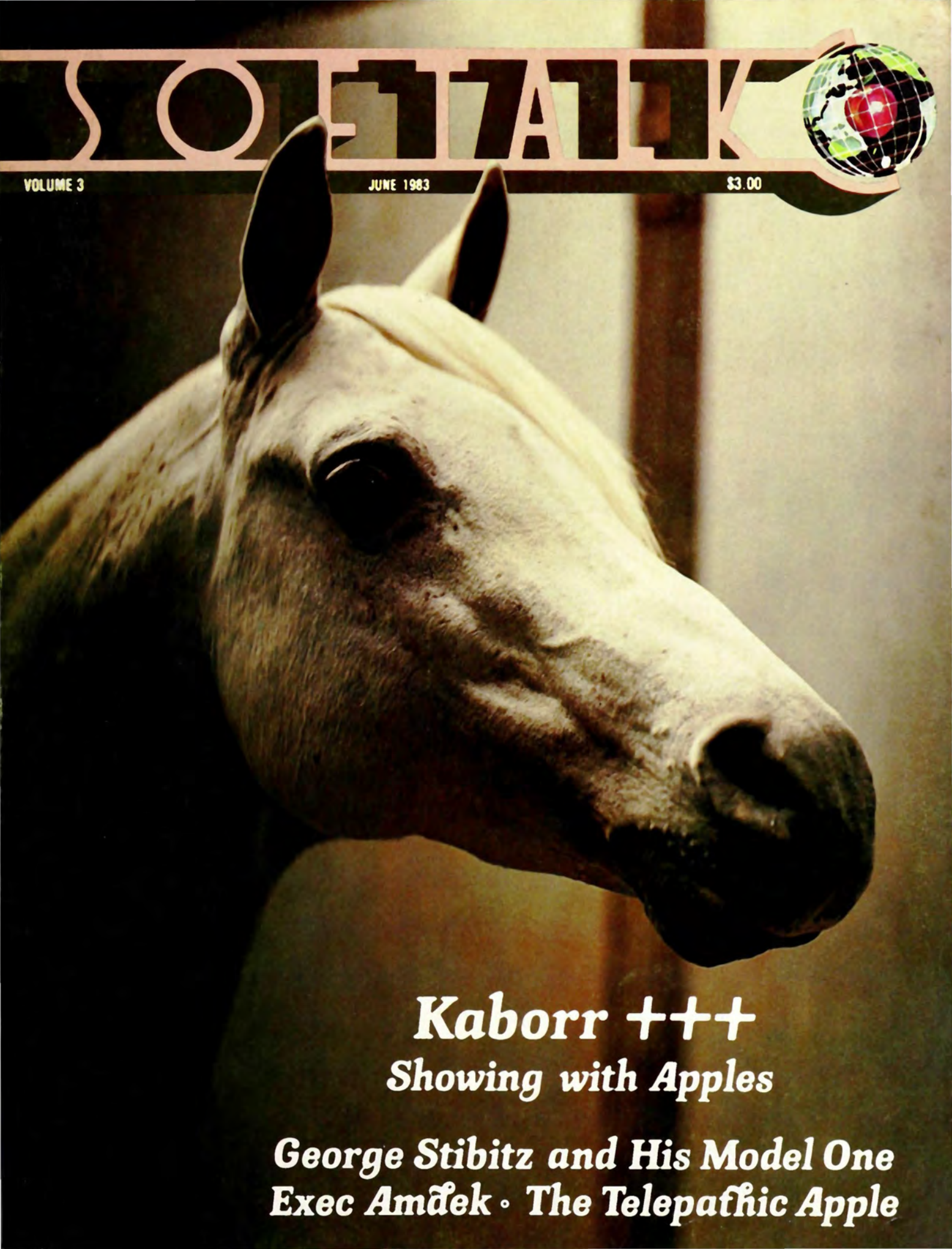
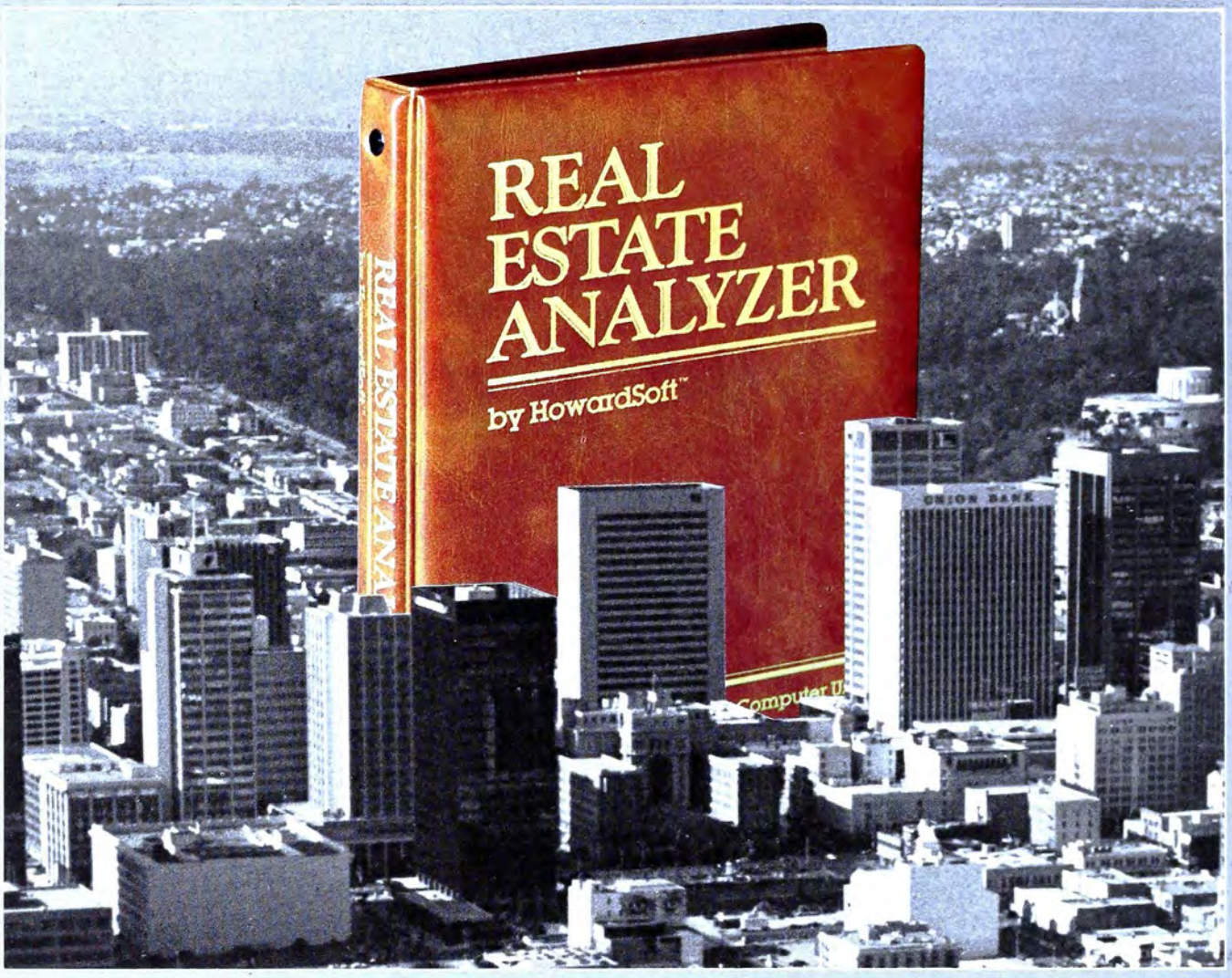

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Exec Amdek: Window on the Future

They're not just monitors anymore. Now Amdek has tiny disk drives that fool your Apple—and more in the works.

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By George, It's a Computer!

Nearly fifty years ago, George Stibitz invented the binary computer; now he enjoys an Apple.

ROE R. ADAMS III . . 104



An Apple among the Champions

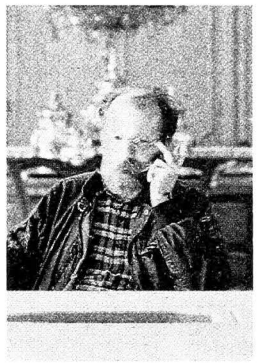
The Chauncey farm in Arizona breeds Thoroughbred Arabian horses that have rarely taken less than third place in a show. An Apple helps.

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Syncopated Apple III

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CONTEST: Final Exam

Good afternoon, class. We're all anxious to go home and pack our bags for Hawaii, Europe, Greece, or wherever we're planning to go for summer vacation, but nobody leaves this room until everyone's taken the final examination.

The test covers the following subjects: history, folklore, literature and humanities, mathematics, anatomy, and general knowledge.

It's really simple. All you have to do is read the questions, write your answers on a separate sheet of paper, and send it in. And, just to keep everyone in the competitive spirit, we'll award $100 worth of *Softalk* advertisers' goods to the person who ends up with the highest score.

Here are a few guidelines for the test:

1. Many of the answers can be found within the confines of your computer room. Others have appeared in books and national publications (*Softalk*, *Newsweek*, *Time*, *Wall Street Journal*, *Mad*). If you think you have a correct answer, but you're not sure your source is the same as ours, be sure to list your source of information with your answer.

2. The test can be a team effort. Work with your family, friends, pets, and local computer store if you like. The more help you get, the better you'll probably do. Visit your computer store. If you have to, go over to Steve Jobs's house and interview him. Your final grade is limited only by your creativity and resourcefulness. Go for it.

3. Some sections have two questions per number. In these cases, the first question (24a, for example) is for students with the Apple II or II Plus. The second question (24b, for example) is for students with the IIe. Apple III students will have to trek down to their computer stores.

If you have a IIe, you don't have to answer the question for the II, and vice versa. If you have a III, you can answer either question.

Questions with several parts to them (a–e, for example) are to be answered by everybody.

4. All questions are worth 5 points each, except where noted. There is a total of 157 points possible.

5. Write your answers on a sheet (or sheets) of paper, with answers appearing by their corresponding numbers.

6. On the bottom left-hand corner of the envelope, indicate which test you're taking: II, IIe, or III.

That's all there is to it. Please do not begin the test until you see the word *go*. You must turn in your test so that it's postmarked by July 10, 1983. Please include the following information on your test form:

Name: _____

Address: _____

City, State, Zip: _____

Phone number: _____

My local dealer: _____

What I'd like to win: _____

Send your exam to Softalk (Con)Test, Box 60, North Hollywood, CA 91603, postmarked by July 10, 1983. *Go*!

THE QUESTIONS:

Literature and Humanities

1. Who is the author of *Super Invader*?

2. *Animals* was written by R. Wigginton. Who does he say the original program idea came from?

3. What is the lowest score you must achieve to attain a rating of "nearly perfect" in *Brick Out* or *Little Brick Out*? Hint: You don't have to play the game to answer this question.

4. Cite the program from which the following quotes are taken (one point each):

a. "Now loading DOS image."

b. "Apple II File Developer."

c. "To operate a demonstration, type its number."

d. "Merge to program on hold."

e. "Happy executing."

f. "Before we begin, please type your first name and then press the return key."

Name the works written by the following people:

5a. Christopher Espinosa

5b. Allen Watson

6a. Caryl Richardson

6b. Meg Beeler

7a. Give the poem, word for word, written by Richard Shacklock in 1565 that has to do with Applesoft. One point off for each spelling error.

7b. What important literary work is Joe Meyers responsible for?

History

8. The Apple IIe was first available on January 19, 1983. When was the first Apple II (not the II Plus) available to the public?

9. Give the dates that the following were introduced (one point each):

a. DOS 3

b. DOS 3.1

c. DOS 3.2

d. DOS 3.2.1

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Final Exam

e. DOS 3.3

10. When was *Phone List* copyrighted?

11. Apple Computer's current address is 20525 Mariani Avenue, Cupertino, CA 95014. Before that, it was 10260 Bandley Drive, Cupertino, CA 95014. What was its address before that? Be sure to give the street address, city, state, and zip code. Hint: Apple I owners should know.

12. Name the two things Steve Wozniak and Steve Jobs had to sell in order to raise money to build the Apple I. Be sure to attribute each item to its correct owner (five points for each item).

13. What was the name of the computer club where Woz introduced the Apple I?

14. What role did Don Valentine play in the forming of Apple Computer?

15. In its development, the Apple IIe had three code names. What were they? (two points for each name)

Folklore

16. Who is Rocky Clark, and how did he get his name? Be specific.

17. Why does Steve Wozniak now order Pepsi instead of Coca-Cola when he goes out to eat?

18. Who did Woz and Jobs say was calling when they phoned the Vatican and asked to speak to the Pope?

Complete the Following:

19. "A locked door. A dead man. And_____."

20. "There are more people doing more things _____."

Identification

21. Besides the fact that they're game programmers, what do Bill Budge, Dan Bunten, and Matt Alexander have in common?

Mathematics

22. Chip has three milliseconds in his left pocket and five hundred microseconds in his right pocket. Dale has nothing. How many nanoseconds must Chip give to Dale so that they have equal amounts?

23. From Applesoft Basic, the command *print 5* will return the value of five; *print 2.5E+10* will return the value 2.5E+10 (twenty-five billion). What is the largest value the Apple will print? Give your answer exactly the way it appears on the screen.

Anatomy

24a. If you laid the 6502 microprocessor and all the RAM chips of a 48K Apple end to end, how far would they stretch? Give your answer in inches to the nearest quarter of an inch.

24b. Which one of the following does not belong: X1, X4, X6, X8?

25a. Put the following in the correct order: D0, E0, F8, E8, F0, D8.

25b. What do these numbers correspond to: 344-0010, 344-0020?

General Research Skills

26. Where will you find, "Under no circumstances is this case to be opened"?

27. Who is Amy Doaks?

28. What do these items have in common: banana, eagle, goose, hat, and icicle?

29a. What color feet does the blue horse have?

29b. Which object doesn't belong: ink bottle, Erlenmeyer flask, chalk, fountain pen, video monitor, disk drive, adding machine tape, Apple IIe?

30a. Back in the days of DOS 3.2, a disk that came with the Apple included a program called *Brian's Theme*. Who is the program named after?

30b. In one sentence, identify Sue Espinosa (four points). What does the program called *Bargle* do? (one point)

Essay Question

In one hundred words or less, explain why the Apple (any model) is the best darn personal computer in the universe (no points will be awarded for this question; it's just for fun).]■

CONTEST WINNERS

Oracle '83: The Saga Continues; Lingering Limericks

The results of this part of the Oracle '83 contest were originally scheduled for the May issue, but everyone around here was so sick of reading, talking, and hearing about the Academy Awards that we decided to wait until most had pretty much forgotten about them.

Oracle Oscar '83. If ever there was a predictable year for Oscar winners, this wasn't it. Most contestants were able to predict that Meryl Streep would be the one to walk off with the award for best actress (*Sophie's Choice*); but only a handful picked Ben Kingsley to run off with the Oscar for best actor in *Gandhi*; and an even smaller group was able to sit through three hours of *Gandhi* (thank goodness for intermission!) and foresee its winning the award for best picture.

Many contestants were clairvoyant enough to pick two of the three correctly, but only ten got them all.

The *Softalk* random number generator was called in to break the tie, and in typical RNG fashion it generated a random number that was guaranteed to upset everyone involved. Everyone, that is, except for David Miles (Gillette, WY), who is this month's winner. Miles plans to put the $100 he wins for this part of the Oracle contest toward the purchase of a Votrax Type-'N-Talk speech synthesizer.

The other movie buffs who correctly predicted this year's winners are, alphabetically, Geraldine Bass (Williamsburg, VA), Scott R. Bauer (Pittsburg, CA), J. Young Liu (Rancho Palos Verdes, CA), Kevin C. Park (Los Angeles, CA), Edward Radanovich (Bellevue, NE), Paul Shanberg (Moraga, CA), Carl Webb (Vista, CA), Michael Wolgelenter (Palo Alto, CA), and Shirley Young (Farmers Branch, TX). Faithful followers of these contests will immediately recognize previous winners in Radanovich (Oracle '82, part 5), Shanberg (Oracle '81, part 5), and Webb (Apple Trivia and *Softalk* Ghosts contests).

Predicting who would take top honors wasn't too hard, given the nominees. However, predicting who would be nominated presented quite a problem for many Oracle contestants. Choices for best actress included Jane Fonda, Dolly Parton, Raquel Welch, Drew Barrymore, and E.T. For best actor, many entries listed Richard Pryor, Jeff Bridges, Yoda, Burt Reynolds, "the kid who played 'Elliott,' " Mark Hamill, and E.T. again.





Save the Subheads contest winner Lisa Oerman is shown here receiving *Deadline* and *Choplifter* from Pete Soukup of Memory Bank (Bettendorf, IA). Oerman got bored with the whole photo session and began eyeing more things she'd like to win. Soukup was more interested in getting his picture in *Softalk*.

The Standings. At the end of round two last month, which included predicting the participants in the NCAA Basketball Tournament's Final Four, the coleaders in the overall Oracle '83 were Gordon Bitko (East Brunswick, NJ) and Matthew Silverstein (New Rochelle, NY), each with eight points. Not too far behind were Lee Banks (Gadsden, AL), with six points, and Tom Brown (Hopatcong, NJ), with five.

But leads are always changing in the Oracle contest, and this round brought out some new faces in the crowd. Not surprisingly, each of the top five leaders in this contest received the maximum fifty points possible for predicting the Academy Award winners. First place is a tie between Wolgelenter and Radanovich, with fifty points each. Hot in pursuit are Webb, forty-

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nine points; Miles, forty-eight points; and Shanberg, forty-four points.

Perhaps the person who suffered the most during this contest is Meryl Streep. No, she didn't enter the contest, so we can't embarrass her. She was, though, the actress whose name lent itself to the most spelling variations. There was Tom Brown, who probably saw *Sophie's Magician*, starring Merlyn Streep; Justin Shaw (Mancos, CO), who was rooting for Merly Street; Wes Wasson (Kingman, AZ), who picked Maralyn Streep; Brian Karmelich (Rancho Palos Verdes, CA), who chose Meryll Steep; Greg Cheong (Astoria, OR), who pulled for Myrle Sreepe; and James Karns (Columbus, OH), who tagged Myrl Strept as the winner.

Oracle judges almost disqualified Don Morgan (Xenia, OH), who obviously wasn't taking this contest seriously. Morgan wrote, "Best picture will be one of the following . . ." and proceeded to list all the likely winners. He did the same for best actor and best actress, knowing that one of them would win and he'd have himself a prize. Pretty clever, Don, except you forgot to include *Gandhi* on your list for best picture and Ben Kingsley on your list for best actor. Okay, everybody point and snicker!

There Once Was a Contest in March. And in typical Limerick Contest fashion, the contest staff couldn't agree on a winner. Let's have a look at what happened.

The contest staff met in the *Softalk* Limerickorama (formerly the Kumquatorium), where they argued for three days and nights over which limerick was the best. "None" was the consensus; most of them were good. Many were great, and some were just plain outstanding. In the final analysis the staff decided that it really didn't matter which limerick they thought was the best. This is the readers' section of the magazine; let the readers decide.

So that's how we're going to settle the Great *Softalk* Limerick Debate '83—the readers will vote for their favorites. The finalists appear at the end of this section, but let's have a little fun first.

Algebra 2 was probably nobody's favorite subject in school, and it's definitely not Sean Walter's or Roger Kitterman's (Kansas City, MO) favorite either. Walter sent in nineteen limericks of his own and collaborated with Kitterman on five more. "Roger and I wrote these during Algebra 2; he wrote a line, then I wrote one, and so on. . . ." Well, Sean and Roger, they weren't that great. Better concentrate on your binomial functions and inequalities.

Walter did, however, submit a limerick in Latin, which is here for everyone's viewing pleasure:

Uxor ludis pommo ludere fruitur.
Si casum habeo sistatur.
Sed ille arduum agere
Quad re fruor etiam ludere,
Ita pommus meus refutabitur.

We all got a good laugh out of it; hope everyone else did, too. "Pommus meus refutabitur"; that's a good one!

Jeff Moyers (Keezletown, VA) is sick. How sick is he? Take a look:

A girl with no regular sleepers
Got infested with some crawly creepers
When asked, "Are they crabs?
You've got gabs and gabs."
She said, "No, they are Lunar Leepers."

That's how sick.

