an extra 4-second start-up delay when the drive is next accessed.) Except for a small bug—most of the Time choices are twice their actual value—the panel works fine. Being at first wary of overheating, I routinely used the 4-minute setting. Eventually, after a few all-night, high-use sessions, it became clear Focus was not going to burn up or eat my power supply. I changed the time-out setting to "Never".

It has taken awhile; but, for sure, the era when we could make do with more diskette drives and more RAM is gone. It's the 1990s; and, for boosting productivity, saving time, and adding to the fun of computer use, nothing comes close to getting "Barbie" a hard disk. Check out the Focus drives. Your Apple II will look better than it ever has!

Harmonie

★★★★

Vitesse

Apple IIGS

\$29.95

Reviewed by Jason Partyka

In a world where everyone wants high-resolution printing, some IIGS owners may be feeling a tad left out. When practically all of the printers rated at 300 dots per inch or better are sold for Mac or PC computers, how can IIGS users get into the hi-res hardcopy race? Fortunately, there is a solution: *Harmonie*, a collection of special driver files from Vitesse.

A "driver" is a file which resides within the System/Drivers folder of your GS/OS boot disk or boot drive. A printer driver contains instructions the computer needs to send the proper commands to your printer along with control options a user can use to affect printout. At present, *Harmonie* supports numerous printers such as Hewlett-Packard LaserJet, DeskJet, and InkJet models, Apple DeskWriters, and a large number of dot-matrix machines including models from Epson and Apple's ImageWriters. (The ImageWriter II driver alone is also available in a separate package called PerfectImage for \$19.95.)

When your computer "talks" to your

printer it does so via a hardware interface called a port. For example, many IIGS users connect a printer to the IIGS serial printer port. Others may plug in an interface card and use a parallel connection. Whatever the interface, your computer needs a port driver to use it. *Harmonie* is the answer to the problem. It has created port drivers to support virtually every popular interface including Apple Parallel, Finger Print G, II Print, Grappler Plus, and a large number of others.

Not surprisingly, you will find that *Harmonie's* drivers are generally larger—i.e. use more megabytes on your disk space than the files they supplant. The explanation is simple: besides offering higher-resolution printing, they deliver easier controls and better setup options.

Harmonie's Page Setup panel allows you to set paper type, aspect ratio, orientation (i.e. vertical or horizontal page printing), top vertical margin, and, of course, horizontal/vertical dots per inch. Aspect ratios are predefined horizontal/vertical DPI settings that affect the size and shape of printed characters. The horizontal/vertical slide bars let you manually adjust a ratio.

The expanded Print Dialog box offers many additional options. Density (level of detail) may, typically, be set to 75 DPI, 100 DPI, 150 DPI, or 300 DPI. The higher the setting, the smoother, the printout (i.e. jaggedness disappears as slanted and curved parts of characters are better "filled in".) Rendering allows you to use either the printer's fonts or the ones in your IIGS System folder. With shading, you can set the number of tones recognized (from 2 through 16); dithering permits checkerboard or halftone printout. As discussed in the manual, the user can even control levels of red, green, and blue to give a slight color tint to any printout!

No question about it, *Harmonie* makes my DeskWriter C look better than ever. It is a very cost effective way to increase the quality of a printout for those using an Apple IIGS. Even the driver HP supplies for Mac users does not have as many bells and whistles. Whether you use a LaserJet, InkJet, or ImageWriter II, if you want a great software deal and a great deal more from your printing machine, get *Harmonie* for your printer!

Big Text Machine 2.0

★★★

Balloons Software

64K Apple II, two disk drives recommended
\$35.00

Reviewed by Dorothy J. Cordes

Big Text Machine is, very simply, what the name implies. It allows text files to be displayed in large attractive letters on the screen of any Apple II computer—a great learning aid for beginning readers as well as the visually impaired. Your Apple II can be used to display electronic advertisement-style messages, too. The user can control the rate of display and show the same file over and over.

BTM comes with three diskettes (5.25" or 3.5") labeled "Program", "Auto Display", and "Sample Files". These supply text files to display on the screen or print, files to set up electronic messages, and an interesting variety of ready-to-go stories and articles.

Among the latter are pieces written by young children, the complete text of "Sherlock Holmes: The Final Problem", and Orville Wright's "How We Made The First Flight". The package also includes lists of French words with their English equivalents and reading selections on plants, air traffic controllers, and the 911 emergency number. A letter written by Johann Gutenberg about progress in communications technology and the thought-provoking children's story, "The Story of the Ordinary Mother Who Almost Fit a 60 Foot Crane Into a Garbage Can" round out this interesting collection of material.

Naturally, all of the *Big Text Machine* pieces can be printed. In the large-text format this is a slow process. As plain text or converted to AppleWorks files, printing is much speedier.

If user friendliness is important to you, BTM is sure to please. Besides comprehensive menus, you get a manual that's thorough and easy to follow without being highly verbal. The program does not, presently, allow including graphics with the text. Still, for large-text display applications, Balloon's *Big Text Machine* is worth taking a look into.

Let's Learn About Computers

★★★★

Troll Associates

48K Apple II
color monitor and mouse recommended,
joystick optional
\$39.95

Reviewed by Margie Stearns

As a nineties educator, you know that even elementary students are not too young to learn about computers. So, let's get going with this package for grades K-2! In Troll's new package, B. Z. Bugg guides students to "Learn About Me" (i.e. the computer), have some "Maze Fun", "Calculate It", and experiment with "Flow Charts".

"Learn About Me" introduces the basic components of a computer. It covers the monitor, CPU (Central Processing Unit), keyboard, disk drive, floppy disk, mouse, and printer. Read the sentences and then watch the monitor... there's B. Z. Bugg waving hello! Click the space button and there's a mouse running around. Using a computer sure looks easy!