Probably the trickiest limericker around is Darren Vengroff (Lubbock, TX). His limerick wasn't very good, but he sure concealed his Apple reference well. See if you can find it:

Oh, the warriors who come from Tai-dou
Are some of the toughest around.
See to beat them I've heard
A slash must convert
'Em from a bull to a cow

(Answer is at the end of this section. No peeking!)

Paul Duggan (Philadelphia, PA) and John Morrison (Philadelphia, PA) came close to winning this contest in the alien division; both entered limericks written in Bezardian text. Unfortunately, they forgot that Bezardian limericks are written with the first and fourth lines rhyming, while the other three lines aren't supposed to rhyme at all. Oh well.

In the Department of Unoriginality, we refused to give finalist consideration to limericks that used the following words or phrases as references to Apple-related companies and products: broader buns or broader bunned (Broderbund), serious (Sirius), innovation and standing ovation (Novation), my crow and so on (Micro anything), th' underwear (Thunderware), and amuse (Muse). Also thrown out were most of the "pen, Gwens" (Penguin).

Attention, Mrs. Jeff Miller (Mishawaka, IN): Keep an eye on your husband. His prize selection read, "If I win, I would be so excited to have a roll in the hay with Stevie Nicks. Otherwise, I guess I would like $100 worth of *Stickybear* products for my young son."

And while we're wrinkling noses at prize selections, let's not overlook Harriet Walsh (Menlo Park, CA), who asked for "a bath in an Irish spring (big enough for two)."

Well, that's enough kidding around for now. Let's get to the finalists. Listed here are the eleven limericks that rated highest with the demented contest staff. The original plan was to invite all of *Softalk*'s readers to a B.Y.O.V. (bring your own volleyball) barbecue and let them choose the finalists. But that would have cost a lot of bucks and we just couldn't afford it, even though contestants' prize selections indicate that they think we could ("a new Apple IIe," "a Hayes Smartmodem 1200," "a Lisa," "lots of money"). Instead, we chose the eleven best and are submitting them for readers' approval. Here's where you come in.

Another Chance To Win. All you have to do is pick the limerick you like best and write its number down on a post card. Limericks should be judged on cleverness, originality, wit, and general emotional movement. Each limerick contains an Apple-related company or product; so if you can't spot the reference, you know the limerick's a good one. Vote only once, but vote! Everyone who casts a ballot will be eligible to win a $50 credit toward games, utilities, hardware, or whatever. The choice is yours.

Of all the voters who vote for the winning limerick, one will be selected to go on a $50 shopping spree, and we'll pick up the tab. And just to assure everyone that we're sincere, if you find another magazine that offers more in the way of prizes for voting in limerick contests, just send us a clipping of its contest page showing what it's offering, and if you win we'll match the offer. Sound fair? Darn right.

So, read the limericks, write the number of the one you like best on a post card (don't forget to include your name, address, and phone number), and send it to Softalk Limerick Debate '83, Box 60, North Hollywood, CA 91603, postmarked by July 10, 1983.

Here are the finalists, in no particular order:

1. Oakland's Henderson, O how he flew,
But the catcher was late to pursue
With the pick-off forsaken,
Result: (accent Jamaican)
Rickie slid! An' he stole de base, too!

2. An Irish had entered the shack

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To join the card game in the back.
He filled up a straight
From the queen to the eight
When he drew the incredible jack.

3. The limerick contest just stunned
A rising young poet named Lund.
He practiced his craft
But soon went quite daft
Attempting to rhyme Broderbund.

4. When Grandma said "chores," we would play
Out back of the barn in the hay.
We tried to look busy.
The churning made us dizzy.
"Hugh, let Pa curd the whey."

5. Gwen's iron could only be blamed
For Mark's best shirt newly maimed.
He asked with a sob,
"What's this polymer blob?"
"It's a pressed-in pen," Gwen proclaimed.

6. To see Fred Astaire's dancing so gentle
I'd gladly pay for a hall's rental.
With Ginger he's ripping
As they're tapping and tripping
Let's face it, they're so-o-o Continental.

7. As the tax man arrived at my door,
From my brow did the sweat start to pour.
I said, "Sir, my computer . . ."
He said, "Son, no dispute here.
"Just see error on line thirty-four."

8. My German brother once was baking.
So I asked him what he was making.
"You want to know?"
He said to his bro',
"Der buns, der rolls, and der caking."

9. Said Der Captain vun day on der job,
"Der reason vhy decks need der svab
Ist, der veasels named Fritz
Un' Hans 're two kidts
Shpilling butter off corn on der cob!"

10. A troll with a razor-sharp axe
In foe combat every skill lacks.
As though in the dark
He misses his mark
Blankly is how he reacts.

11. One of twelve software masters from Kent
Wrote in unstructured code ('twas his bent).
Subroutines he'd abuse
Ending all with gotos.
Thus, instead of returning they went.

The authors are, alphabetically, Naida Dickson (Gardena, CA), Nancy Docken (Minneapolis, MN), Brian Gaines (Colorado Springs, CO), John Hendrick (Seattle, WA), Sonia Kantor (Palo Alto, CA), J. David Kauffman (Archie, MO), Charlie Lubinsky (South Deerfield, MA), Thomas D. May (Idaho Falls, ID), Leo Scanlon (Inverness, FL), Tony Taubert (Clinton, IL), and Judi B. Winters (Santa Ana, CA).

Answer to Vengroff's limerick: *ORCA/M* by Hayden. Reading first words of each line, "Oh, Are, See, A slash, 'Em."

Infocomania. October 1982. John DeLorean was having problems raising business capital, John Cougar's *Jack and Diane* was topping the pop charts, and *Softalk* ran its Ghosts contest. Ah, what memories; isn't it fun getting nostalgic? We realize a lot of you are too young to remember any of those events, so we'd like to help by giving a summary of how these situations progressed.

In November 1982, DeLorean sports cars began selling like crazy to collectors; in December, *Jack and Diane* came tumbling down; and this month, *Softalk* is announcing the winner of the Ghosts contest.

Kudos are in order for Carl Webb (Vista, CA), who read the "Exec Infocom" article in the October 1982 *Softalk* and turned in the most complete and detailed list of references to games written by Infocom authors. Contest winning is beginning to become a habit for Webb. Last summer, he also came in first place in the Apple Trivia contest, winning himself a Disk II drive in the process.

Webb managed to recognize twenty-two of the forty-three Infocom references and identify the games they appeared in. "I haven't played all the games, but I recognized them by reading *Softalk* reviews of the games," explained the sneaky ghost hunter.

To get more use out of the disk drive he won for the Trivia contest, Webb will receive Infocom's *Starcross* adventure.

Parse/Fail Test. Tests have been graded, and the winner of the *Softalk* Lit contest is Ron Hollar (Bakersfield, CA), who not only turned in the longest program, but also one that made coherent sense. Hollar will get $25 credited toward the purchase of Ultrasoft's *Mask of the Sun.*

To help you compare notes, here's Hollar's winning entry:

```
10 IF ICAPTURETHE = INT (ERNA + TIO +
   NAL) + SPY THEN MY = FRE (EDOM) +
   WILLBE: RESTORE :DB UTTHE = COS
   (T) * ISHIGH: FOR I KNOW = IHAVE TO
   OLITT: LET I = ME
20 IKNOW = SOMETHINGIS: ROT = TEN +
   SIN (CE) + THERE: IS$ = STR$ (O +
   NGEVIDENCETHA + TMYPHO + NE) +
   HASA$: TRACE
30 I = M + NOT (ABS (OLUTELY) + SURE)
   + WHOITIS + BUTIM + POS (ITIVE):
   THA = T: THE$ = RIGHT$
   (GUESSW$,I):LLPROVE = VAL
   (UABLE$)
40 IM = NO: DIM W(IT),SO(IKNOW): THE$
   = RIGHT$ (ANSWER$,I + S
   THEKEYTHA + TMUSTBE): READ
   PRECISELY$
50 FLASH : THESOLUTIO = NIS: CLEAR
   :THESPY = HA: DATA "BLET": IF ICAN
   <> PEEK (A + TIT) THEN ALLWILL =
   BE: NORMAL
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FASTALK

Fastalk is your quick guide to popular, specialized, or classic software. Programs appearing in Fastalk must meet one or more of the following criteria: (1) equal or surpass in sales the least-selling program to appear on any of the current bestseller lists; (2) relate to a specialized subject area and be in general distribution (more specialized packages and areas will be included as Fastalk matures); (3) be new and of professional quality (such programs will be carried for one month only—after that, they must meet other criteria for inclusion); (4) stand out as extraordinary.

Designation as a classic is noted by a bullet preceding a program's title.

Where opinion is expressed, *Softalk* has seen the software in question; the date of *Softalk*'s review, if any, is given at the end of the item.

Softalk may arbitrarily omit any package from Fastalk, whether or not it meets the foregoing criteria.

Adventure

●**Adventure.** Crowther, Woods. The original text adventure, created on mainframe, contributed to by many over a long time. Very logical within fantasy framework, excellent puzzles, maps; complex, convoluted, and great. Several publishers: Microsoft, 10700 Northup Wy., Bellevue, WA 98004. $28.95. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $35. Frontier Computing, Box 402, 666 N. Main, Logan, UT 84321. $10.

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● **Cyborg.** Berlyn. Text adventure with brief action skill game hidden in plot. As a futuristic cyborg, you're lost in a strange forest, desperately needing food and power. In its realism and use of true plot, it represents one of the most significant advances in adventuring since the original *Adventure*. Sentient, Box 4929, Aspen, CO 81612. $32.95. *11/81.*

The Dark Crystal. Williams. Hi-res adaptation of popular fantasy movie. Puzzles to challenge even those who've seen the movie. Includes player option to let the Skeksis win. Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $39.95. *4/83.*

Deadline. Blank, Lebling. Episode one in a projected series of murder mysteries by the authors of *Zork*. Interrogate, accuse, make transcripts. Includes inspector's casebook, lab report. Text. Infocom, 55 Wheeler St., Cambridge, MA 02138. $49.95. *8/82.*

Escape from Rungistan. Blauschild. Graphics adventure with some animated real-time puzzles. Espionage theme. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $29.95. *8/82.*

Escape from Traam. Pearson, Sailer. You crash on a world no human has seen. Its strange beauty hides danger that makes escape imperative. Adventure International, Box 3435, Longwood, FL 32750. $29.95.

Genesis. Pritchett. Adventure program generator. Develops standard format, two-word-parser adventures with rooms, objects, flags; up to 99 apiece. No program knowledge necessary whatsoever. Fun. Hexcraft, Box 39, Cambridge, MA 02238. $49. *4/83.*

●**Hi-Res Adventure #1: Mystery House.** Williams. Whodunit in a Victorian mansion. First adventure with pictures. 2-word parser with logical comprehension. Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $24.95.

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Labyrinth of Crete. Johnson, Pinero. Player is Jason and Hercules, simultaneously or independently, searching for golden fleece in a three-level labyrinth. Text with occasional graphics. Maps included. Adventure International, Box 3435, Longwood, FL 32750. $29.95. *3/83.*

Mask of the Sun. A unique animated graphic quest with full though sometimes frustrating parsing. Moving from room to room involves seeing scenery along the way go by—a graphics breakthrough with nice puzzles. Ultrasoft, 12503 Bell-Red Rd., #200, Bellevue, WA 98005. $39.95. *11/82.*

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● **Prisoner 2.** Mullich. Totally relandscaped but loyal version of original game: full-color hi-res graphics added, puzzles reworded, obstacles expanded. Sophisticated and difficult exercise in intimidation with elements of satire. Escape from an island requires player to solve logical puzzles, overcome obstacles, and answer riddles. Excellent computer fare; nothing else like it. Edu-Ware, Box 22222, Agoura, CA 91301. $32.95. *The Prisoner, 3/81*; *Prisoner 2, 10/82.*

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Sherwood Forest. Holle, Johnson. Dating game in legendary times. In premiere Softoon adventure featuring neat UltraRes graphics, Robin Hood woos Maid Marian all the way to the honeymoon. Go for it. Phoenix Software, 64 Lake Zurich Dr., Lake Zurich, IL 60047. $34.95. *3/83.*

Starcross. Science fiction prose adventure that comes wrapped in a flying saucer. Set in the year 2186, main puzzle is to discover raison d'etre of miniworld asteroid. Likable, engaging. Infocom, 55 Wheeler St., Cambridge, MA 02138. $39.95. *11/82.*

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Transylvania. Antiochia. Some of best graphics ever in a hi-res adventure. Excellent puzzles and logic—no unfair tricks. Enjoyable. Penguin, 830 4th Ave., Geneva, IL 60134. $34.95. *10/82.*

● **Zork I.** Part one of mainframe adventure; understands complete compound sentences and questions. Simultaneous manipulation of objects. Text, but so what. Infocom, 55 Wheeler St., Cambridge, MA 02138. $39.95. *6/81.*

●**Zork II.** Lebling, Blank. *Zork* comes into its own. Great text adventure technique and communication. Infocom, 55 Wheeler St., Cambridge, MA 02138. $39.95. *3/82.*

Zork III. Lebling, Blank. Text lives! A masterpiece of logic and a grand adventure to revel in. Hard, logical puzzle with unique point system. Benevolence conquers. Infocom, 55 Wheeler St., Cambridge, MA 02138. $39.95. *9/82.*

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BPI System. Popular five-module business package; programs also available separately. Includes general ledger (a bestseller), accounts receivable, accounts payable, payroll, inventory control, and job costing. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $395 each; job costing, $595.

Computer Programmed Accountant. Five-module package: general ledger (very popular), accounts receivable, accounts payable, payroll, and property management. All other modules post automatically to general ledger. Continental, 11223 S. Hindry Ave., Los Angeles, CA 90045. $1,495; separate modules: $250 each; property management: $495.

dBase II. Speedy relational database management system. Requires SoftCard. Ashton-Tate, 9929 W. Jefferson Blvd., Culver City, CA 90230. $700.

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Payroll. Faulkner. Handles payroll accounting, report generation, and check writing for 300 employees in fifteen divisions at Pascal speeds on non-Pascal-equipped Apple computers. Two disk drives required. Broderbund, 1938 4th St., San Rafael, CA 94901. $395.

PFS:File (formerly *Personal Filing System*). Page, Roberts. User controls data in totally unstructured database. Up to thirty-two pages (screens) of information in each record. IIe version has 80 columns, u&lc. Software Publishing, 1901 Landings Dr., Mountain View, CA 94043. $125. *10/80.*

PFS:Graph. Chin, Hill. Works alone or interfaces with files created with *PFS:File* and *VisiCalc*. Produces bar, line, and pie charts merging data from several sources. 80 columns and increased graphics support in IIe version. Software Publishing, 1901 Landings Dr., Mountain View, CA 94043. $125. *5/82.*

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Finally, aliens your kids can reason with instead of destroy.





This year, thousands of kids will be searching for the most amazing thing.

At Spinnaker, we don't believe in the "kill or be killed" concept behind most computer games. In fact, we believe computer games should be instructive. Not destructive. But just as importantly, they should be fun.

That's why IN SEARCH OF THE MOST AMAZING THING™ is designed to let your kids negotiate with aliens instead of destroying them. Because given the opportunity, kids enjoy using their minds.



It's Amazingly Fun.

The Most Amazing Thing is out there somewhere. Finding it won't be easy. But relax, your kids will have the help of their old uncle Smoke Bailey. He'll give them a B-liner (sort of a cross between a hot air balloon and a dune buggy) to use on their journey. They'll have to learn how to fly the B-liner and navigate it through storms and fog. But before they do anything, your kids will have to talk to Old Smoke. He'll tell them about the Mire People and the strange language that they speak. He'll also tell them to avoid the dangerous Mire Crabs and how to get fuel for the B-liner.

Your kids will visit the Metallican Auction where they'll trade with the aliens for valuable chips. Your kids will then use these chips to buy things they'll need for their trip. And your kids will learn how to fly over the planet using their jet pack.

The Most Amazing Thing holds great powers, but it will take great skill, persistence and imagination to find it.

It's Amazingly Educational.

IN SEARCH OF THE MOST AMAZING THING is written by Tom Snyder, educator and author of the best-selling Snooper Troops™ Detective Series.

And like all Spinnaker games, IN SEARCH OF THE MOST AMAZING THING has real educational value. For instance, your kids will sharpen their ability to estimate distances and quantities. And since they'll be navigating their B-liner, they'll become aware of distance, direction and time. They'll also develop a knack for economic and monetary principles through trading with the aliens. And they'll solve problems through trial and error.

They'll learn all of these things, plus they'll learn that nothing is impossible if you put your mind to it.

A Novel Approach to Computer Games.

Besides offering your children all of the above, IN SEARCH OF THE MOST AMAZING THING gives them an opportunity to develop their reading skills. Because included with the game is Jim Morrow's new novel The Adventures of Smoke Bailey.* So your children will have hours of fun reading the book or playing the game. And they'll be learning at the same time.

Parental Discretion Advised.

If you're a parent who would rather see your kids reason with aliens than destroy them, you've got plenty of reasons to ask your local software retailer for IN SEARCH OF THE MOST AMAZING THING. It's compatible with Apple,® IBM,® Atari,® and Commodore 64™ computers. And it offers so much fun you'll probably be tempted to play it yourself. Or you can write us directly at: Spinnaker Software, 215 First Street, Cambridge, MA 02142.



You'll find this is one computer game that won't alienate you from your children.





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We make learning fun.

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signed for use with *PFS:File*. Sorts, calculates, totals, formats, and prints presentation-quality columnar reports. Software Publishing, 1901 Landings Dr., Mountain View, CA 94043. $125. *6/81.*

Quick File IIe. Easy-to-use personal database filing system. Fifteen fields; files as long as disk allows. IIe, 2 disk drives. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $100.

Risk Simulator. Estimates probability distributions associated with risk situations, such as automobile maintenance expenses or employer funding of health benefits. Actuarial Microcomputer Software, 3915A Valley Ct., Winston-Salem, NC 27106. $185.

State of the Art General Ledger and **Budget and Forecasting Module.** The ledger does 12-period accounting, two-digit subaccounts; handles up to 470 accounts; enter 100 transactions before updating to permanent files. Budget module extends the account number to nine digits; custom designs reports; does previous year comparisons. State of the Art, 3183A Airway Ave., Costa Mesa, CA 92626. $495; budget module, $395.

VersaForm. Business forms generator for invoicing, mailing lists, sales analysis, inventory. Hard disk compatible. Applied Software Technology, 14125 Capri Dr., Los Gatos, CA 95030. $389. *6/82.*

Videx Preboot VisiCalc. Prepares *VisiCalc* to run in 80 columns, u&lc. Advanced version uses mixture of existing memory cards. Videx, 897 N.W. Grant St., Corvallis, OR 97330. $49; advanced: $89.

- **VisiCalc.** Bricklin, Frankston. Electronic work sheet for any problem involving numbers, rows, and columns. No programming necessary. VisiCorp, 2895 Zanker Rd., San Jose, CA 95134. $250. *10/80.*

VisiFile. Creative Computer, Jameson, Herman. Database management system for organization and retrieval of information, allowing sort and modification of records. VisiCorp, 2895 Zanker Rd., San Jose, CA 95134. $250.

VisiTrend/VisiPlot. Kapor. Combines *VisiPlot* graphics with time-series manipulation, trend forecasting, and descriptive statistics. VisiCorp, 2895 Zanker Rd., San Jose, CA 95134. $259.95. *7/81.*

Communications

Address Dialer. Phone appointment management system for Novation Apple-Cat or Hayes Micromodem II. Automatic dial, redial, and date reminder, plus label printing and mailing list features. Christopher Systems, 2775 Glendower Ave., Los Angeles, CA 90027. Hayes version, $59; Novation, $79.

Apple Link. Jaffe, Pierce. Creates intelligent terminal at receiving end with no additional software. Only modem software known to man that can transmit *ScreenWriter* text files. Also transmits random access text files. Computer Applications, 13300 S.W. 108 Street Circle, Miami, FL 33186. $59.95.

ASCII Express: The Professional. Robbins, Blue. Greatly improved version of original modem software package features automatic redial, individual macro files, and conversion of Integer, Applesoft, or binary programs into text files. Works with a plethora of hardware. Southwestern Data, 10761-E Woodside Ave., Santee, CA 92071. $129.95. *12/82.*

Data Capture 4.0. Copyable, modifiable smart terminal program; compatible with Apple III and most lower-case adapters. Southeastern Software, 6414 Derbyshire Dr., New Orleans, LA 70126. $65.

Dow Jones Connector. Guide to the use of the company's news retrieval service and Blue Chip membership, too. Dow Jones Software, Box 300, Princeton, NJ 08540. $95.

Hayes Terminal Program. Standalone disk designed for the Micromodem II lets CP/M, DOS 3.3, and Pascal disks create, list, delete, send, and receive files. Opens access to nonkeyboard ASCII characters and prints incoming data as it is displayed. Hayes Microcomputer Products, 5835 Peachtree Corners East, Norcross, GA 30092. $99.

Micro/Terminal. Access and exchange information with mainframes and minis, databases like the Source, and other remote terminals and personal computers. Allows keyboard mapping, u&lc, 80-column cards. Microcom, 1400A Providence Hwy., Norwood, MA 02062. $84.95.

P-Term: The Professional. Supports all Pascal-compatible interfaces, asynchronous serial cards, Apple-compatible modems, and baud rates up to 2400. Southwestern Data, 10761-E Woodside Ave., Santee, CA 92071. $129.95.

Softerm. Emulation program makes the Apple II Plus into a lookalike for many other popular CRT terminals, allowing use of programs written for terminals without programming changes. Also enables access to mainframes, timesharing services, and other Apple computers. Keyboard macros and automatic answer-back capabilities. Softronics, 6626 Prince Edward, Memphis, TN 38119. $150.

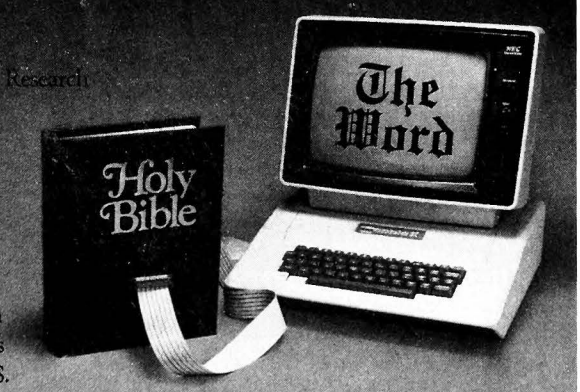
Tekterm. Intelligent graphics terminal software. Five modes: 70-column hi-res display, Tektronix 4010 graphics terminal simulation, 19,200 baud rate, or predefined automation of communications sequences. Fountain, 1901 Kipling, Lakewood, CO 80215. $90.

Transend 1, 2, 3. Intelligent terminal software with multiple hardware compatibility. Advanced, easy to use. *1* sends text only; menu-driven, limited editor. *2* sends text and files like *VisiCalc*, verifies transmission. *3* does both and handles electronic mail with auto-redial, clock calendar, and password protection. Upgrade: difference in price between two packages plus $20 service fee. SSM, 2190 Paragon Dr., San Jose, CA 95131. $89, $149, $275. *9/82.*

VisiTerm. Hi-res 60-character display; wide range of protocols for sending text. Well-planned and comprehensive. VisiCorp, 2895 Zanker Rd., San Jose, CA 95134. $129. *9/81.*

Z-Term: The Professional. More than an update. Compatible with a great variety of modems, interface cards, and screen modes. Simple file transfer with integrity. Southwestern Data, 10761-E Woodside Ave., Santee, CA 92071. $149.95.

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Fantasy

- **Beneath Apple Manor.** Worth. The original dungeon game for the Apple, created in 1978. Newly released version has hi-res, sound effects, a few more magic items, but still the classic game. Quality, 6660 Reseda Blvd., #105, Reseda, CA 91335. $29.95. *2/83.*

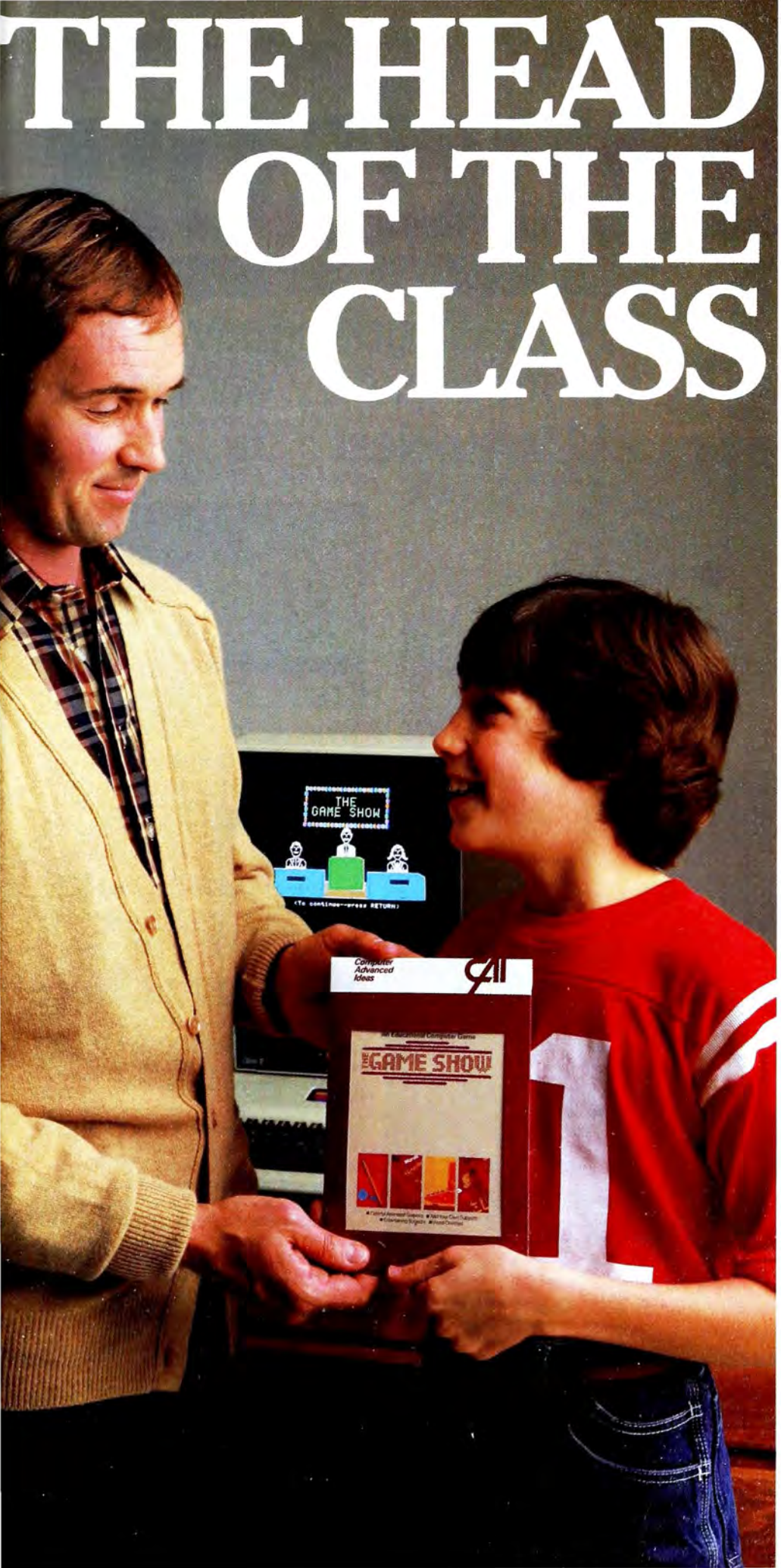
Galactic Adventures. Reamy. Role-playing science fiction adventure revision of *Galactic Gladiators* strategy game. 26 scenarios. Allows creation and saving of your own adventures. Strategic Simulations, 465 Fairchild Dr., #108, Mountain View, CA 94043. $49.95. *4/83.*

Knight of Diamonds. Second scenario of *Wizardry*, requiring thirteenth-level characters from the original. Individual quests on each of six dungeon levels. Great. Sir-tech, 6 Main St., Ogdensburg, NY 13669. $34.95. *7/82.*

Missing Ring. Romine. Find wizard's missing ring alone or with the help of up to four independent characters. Task becomes more complex as number of players increases. DataMost, 9748 Cozycroft Ave., Chatsworth, CA 91311. $29.95.

- **Odyssey: The Compleat Apventure.** Clardy. Fantasy adventure far beyond one place and one setting. Castles, catacombs, an ocean voyage, and the orb of power. Synergistic, 830 N. Riverside Dr., #201, Renton, WA 98055. $30. *10/80.*
- **Temple of Apshai.** Lead title in Dunjonquest series, winner 1981 Academy of Adventure Gaming

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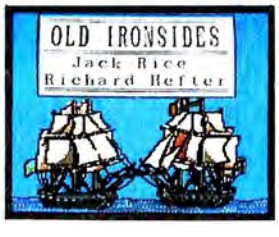
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Apple II and Apple II Plus 48K 3.3 DOS



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Arts and Design "Computer Game of the Year" award. Epyx/Automated Simulations, 1043 Kiel Ct., Sunnyvale, CA 94086. $39.95.

Ultima. British. Hi-res color adventure, progressing from Middle Ages to beyond the space age. A masterpiece. California Pacific, 1623 5th St., Davis, CA 95616. $39.95. *6/81.*

Ultima II. British. Faster play in a bigger universe with a time-travel option. Typically British look and feel. Events are much more interdependent; larger realm of fantasy with more transactions available. Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $59.95.

- **Wilderness Campaign.** Clardy. First fantasy game to leave the dungeon for the great outdoors; first in hi-res; first to bargain with merchants; and more. Synergistic, 830 N. Riverside Dr., #201, Renton, WA 98055. $17.50.
- **Wizardry.** Greenberg, Woodhead. Ultimate role-playing fantasy; ten-level maze in hi-res. Generate twenty characters, six at a time on expeditions. Gripping game; superbly produced. Sir-tech, 6 Main St., Ogdensburg, NY 13669. $49.95. *8/81.*

Graphics

Alpha Plot. Kersey, Cassidy. Hi-res graphics and text utility with optional xdraw cursor and proportional spacing. Beagle Bros, 4315 Sierra Vista, San Diego, CA 92103. $39.50.

Banner Magic. Star. Just like it says. This and your printer will give you banners for all occasions, in seven-inch letters. Phoenix, 64 Lake Zurich Dr., Lake Zurich, IL 60047. $24.95.

The Complete Graphics System II. Pelczarski. A wealth of graphics tools at a reasonable price. Make 2-D drawings with game paddles, add text in destructive, nondestructive, or reverse modes, create 3-D figures and shape tables. Manual features complete outline of command structure. Penguin, 830 4th Ave., Geneva, IL 60134. $69.95; Apple Graphics Tablet version, $119.95. *7/81.*

GraForth. Lutus. A graphics language rewritten for maximum speed. Plotting, line, text display, character image, and high speed 3-D graphics, with variety of colors and drawing options. Includes music synthesizer. Insoft, 10175 S.W. Barbur Blvd., #202-B, Portland, OR 97219. $75. *8/82.*

The Graphics Magician. Jochumson, Lubar, Pelczarski. Outstanding animation package consisting of picture editor and shape table extender. Comes with utility program to transfer binary files. Penguin, 830 4th Ave., Geneva, IL 60134. $59.95; Apple Graphics Tablet version, $69.95. *5/82.*

Imaginator. Entry and professional level 3-D graphics programs for creating, editing, and manipulation of 3-D images. Townsend Microware, 921 Water St., Box 1200, Port Townsend, WA 98368. *Imaginator I*, $79; *Imaginator II*, $119.

LPS II. Superb hi-res graphics drawing system with light pen. Draw freehand or use circles and lines to create geometric shapes. Fill routine with colors and patterns; fun animation demo; programmable Pentrak driver. Gibson, 23192-D Verdugo Dr., Laguna Hills, CA 92653. $349. *10/82.*

Zoom Grafix. Holle. Graphics printing utility allows display of picture on screen prior to print; prints out selected portion at any size. Phoenix, 64 Lake Zurich Dr., Lake Zurich, IL 60047. $39.95. *2/82.*

Home

The Accountant. Forman. Simple-to-use double-entry finance system features seven integrated files and a set of automatic transactions. A sleeper just beginning to get wider distribution. Decision Support, 1438 Ironwood Dr., McLean, VA 22101. $129.95. *1/82.*

Bowling Data System. Data Dynamics. Two-disk record keeping and report preparation program for infinite number of leagues, up to 40 teams. Weekly recap, season average, more. Rainbow Computing, 9719 Reseda Blvd., Northridge, CA 91324. $149.95.

Chequemate. Home finance package that handles checks, charge cards, cash control, automatic tellers, and more. Reports to screen or printer. A bargain. Masterworks, 25834 Narbonne Ave., Lomita, CA 90717. $39.95. *4/82.*

- **Crossword Magic.** Crossword puzzle maker. Choose subject, words, and clues; program automatically connects words. Play on-screen or make printout. L & S Computerware, 1589 Fraser Dr., Sunnyvale, CA 94087. $49.95.

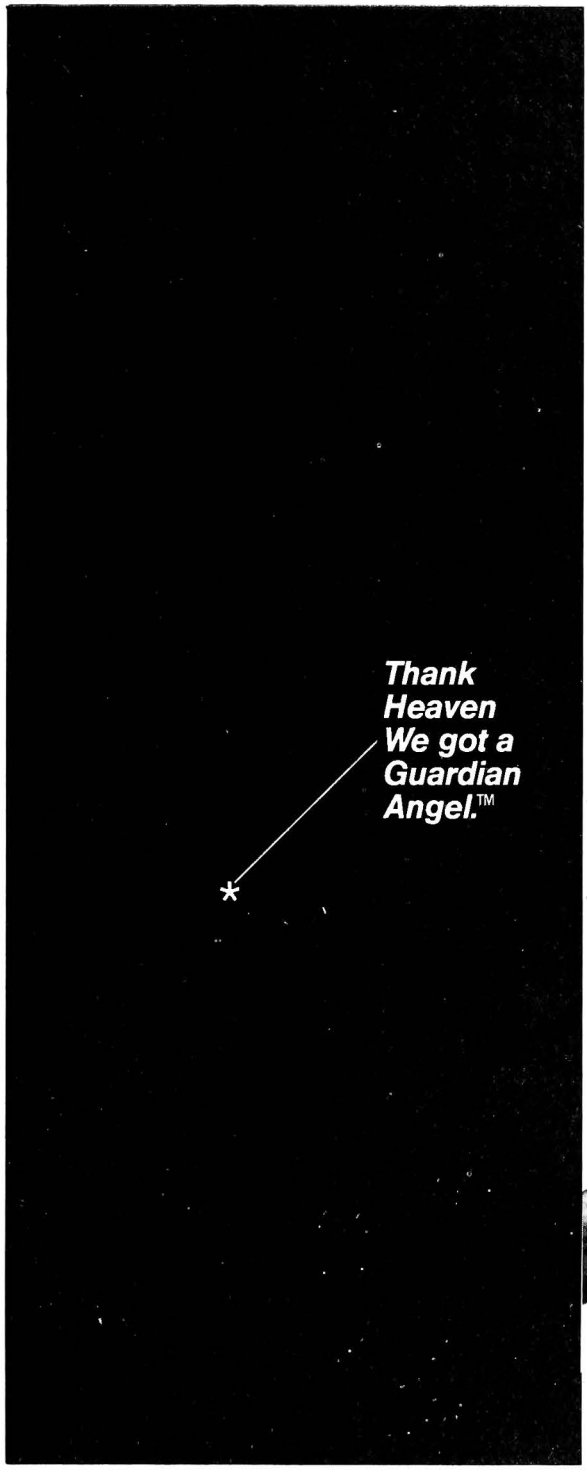
Dow Jones Market Analyzer (formerly *RTR Market Analyzer*). Automatically collects, stores, and updates historical and daily market quotes. Provides technical analysis and plots eighteen different types of charts. Dow Jones Software, Box 300, Princeton, NJ 08540. $350.

Family Roots. Professional genealogy database with unlimited records capability. Unprotected; works with 80-column and lower case. Extensive documentation. Quinsept, Box 216, Lexington, MA 02173. $185.

File-Fax. Simple general-purpose DBMS with 8-level sort and report generator. TMQ, 82 Fox Hill Dr., Buffalo Grove, IL 60090. $175.

Golf Statistician. Haberle. Helps golfers lower their scores by examining their strengths and weaknesses. GolfSoft, 10333 Balsam Ln., Eden Prairie, MN 55344. $34.95.

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Continental, 11223 S. Hindry Ave., Los Angeles, CA 90045. $74.95. *4/82.*

Hoss. Calhoun. Systematic Thoroughbred handicapping with user modeling coefficients. Five systems and handbook. Tout, 360 S. Gordon St., Pomona, CA 91766. $89.

Know Your Apple. Visually oriented computer tutorial with manual. Covers disks, drives, and peripherals. A model of clarity. Muse, 347 N. Charles St., Baltimore, MD 21201. $34.95. *3/83.*

Know Your Apple IIe. Tutorial program with everything you wanted to know about the soul of your new machine. Muse, 347 N. Charles St., Baltimore, MD 21201. $24.95.

Micro Cookbook. Recipe management system allows entry and modification; selection of recipes by common ingredients, name, or classification. Calorie and nutrition guide. Virtual Combinatics, Box 755, Rockport, MA 01966. $40.

Money Street. Payne. Does accounting, collects data, and balances unlimited number of checkbooks. 100 user-defined categories, 15 reports. Computer Tax Service, Box 7915, Incline Village, NV 89450. $99.95.

PDQ. Alternative to complex database programs. Scans for record, performs two-word search, displays, and prints out. Saves up to 114,500 characters in 4 files. Howard W. Sams, 4300 W. 2nd St., Indianapolis, IN 46268. $59.95.

Personal Finance Manager. Gold, Software Dimensions. Handles 200 entries a month from 14 separate accounts. Search-sort-enter routine. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $75. *11/81.*

Pick That Tune. Swearingen. Just like the famous show of almost the same name. Players select number of notes they think they'll need to I.D. any melody in Pop, Country/Western, Children, and TV categories. 16 variations, 1 to 10 players. Additional categories purchased separately. Swearingen Software, 6312 W. Little York, #197, Houston, TX 77088. $29.95.

Stock Portfolio System. Tracks investments, gives record-keeping reports and timing notices, stores quotes for historical recall. Smith Micro Software, Box 604, Sunset Beach, CA 90742. $185.

The Tax Advantage. General tax preparer program for Form 1040 and related schedules. Computes tax and itemizes at each line; prints out. Modifiable tax tables. Continental, 11223 S. Hindry Ave., Los Angeles, CA 90045. $59.95.

Tax Manager. Helps prepare federal returns and print schedules. Micro Lab, 2310 Skokie Valley Rd., Highland Park, IL 60035. $150.

Tax Mini-Miser. Sunrise. Tax-planning package computes six tax strategies over one year or one strategy up to six years. Starsoft, 4984 El Camino Real, #125, Los Altos, CA 94022. $295.

Tax Preparer. Record-keeping program with wide variety of federal tax forms and schedules; creates itemized lists. Yearly updates. Howard Software, 8008 Girard Ave., #310, La Jolla, CA 92037. $99.

ThinkTank. Idea processor program allows you to see ideas in outline form. Outline can be collapsed to see the big picture or expanded to reveal hidden details. Living Videotext, 450 San Antonio Rd., #56, Palo Alto, CA 94306. $150.

Home-Arcade

A.E. Wada, Horai. Blasting away like mad in 3-D. Time the release and detonation of missiles and repel the next wave. Innovative graphics, new firing technique, and fugues to boot. Broderbund, 1938 4th St., San Rafael, CA 94901. $29.95. *2/83.*

• **Alien Rain (Apple Galaxian).** Suzuki. Monsters in this classic seem to take it personally when you gun down one of their kind. Broderbund, 1938 4th St., San Rafael, CA 94901. $29.95. *9/81.*

• **Apple Panic.** Serki. Rid a five-story building of crawling apples and butterflies by running up and down connecting ladders, digging traps, then covering critters before they devour you. Extremely addictive, excellent hi-res play. Broderbund, 1938 4th St., San Rafael, CA 94901. $29.95. *9/91.*

The Arcade Machine. Jochumson, Carlston. Step-by-step arcade game designer—shapes, scoring, sound, and titles. Begin with variations on five games included, then on to your own. Broderbund, 1938 4th St., San Rafael, CA 94901. $59.95. *11/82.*

Aztec. Stephenson. Graphic fantasy arcade with animation throughout. DataMost, 8943 Fullbright Ave., Chatsworth, CA 91311. $39.95. *1/83.*

Beagle Bag. Kersey. Twenty games and miscellany, written in Basic and unprotected. Great humor, good two-player games. Manual is worth the price of admission. Beagle Bros, 4315 Sierra Vista, San Diego, CA 92103. $29.50. *1/83.*

Bolo. Micro version of sci-fi fantasy. Huge maze where you don't eat anything. Drive around in tank and destroy enemy bases as you're dogged by intelligent assassin tanks. Much depth, many months' fun. Top class. Synergistic, 830 N. Riverside Dr., #201, Renton, WA 98055. $34.95. *2/83.*

Cannonball Blitz. Lubeck. In the cold light of *dawn,* you must find the *key* to victory, no matter how *incongruous.* Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $34.95. *7/82.*

Canyon Climber. Mountford. Scale the levels and ladders while avoiding arrows, gorges, and hi-res sheep (no cows). Datasoft, 19519 Business Center Dr., Northridge, CA 91324. $29.95.

• **Choplifter.** Gorlin. Fly your chopper to rescue 64 hostages, avoiding interceptor jets, homing mines, and tanks. Challenging, realistic, and playful. Stunning graphics. Broderbund, 1938 4th St., San Rafael, CA 94901. $34.95. *7/82.*

Crime Wave. Your beat: the city. Bank robbers strike; can you catch them? Metropolitan chase-'em-up on city streets or at the scene of the crime. Penguin, 830 4th Ave., Geneva, IL 60134. $19.95. *4/83.*

Crisis Mountain. Schroeder. Run, crawl, walk, and leap through mountain maze fraught with rolling rocks, geysers, and chasms; defuse nuclear devices. Synergistic, 830 N. Riverside Dr., #201, Renton, WA 98055. $34.95. *10/82.*

• **Crossfire.** Sullivan. Aliens come at you from four directions on a grid laid out like city blocks. Strategy and intense concentration required. Superb, smooth animation of a dozen pieces simultaneously. One of the great ones. Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $29.95. *1/82.*

• **Epoch.** Miller. Superbly stylized animation enhances this filmic shoot-'em-up. Tremendous sense of being in space; neat classical music and dramatic time warp sequence. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $34.95. *10/81.*

Frogger. Lubeck. Not even close. Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $34.95. *12/82.*

• **Gorgon.** Nasir. Fly over planet shooting and dodging invaders and saving kidnapped inhabitants. Outstanding hi-res graphics, challenging refueling sequence. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $39.95 *8/81.*

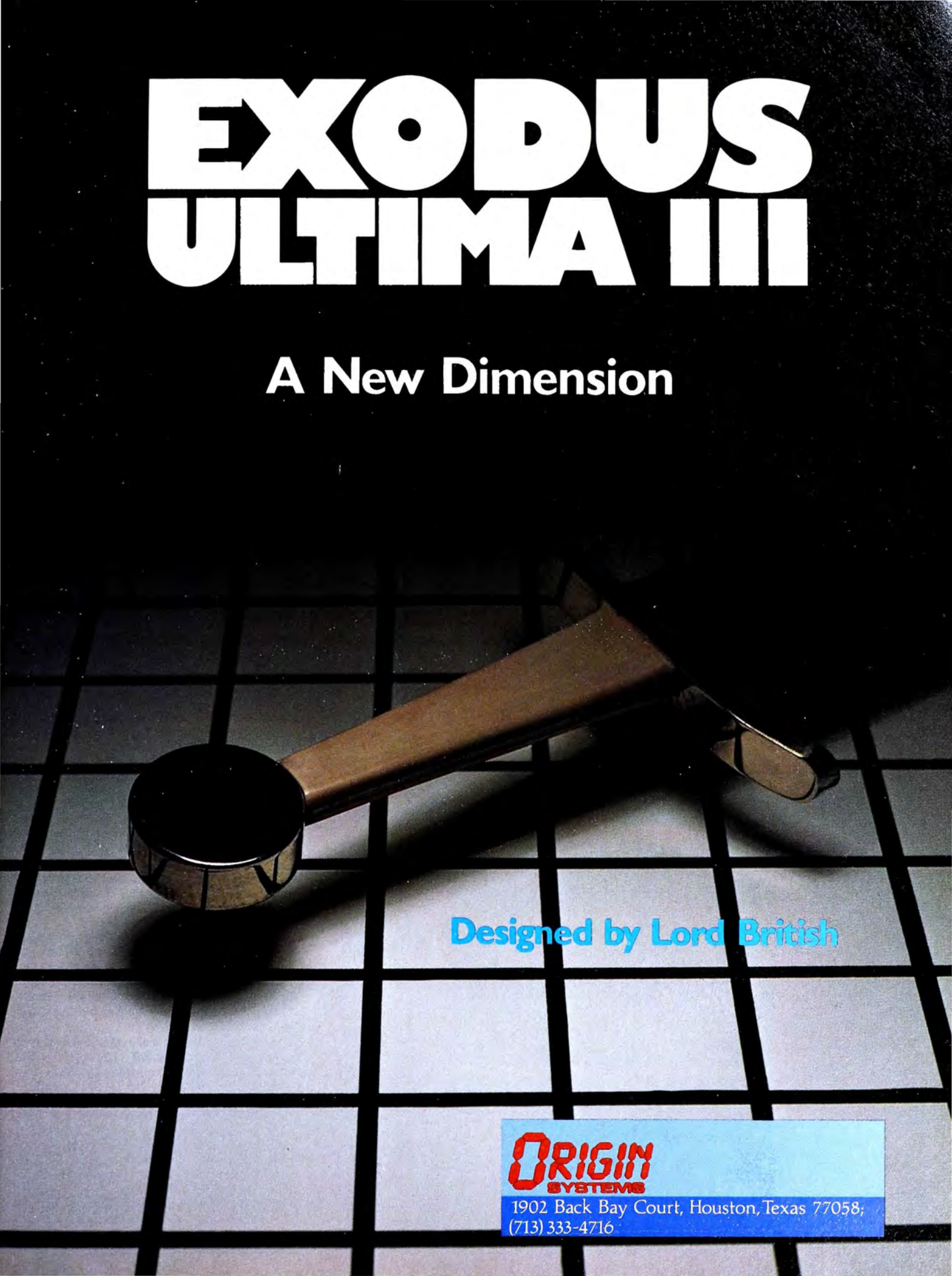
Hard Hat Mack. Abbott, Alexander. Poor Mack. He must avoid vandals, inspectors, falling rivets, and hungry cement mixers to complete his building. Electronic Arts, 2755 Campus Dr., San Mateo, CA 94403. $35.

It's the Pits. Ray. You are the grimpet's only hope. Can you save him from fiery pits and predatory wirlybats? Three skill levels. Sagebrush Software, 39 Carriage Pl., Urbana, IL 61801. $29.95. *5/83.*

Lode Runner. Smith. Design your own puzzles, scenes, and setups, in quest to steal Bungeling Empire's gold. Use tightropes, trap doors, and ladders to your advantage. Broderbund, 1938 4th St., San

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Rafael, CA 94901. $34.95.

Lunar Leeper. Bueche. Silly, enjoyable rescue mission with challenging ship control and unpredictable foes. Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $29.95. *1/83.*

Maze Craze Construction Set. Hammond. Play their mazes or construct your own. Two can enter the same maze. DTI Data Trek, 121 West E St., Encinitas, CA 92024. $39.95.

● **Meteoroids (Asteroids) in Space.** Wallace. Make little asteroids out of big ones, plus occasional hostile alien ships. Hyperspace, autobrake, autofire. Quality Software, 6660 Reseda Blvd., #105, Reseda, CA 91335. $19.95.

● **Microsoft Decathlon** (formerly *Olympic Decathlon*). Smith. Ten standard decathlon events. Hi-res animated athletes, muscle-stirring music; you provide the sweat. Microsoft, 10700 Northup Wy., Bellevue, WA 98004. $29.95. *6/81.*

Miner 2049er. Livesay, Hogue. Run, jump, climb, and slide through the mines, reinforcing the groundwork along the way. Elevators, cannons, chutes, and ladders help; mutants don't. Hot stuff, best of the genre. Micro Lab, 2310 Skokie Valley Rd., Highland Park, IL 60035. $39.95. *1/83.*

Pentapus. Sagan. A giant purple octopus threatens the universe. Destroy it on adult or child's level. Turning Point Software, 11A Main St., Watertown, MA 02172. $29.95.

Pinball Construction Set. Budge. Design and play your own computer pinball games, on-screen, with zero programming. A miracle of rare device. Superior. BudgeCo, 428 Pala Ave., Piedmont, CA 94611. $39.95. *2/83.*

Pinball Paradise I,II. Stockla. Pinball games written with Bill Budge's *Pinball Construction Set*. Four games per disk. Golden Knight Software, 11 Lark Ln. S., Huntington, CT 06484. $24.95.

● **Pool 1.5.** Hoffman, St. Germain, Morock. Makes most shots you could on a real table, with the advantages of instant replay and slow motion. Four different games. IDSI, Box 1658, Las Cruces, NM 88004. $34.95. *6/81.*

● **Raster Blaster.** Budge. First realistic pinball game. *Softalk* readers' Most Popular Program of 1981. BudgeCo, 428 Pala Ave., Piedmont, CA 94611. $29.95. *5/81.*

Repton. Thompson, Kaluzniacki. The *ne plus ultra* of planet-defending, in the *Defender* style, plus. Top flight all the way. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $39.95. *1/83.*

Sammy Lightfoot. Schwader. Sammy must dodge a variety of obstacles as he tries out for the circus. He evidently used to be a miner. Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $29.95.

Seafox. A good sub-versus-convoy home-arcader. Variety of vessels, bouncing torpedoes, refueling dolphins, and intelligent depth charges. Broderbund, 1938 4th St., San Rafael, CA 94901. $29.95. *11/82.*

Serpentine. Hypnotic snake-chase maze game. Clean action, thrills, hairy escapes. Recommended. Broderbund, 1938 4th St., San Rafael, CA 94901. $34.95. *10/82.*

Snack Attack. Illowsky. Three-maze eat-'em-up; starts at any of five speed levels. Nonfattening. DataMost, 8943 Fullbright Ave., Chatsworth, CA 91311. $29.95. *1/82.*

● **Sneakers.** Turmell. Many-layered shoot-'em-up; one of the best. Stomping sneakers and other creatures require varying techniques. Fun. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $29.95. *9/81.*

Spy's Demise. Be the first on your block to run a maze of pile-driving elevators. Fast, frustrating fun. Complete puzzle after all nine levels. Penguin, 830 4th Ave., Geneva, IL 60134. $29.95. *11/82.*

Star Blazer. Suzuki. Bomb-run game with five levels, minutely exact animation, and style to burn. A joy. Broderbund, 1938 4th St., San Rafael, CA 94901. $31.95. *4/82.*

● **Super Invader.** Hata. Progenitor of home arcades. Still good hi-res, still a challenge. *Softalk* readers' Most Popular Program of 1978-80. Astar Intl., through California Pacific, 1615 5th St., Davis, CA 95616, and Creative Computing, 39 E. Hanover Ave., Morris Plains, NJ 07960. $19.95.

Super Taxman 2. Fitzgerald. Pac up your troubles! Bigger, more complex version of the most perfect extant rendition of a certain arcade game. H.A.L. Labs, 4074 Midland Rd., #23, Riverside, CA 92505. $25. *1/83.*

Swashbuckler. Stephenson. Hi-res swordfighting with animated pirates, snakes, rats, and other scum. DataMost, 8943 Fullbright Ave., Chatsworth, CA 91311. $34.95. *8/82.*

Thunderbombs. Becklund. You'll need two sets of eyes, hands, and reflexes to survive this one. Your cloudship is under bilateral attack, and it's just you and your bilateral lightning torpedoes. Penguin, 830 4th Ave., Geneva, IL 60134. $19.95.

● **Wayout.** Exciting 3-D maze that moves in perspective as you play. Map displayed at all times. Lots of angles and Cleptangles. Separate version for IIe. Exquisite motion animation is breakthrough. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $39.95. *10/82.*

Home Education

Algebra 1-4. Sets of learning units progressing from algebraic rules and definitions to graphing and inequalities. Individualized teaching styles to fit everyone's needs. Good for adults wanting to overcome math anxiety as well as for schoolkids. Edu-Ware, Box 22222, Agoura, CA 91301. $39.95 each.

Apple Logo. Papert. Custom version (by its inventor) of turtle graphics language. First-rate educational tool. Great kid-friendly documentation. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $175.

Compu-Read. Set of programs develops speed and retention in reading. Stresses character and word recognition, comprehension. Edu-Ware, Box 22222, Agoura, CA 91301. $29.95.

Compu-Spell. Teaches spelling through positive reinforcement for grades 4–8. Program keeps a file to monitor spellers' progress. Additional unit designed for adult user included. Edu-Ware, Box 22222, Agoura, CA 91301. Program and one data disk, $39.95. Additional disk, $19.95.

Computer Literacy: A Hands-On Approach. Luehrmann, Peckham. Textbook, disk, and teacher's guide package introducing students to the world of computers and basic programming. McGraw-Hill, 1221 Ave. of the Americas, New York, NY 10020. $23.97.

CyberLogo. Woodhead. Logo learning package introduces computers, uses imaginary school and playground settings to teach kids language with fun. Includes off-computer activities for reinforcement. By *Wizardry* author. Only Logo for 48K Apples. Cybertronics Intl., 999 Mount Kemble Ave., Morristown, NJ 07960. $99.95.

Delta Drawing. Kids can make colorful drawings by using single-key commands. No special talent needed; this one develops programs that create complex graphics. Spinnaker, 215 1st St., Cambridge, MA 02142. $59.95. *11/82.*

Early Games for Young Children. Paulson. Basic training in numbers, letters, Apple keyboard for children ages two to seven with no adult supervision. Has a neat little drawing program. Counterpoint Software, #140, Shelard Plaza North, Minneapolis, MN 55426. $29.95. *11/82.*

Ernie's Quiz. CTW. Four games, four subjects, one disk. Image recognition, counting skills, creativity, and Muppet expertise are introduced with lots of positive feedback. Apple, 20525 Mariani Ave., Cu-



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pertino, CA 95014. $50. *2/83.*

Facemaker. DesignWare. Exercises kids' creativity and introduces programlike command sequencing as kids create faces and link them together in animated pattern. Spinnaker Software, 215 First St., Cambridge, MA 02142. $34.95.

First Words. Wilson, Fox. Vocabulary comprehension training program using color-graphics animation and sound to teach fifty basic nouns to children ages nine months to two years. Requires Echo II speech synthesizer. Laureate Learning Systems, 1 Mill St., Burlington, VT 05401. $185.

Gertrude's Secrets. Gertrude the Goose teaches four-to-nine-year-olds shape and color relationships. Solve logic puzzles, create shapes. The Learning Co., 4370 Alpine Rd., Portola Valley, CA 94025. $75. *2/83.*

Instant Zoo. CTW. Identify animals, test perception and reaction, match and decode words. Word editor lets you create your own word lists. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $50.

Juggles' Rainbow. Pre-reading tots can create colorful pictures by using the keyboard. Learning Co., 4370 Alpine Rd., Portola Valley, CA 94025. $45.

Language Arts. Mitchell, Roblyer. Drills grades 1–8 in letter recognition, alphabetization skills. Includes *Manager Program* that allows teachers to make assignments and review progress of 100 students on each disk. Milliken, 1100 Research Blvd., St. Louis, MO 63132. $75.

Magic Crayon. Clark. Keystroke command draws pictures in lo-res. Saves pictures to disk. Option for sound; class rosters can be maintained. C & C Software, 5713 Kentford Circle, Wichita, KS 67220. $35.

• **MasterType.** Zweig. Learn to type by playing a game; simple and ingenious. IIe version teaches new keyboard. Lightning, Box 11725, Palo Alto, CA 94306. $39.95. *4/81.*

Math Blaster. Davidson, Eckert. Elementary-school-level training in four basic math functions. Options to create lessons; several levels of difficulty for various ages. Human cannonball arcade game for each function. Davidson & Associates, 6069 Groveoak Pl., #12, Rancho Palos Verdes, CA 90274. $49.95.

The Medalists Series. Elementary and junior high level puzzles about continents, presidents, and states. Disk are modified and hold fifty students' records. Students buy clues for points according to difficulty, then use them to identify the subject. The *Create* disk lets teachers devise *Medalist* competitions for the topic of their choice. Hartley Courseware, Box 431, Dimondale, MI 48821. $39.95.

Mix and Match. CTW. Create mixed-up Muppets and teach the Apple about animals. Logic and word-guessing games. Add your own word lists. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $50. *2/83.*

Multiploy. Coletta. From answer base, blast menacing arithmetic problem ships out of the sky. Ranks and scores kept for tracking progress. Reston Publishing, 11480 Sunset Hills Rd., Reston, VA 22090. $19.95.

• **The New Step by Step.** Software and audio tape team up to teach Basic programming painlessly. Graphics, animation, sound effects, and workbook. Superior. Program Design, 11 Idar Ct., Greenwich, CT 06830. $79.95. *7/82.*

Police Artist. Levin. Pick the culprit out of a lineup or rebuild culprit's face from memory. Three games can create a million faces. Ages 7 to adult. Sir-tech, 6 Main St., Ogdensburg, NY 13669. $34.95.

Punctuation Skills: Commas. Covers all uses of the comma. **Punctuation Skills: Endmarks.** Covers semicolons, colons, exclamation points, and periods. Milton Bradley, 111 Maple St., Springfield, MA 01105. Each, $49.95.

Report Card. Ringuette. Grading system lets teachers weight different activities. No commands to learn. Sensible, 6619 Perham Dr., W. Bloomfield, MI 48033. $59.95.

Rocky's Boots. Rascally raccoon helps children build logical thinking and computer understanding. Construct machines of logical gates in convolutions of thickening complexity. Music and sound effects add to fun. The Learning Co., 4370 Alpine Rd., Portola Valley, CA 94025. $75. *2/83.*

Snooper Troops. Snyder. Ongoing hi-res mystery series in form of educational games. Highly structured; excellent fourth through eighth-grade educational tool. Fun for adults, too. Spinnaker Software, 215 1st St., Cambridge, MA 02142. $44.95 each. *9/82.*

Speed Reader. Coad. Self-teaching program accommodates 20 readers; tests, records their progress. Can use your own reading material. BPI Systems, 3423 Guadalupe, Austin, TX 78705. $195.

Spelling Bee Games. Hi-res games strengthen hand-eye coordination, memory, motor skills. Word lists include shapes, animals, more. Edu-Ware, Box 22222, Agoura, CA 91301. $29.95.

Steps to Advanced Reading. Courseware stressing comprehension and speed. Programmed reading lessons and computer stories on four disks; supplemental reading book. Tests and answer sheets included. Creative Curriculum, 15632 Producer Lane, Huntington Beach, CA 92649. $99.

Stickybear. Hefter, Worthington, Rice. Animated early education programs. In *Stickybear ABC*, moving pictures with sound represent letters. In *Stickybear Numbers*, groups of moving objects teach numbers and simple arithmetic. Ages three through six. In *Stickybear Bop*, ducks, planets, and balloons bop across screen in three shooting galleries. For all ages. Xerox Education/Weekly Reader, 245 Long Hill Rd., Middletown, CT 06457. $39.95 each.

Story Machine. Helps develop positive attitude toward writing and ability to write correctly. Words come to life when sentence typed is acted out on-screen. Kids five to nine love to type "The tree ran down the street" and see it do so. Spinnaker Software, 215 1st St., Cambridge, MA 02142. $34.95.

Supermath II. Tests students' skills in addition, subtraction, multiplication, and division. Difficulty levels change automatically according to responses. Interacts with this company's *Class Records*. Educational Systems Software, 23720 El Toro Rd., #C, Box E, El Toro, CA 92630. $39.95.

Type Attack. Hauser. Learn to type while defending the planet of Lexicon from invaders. IIe version teaches IIe keyboard. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $39.95.

Typing Tutor. Ainsworth, Baker. Four levels of proficiency; individualized drills created with time-response monitoring. Microsoft, 10700 Northup Wy., Bellevue, WA 98004. $24.95.

The Visible Computer: 6502. Hi-res simulation teaches machine language programming by illustrating inside of working 6502 microprocessor. Software Masters, 3330 Hillcroft, #BB, Houston, TX 77057. $49.95.

Vocabulary Skills: Subtext Clues. Develops vocabulary through context, contrast, educated guesses, and examples. **Vocabulary Skills: Prefixes, Suffixes, Roots.** Includes concepts, prefix and suffix tutors, and word building. Milton Bradley, 111 Maple St., Springfield, MA 01105. Each, $49.95.

Wordrace. Timed dictionary game. Pick correct definition out of six choices. Three levels, 2,000 words and definitions. Don't Ask, 2265 Westwood Blvd., #B-150, Los Angeles, CA 90064. $24.95.

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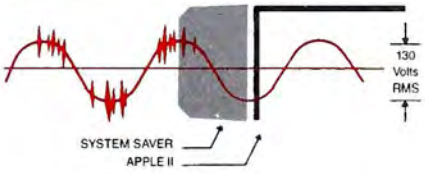
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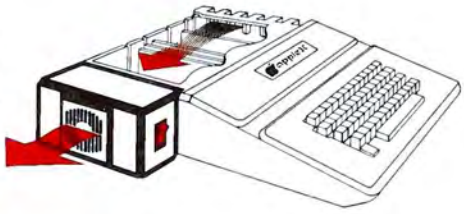


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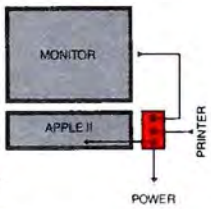
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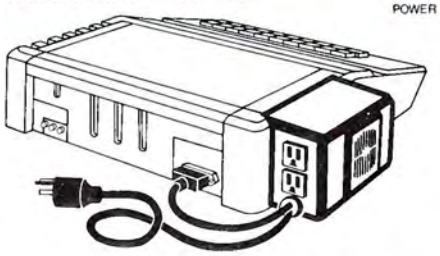
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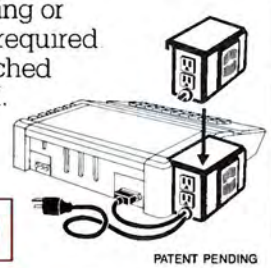
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Bomb Alley. Grigsby, Billings. Detailed re-creation of 1942 Mediterranean naval and air war, including critical supply problems. Full scenario and two short scenarios. Strategic Simulations, 465 Fairchild Dr., #108, Mountain View, CA 94043. $59.95. *3/83.*

Casino. Five hi-res games, Vegas-style: blackjack, baccarat, keno, poker, and roulette. DataMost, 8943 Fullbright Ave., Chatsworth, CA 91311. $39.95. *10/82.*

● **Castle Wolfenstein.** Warner. First game to fuse successfully strategy, home-arcade fantasy. Escape from Nazi stronghold with secret plans. Room layout changes with each new game. Enemy speaks, in German. Muse, 347 N. Charles St., Baltimore, MD 21201. $29.95. *10/81.*

Chess 7.0. Atkin. A loving piece of programming; neither too slow nor too easy. Plays a mean end game. Tops yet. Odesta, 930 Pitner, Evanston, IL 60202. $49.95. *1/83.*