"Maze Fun" helps users learn to use keyboard, mouse, and/or joystick input to guide B. Z. Bugg. You move around the maze by pressing (or clicking on) "F" for forward, "B" for back, and so on. The

object of the game is to collect five objects and place them in a jar so that B. Z. Bugg can fly home. There are five different maze games to play.

A different kind of maze game is "B. Z. Bugg Finds Home". Here students learn about programming by following step by step instructions ("turn right", "forward five steps", etc.) to complete the maze.

"Calculate It" is an introduction to using a calculator for adding and subtracting numbers. Blocks show up on the screen to show the operation of the calculator and when a calculation is made, you'll see blocks added or subtracted. A little guy even pops up to help count how many blocks are left!

"Flow Chart" helps show how programs are written and what they do when running on a computer. For instance, you could write a program that would create and operate a hot air balloon.

The *Let's Learn About Computers* package comes in a vinyl mini-folder with user's guide and 5.25" or 3.5" diskette. (The software is copy protected, so don't expect to run it from hard disk.)

With *Let's Learn About Computers*, more than once I found myself wishing computers had been in the classrooms when I was in school! The colorful animated activities with sound effects do provide an easy, fun route for younger students to get an introduction to computers. ■

Vendor Information

Alltech

2618 Temple Heights
Oceanside, CA 92056
(619) 724-2404

Animasia

12175 Science Drive, #3
Orlando, FL 32826
(407) 380-9932

Balloons Software

5201 Chevy Chase Pkwy. NW
Washington, DC 20015
(202) 244-2223

MECC

6160 Summit Drive
Minneapolis, MN 55430-4003
Attn: Pat Kallio 800-685-6322;
(612)569-1500

Troll Associates

100 Corporate Drive
Mahwah, NJ 07430
800-526-5289

Vitesse

P.O. Box 929
La Puente, CA 91747-0929
(818) 813-1270

News & Rumors

Animasia Address Change

Animasia, publisher of Animasia 3-D, has moved to:

Animasia
12175 Science Drive, #3
Orlando, FL 32826z

The telephone number remains the same: 407-380-9932.

Timeout Statistics and Timeout ShrinkIt Plus

Office Productivity Software claims it is close to releasing TimeOut Statistics, a statistical package that will be compatible with AppleWorks 3.0 through 5.1. (Hey, does anyone else remember when Beagle Bros announced they were working on something similar? It looks as though we may finally get it!) OPS is also said to be working on an upgrade that will allow TimeOut ShrinkIt Plus to work under AppleWorks 5. This utility allows you to decompress files without having to leave AppleWorks. OPS hopes that owners of the current version will be about to upgrade for less than \$10. Contact: Office Productivity Software, P.O. Box 2132, LaGrange, GA 30241-2132.

Autoark V 1.1 for IIGS System 6.0.1

EGO Systems has released AutoArk version 1.1, which is compatible with System 6.0.1 and the Finder. Previously distributed by ECON, AutoArk is a file compression utility that works behind the scenes to automatically compress and decompress files on your IIGS. In addition to making AutoArk compatible with the current system software, EGO Systems has fixed many small bugs and has even added a few features, such as letting you set up a "home application"—handy for ProSel-16 users or anyone else who doesn't choose the Finder as their program launcher. Also, you can tell AutoArk v1.1 to wait until you shut down your computer before it starts to recompress its files. The price for AutoArk is \$35, but if you order it before October 31, 1995, you can get it for \$5 off. For more information contact EGO Systems.

Contact: EGO Systems
P. O. Box 15366
Chattanooga, TN 37415-0366
(615) 332-2087.

Iomega Zip 100 versus SyQuest EZ135

For months now, the Iomega Zip drive, with its 100-megabyte disks, has been a much-talked about item... not just in Apple II circles, but in the Macintosh and IBM kingdoms as well. Since it is a SCSI device, the Zip drive, with its \$200 price and its \$20 100-meg disks, has been enthusiastically embraced by the Apple II hard disk user. Now SyQuest, a name already known to many Apple II users, has unveiled the SyQuest EZ135 removable hard drive. The drive itself retails for approximately \$240 and its 135-meg cartridges for \$25. Clearly the Zip is cheaper, but since SyQuest is more established, many users are waiting to see which turns out to be the best buy. A choice is forced upon you, since the two disks/cartridges, while roughly the same size (about twice as thick as conventional 3.5" disks), aren't even remotely compatible.

Second Sight Video Card

On the topic of hardware we haven't bought yet, the SecondSight VGA video card from Sequential Systems seems to be getting a warm reception from early purchasers. In short, what the SecondSight card does is give you better graphics on a conventional Apple RGB color monitor, or *much* better graphics on a standard IBM VGA or SVGA monitor. Sequential Systems is still working on the card to get it to support all Apple II graphics modes. There's a model for the IIe that costs \$169, a 8-bit model for the IIGS that also costs \$169, and a 24-bit model for the IIGS that costs \$199. For more information, write: Sequential Systems, 1200 Diamond Circle, Lafayette, CO 80026; 303-666-4549.

Now that's a Summer Job!

No one seemed to have heard from Auri Rahimzadeh, editor of *PowerGS* disk magazine, in a little while. Had he been kid-

napped by the same space aliens that bagged Elvis? No, he popped up on GENie to explain that he'd been spending the summer working for Steve Wozniak! Auri promised to tell all in a coming edition of his shareware HyperStudio-based magazine. To find out how to get *PowerGS*, write to Auri at 114 Meadow Lane, Fishers, IN 46038-1145 or E-mail him at powergs@indy.net.

KansasFest '96

KansasFest is usually our best chance of the year to spread rumors, but here's a solid fact: the eighth annual KansasFest will be held at Avila College, Kansas City, Missouri on July 17-21, 1996, according to KansasFest organizer Cindy Adams.