Computer Ambush. Williger. Gutty soldier-to-soldier street fighting in World War II France. Latest version is forty times faster than the original, which was one of best games ever created for Apple, except for slowness. Strategic Simulations, 883 Stierlin Rd., A-200, Mountain View, CA 94043. $59.95.

● **Computer Baseball.** Merro, Avery. Simulates individual player abilities from the teams of thirteen famous World Series. Enter and play teams of your own creation. Strategic Simulations, 883 Stierlin Rd., A-200, Mountain View, CA 94043. $39.95. *9/81.*

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Flip Out. Huskey. Drop marbles through top of maze, activating traps to free your marbles and trap your opponent's. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $29.95. *4/83.*

Germany 1985. Keating. NATO forces tangle with Soviet troops in West Germany in the first act of SSI's *When Superpowers Collide* saga—accompanied by *RDF 1985*, *Norway 1985*, and *Baltic 1985*. Includes rulebook necessary for play of the other acts. Strategic Simulations, 883 Stierlin Rd., A-200, Mountain View, CA 94043. $59.95. Others $34.95. *4/83.*

Gin Rummy. Carpet. Play against computer. Hi-res hand can be arranged. Knocking allowed. Computer plays pretty well. DataMost, 8943 Fullbright Ave., Chatsworth, CA 91311. $29.95. *6/82.*

Go. Erwin. Classic Oriental territory game in hi-res. Surround your opponents before they surround you. Play in solitaire or bihuman mode. Hayden, 600 Suffolk St., Lowell, MA 01853. $34.95.

Hi-Res Computer Golf. Aronoff. A masterpiece; requires judgment, strategy, and visual acuity. One of the few computer sports simulations that requires dexterity. Avant-Garde, Box 30160, Eugene, OR 97403. $29.95. *2/82.*

● **Microgammon II.** Program for play, practice, improvement of backgammon skills. Pretty good competition. Softape, 5547 Satsuma Ave., North Hollywood, CA 91601. $19.95. *2/81.*

Old Ironsides. Rice, Hefter. Delightful program provides simple but excellent hi-res simulation of thundering ship-to-ship combat. Package includes poster and logbook. Xerox Education Publications, 245 Long Hill Rd., Middletown, CT 06058. $39.95. *5/83.*

Pro Poker. Allen. Hi-res 8-handed poker tutorial between just you and your Apple in kibitz mode. Plays 300 hands per hour; California poker club rules. Quality, 6660 Reseda Blvd., #105, Reseda, CA 91335. $39.95.

Rendezvous. Huntress. Space shuttle simulation in 3-D, created by senior scientist at JPL. Orbit earth, match orbit, and dock with space station. Authentic, demanding. Edu-Ware, Box 22222, Agoura, CA 91301. $39.95. *7/82.*

● **RobotWar.** Warner. Strategy game with battling robots is teaching device for programming. Muse, 347 N. Charles St., Baltimore, MD 21201. $39.95. *1/81.*

● **Sargon II.** Spracklen, Spracklen. Computer chess game with seven levels of play. Hayden, 50 Essex St., Rochelle Park, NJ 07662. $34.95.

Spitfire Simulator. Air flight simulator—Spitfire in combat with German Aces—with 3-D scenery and moving target aircraft. Mind Systems, Box 506, Northampton, MA 01061. $40. *12/82.*

Warp Factor. Space war game featuring twelve starship designs representing five galactic empires, with possible scenarios ranging from skirmishes to galactic war. Extremely challenging. Strategic Simulations, 465 Fairchild Dr., Ste. 108, Mountain View, CA 94043. $39.95. *7/81.*

Utility

Amper Magic. Nacon. Attaches machine-language routines to Applesoft programs. No knowledge of machine language necessary. Anthro-Digital, 103 Bartlett Ave., Pittsfield, MA 01201. $75.

Apple-Cillin. Hardware diagnostic tests for all RAM and ROM, plug-in cards, cp registers, disks; nine video test patterns. XPS, 323 York Rd., Carlisle, PA 17013. $49.95.

Apple Pascal. Structured operating system featuring enhancements of color graphics, sound generation, and Apple's 1/O features. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $495.

Audex. Collection of utilities to create, edit, and play back sounds; in Basic and assembly language. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $29.95.

Bag of Tricks. Worth, Lechner. Four utility programs for dumping and examining raw tracks, sector editing, reformatting tracks, and repairing damaged catalogs. Indispensable. Quality Software, 6660 Reseda Blvd., #105, Reseda, CA 91335. $39.95.

Bug Byter. Screen-oriented mnemonic debugging tool with resident assembler and disassembler. Displays contents of accumulator, X and Y registers. Computer-Advanced Ideas, 1442A Walnut St., #431, Berkeley, CA 94709. $47.50.

DOS Boss. Kersey, Cassidy. Utility to change DOS commands; customize catalog. Good ideas and witty presentation. Beagle Bros, 4315 Sierra Vista, San Diego, CA 92103. $24. *10/81.*

DOS Tool Kit. Excellent utility package; Apple II assembler-editor system and Applesoft toolkit. Edit, assemble machine language programs; write, edit Basic programs. Simplifies graphics, includes character generator. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $75. *10/81.*

Einstein Compiler. Goodrow, Einstein. Translates Applesoft programs into machine language for runtime up to 20 times faster. Supports all graphics modes, defined functions, and DOS commands. Einstein, 11340 W. Olympic Blvd., Los Angeles, CA 90064. $119.95.

Expediter II. Einstein, Goodrow. Applesoft compiler translates Basic programs into machine language. Will display or print a running list of source program lines and compiled addresses; compiled program size reduced up to 50 percent. No stop on fatal errors. Sierra On-Line, Sierra On-Line Bldg., Coarsegold, CA 93614. $99.95. *9/81.*

Global Program Line Editor. Enhanced version of *Program Line Editor* with programmable cursor and listing control. Edit line by line or by range of lines and search for strings. Synergistic, 830 N. Riverside Dr., #201, Renton, WA 98055. $60.

Hands-On Basic Programming. Kamins, Bennett. Workbook and disk teach Basic programming, other basic knowledge of the Apple. User frustration deliberately omitted from this tutorial. Edu-Ware, Box 22222, Agoura, CA 91301. $79.

IDS. An integrated development system allowing screen form I/O techniques, more convenient access to disk files, and print-line formatting. R. R. Michaels, Box 565, Leesburg, VA 22075. $85.

Lisa 2.5. Hyde. Longtime popular assembler with extended mnemonics and more than thirty opcodes. Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $79.95.

Merlin. Does assembly language programming with dozen editing commands and 28 pseudo-ops. Southwestern Data, 10761-E Woodside Ave., Santee, CA 92071. $64.95.

MUD. *Master Utility Disk* for aid in program maintenance and repairs of fatal errors. Different versions for II, II Plus, and IIe. WM Enterprises, 9348 Santa Monica Blvd., #101, Beverly Hills, CA 90210. $69.95.

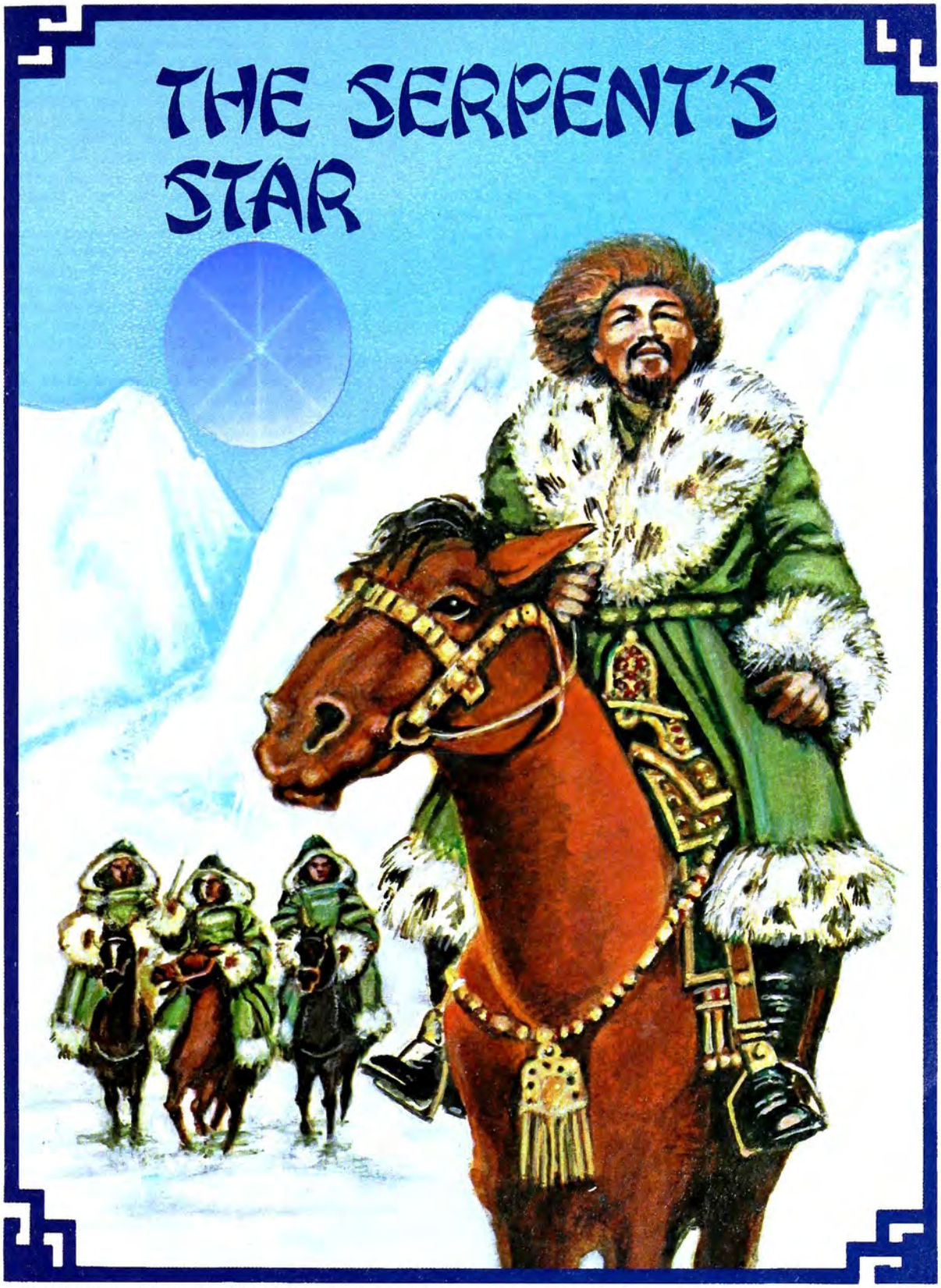
ORCA/M. Object relocatable code assembler for micros. Macro language features; linker produces executable binary files. Co-resident screen editor and system disk sector editor. Hayden, 50 Essex St., Rochelle Park, NJ 07662. Introductory, $99.95.

Programmer's Workshop. Sixty general-purpose subroutines to integrate into Basic programs. Includes variety of visual and sound effects, math utilities, sorting, input/output subroutines, and screen controls. Hayden Software, 600 Suffolk St., Lowell, MA 01853. $49.95.

ProntoDOS. Weishaar. High-speed disk utility cuts about two-thirds of the time off bload and save functions. Compatible with all DOS commands; frees up to 15 extra sectors per disk. Beagle Bros, 4315 Sierra Vista, San Diego, CA 92103. $29.50.

Sphinx. Software giving single-pass encryption be-

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yond 10 to the 400th power. Crane Hill, Box 273, Gonzalez, FL 32560. $37.50.

•**Super Disk Copy III.** Hartley. Easy-to-use menu-driven software utility; correct file sizes, undelete, free DOS tracks, more. Sensible, 6619 Perham Dr., W. Bloomfield, MI 48033. $30. *10/81.*

TASC. Peak, Howard. Applesoft compiler; user controls locations of three memory compartments. Microsoft, 10700 Northup Wy., Bellevue, WA 98004. $150. *9/81.*

Utility City. Kersey. Twenty-one utilities on one disk. Beagle Bros, 4315 Sierra Vista, San Diego, CA 92103. $29.50.

Word Processing

Apple Writer II and IIe. Includes WPL, word processing language. Additional functions menu; continuing features and functions menu; continuous readout of character count and length. *IIe* has shift, shift-lock, and tab, four-arrow cursor control, and delete key; data files compatible with *II*. Apple, 20525 Mariani Ave., Cupertino, CA 95014. *II*, $150; *IIe*, $195.

Apple Writer II Pre-boot. Armstrong, Borgorsen. Allows you to run *Apple Writer II* in 80-column format with the Videoterm 80-column card. Videx, 897 N.W. Grant Ave., Corvallis, OR 97330. $19.

Bank Street Writer. Kusmiak, Bank Street College of Education. Designed for use by whole family. Universal search and replace, word wrap are standard. U&lc without hardware. On-disk tutorial. Takes advantage of memory, keyboard on IIe, if you have one. Broderbund, 1938 4th St., San Rafael, CA 94901. $69.95. *2/83.*

Magic Window II. 40, 70 (in hi-res), or 80 columns in this expanded version. Compatible with Pascal 80-column. With user-tailored, fast menu; underlining; global search and replace. IIe version uses all 64K, more if you have it. Artsci, 5547 Satsuma Ave., North Hollywood, CA 91601. $149.95.

Pie Writer. Business processor allows 9,999 pages. Word deletion, auto indent, spooling, and type-ahead buffer. Hayden, 50 Essex St., Rochelle Park, NJ 07662. $149.95.

ScreenWriter II. Kidwell, Schmoyer. No extra hardware for u&lc, 70-column display, printer spooling. Edits Basic, text, and binary files; complete search and replace. IIe version uses 80 columns, u&lc, shift key, and all available memory. Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $129.95. *1/83.*

Sensible Speller. Spell-checking program sports listable 85,000 words, extensible up to 110,000 words. Recognizes contractions, gives word counts, word incidence, number of unique words. Clear documentation and simplicity of operation. Works with many word processors' files. Best of breed. Sensible, 6619 Perham Dr., W. Bloomfield, MI 48033. $125. *1/82.*

Super-Text Professional (40/80). Automatic 80-column, u&lc on equipped IIe; with appropriate equipment on II Plus. On-screen formatting and help reference guides. Muse, 347 N. Charles St., Baltimore, MD 21201. $99.

Word Handler II. Elekman. Simple program with straightforward documentation. Allows folded paper printout for two-sided printing. 80-column with the IIe. Silicon Valley Systems, 1625 El Camino Real, #4, Belmont, CA 94002. $199. *11/82.*

WordStar. Screen-oriented, integrated word processing system in CP/M. Z-80. MicroPro, 33 San Pablo Ave., San Rafael, CA 94903. $495.

Zardax. Philips. Highly recommended. Single program includes supersimple use of powerful word processing features. Considerable extras including communication by modem. Good 80-column facility with board, automatic in IIe version. Computer Solutions, Box 397, Mount Gravatt, Queensland, Australia. In the U.S.: Action-Research Northwest, 11442 Marine View Dr. S.W., Seattle, WA 98146. $295. *Zip-Comm* modem program. $80. *11/82.*

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Apple III

Access III. Communications program for time sharing and standalone tasks; gives access to remote information services, minis, and mainframes. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $150.

Apple Business Basic. High-level structured programming language. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $125.

Apple III Business Graphics. BPS. General-purpose graphics program draws line graphs, bar graphs in three formats, overlays, and pie charts in 16 colors. Continuous or discrete data; curve-fitting capabilities. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $175.

Apple III Pascal. Program preparer with editor, compiler, disassembler, linker, filer, system library. Features cursor control, text modeling, formatting. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $250.

Apple Writer III. Lutus. Uses WPL (word processing language) to automate text manipulation and document creation. Adjusts print format during printing; translates from typewriter shorthand to English or other language and back again. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $225.

Catalyst. Allows boot from hard disk; transfers all programs to ProFile. Quark Engineering, 1433 Williams, #1102, Denver, CO 80218. $149.

Data Manager III. Expansion of *Data Factory* allowing 32,000 records per file. Custom screen display and printing. Micro Lab, 2310 Skokie Valley Rd., Highland Park, IL 60035. $750.

Discourse. Spooler to be used with hard or floppy

disk drive. Printer output goes to disk, then from disk to printer while you use the computer for other tasks. Holds up to fourteen files at a time. Quark, 1433 Williams, #1102, Denver, CO 80218. $125.

Hardisk Accounting Series, 2.0. General ledger, accounts receivable, and accounts payable handle 32,766 customers or accounts; inventory features five methods of evaluation. Also payroll, management analysis, and mailing labels. Great Plains Software, 123 N. 15th St., Fargo, ND 58102. $495 to $595 per module.

Mail List Manager. Generates, stores, sorts, edits, and prints mailing list files. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $150.

Micro/Terminal. Gives access to any in-house or remote database; set up and log only once. Built-in editor or edit off-line. Microcom, 1400A Providence Hwy., Norwood, MA 02062. $99.95.

PFS:File (formerly *Personal Filing System*). Page. Form-oriented information management system stores and retrieves up to 32,000 entries. Software Publishing, 1901 Landings Dr., Mountain View, CA 94043. $175.

PFS:Graph. Chin, Hill. Works alone or interfaces with PFS databases and *VisiCalc* files. Produces bar, line, and pie charts, merging data from several sources. Software Publishing, 1901 Landings Dr., Mountain View, CA 94043. $175.

PFS:Report. Page. Generates reports; sorts, calculates, and manipulates data filed with *PFS:File*. Software Publishing, 1901 Landings Dr., Mountain View, CA 94043. $125.

Pick That Tune. Swearingen. Up to 10 players bid on least notes to I.D. any melody in Pop, Country/Western, Children, and TV categories. 16 variations. Additional categories available separately. Swearingen Software, 6312 W. Little York, #197, Houston, TX 77088. $29.95.

Quick File III. Personal index card or filing system. 15 fields; file as long as disk allows; can be put on ProFile. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $100.

Senior Analyst III. Corporate planning tool for developing budgets, forecasts, financial models without programming; automatically formats reports and documents and assumptions in plain English. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $300. *4/83.*

State of the Art General Ledger and **Business Modules.** Standalone interfaceable modules for 12 accounting periods. General ledger can handle 470 accounts, 100 transactions before updating files. Modules for budget and financial reporting, accounts receivable/payable, and inventory control. State of the Art, 3183A Airway Ave., Costa Mesa, CA 92626. General ledger, $595; modules, $495.

VersaForm. Landau. State-of-the-art business forms processor. Does invoicing, purchasing orders, mailing lists, client billing. Powerful, complex, worth getting to know. Hard-disk-compatible. Applied Software Technology, 14128 Capri Dr., Los Gatos, CA 95030. $495. *8/82.*

VisiCalc Advanced Version. For corporatewide modeling applications; develop sophisticated templates to be filled in by novice users. On-screen help, IRR and calendar functions, macro facility, variable column widths, locked cell values, and hidden cell contents. VisiCorp, 2895 Zanker Rd., San Jose, CA 95134. $400.

VisiCalc III. Software Arts, Bricklin, Frankston. Just like it sounds; expanded memory, u&lc, 80 columns. Four-way cursor movement. VisiCorp, 2895 Zanker Rd., San Jose, CA 95134. $250.

VisiSchedule. Critical path PERT scheduler. VisiCorp, 2895 Zanker Rd., San Jose, CA 95134. $300.

Word Juggler. Gill. Word processor uses expanded memory. Printout can be reviewed on-screen prior to printing; multiple copies printed of selected pages. Quark Engineering, 1433 Williams, #1102, Denver, CO 80218. $295. *12/82.* ❑■

The Shape of Things To Come

Two hundred years ago, in 1783, a new sort of society and a new sort of state came into being.

"It was like something coming out of an egg," writes H. G. Wells in *The Outline of History.* "It was a western European civilization that had broken free from the last traces of Empire and Christendom; it had not a vestige of monarchy left and no state religion. . . . Even its unity was as yet a mere unity for defense and freedom. It was in these respects such a clean start in political organization as the world had not seen before."

The new society and state was the young United States of America, which officially ceased fighting with Great Britain on April 19, 1783. Two hundred years later the United States is again the site of a struggle to reshape the world we live in. America has been an industrial and agricultural society for most of its two hundred-plus years, but that is now changing.

With the help of computers, big and small, we are entering the information age—a society that depends more on the exchange of knowledge than physical goods. In the coming decades we just might eliminate all mindnumbing, backbreaking work and improve the quality of life for those ready to embrace the computer revolution.

Softalk is dedicated to making the shift to the information age as smooth as possible. We recognize and understand the needs of those who are taking the gamble of buying a personal computer. The Apple is a wonderful machine, but it's only as smart as its owner.

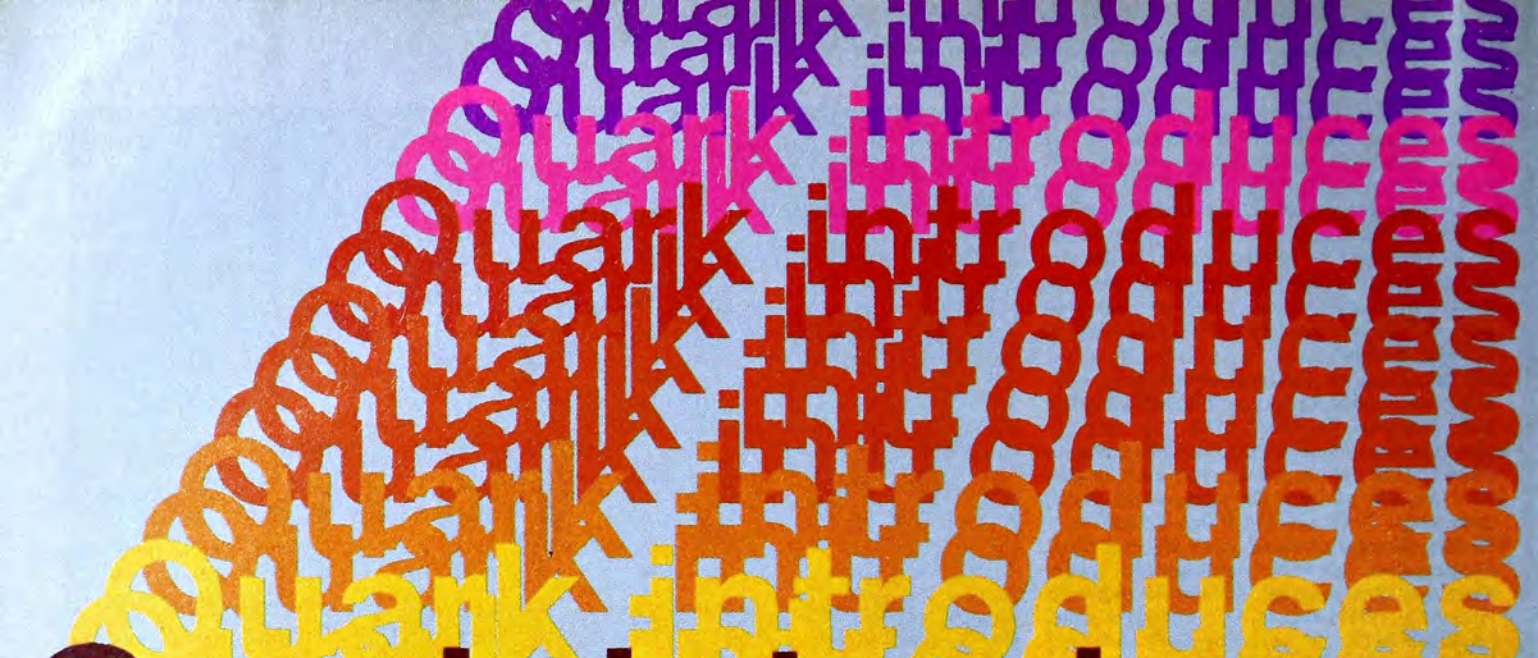
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Word Juggler™ IIe.

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Word Juggler IIe	$239. sug. U.S. retail price
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The Best Damn Computer Game Magazine.



Summer's here and the time is right for playing computer games. School's out, vacation time is right around the corner, and *Softline*, the bimonthly computer games magazine, is waiting for you.

Summertime means fun, and if you're into computer games fun means spending hours on your Apple blasting aliens and searching for misplaced treasures. Reading *Softline* is fun—and funny. Every fun-loving game player should check it out. Every funny one, too.

This summer in *Softline* we'll be pondering the anatomy of games: stepping back to get the big picture on where they're going and then diving right in to find out how they're made. We've got the scoop on Electronic Arts, the game company's game company, and their remarkable lineup of programming talent. We'll tell you how to win at adventure and fantasy role-playing games, and how to make them yourself.

Plus all of *Softline*'s usual features and plenty of surprises. Each issue is packed with news, reviews, the ever-popular High Scores, the notorious Infomania, and loads of contests.

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OPEN DISCUSSION

Zoom to Strictly Supportive

I'd like to sing the praises of two companies I've recently had the pleasure of doing business with.

The first company is Phoenix Software. My husband and I bought *Zoom Grafix* from this firm in 1982 and used it frequently. The program was everything we heard it was and did everything we hoped it could do. Just two months ago we purchased the Apple IIe as well as Apple's Dot Matrix Printer and began a search and sort to determine which of our programs were compatible. Sadly, *Zoom Grafix* and the printer were not. I called Phoenix Software, and the very first employee to take my call was able to solve the problem. By sending one dollar and our disk to Phoenix, the disk was updated and returned to us, all in one week's time. *Zoom Grafix* works perfectly, and I'd like to say thanks for the valued-customer treatment I received.

The second company is Strictly Software. We've ordered software from this organization before and have always been satisfied with its products. After purchasing the new computer, we ordered *Sensible Speller* from Strictly Software and eagerly awaited the program's arrival. Within thirty minutes of delivery we were attempting to run the program and stepping through the documentation. The main dictionary disk wouldn't copy, wouldn't run, and gave us nothing but error messages. A quick call to Strictly Software resolved the difficulty. The company's representatives were courteous and apologetic. I was urged to return the entire package for an immediate replacement. Approximately a half hour later, another company representative called and advised me to hang on to the defective copy until the replacement arrived as insurance against the possibility of the replacement being defective also. The representative also stressed that since part of the package was still operational, I could continue to use it and not be inconvenienced further. The replacement arrived in less than two days and works beautifully.

Thank you, Strictly Software and Phoenix, for the assistance you gave me.

Mildred Edwards, Waterloo, IA

Keep Talking

M & R Enterprises of Santa Clara, California, has just replaced, without charge or question, an RF Modulator I had sent to them for repair. Readers should know of this excellent action taken by M & R to back up its product.

I wish to encourage readers to write in more letters that will help spread the word about companies taking the time to give needed customer support *after* the sale. There are so many companies advertising in the microcomputer magazines, and so many that come and go quickly, that we need this word-of-mouth advertising among consumers to help us identify the companies that really deserve our continued support.

Leroy Stone, London, Canada

The Good, the Bad, and the Sneaky

I've been a microcomputer user for eleven months and would like to share some of my experiences with other new users. Here's the good and bad.

Good—A local Apple dealer gave me a very good twenty-two-hundred-dollar package in May 1982, consisting of an Apple II Plus, Disk II drive, nine-inch green Zenith monitor, and an *Apple Writer* word processing program.

Bad—A week later that same dealer brushed me off when I asked naive questions about some software. Right there, he lost one thousand dollars in hardware and software purchases I was prepared to make.

Good—Reaping the benefits of the dealer's brusqueness was East Coast Software, a mail-order house in Hershey, Pennsylvania, that has reasonable prices and excellent backups, including consultations and refunds.

Good—The Apple computer itself. Primarily interested in word processing, I had been considering a Xerox, an IBM pc, and a Kaypro. A friend advised me of the Apple's versatility and support, and that it was more than competitive in price to everything except the Kaypro. What he failed to add was the fun you can have tinkering with the Apple, a factor denied by the other computers. I'm delighted with the Apple.

Bad—The Applesoft tutorial manual that comes with the computer. It isn't badly written or hard to understand. It's simply obsolete. An anachronism, it instructs the new user on how to use tape recorders, hook up the color television, and program color graphics—all of which is irrelevant to the standard-profile new user who starts out with a disk drive, monochrome monitor, and could care less about programming color graphics.

Good—The Epson MX-80 printer.

Unbelievably bad—The manual that came with it. The writer (I use the term quite loosely) of the manual uses a folksy conversational style that approaches the grotesque, while avoiding as much factual content as possible. It is almost impossible to learn anything about the printer beyond how to turn it on. The index is sloppy and the hands-on programming tutorial simply doesn't work. For the new Apple user this is depressing. What could you be doing wrong? Nothing, because on page 87 you learn that all the previous instructions apply only to the TRS-80. Don't spend ten dollars to get Epson's 1982 revised manual. It's by the same author and it's almost as bad.

Sneakily bad—*Home Accountant.* This best-selling program rigidly controls the user, forcing you to spend a lot of time doing things you don't want to do, like filling out budget information demands. There's no freedom. It's like being conscripted into the Albanian army. I suspect the programmer is a former bureaucrat, because all you do is fill out form after form after form. Furthermore, Continental Software has been less than candid with me about glitches in the program. Only when pressed did the personnel I approached reluctantly concede "serious errors" in update patches and in the end-of-the-year mode, which I simply can't get to work.

Good—Videx Corporation. I use the company's eighty-column board and a soft switch. The hardware, the manual, and the backup couldn't be better.

Good—The *PIE Writer* word processing program. I'm a magazine reporter who also writes books. I use the Apple daily to communicate with a Lane SP6000 in New York, sending files, articles, and memos. I am writing a novel and I use the Apple to write letters such as this to Open Discussion. I own, or have used, *Apple Writer I* and *II*, *Magic Window*, *WordStar*, and *Format II*. For heavy-duty writing, none can equal *PIE Writer*, including *WordStar*, which is slow, cumbersome, and seems to have a lot of problems with what's in the left margin. *Pie Writer* is complex and has a heavy load of commands to learn, but it's worth it. The manual is excellent, the best I've seen in computerdom.

David Chandler, North Miami, FL

Of Planes and PIE

Thank you for the reviews in *Softalk* of Hayden Book Company's *PIE Writer* word processing system for the Apple II.

We disagree, though, with your portrayal of its ease of use. *PIE Writer*'s manual received the only perfect score in *Peelings*'s word processing reviews last summer. *PIE Writer* was reviewed there as being twice as easy to learn as *WordStar*, the only other program in *PIE Writer*'s class on the Apple II. In comparison to the many other, less powerful word processing programs, it makes sense that a Lear jet is harder to learn to fly than a Piper Cub—it's a faster, sleeker, and more powerful plane. Word processing courses at the University of California Extension and New Jersey's MicroCampus, among other schools, use *PIE Writer* to familiarize students with the capabilities of word processing. MicroCampus teaches *PIE Writer* to kids as young as nine, and to adults as old as ninety. *PIE Writer*'s manual includes guides for using both the editor and the formatter, and the

PIE Writer package includes an on-screen tutorial. We've sat noncomputer people down with nothing but the tutorials in the manual and on the screen, and they've consistently learned *PIE Writer* well enough in less than an hour to begin using it for their own work. We thank *Softalk* for recognizing its power and comprehensiveness, and for mentioning so many of its special features.
Ron Lichty, Softwest, Sunnyvale, CA

The Wrong Word for It

The continuing debate on software piracy has prompted me to write. The name "software piracy" is very odd. When I think of a pirate, I don't picture someone hunched over his Apple with a knife between his teeth and a patch over his eye exclaiming, "Well, me bucko, ar ar; I've cracked another un. Now I can sell it and make me some booty, ar ar."

The record industry and the latest groups producing video and sound tapes have had a word for this in their circles for years. The name of these thieves is bootleggers, which is a much more apropos name. It has been mentioned that in the record and tape industry, as well as in the book industry, the attractive packaging and relative high quality of the products is what causes people to purchase the original and not a copy. Several software companies seem to be following these concepts and they produce beautiful manuals to go with their software. Bootleggers, however (at least as I infer it from the great piracy debate letters in Open Discussion), will make copies of the software and sell them as if they were their own—or worse, as if they were original products. If these people are the real target of copy protection, then I think the whole effort is futile. If I lock my car, it won't keep out the guy who really decides that he wants to steal it! It will only slow him down.

If the effort to stop these software thieves is futile, then who is suffering? The claim is also made that these companies want to keep from losing revenue on copyable software. In my experience these claims of lost revenue are a bit on the flimsy side. There are very few times (that I know of) in which someone acquiring copied software would ever have purchased the product in the first place. Therefore the friend who got a copy of such a program was never a source of revenue to lose.

In the first place I know that I love to solve a good puzzle anytime and have delved into the inner workings of a number of protected disks. Someone with a bit more fortitude than myself could easily crack most code schemes available. Once again, the car may be locked, but it only slows one down a bit.

Personally, I would be flattered if I wrote a good book and lots of folks passed it around and had a great time reading it. Although I wouldn't have made a penny off their enjoyment, the next time they saw one of my books on the newsstands, they'd buy a copy. I know that there are several game companies producing more winners than losers, and I would go back to them quite often because I've seen their goods. At thirty-five dollars a shot for game software, I am going to buy only those that are any good.

My conclusion? Don't lock up the software. Either lower the price and make it darned good, or expect that people such as myself are never going to buy from your stock ever again.
John T. Cox, Houston, TX

Some Wild and Crazy Ideas

I am in complete agreement with Jeffery Partridge and Larry Houston on the subject of copy protection (March Open Discussion). Users definitely have a legitimate right to a backup copy of software they have paid for. I thought so when I was only a software consumer, and I emphatically think so now that I'm both a consumer and a publisher.

The various alternatives to copy protection (giving copyable disks to dealers only, allowing each copy to make one more copy, supplying two copies, and so forth) are either complicated or too expensive for a shoestring operation like Cheapsuit Software. So I decided it would be easiest to keep it simple: all Cheapsuit Software products are copyable. Period. Naive, perhaps, but I'm willing to experiment with it—especially after seeing the obvious successes of companies like Beagle Bros that sell no copy-protected software.

Speaking of naivete, Jeffery Partridge's remark that "dealers do *not* get free copies to demonstrate" made me wonder just how naive I



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am. See, I'm new in this business, and I foolishly thought that the good will of a dealer was worth much more than the cost of a disk and a manual. But now that I've had my eyes opened, I think I'll still keep my original demo policy, which is that dealer demos of Cheapsuit Software products are free. This policy makes sense to me, having heard a lot of talk about how dealers are the backbone of this industry. If this policy makes major software houses look rude by comparison, so be it. They may have to treat dealers better if enough wild and crazy upstarts set an example.

As a consumer too, I want to take this opportunity to say something about my dealer, Jeanette Merrill. She's the kind of dealer that makes it a lot easier to own an Apple. Whenever I have a service problem—I've had several—she's there. And she never even laughs when I say that I pulled out a peripheral card with the power on. She never complains when I call at totally crazy times to scream for help. She shows up on my doorstep with her *personal* Apple (it answers to the name Genghis Khan), and though she is obviously dressed to go out dancing she takes time to look for some obscure, intermittent problem that no one will ever find—for free! And when she doesn't find the problem, she loans me Genghis so I'll be able to keep working while my Apple is in the shop. She is wonderful.

Don Doumakes, Cheapsuit Software,
Iowa City, IA

Explosive Reactions

Open Discussion is the first section I turn to when I open a new issue of *Softalk*. I'm always interested in the various discussions and varying points of view expressed there. However, the editorial comments of Robert Marlowe in the April issue not only interested but disturbed and irritated me. In fact, while I intend to address several of the points that he brought up in his letter, I don't think *Softalk* is the proper place for discussions of this nature, even when thinly veiled under the guise of software criticism, as his was.

Mr. Marlowe expressed his concern that certain war simulation games "convey (or perpetuate) misunderstandings of the present East/West stand-off that are not only false but also highly dangerous," then proceeded to expound at some length on his own understandings of this complex and highly volatile political situation. Aside from the obvious questions raised simply by the reasoning behind the inclusion of this correspondence, there remains the necessity of some kind of balanced response to the incredible assumptions made, and conclusions reached, by Mr. Marlowe. I'd like to attempt just such a response.

Mr. Marlowe (an expatriate by his own admission) begins his diatribe by stating his view of the current public understanding of Soviet/American relations as if it were undeniable fact. I hardly accept the ridiculous notion that the American public holds the opinion that the "Soviet Union is the embodiment of everything evil, and thus of everything un-American." However, I do believe that the American public can and does recognize a well-defined threat when it exists, and that the American people are capable of acting for the good of their own enlightened self-interest in the face of such a threat.

I will accept Mr. Marlowe's premise that peaceful trade with Western Europe is much to the advantage of the Soviet Union (where else is it going to obtain the technology that so far it has been incapable of developing?) and will leave moot the question of just what the advantages to Western Europe might be. I cannot accept the contention that recent administrations and the Pentagon have fostered the idea that a Soviet invasion of Western Europe would be impending in the absence of an adequate NATO (nuclear) defense against such a move. The thrust of current administration policies regarding the prospect of nuclear war in Europe is based not on what the Soviets might do in Western Europe tomorrow, but on what the Soviets have done consistently and historically when faced with opportunities for expansion, whether in the interest of territory, military leverage, or political advantage. What it's done is to reach for whatever gain it could obtain and hold. Here we might pause for a calling of the roll: Afghanistan, Yugoslavia, Czechoslovakia, Latvia, Estonia, Lithuania, Bulgaria, Poland, Hungary, East Germany, Cuba, Angola, Vietnam, and so forth.

Next, Mr. Marlowe moves on to a discussion of various defensive strategies (or lack thereof) based again on his own point of view. Actually, the reason America lacks an ABM system is not for want of money, or because such a system wouldn't provide an adequate defense, but because the American government is party to an international agreement, SALT I, which prohibits the deployment of such systems. Of course, the Soviet Union is also a signatory to this agreement, and allows (indeed, even encourages) frequent neutral third-party inspections for the purpose of verification of its adherence to the agreement.

On another point, I feel I must remind Mr. Marlowe that the United States' position on the first use of nuclear weapons does not constitute the "cornerstone" of NATO's European defense strategy. That position is as follows: NATO will use nuclear weapons in the defense of Western Europe only in the instance of a Soviet invasion, whether by conventional or nuclear means, when it has been determined that all conventional means of repelling the invading forces have been exhausted. Of course the Soviets have repeatedly and publicly renounced the first use of nuclear weapons! What a public-relations coup! While the Soviets concentrate on building their conventional arsenal in Europe to hitherto unheard-of levels, the Western press, and misguided individuals such as Robert Marlowe, will effectively straitjacket NATO defense strategies so as to allow the Soviets to eventually apply the political leverage their huge conventional arms superiority gives them. Remove the balancing leverage of the Western powers' nuclear capability and the So-

viets enjoy the advantage they so ardently seek.

Finally, Mr. Marlowe's cheap and flippant bandying about of the statistics representing the pain and anguish of the Holocaust is beneath contempt. I ask how such a correspondent can dare mention the term "moral responsibility." I believe that he abandoned moral responsibility just as he abandoned his former homeland, and the principles and ideals that it stands for.

This discussion has nothing to do with software. I hope that in the future I can expect to find mention of these subjects in the editorial section of my newspaper, not in the pages of *Softalk*.
Charles T. Morrow, Herndon, VA

I was going to voice my opinion on copy protection, but when I read Robert Marlowe's criticism of games like *Norad* and *Germany 1985*, I changed my mind. I think Mr. Marlowe misses an important point: A game is only a game. I don't think that SSI or SDS supports a conflict between the U.S. and the U.S.S.R. The publishers simply took an interesting scenario and adapted it to a game format. There's nothing flippant about this.

As to the idea that games create and contribute to the misunderstanding between the two superpowers, I think that that idea is absurd. I have a copy of *Norad* and think it's great fun (so does my little sister). I don't think *Norad* is any more guilty of creating misunderstanding and misinformation than the other *Missile Command*-type games. In fact, *Norad* is almost like these games except that it's superimposed on a map of the U.S. (I suppose if it were a map of Botswana, Mr. Marlowe wouldn't complain.) I know the U.S. doesn't have an ABM system. Also, I don't believe a nuclear war can be won, and I pray that one will never occur. I also think many other people who have played *Norad* feel the same way.

I'm not familiar with *Germany 1985*, but I believe the same principle applies here. The game takes you into its own microcosm and places you in a situation that probably couldn't occur in real life. I don't think that after playing *Germany 1985*, or any similar game, a player would develop a hatred toward the Russians (toward the computer, maybe) or develop any misunderstandings about the Russians. A person's convictions and opinions are formed and changed in real life, not by playing a game. Playing games like *Germany 1985* doesn't create any more hatred, fear, or misunderstanding of the Russians than other games (like *Super Invaders* and *Repton*) create toward aliens.

Mr. Marlowe should stop criticizing the software publishers, who, like the film, book, and television industries, are doing a service by creating a temporary means of escape from the hectic world. Instead, he should criticize the governments involved.
Frank Hsu, Ann Arbor, MI

The last person I need to explain present-day U.S./U.S.S.R. relations is Robert Marlowe. How dare he bring his political propaganda into the field of computer software, more explicitly entertainment software. Does he really think the majority (or even a substantial minority) of American people plan to buy *Norad* or *Germany 1985* and say, "Gee, since this is on a disk it must be the truth." Marlowe must sit in his room, into the wee hours of the night, looking in every publication for things that in his distorted mind promote nuclear war or its feasibility. Who made him an East/West-relations expert that understands any more or less the "nature and degree of the Soviet threat to the West"? Is his sense of reality so weak that he actually believes this software could change people's feelings about such an important issue as the deterrence of nuclear war?

Maybe he'd like to ban *Space Invaders* since this would foster bad relations with any future aliens that might visit the earth. Where does his sense of fantasy end and reality begin?
Peter Rosenfeld, Flushing, NY

Fan's Admonition

As an avid reader of *Softalk* since last November's San Francisco Applefest, I'd like to commence my letter with a few positive comments, since the remainder of this letter is largely negative. I fully enjoy all of *Softalk*'s columns, especially DOStalk and Graphically Speaking. However, when I received the April issue, I was shocked and dismayed at a poorly written piece on computer music in Newspeak titled "And on the Computer-Music Scene" (page 272).

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Whereas *Softalk* is, after all, a magazine catering specifically to Apples, the coverage of computer-oriented music is a foreseeable by-product. However, that does not give *Softalk* a license to attack any piece of music vaguely having to do with technology.

The section of the review having to do with Neil Young's *Trans* is definitely appropriate. Young has shown the public his diverse talents and some of the various effects possible with computer-assisted, synthesized music.

However, the inclusion of a criticism of Styx's *Kilroy Was Here* is hardly justifiable. Styx has been using synthesizers as long as I've heard the band—at least six years. If the reviewer wished to criticize Styx for its use of electronic keyboards, he should have started with *The Grand Illusion* or with *Equinox*. Also, if the use of synthesizers (computer music?) was the criterion, why wasn't Thomas Dolby's *She Blinded Me with Science* or the Human League's *Dare* included?

The message of *Kilroy Was Here*, erroneously stated by the reviewer as "rock 'n' roll's ability to save mankind from technototalitarianism," can be seen, by any "adolescent space cadet" who has taken the time and gone out of his way to read the inside of the album jacket, as a cry against censorship and a plea to keep church and state separate. Perhaps the reviewer considers computer music to be synonymous with anything with a futuristic theme that has synthesizers in it.

Regarding the heralding of "beer-and-broads technorock being brought to the eighties," I'm afraid the reviewer has neglected his homework. Styx's *Paradise Theatre* (1981) contains as much synthesizer/keyboard as *Kilroy*. Did the reviewer miss that release, or did he start counting the eighties later than the rest of us?

Whereas I enjoy comparative reviews of recent album releases, *Softalk* is not what I turn to for such. However, if *Softalk* feels it must burden its readership with such escapades, at the very least it can make sure such a review is free from contradiction. The Newspeak article praises Young for using synthesizers and vocoders, yet condemns Styx for the use of these same instruments. As a result, the article contradicts itself and comes across as a self-righteous, juvenile expression of the reviewer's personal biases—instead of a carefully balanced, point-by-point comparison, as a good review should be. The choice of words holding negative connotations to describe Styx's effort is seen by this reader as the failure of the reviewer to rely on any source except personal prejudice and his lack of concrete arguments, condemning *Kilroy* as "bombastic crud."

One gets the impression from reading this review that the reviewer has a bleak, pessimistic outlook on the future and patronizes the album that supports his views. The optimistic "good-versus-evil, good triumphs-in-the-end" concept of *Kilroy Was Here* is rejected in favor of the Orwellian *Trans*. I think that in the future *Softalk* would be well advised to keep its pages devoted to Apples and their applications (the in-

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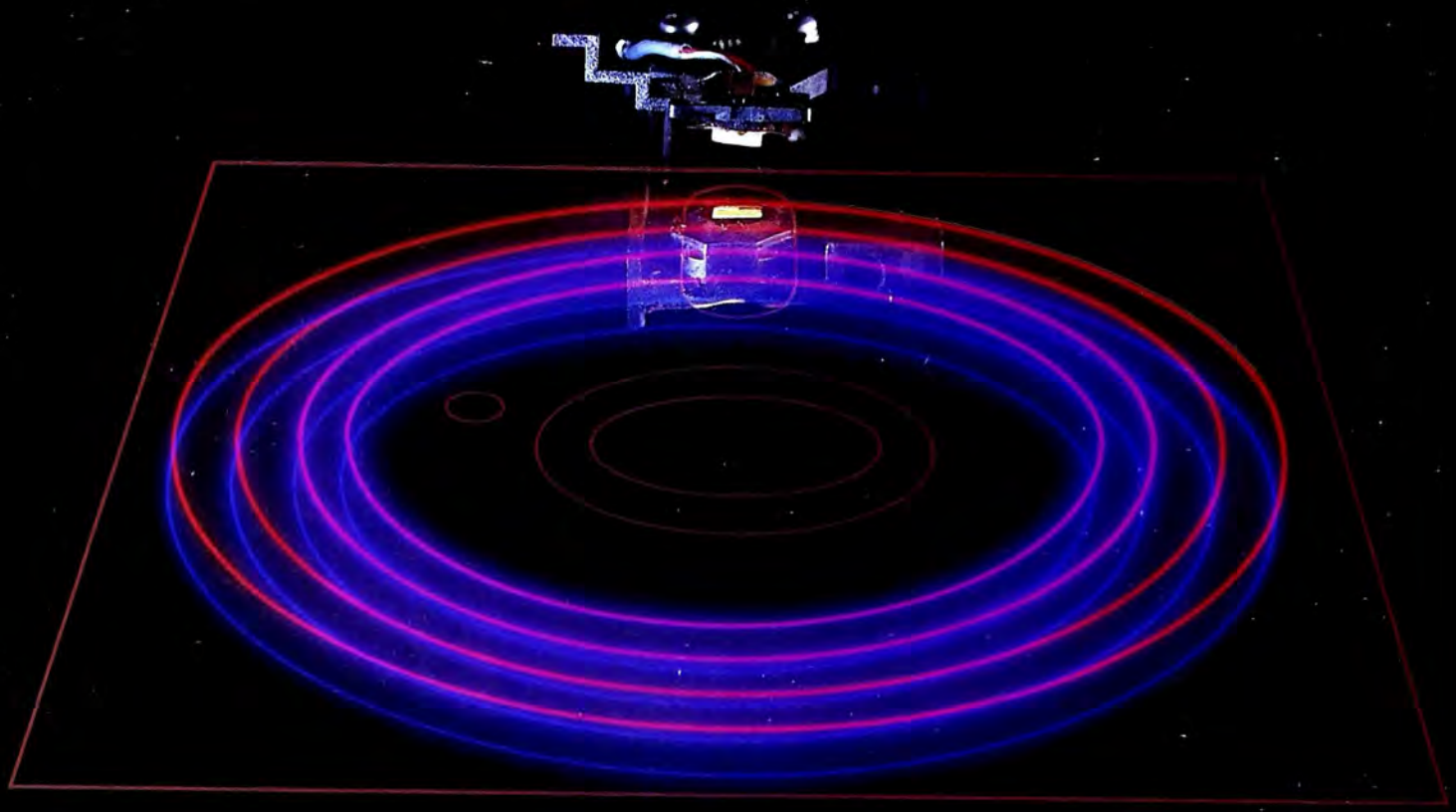
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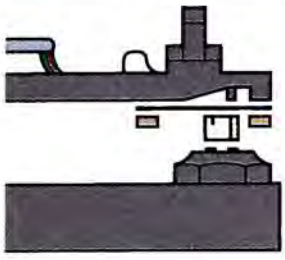
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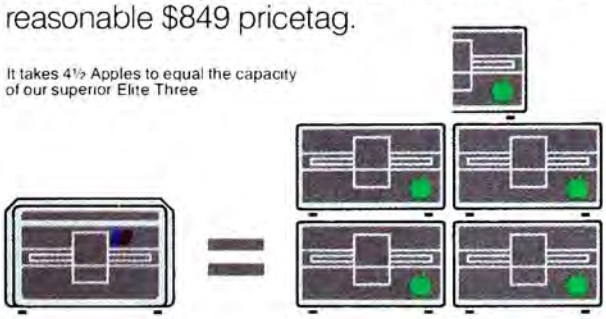


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It takes 4½ Apples to equal the capacity of our superior Elite Three



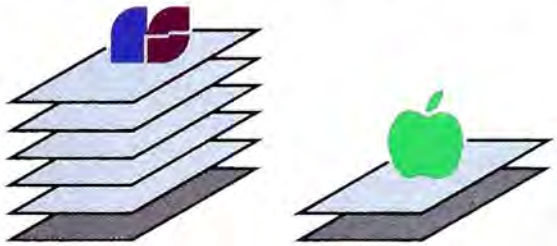
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clusion of *Trans* is acceptable), and reserve the rock 'n' roll reviewing to *Rolling Stone* and the like.
Jeff Hadfield, San Jose, CA

Even Bugs Can Teach
David Durkee's *SoftGraph* was outstanding. My thanks for a useful, as well as educational, program. The *Pie Chart* and *Bar/Line Graph Chart* programs have already been put to work helping analyze data in my MBA studies at Mississippi State University.

Typing is not my area of expertise, and no matter how careful I attempt to be, it's guaranteed I'll have typos to debug before any program that I enter will run. However, I have found this to be where the learning process occurs. Tracing the code through the program with the help of Durkee's explanations provided the insight into what makes this program tick. I did find a bug that I'd like to pass on to others who may not have found it. Line 55 for the hello program should read