Having said that, let's look at some of the products announced, previewed, or at least hinted at during the 1995 KansasFest:

PMPFax

Paul Parkhurst was demonstrating his long-awaited fax modem software PMPFax at KansasFest, and the feeling is that IIGS users will find it well worth waiting for. It features group sends (with a customized cover page for each recipient), multiple phone books, scheduled (delayed) send, configurable cover page (memos, graphics, headers, footers, page numbers, return address)—all in a New Desk Accessory! Expect to see it soon with a price tag near \$80. Contact: Parkhurst Micro Products, 2491 San Ramon Valley Blvd., Suite 1-317, San Ramon, CA 94583; phone 510-837-9098.

Superconvert and GraphicWriter III Updates

Seven Hills Software will soon be releasing updated versions of their SuperConvert graphic conversion software and their GraphicWriter III desktop publishing software. The new version of GraphicWriter III is rumored to support external commands that make it easier for third parties to write add-on modules. (Our resident cynic could not find out who, in the Apple II community of 1995, is expected to write these modules. As for SuperConvert 4.0, it will support JPEG

of the SecondSight card. Contact: Seven Hills Software, 2310 Oxford Road, Tallahassee, FL 32304; phone 904-575-0566.

Front end for GENie

GENie has long been known as *the* place for Apple II support online, but unfortunately, it's also had a reputation for an unfriendly user interface. That problem will plague you no more once GENie releases its navigator for the IIGS, rumored to be nearing completion. The navigator doesn't require a separate telecommunications program—everything is included. Insiders say the program will support third party add-ons. We expect you'll be able to point and click, and that will make travelling around GENie a lot easier for the beginner! The new program will require System 6.0.1 and will be free.

To connect with GENie, have your modem dial 1-800-638-8369 in the US or 1-800-387-8330 in Canada. To speak with a representative, dial 1-800-638-9636.

Symbolix Now Shareware

Symbolix, a desktop program that handles complex numeric and symbolic math, has become shareware. This program from the European group Bright Software (once distributed in North America by Seven Hills Software) will be distributed by Shareware Solutions II, and half the profits will go to a non-profit organization (named later). Symbolix integrates, solves, plots (two- and three-dimensionally) formulas and also collects, simplifies, and expands them symbolically. For more information, contact: Joe Kohn, 166 Alpine Street, San Rafael, CA 94901-1008.

KansasFest Memorabilia

Whether you want a souvenir or wished you could of afforded to attend KansasFest 1995 (we fall in the latter class), you're in luck! Tony Diaz of Alltech (2618 Temple Heights, Oceanside, CA 92056; phone 619-724-2404) is making a CD of KansasFest goodies. Also, EGO Systems is working on a videotape of the conference. If you missed the 1992 KansasFest, they can also supply with you a video of that for \$15. ■

Correction:

In our last issue, Shareware Spy claimed that the author of LF2CR is Paul Creager. In fact, it was written by Jason Simmons. We goofed. Sorry.

Statement of Ownership, Management, and Circulation (Required by 39 U.S.C. 3685)

1. Publication Title: II ALIVE.
2. Filing Date: November 2, 1995.
3. Issue Frequency: Quarterly.
4. Number of Issues Published Annually: Four.
5. Annual Subscription Price: \$19.95.
6. Complete Mailing Address of Known Publication: II ALIVE, 20200 Nine Mile Road, St. Clair Shores, Michigan, 48080.
7. Complete Address of Headquarters of General Business Office of Publisher: Same.
8. Full Names and Complete Mailing Addresses of Publisher, Editor and Managing Editor:
Publisher: Joseph P. Gleason, 20200 Nine Mile Road, St. Clair Shores, Michigan, 48080.
Editor: Same as above.
Managing Editor: Same as above.
9. Owner (if owned by a corporation, its name and address must be stated and also immediately there after the names and addresses of stockholders owning or holding 1 percent or more of the total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address as well as that of each individual must be given. If the publication is published by a nonprofit organization, its name and address must be stated.)

- Scantron Quality Computers
20200 Nine Mile Road
St. Clair Shores, Michigan, 48080
10. Known Bondholders, Mortgagees, and Other Security Holders Owning or Holding 1 percent or More of Total Amount of bonds, Mortgages, or Other Securities. If none, so state: None.
11. For Completion by nonprofit organizations authorized to mail at special rates. —*not applicable.*
12. Publication Name: II ALIVE
13. Issue date for Circulation data below: November 1994-October 1995
14. Extent and Nature of Circulation

	Average no. of copies each issue during preceding 12 months	Actual no. of copies of single issue published to nearest filing date
a) Total no. of copies printed	10712	7959
b) Paid and/or requested circ.		
1. Sales through dealers, carriers, street vendors, and counter sales.	0	0
2. Paid or requested mail subscriptions.	9816	6961
c) Total paid/requested circul.	9816	6961
d) Free distribution by mail	232	186
e) Free distribution outside/mail	0	0
f) Total free distribution	232	186
g) Total distribution	10048	7147
h) Copies not distributed	664	812
i) Total	10712	7959
j) Percent paid and/or requested circulation	97.69%	97.40%

The Weekend Hacker

Puzzling Recursion by Mike Westerfield

Two Articles in One

Someone once told me, "A pipe gives a wise man time to think and a fool something to stick in his mouth." I have no idea who first spawned this witticism, although it sounds suspiciously like Mark Twain or Will Rogers. It's cute, though, because it shows a way of looking at something from two completely different viewpoints—just like the program for this issue.

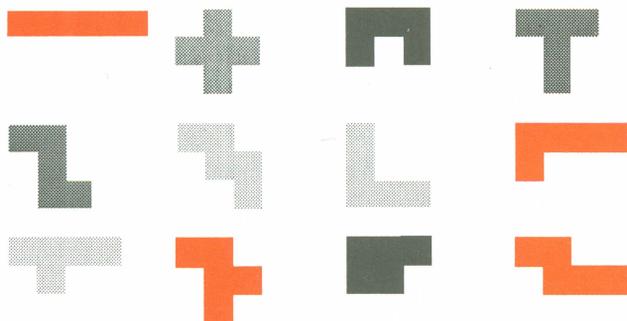
This issue, we'll see how to solve one of the most famous of all computer puzzles, the pentomino puzzle. Along the way, we'll see how recursion can be used to solve puzzles. We'll also look at the role of heuristics in recursive problem solving (and find out what the word means, too!).

But the other way of looking at this article is radically different from an exercise in computer programming. The program for this issue just happens to create a beautiful example of animated computer art. Watching the program run is relaxing, thought provoking, and just plain fun. I have it running on my Apple IIGS while I write this article, and it's every bit as pleasant to look at as the pictures that decorate my wall.

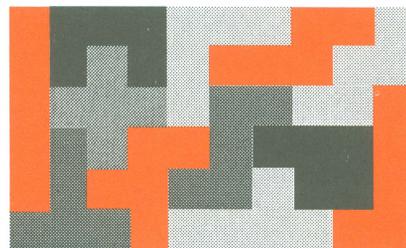
So, this program gives a computer programmer something to think about, and a computer user something to watch. Not quite as catchy as the pipe maxim, but you can sure look at this article from two very different perspectives!

The Pentomino Puzzle

A pentomino is a shape made up of five squares, just like a domino is a shape made up of two squares. Like a domino, all of the squares in a pentomino have to connect with the edge of at least one other square—connecting corners doesn't count. With a domino, there is only one shape you can create this way, but with a pentomino, there are 12 distinct shapes. I'll save you the trouble of working them out on a sheet of graph paper.

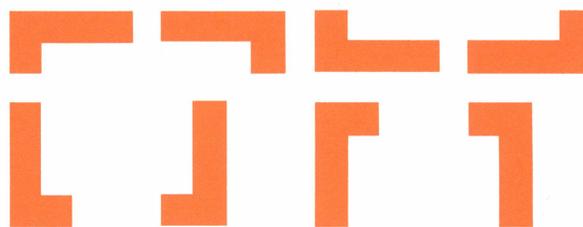


The pentomino puzzle is a geometric jigsaw puzzle. The 12 pentominoes, as a group, cover 60 squares. To solve the puzzle, you put all 60 shapes into a 6x10 grid. You are allowed to rotate or flip a piece any way you like, but you can't use the same piece twice, and the pieces can't overlap. Here's one of the many solutions to the pentomino puzzle.



Solving the puzzle with the computer works pretty much the same way you would solve the puzzle by hand, but the computer is a little more organized. The computer puts down a shape, then puts down another one, and keeps going until it can't fit another piece into the puzzle, or until all of the pieces are in, which is a solution to the puzzle. The difference between the computer and you is that the computer is more methodical, and also stupider.

The program starts by placing the first piece in the top left corner of the game board. It then places the second piece on the board in the first position it finds, working from the top down, then left to right. At each location, it will flip and rotate the piece to try every possible orientation of the piece. That happens more times for some pieces than others. For example, the cross shape only has one orientation. No matter how you rotate or flip the piece, it ends up looking the same. The L shaped piece has a total of 8 orientations, though, like this:



These are all the same piece, but each orientation occupies squares in the puzzle in a unique way.

When the computer program gets to a point where a piece can't be added, it backs up to the last piece on the board and tries a different orientation. Once all of the orientations have been tried, it moves the piece down one square, then to the top right of the next column, and so on until the piece has been tried in each and every location on the board. Then, and only then, the computer backs up to the piece placed on the board before that one, and tries a new orientation or location for the previous piece. The program keeps going until every possible combination has been tried.

These ideas fit snugly into a computer programming technique called recursion. A recursive subroutine is a subroutine that calls itself. It's easy to see how recursion would help with the puzzle. The main program calls a subroutine to place the first piece on a

blank puzzle board. The subroutine loops through all orientations and all locations for this piece, and for each of the possibilities, the subroutine calls itself to put the second piece on the board. Once the subroutine tries each possible location for the piece, it returns-possibly to itself to try the previous piece in a new orientation.

Roughing it out, the subroutine that does all of the work looks like this:

```
procedure Place (index: integer);

var
  x, y: integer;

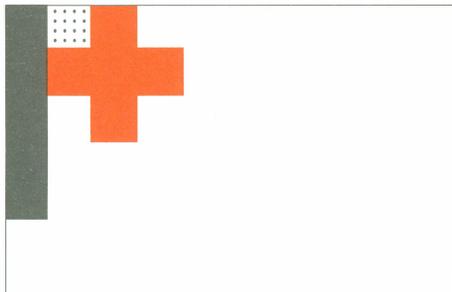
begin
  for x := 1 to 10 do
    for y := 1 to 6 do
      for o := 1 to <number of orientations for this piece> do
        if <the piece fits here> then begin
          <put the piece on the board>;
          if index < 12 then
            Place(index + 1)
          else
            <record a solution>;
          <remove the piece from the board>;
        end; (if)
      end;
    end;
  end;
```

There is a lot of intricate coding to handle the minor details, but these few lines are a complete description of the logic for a simple pentominoes puzzle solver.

As it turns out, this is a little too simple, though.

The Role of Heuristics

The way I set up the pieces in the program, the first piece the program places on the board is the long, straight line. The first orientation is vertical. The next piece the program places on the board is the cross. The result, after the first two pieces are on the board, looks like this:



It's easy to see that this position is hopeless. No matter where you put the rest of the pieces, no solution is possible, because nothing can fit in the square with the dotted pattern. The computer still has 10 more pieces to try, though, and on average, gets about 7 of them on the board before it figures out there is a problem. The number of positions the computer examines in this hopeless situation is enormous. So enormous, in fact, that when I tried this

simple algorithm, the program ran over 11 hours on an accelerated Apple IIGS without finding a single solution!

What's obvious to us is that with the single, isolated square, there's just no point in looking further. In computer terms, this is a heuristic—a rule of thumb we can use, in this case, to reject a solution quicker. I added this rule to the simple program, using it to reject the placement of a piece even if it would fit on the board, and the new program found a solution in 29 minutes.

Watching the program run with the new heuristic in place, it wasn't long before I spotted another hopeless position sucking up computing time. This time, there were two isolated cells. The problem with a single isolated cell is that you can't put a pentomino into the single space. That's the same problem with two adjacent empty squares. In general, the number of connected squares must be divisible by five, or it's clearly impossible to fill the area with pentominoes. In the program in Listing 1, the subroutine Fill checks various blank areas to see how many connected blank squares they contain. If the number of squares in each empty area is not divisible by five, the program doesn't bother to try adding any other pieces.

I'll leave it to you to read the subroutine and see how it works, but it's worth looking at the subroutine for a moment to see where the algorithm comes from. Fill needs to count all of the adjacent free squares on the puzzle board. That's not a simple problem, and in fact, Fill is recursive, too. The interesting point is that the algorithm for Fill comes from computer graphics. It's the same idea used to implement the flood fill used by the paint bucket tool in almost every paint program you've ever used. The point is that algorithms you probably never expect to use can easily pop up in a seemingly unrelated area of programming. Routines used in graphics and compiler design show up in an amazing number of programs that look like they would have nothing in common with a compiler or paint program. It's rarely a waste of time to learn new algorithms.

Other Recursive Puzzles

If you would like to try another puzzle, here's a good one. One of the classic problems in undergraduate computer science is the Eight Queens problem. The problem is to place eight chess queens on a chess board so none of the queens attacks another queen. For non-chess players, that means that no queen can be in the same row, column, or diagonal as another queen. The Eight Queens problem is a great introduction to recursive puzzle solving because it can be solved without heuristics in a reasonable amount of time.

Practical Applications

Puzzles, puzzles. There are many practical uses for this algorithm. The first I ran across was positioning components of a radar unit in the limited space available in the nose of an Air Force fighter. The same basic idea is also used to find the optimal placement for electrical components on circuit boards, although, the restraint is generally minimizing wires, not crowding parts onto the board. Anytime you need to find the best way to crowd a limited number of things into a space, this technique of heuristics will always work well.

Although, getting a pretty picture is practical in its own way, too.

The Weekend Hacker

```
program Pentominoes (output);
uses Common, QuickDrawII;
label 999;

const
  maxo = 8;           (maximum number of orientations)
  num = 12;          (number of shapes)

type
  square = 1..num;   (number code/color for shapes)

  shape = array[1..5, 1..5] of square; (one pentomino shape)

  pentomino = record (one pentomino)
    orientations: 1..maxo; (number of orientations)
    shapes: array[1..maxo] of shape; (shapes for orientations)
  end;

  boardArray = array[0..14, 0..10] of square; (game board)

var
  board: boardArray; (the puzzle board)
  pentominoes: array[1..num] of pentomino; (the pentominoes)
  solutions: longint; (number of solutions found)
  tboard: boardArray; (copy of board; global for efficiency)

procedure CreatePentominoes;

{ Set up the pentomino records }

type
  string5 = packed array[1..5] of char; (line of pentomino blocks)

  procedure Create (index: square; a, b, c: string5);

  { Create all orientations of a pentomino }
  { }
  { parameters: }
  { index - array index of pentomino to create }
  { a, b, c - shape as a string }

var
  i, j: 1..5; (loop/index variables)
  flipped: 1..maxo; (number of the first flipped object)

function Duplicate (s: shape): boolean;

{ See if a shape duplicates an existing shape }
{ }
{ parameters: }
{ s - shape to check }
{ }
{ Returns: True if the shape is a duplicate, else false }

label 1;

var
  i: 1..num; (loop/index variable)

function EqualShapes (s1, s2: shape): boolean;

{ Check to see if two shapes are the same }
{ }
{ parameters: }
{ s1, s2 - shapes to check }
```

```

}
(Returns: True if the shapes are equal, else false)
label 1;

var
  i, j: 1..5; (loop/index variable)

begin (EqualShapes)
  EqualShapes := true;
  for i := 1 to 5 do
    for j := 1 to 5 do
      if s1[i, j] <> s2[i, j] then begin
        EqualShapes := false;
        goto 1;
      end; (if)
    i: ;
  end; (EqualShapes)

begin (Duplicate)
  Duplicate := false;
  with pentominoes[index] do
    for i := 1 to orientations do
      if EqualShapes(s, shapes[i]) then begin
        Duplicate := true;
        goto 1;
      end; (if)
    i: ;
  end; (Duplicate)

procedure Normalize (a: square);

{ Push the object to the top left of the array }
{ }
{ parameters: }
{ a - index of the object to normalize }

var
  i, j: 1..5; (loop/index variables)

function LeftIsBlank: boolean;

{ Is the left column blank? }
{ }
{ Returns: True if so, else false }

var
  i: 1..5; (loop/index variable)

begin (LeftIsBlank)
  LeftIsBlank := true;
  with pentominoes[index] do
    for i := 1 to 5 do
      if shapes[a, i, 1] <> 0 then
        LeftIsBlank := false;
  end; (LeftIsBlank)

function TopIsBlank: boolean;

{ Is the top row blank? }
{ }
{ Returns: True if so, else false }

var
  j: 1..5; (loop/index variable)

begin (TopIsBlank)
  TopIsBlank := true;
  with pentominoes[index] do
    for j := 1 to 5 do
```

```

    if shapes[a, 1, j] <> 0 then
      TopIsBlank := false;
    end; {TopIsBlank}
  begin {Normalize}
    with pentominoes[index] do begin
      while TopIsBlank do
        for j := 1 to 5 do begin
          for i := 1 to 4 do
            shapes[a, i, j] := shapes[a, i + 1, j];
            shapes[a, 5, j] := 0;
          end; {for}
        while LeftIsBlank do
          for i := 1 to 5 do begin
            for j := 1 to 4 do
              shapes[a, i, j] := shapes[a, i, j + 1];
              shapes[a, i, 5] := 0;
            end; {for}
          end; {with}
        end; {Normalize}
      end;

function Flip (a, b: square): boolean;

{ Flip an object }
{ }
{ parameters: }
{ a - original object }
{ b - new object }
{ }
{ Returns: True if the flipped object is unique }
{ (not the same ) }
{ as any previous object in the pentomino } }

var
  j: 1..5; {loop/index variable}

begin {Flip}
  with pentominoes[index] do
    for j := 1 to 5 do begin
      shapes[b, 1, j] := shapes[a, 5, j];
      shapes[b, 2, j] := shapes[a, 4, j];
      shapes[b, 3, j] := shapes[a, 3, j];
      shapes[b, 4, j] := shapes[a, 2, j];
      shapes[b, 5, j] := shapes[a, 1, j];
    end; {for}
  Normalize(b);
  if Duplicate(pentominoes[index].shapes[b]) then
    Flip := false
  else begin
    pentominoes[index].orientations := b;
    Flip := true;
  end; {else}
end; {Flip}

function OrdHex (c: char): integer;

{ Converts a character to a hexadecimal value }
{ }
{ parameters: }
{ c - character to convert }
{ }
{ Returns: Hexadecimal value }
{ }
{ Notes: }
{ 1. Assumes ASCII }
{ 2. Works beyond hex (e.g. 'G' = 16) } }

begin {OrdHex}
  if c <= '9' then
    OrdHex := ord(c) - ord('0')
  else if c <= 'Z' then
    OrdHex := ord(c) - ord('A') + 10
  else
    OrdHex := ord(c) - ord('a') + 10;

```

```

end; {OrdHex}

procedure Rotate (a, b: square; turns: integer);
{ Rotate an object turns*90 degrees }
{ }
{ parameters: }
{ a - original object }
{ b - new object } }

var
  i, j: 1..5; {loop/index variables}
  t: square; {temp value (for swaps)}

begin {Rotate}
  pentominoes[index].shapes[b] :=
    pentominoes[index].shapes[a];
  while turns <> 0 do begin
    with pentominoes[index] do begin
      for i := 1 to 4 do
        for j := i + 1 to 5 do begin
          t := shapes[b, i, j];
          shapes[b, i, j] := shapes[b, j, i];
          shapes[b, j, i] := t;
        end; {for}
      for j := 1 to 5 do begin
        t := shapes[b, 1, j];
        shapes[b, 1, j] := shapes[b, 5, j];
        shapes[b, 5, j] := t;
        t := shapes[b, 2, j];
        shapes[b, 2, j] := shapes[b, 4, j];
        shapes[b, 4, j] := t;
      end; {for}
    end; {with}
    turns := turns - 1;
  end; {while}
  Normalize(b);
  if not Duplicate(pentominoes[index].shapes[b]) then
    pentominoes[index].orientations := b;
  end; {Rotate}

begin {Create}
  with pentominoes[index] do begin

{fill in the initial shape}
    orientations := 1;
    for i := 1 to 5 do begin
      for j := 1 to 5 do
        shapes[1, j, i] := 0;
      if a[i] <> ' ' then
        shapes[1, 1, i] := OrdHex(a[i]);
      if b[i] <> ' ' then
        shapes[1, 2, i] := OrdHex(b[i]);
      if c[i] <> ' ' then
        shapes[1, 3, i] := OrdHex(c[i]);
    end; {for}

{create rotations of the shape}
    Rotate(1, orientations + 1, 1);
    Rotate(1, orientations + 1, 2);
    Rotate(1, orientations + 1, 3);

{flip the shape and create the rotations}
    if Flip(1, orientations + 1) then begin
      flipped := orientations;
      Rotate(flipped, orientations + 1, 1);
      Rotate(flipped, orientations + 1, 2);
      Rotate(flipped, orientations + 1, 3);
    end; {if}
  end; {with}
end; {Create}

begin {CreatePentominoes}

```

The Weekend Hacker

```

Create( 1, '11111',
      '1 ' ,
      '1 ' );
Create( 2, '2 ' ,
      '222 ' ,
      '2 ' );
Create( 3, '333 ' ,
      '3 3 ' ,
      ' ' );
Create( 4, '4 ' ,
      '444 ' ,
      '4 ' );
Create( 5, '5 ' ,
      '555 ' ,
      ' 5 ' );
Create( 6, '6 ' ,
      '66 ' ,
      ' 66 ' );
Create( 7, '777 ' ,
      '7 ' ,
      '7 ' );
Create( 8, '8888 ' ,
      '8 ' ,
      ' ' );
Create( 9, '9999 ' ,
      '9 ' ,
      ' ' );
Create(10, 'A ' ,
      'AAA ' ,
      ' A ' );
Create(11, 'BBB ' ,
      'BB ' ,
      ' ' );
Create(12, 'CC ' ,
      'CCC ' ,
      ' ' );
end; {CreatePentominoes}

procedure InitBoard;
{ Set up the puzzle board }

var
  i, j: 1..14; {loop/index variables}

begin {InitBoard}
for i := 1 to 10 do begin
  for j := 1 to 6 do
    board[i, j] := 0;
  for j := 7 to 10 do
    board[i, j] := -1;
  end; {for}
for i := 11 to 14 do
  for j := 1 to 10 do
    board[i, j] := -1;
  for i := 0 to 14 do
    board[i, 0] := -1;
  for j := 1 to 10 do
    board[0, j] := -1;
  end; {InitBoard}

procedure InitGraph;
{ Set up the graphics screen }

var
  r: rect; {screen rectangle}

begin {InitGraph}
StartGraph(320);
PenNormal;
SetSolidPenPat(0);
GetPortRect(r);
PaintRect(r);
end; {InitGraph}

procedure Place (index: integer);
{ Recursively place objects }
{ parameters: }
{ index - object to place }

var
  o: 1..maxo; {orientation being checked}
  x, y: 1..10; {board position being checked}
  i, j: 1..5; {shape location}

function CanPlace (s: shape; x, y: integer): boolean;
{ See if we can place a shape at this location }
{ parameters: }
{ s - shape to place }
{ x, y - board location }
{ Returns: True if the shape can be placed, else false }

label 1;

var
  i, j: 1..5; {loop/index variables}

begin {CanPlace}
CanPlace := false;
for i := 1 to 5 do
  for j := 1 to 5 do
    if (s[i, j] <> 0) and (board[x + i - 1, y + j - 1] <> 0) then
      goto 1;
CanPlace := true;
1: ;
end; {CanPlace}

procedure Draw (p: shape; erase: boolean; x, y: integer);
{ Draw (or erase) a pentomino }
{ parameters: }
{ p - shape to draw }
{ erase - erase? (or draw)? }
{ x, y - position to draw }

label 1;

const
  xSize = 16; {width of a block}
  ySize = 16; {height of a block}
  xDisp = 80; {disp to top of board}
  yDisp = 50; {disp to top of board}

var
  count: 1..5; {number of squares drawn}

```

```

i, j: 1..5;                {loop/index variables}
      r: rect;              {drawing rectangle}
begin {Draw}
count := 0;
for i := 1 to 5 do begin
  r.h1 := xDisp + (x + i - 1)*xSize;
  r.h2 := r.h1 + xSize;
  for j := 1 to 5 do
    if p[i, j] <> 0 then begin
      if erase then
        SetSolidPenPat(0)
      else
        SetSolidPenPat(p[i, j]);
      r.v1 := yDisp + (y + j - 1)*ySize;
      r.v2 := r.v1 + ySize;
      PaintRect(r);
      count := count + 1;
      if count = 5 then
        goto 1;
      end; {if}
    end; {for}
  end; {for}
1: ;
end; {Draw}

function KeyPress: boolean;

{ Check to see if a key has been pressed      }
{ Returns: True for a keypress, else false    }

var
  keyboard: ^byte;          {keyboard latch location}

begin {KeyPress}
keyboard := pointer($00C000);
KeyPress := keyboard^ & $0080 <> 0;
end; {KeyPress}

function NoDeadCells (x, y: integer): boolean;

{ See if there are any areas that can't hold a pentomino }
{ parameters:                                           }
{   x, y - top left area of the board to check         }
{ }                                                     }
{ Returns: False if there is no point in going on, else }
{ true                                                  }

label 1;

var
  i, j: -1..5;            {loop/index variable}

function Fill (x, y: integer): integer;

{ Count the number of connected empty squares      }
{ parameters:                                       }
{   x, y - starting blank square to check         }
{ Returns: Number of connected blank cells        }
{ Notes: Fills in cell area to prevent redundant checks}

var
  f: integer;            {number of filled cells}

begin {Fill}
f := 1;
tboard[x, y] := -1;
if tboard[x, y + 1] = 0 then
  f := f + Fill(x, y + 1);
if tboard[x, y - 1] = 0 then
  f := f + Fill(x, y - 1);
if tboard[x + 1, y] = 0 then

```

```

  f := f + Fill(x + 1, y);
if tboard[x - 1, y] = 0 then
  f := f + Fill(x - 1, y);
Fill := f;
end; {Fill}

```

```

begin {NoDeadCells}
NoDeadCells := true;
tboard := board;
for i := -1 to 5 do
  for j := -1 to 5 do
    if tboard[x + i, y + j] = 0 then begin
      if Fill(x + i, y + j) mod 5 <> 0 then begin
        NoDeadCells := false;
        goto 1;
      end; {if}
    end; {if}
  end;
1: ;
end; {NoDeadCells}

```

```

begin {Place}
with pentominoes[index] do
  for x := 1 to 10 do
    for y := 1 to 6 do
      for o := 1 to orientations do
        if CanPlace(shapes[o], x, y) then begin
          for i := 1 to 5 do
            for j := 1 to 5 do
              if shapes[o][i, j] <> 0 then
                board[x + i - 1, y + j - 1] := shapes[o][i, j];
          Draw(shapes[o], false, x - 1, y - 1);
          if NoDeadCells(x, y) then
            if index < num then
              Place(index + 1);
          for i := 1 to 5 do
            for j := 1 to 5 do
              if shapes[o][i, j] <> 0 then
                board[x + i - 1, y + j - 1] := 0;
          Draw(shapes[o], true, x - 1, y - 1);
          if index = 12 then begin
            solutions := solutions + 1;
            MoveTo(110, 180);
            writeln(solutions: 1, ' solutions found');
          end; {if}
          if KeyPress then
            goto 999;
          end; {if}
        end; {Place}
      end;
    end;
  end;
end; {Place}

```

```

procedure TermGraph;

{ Shut down the graphics screen                }

begin {TermGraph}
EndGraph;
end; {TermGraph}

begin
InitGraph;

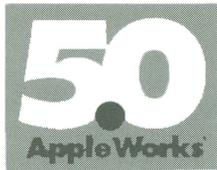
CreatePentominoes;
InitBoard;
solutions := 0;
Place(1);

999: TermGraph;
writeln(solutions: 1, ' solutions found');
end. ■

```

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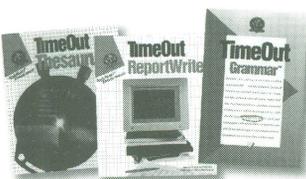
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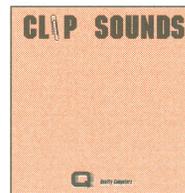
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Letters

by Doug Cuff, Editor

Dear II Alive,

With reference to Jon McCreight's review of our Super Menu Pack in the January/February 1995 issue of II Alive: I was told that most of the review is "quite laudatory", but that there were several paragraphs of "disparaging comments": esp.[the font menu] functions if you use bitmapped fonts, but if you use TrueType fonts you're in for some nasty surprises.

After booting a program, opening a two-page letter took almost two minutes to open! My font menu with 28 TrueType and 8 bitmapped fonts took almost a minute to scroll down. Oddly, while SMP's Pretty Font Menu works fine with some wares, like AppleWorks GS, it does not function with others, like Platinum Paint by Beagle Bros.

Page 12 of the Super Menu Pack manual describes the three sizing choices for the "Pretty Font Menu", it then follows with this paragraph:

The "Use size that fits in item rectangle" option can significantly increase the time it takes to launch an application—to several minutes longer, unless you have the 12 point bitmap font available in your Fonts folder. TIP: If you own Pointless, use its "Save Font" option to create 12 point bitmaps of all your TrueType fonts. I'm not sure what part of "several minutes longer" the reviewer failed to understand, but that option takes much longer *unless* you have the 12 point bitmap font found in your Fonts folder. (Read the manual.)

By the way, the reason it takes so long is because *Pointless* has to load the TrueType font and generate the 12-point characters that are being displayed in the menu—something Super Menu Pack *cannot* control, which is *why it's documented*.

Page 11 of the SMP manual clearly states, "When this [Pretty Font Menu] option is checked, applications that have a standard Font menu will display the font names in the actual font."

So, applications that *have a standard font menu* will work, but any others will *not* work... and *Platinum Paint* was even *specifically* mentioned as one that *does not* have a standard Font menu.

Nothing "odd" there! (By the way, we footnoted that GraphicWriter III version 1.2 will have a "real" font menu so that version will work.)

With complaints like these, I really have to wonder if the reviewer bothered to *read* the manual?

I'm sorry I'm upset, but it really fries my cookies when we go to the effort of producing useful software only to have it "shot down" by a reviewer who doesn't read the manual, then doesn't even bother to *ask* us about the problems he's "found".

Dave Hecker
Vice President of Research &
Development
Seven Hills Software

Dave: *I agree with you that reviewers must read the manual of the product they are reviewing—and Mr. McCreight must have at least glanced at his, for in his review he notes "SMP's booklet fails to mention one additional goodie..."—but beg to be allowed to remind you that the reviewer's first duty is to the prospective customer. McCreight's warnings about slowness address legitimate concerns that a customer might have, and he average user neither knows nor cares whether the slowness is attributable to Pointless or Super Menu Pack. Limitations addressed by a manual are still limitations, even if the manual provides workaround solutions. I agree that Mr. McCreight should have made it clear, for the record, that the root cause of the slowness was Pointless, since the reviewer owes an equal but secondary duty to those who have produced the article. However, I suspect that the omission was an honest one; doubtless Mr. McCreight assumed everyone knew it. What you perceive to be a slight was probably unintentional, but I will apologize for the oversight on Mr. McCreight's behalf.*

Dear II Alive,

I was disturbed by "The Internet Made Easy", particularly the list of ftp commands on page 8. The commands had the

proper letters but not the proper capitalization. Unix is case sensitive. All of the commands should be completely in lower case letters. Also, there is no mention of ncftp. If the intention is to make the Internet more accessible for the beginner, ftp'ing with ncftp is a lot easier. No more typing "anonymous" (how many times did I misspell it before writing a ProTERM macro) or email address to log in. No more typing "cd" when wanting to change directories.

Brad von Haden
b.vonhaden@genie.com

Brad: *As to our table of commands, you're absolutely right. We let our need to be stylistically correct override our obligation to be technically correct.*

As for ncftp, I think perhaps you have mistaken the intended audience for the article. It was for absolute beginners, and meant to introduce them to the basic concepts they would find useful. I'm sorry the article wasn't what you were looking for.

Dear II Alive,

I enjoyed reading "My First Apple." Two things made *me* want a computer: A game I had seen in Germany pertaining to elephants and I wanted to write columns with formatted text.

I looked at a couple of (now non-existent) computers, but they were very limited in what they could do, and expensive. A friend of mine in the US had worked at a computer store, and sold Apples. He gave me a discount, so in 1982 I bought a "fully loaded" II+ with 48K! Just the CPU cost \$1250. That first afternoon I started working through the Applesoft Tutorial. Then I found Little Brickout on the disk, which I played the rest of the day and into the night. The next thing I did was translate Little Brickout into German!

Now I own a couple of IIs and a IIGS. I'll always hang onto my II+.

Terrell Smith
t.smith59@genie.com

Thanks for sharing your story, Terrell!

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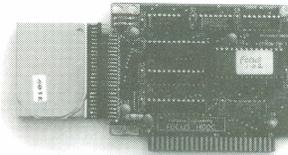
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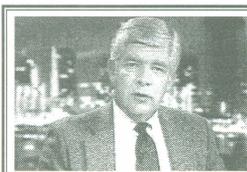


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