```
55  PRINT CHR$(4);"BLOAD B/L.SHAPES"
```

Bob Boynton, Meridian, MS

Just Skip It
I am writing in response to Peter T. Clark, who wrote in the April *Softalk* about modifications he would like to see made. First of all, about the telecommunications section, I personally don't have any telecommunication devices for my Apple, but I think this column is fantastic for those who do; for those who don't it provides a source of enlightenment. I agree that advertisement cards should be used. However, as to the limit of three to a customer, this seems a little restrictive. Six or seven may be a better number. Marketalk Reviews provides a service for everyone and should not, in my opinion, be cut short. *Softalk*'s done a superb job so far; keep up the good work.

Now we come to Peter Clark's and my major point of disagreement. He hates the Storytalk Fiction section, and finds it "dull and boring." My message to you, Mr. Clark, is that if you don't like it, don't read it! You can even tear out the section if you find it so offensive, but don't try to ruin it for the people out there (myself included) who enjoy some fiction after reading the rest of *Softalk*! I happen to love the computer fiction stories and so do most of my friends that subscribe to *Softalk*. Why should we sit back and let you try to take it away from us?
Bear Braumoeller, Orinda, CA

Murphy's Probability
First, I would like to comment on Paul Wilson's apparent problem with Wabash disks. It seems to me rather incredible that three disks in a row would have intermittent I/O problems. In the past I have experienced similar problems and they have always been traced to a disk drive or controller. I have over two hundred disks in my library (using both sides), and in five years I've had only two media failures (both on the front side of the disk, I might add). I have over fifty Wabash disks in use and I rate them among the best. If your problem truly was due to the disks, I would contact the manufacturer. Most disk manufacturers will stand behind their products rather than suffer the lost sales that can be caused by disgruntled users.

Secondly, I would like to comment on Edwin Winter's glowing appreciation of *Diversi-DOS*. I have had the opportunity of using this product and must agree that the speed improvements are dramatic. I would just like to warn users of *Diversi-DOS* and other DOS speedup packages that one of the things done to achieve these speed improvements is the elimination of "verify after write" when writing to the disk. *Diversi-DOS* has instructions on how to reenable this feature, and, although it degrades performance a little, it is well worth it. The floppy disk and floppy disk drive are hardly perfect. Most (if not all) disk operating systems contain logic to verify that whatever you wanted to write was actually written, and they do it for good reason. The original designers of Apple DOS didn't put that logic in just to make it run slowly; even hard disk systems perform write verification. One of Murphy's Laws states that if anything can go wrong, it will. Running a disk system without write verification just increases the probability of Murphy being right.
Dick Rettke, Appleton, WI

User Groups—A Healthy Association
In answer to Guillermo Geisse's letter in April's Open Discussion, although there may not be commercial software that will exactly meet his needs, I suggest that he contact one of the three Saint Louis area Apple user groups. The software he wishes may be designed by one of the local programmers at a reasonable cost. In fact, the magazine of the user group I belong to is currently publishing a serialized version of a program, with the code and explanation of its construction, that does exactly the kind of scheduling he desires for three radiologists. It is titled *Call Schedule* and is being published by the *MSB* magazine. This is the combined magazine and newsletter from all three user groups in the area (Applejacks, Disk Drivers, and Personal Computer Club). One can get a copy from a local computer store or obtain copies free as a member of any of these groups. From looking at the article, a user may be able to modify the program's code to fit his particular needs. The reason I know about this is because I wrote the article.

I could easily have called Dr. Geisse and told him this, but I believe a plug should be made for local user groups. These are groups of Apple owners who get together to learn more about their machines. They don't sell hardware or software, and they exist for the betterment, education, and edification of their members. A strong user group can be a real boon to its members.

I would call for physicians in the Saint Louis area to get together, join a local user group, and form a medical special-interest group to exchange ideas and knowledge regarding programs in the medical field. Any or all of the Saint Louis-area computer user groups would welcome this. The dues for such groups are minuscule compared to what physicians pay for the A.M.A. and other specialty societies.
David S. Martin, M.D., Creve Coeur, MO

Eureka!
Since my letter entitled "Serendipity" appeared in the April issue, I have discovered still an easier way to access the printer commands for my Epson MX-80 F/T printer via *Apple Writer II*.

When entering terms for the glossary, press escape twice and the flashing [(the escape command symbol) appears as part of your term, making it possible to set up all the printer escape commands you'll need in the glossary.

For example, I frequently use the emphasized mode and italics, and I enter these commands into my glossary with the following command strings:

```
[G]?e<ESC><ESC><ESC>E<RETURN>  (escape "E")
[G]?4<ESC><ESC>4<RETURN>  (escape "4")
[G]?5<ESC><ESC>5<RETURN>  (escape "5")
```

The reason three escapes are needed for escape-E is that lettered commands must be in upper case. None of these commands take up spaces during printing, and any may be placed within your text. Note also that my defining symbols are the same as the escape commands to make it easier to remember how each is defined in the glossary. You may also enter all the printer commands you'll ever use and save the glossary to a disk; check page 44 of your *Apple Writer II* manual.

I plan on purchasing a new Apple IIe and *Apple Writer IIe*, and I hope that I'll still be able to access my printer commands just as easily.
Charles Miller, Cambridge, MA

I have read a lot about how one can control the print modes of the Epson MX-80 printer through the *Apple Writer II* word processing program. I have been amazed at the complexity of the methods. I have found it to be fairly straightforward. Obviously, pressing escape while entering text will either capitalize the next letter or, if pressed twice, will enter the editing mode. However, both the glossary (control-G) and find (Control-F) will allow you to send an escape to the printer.

To use control-G, first define a key to represent the escape key. For example, if you wanted the / key to represent the escape key, press control-G then ? to enter the definition. Press the / key, then the escape key twice. A flashing [will appear to represent the escape key. Now every time control-G followed by the / key is pressed while entering text, the flashing [will appear.

To use the control-F method, choose a key such as * to represent the escape key. To switch the printer to emphasized mode, you would type **E*. Then use control-F to replace the star with escape. You can get the escape key in this mode again by pressing escape twice, and the

flashing [will appear. After replacement, all of the *s will become flashing [s.

I find *Apple Writer* to be a handy and useful program. The ability to send signals to the printer makes the printed material much more attractive.
Tim Anderson, Logan, UT

A "True" Pirate Speaks

I am a software pirate and a good one at that. I am not, however, 100 percent pro software piracy. I will copy games for myself and my friends, but I refuse to sell any software not written by myself.

I would first of all like to clear up some myths about software piracy. Some people have the idea that the average software pirate copies software for profit. Most of the pirates I know, and I know most of the best in the Bay Area, copy software they don't have the money to buy, or that aren't worth the disks they come on.

There are two main reasons that I copy software: The first is to whet my appetite for games. I love all games, and I want much more than I could legally afford. The second reason is to reduce the number of disks required to keep these games.

In relation to the second reason, let me explain that a software pirate is not one who wastes time on nibble copiers such as *Locksmith*. *Locksmith* does not bypass the copy protection and does not require any brains to use. I break games. I attempt to eliminate the protection on a game at least far enough to copy it with *CopyA*. Anyone who has never removed the copy protection from a game is *not*, in my opinion, a true software pirate.

As to Richard Ekblaw's letter in April Open Discussion, let me say that there will never be a software protection method that can not be broken. Anything coded by man can be decoded by man.

Also, there is no way that a printer card or any other card will ever be mistaken for a wildcard. They do entirely different things, and therefore require an entirely different machine language routine on the card to operate. It is this routine that is checked to see if a wildcard-type device is present. Regarding your problem with the encoder board, why didn't you contact the manufacturer when you first noticed the problem?

To Dan Kunesh: Did you know that the bit patterns on the hi-res screen of the Apple II run backward? That is, the bits are numbered left to right instead of right to left. This means that a bit pattern of 01101000 on the screen is stored as 22 ($16) rather than 104 ($68). Try converting your numbers to binary, reversing the bit patterns, and converting them back. I think you'll find that your character set is now facing the correct direction.

As a programmer, I was a little surprised that there wasn't a footnote like the following after Charles Miller's letter titled "Serendipity" in the April Open Discussion: The flashing [character is explained by noting that 27, the ASCII value for escape, generates the flashing [character when placed on the screen from machine language. The reason for the upper-case letter following it is that the printer codes used by the MX-80 are all upper-case characters.

Although this wasn't needed, it sure would have helped me understand how my computer worked if someone had told me that when I was first starting out.
Bill Jones, Alamo, CA

Stamps and Everything Else

I think a fellow *Softalk* reader might be able to help me with a problem I'm having with a program. This program will help me to catalog all of my stamps, or anything else. It is in eighty-column, and I need to use text files to keep the stamps "in." I cannot seem to use DOS, which runs in forty-column. (It's a Videx Videoterm board.) There must be some way to use DOS in eighty-column because eighty-column is what most word processors use. Do I need to switch back and forth between eighty and forty-column when working with the text files? The reason I want it in eighty-column is so I can display most or all of the file on one screen. Can anyone help me?

I love Open Discussion, but I am getting a little tired of hearing something about *Frogger* every month. Yes, I do have *Frogger*. It isn't exactly a graphics breakthrough, but it is a very playable game. The only thing I think they screwed up on is the sound. But Apple sound is a little screwed up itself, so what should we expect? It is nowhere near as good as the Atari's version. Since I don't have an Atari 400 or 800, it doesn't bother me a bit. If the people who are speaking out against *Frogger* don't like it, why don't they all get together and make a version so good nobody can complain. I'd be willing to buy it if it were as good as they want Sierra On-Line's version to be.

Bravo Richard Ekblaw, you couldn't be any more right on software protection. If someday they make an uncopyable protection code, the next day it will be a copyable software code. Penguin Software has the right idea. Its new prices of $19.95 are about what any game is worth, with the exception of *Time Zone*. I think one of the main reasons Penguin is able to give a reasonable price on its games is because it has given up on spending the money on software protection. I intend to purchase one of its programs in the near future.

To Alan Gallatin: I tried the same thing but put the disk controller in slot 7. It still did the same thing. Why? Who knows? And by the way, where is Oceanside? I spend a lot of time in New York around the Braircliff, Tarrytown, part of Westchester County. I am also fourteen years old.
Matt Capozza, Huntington, IN

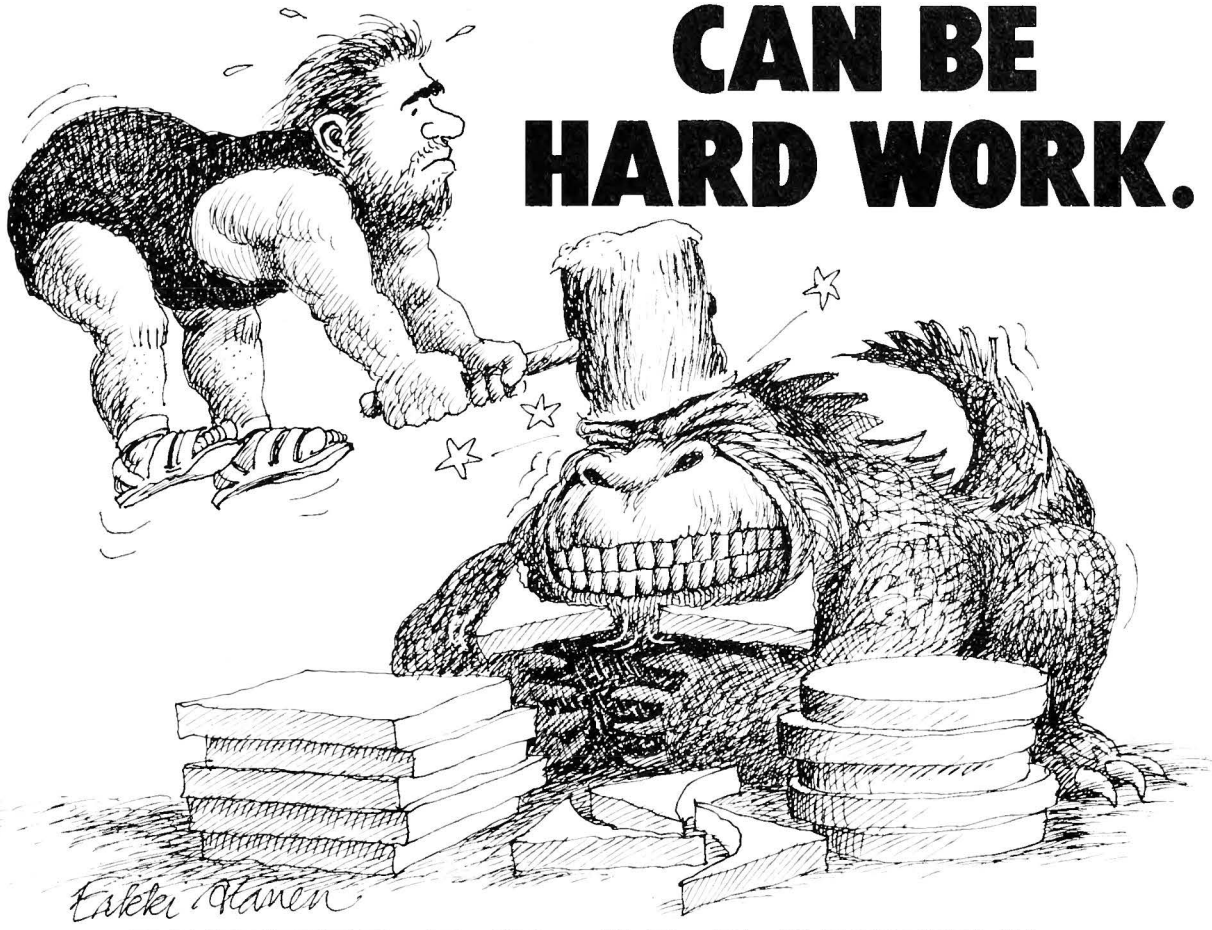
Of Hooks and Hangs

This is in response to Alan Gallatin's question (April Open Discussion) about the program:

```
10  FOR A=0 TO 6
20  PR#A
30  NEXT A
```




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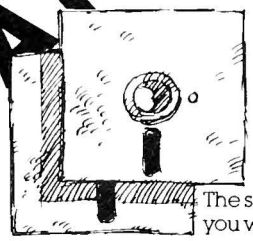
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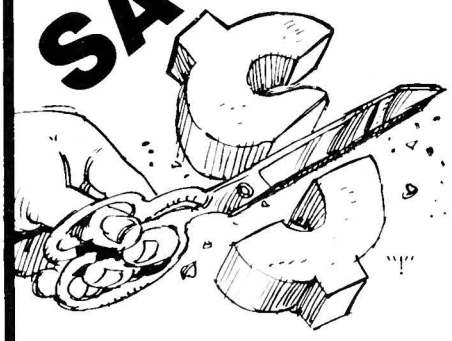


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The reason why this program will boot the disk in slot 6, instead of hanging, is that when Basic interprets a PR# or IN# command, it merely sets the input/output hooks on the zero page to $C*n*00 (where *n* is the slot number specified). When the computer next attempts to output (or input, if you're using IN#) a character, control will be turned over to the program residing on the peripheral card in the specified slot. Note that a request for a character to be input or output is what activates the card, not the PR# or IN# command.

Since the program does not input or output any characters, nothing happens until the program terminates. At that time, Basic prints a prompt and requests input. This activates the card whose address has been last placed in the I/O hooks by the program. In this case, this is card #6, hence the disk in slot 6 boots. Using the same logic, it is clear that changing PR#A to IN#A does not change the situation. Printing during each loop when using IN#A still does not activate the slot you're addressing, but if you use PR#A, it will activate it and the system will hang at the first unoccupied slot.

For teacher Rodney D. Hixon of Fairbanks, Alaska, who is avoiding Pascal because of the hardware expense, I would suggest that he look into *Lazer Pascal* from Lazer Microsystems, Riverside, California. This is an extended version of Tiny Pascal that has been extended in the direction of the C programming language. It will operate with one disk drive and 48K of memory, although you must reload the compiler if you have used any other programs between compilations. Documentation is satisfactory if you are already familiar with Pascal. I would highly recommend investing in either the Videx Keyboard Enhancer or the Lazer Keyboard Plus, since Pascal is really intended for an environment that supports both upper and lower case. This upgrade is not, however, absolutely necessary. *Lazer Pascal* is set up to run under the ANIX operating system but is compatible with DOS. ANIX comes with the system, but it is available with complete documentation and extensive disk utility programs for a moderate cost.

I have used this system to create a medical office management and billing system and can recommend it as a cost-conscious alternative to Apple Pascal. Its main limitations are that it does not support floating-point numbers and is limited to one-dimensional arrays. Its files, however, are completely DOS-compatible, and the operating system is very advanced. The basic system comes with editor, compiler, p-code interpreter, p-code disassembler, program library and example programs, *Lisa* source code for compiler and interpreter, and a manual.

With regard to textbooks, I suggest that anyone who's looking for them come to San Francisco and visit Stacy's bookstore on Market Street. It has one of the largest stocks of computer texts, including Apple-specific books, west of the Mississippi.

I recently added an Apple IIe to my office and would like to comment on some compatibility problems. *Locksmith 4.1* will not function on the IIe because it crashes when it reaches an error in reading or writing. Pascal 1.1 is nonfunctional because its boot procedure requires a press of the reset key, which functions differently on the IIe. (As opposed to the II's protocol, which would leave you with the memory card connected, the IIe puts you back under ROM control. This was intended probably as a piracy-prevention device.) Apple has a Pascal update in the works. The eighty-column board does not work with *Merlin*, but there is an update available. *Apple Writer II* does not recognize the eighty-column board. *Screenwriter II* does not recognize the keyboard correctly—but there's a IIe-compatible version in beta testing. *VisiCalc* is okay; *Lazer Pascal* is compatible but does not use the eighty-column board. All my games and adventures work correctly.

Everyone should be aware that the new System Master disk not only includes the DOS 3.3e mentioned in April's DOStalk but also includes a much improved hello program that fast-loads the language card in less than five seconds. This program is compatible with the II and II Plus and is worth the trouble of obtaining.

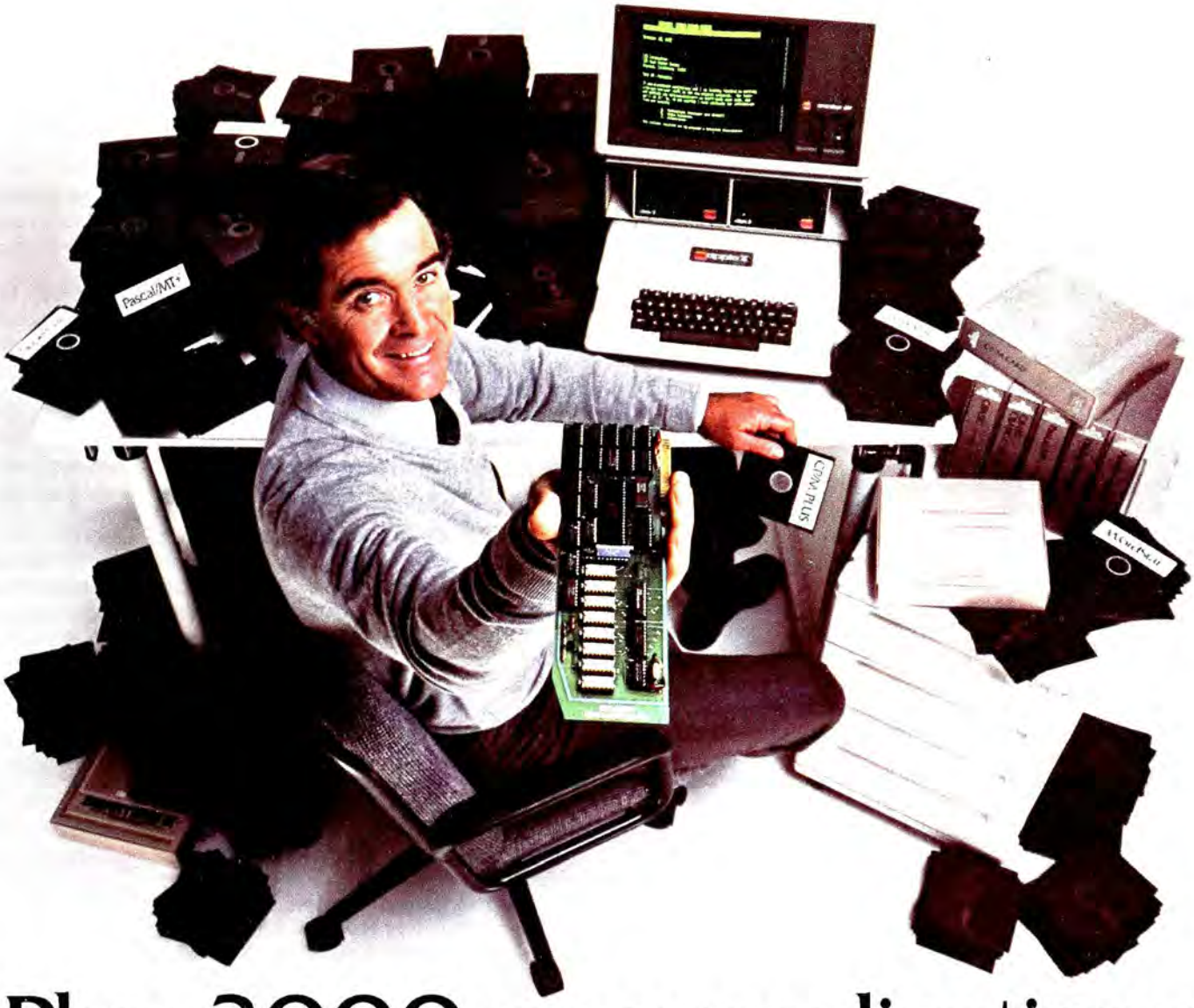
Apple is trying to standardize the user interface for all user programs. To this end Apple has made available a set of Applesoft routines for menu creation, input, output, and computer identification. These routines can be used to make programs that are compatible with all three Apples but can still make use of the new features of the IIe. The routines are provided with the new Applesoft tutorial manual. I would recommend that anyone interested in writing commercial programs get hold of these routines and use them. Apple has also written a manual of Apple software standards that is available free through any Apple dealer.
Douglas C. Peterson, Antioch, CA

Help off the Shelf

I just received my copy of *Softalk* this morning and would like to respond to Jim Rebeck, the gentleman in Open Discussion who'd like information on Pascal.

I am currently studying Pascal at San Diego State University. The text they use is superb! It is designed around standard Pascal and should present no problems in transfer to Apple Pascal. The book is *Oh! Pascal!*, by Doug Cooper and Michael Clancy, published by W. W. Norton, 500 Fifth Avenue, New York, NY 10110. The book should be available through university bookstores. I can't say enough about this book and its ability to provide insight into functional problem-solving in Pascal.
Michael Simonds, National City, CA

In the April Open Discussion Jim Rebeck asked for suggestions on books for Apple Pascal. As a fellow novice to both microcomputers and Apple Pascal, I have all too often found that my questions could not be answered by the supplied manuals. I thought I was alone until I spoke with many of my friends who also think the supplied manuals leave much to be desired.



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On the suggestion of a friend, I purchased a book entitled *Apple Pascal: A Hands-On Approach* by Arthur Luehrmann and Herbert Peckham. This volume has proven to be a most valuable source book for learning both the language itself as well as the peculiarities of the Apple Pascal system. My wife and I are now enrolled in a Pascal programming course at the local college, and after spending many frustrating hours with the recommended text, we have opted to use the far superior book by Luehrmann and Peckham. Of all the various documentations I have read, this volume is the best by far. I highly recommend it for all beginning Apple Pascal users.

Another excellent source of information on Apple Pascal is the column by Jim Merritt in *Softalk*. The problem with this is that I began reading *Softalk* only a few months back and thus have read the Pascal Path from about part eighteen on. Maybe if enough of us complain, we can get *Softalk* to publish a collection of these articles in one volume, which would be a great supplement to our libraries.

In a slightly different vein, I have a question I would like to pose to all *Softalk* readers (and I hope the people at Apple Computer have their ears on for this one): Does anyone know where, in either of the supplied Apple Pascal manuals, we are told how to route output to a printer and then return control of the system to the console? If this knowledge is given in either manual, it must be written in machine language, for I've searched high and low but to no avail. Apparently this sort of information is to be passed along verbally.

The solution: Immediately preceding the portion of the program that will route output to the printer, the following two lines must be inserted:

```
Close (Output);
Rewrite (Output, 'Printer:');
```

Immediately following that block of printer output, the following two lines must be inserted to return control of the system to the console:

```
Close (Output);
Rewrite (Output, 'Console:');
```

It's amazing that something that seems so vital as routing output to a printer has been ignored in the Apple Pascal manuals, and I hope that newer versions will include these simple instructions. As a matter of fact, maybe Apple could arrange to include the Luehrmann and Peckham book as part of the Apple Pascal system!
Kenneth Buchholz, Bordentown, NJ

A First and Final Insult
I have a question and a problem. I thought that the "MON I, C, O" (Apple II Plus, Applesoft) displays what is written to the file. Yet when writing to a random access file from an Applesoft program, the display appears normal, but occasionally no entry is made in the file. The problem occurs in a large personal accounting program I've written. The program involves using a random access file to preserve detail entries in any of sixty different accounts. When the error occurs, there's no indication the disk entry has not been made, unless later in the program I try to read the detail entries. I've checked everything I can think of. The file is open (it must be read at the start of the program to initialize the arrays in the program), the command preceding the control-D DOS command ends with a carriage return, the displayed "MON I, C, O" is similar for each entry, but occasionally the file entry is not made. The final insult is that if I make an entry into the dividend account and then the groceries account, the dividend is not entered but the groceries is. By simply reversing the order of these two entries, the program works fine. Any ideas? Why does the display incorrectly indicate that the entries were made to the file?
Al Goodwin, Fountain Valley, CA

Three-Cee-Pee-Em
I am very much interested in the *dBase II* database program. The problem is, how do I CP/M my Apple IIIs? SoftCard III is supposed to do the trick. An acquaintance of mine bought the card, but is unable to make *dBase II* work on the Apple III. I understand Z-card and Applicard are for Apple IIs. If they could boot *dBase II* on my Apple III in Apple II mode, I would consider them. Can fellow readers of *Softalk* offer me any help?
Larry Freeland, Harrisburg, PA

Room for Enhancement
I am interested in buying a DOS enhancer such as *Diversi-DOS*, but I would like to have both the speed of an enhancer and the storage space of my *Rana Elite One*. I have had trouble making even minor modifications with Beagle Bros's *DOS Boss*, which, by the way, is a useful and fun utility. If anyone can offer me advice, I would truly appreciate it.
Stewart Loving-Gibbard, New Haven, CT

Statistically Speaking
I have a need for some apparently specialized statistical software that I hope fellow readers of *Softalk* could help me locate. Specifically, I am looking for cross-tabulation or contingency table programs and a program that would do a discriminate function analysis. I am using an Apple II. Any suggestions?
George V. Hutchinson, Helmuth, NY

Taking Care of Business
I purchased Apple Business Basic with my computer and, as I'm new to programming, I've not been able to find any examples of programs written in the language. If anyone knows of some examples, I'd be very appreciative.
Kenneth D. May, Marlborough, MA

Recreational Computing
Our home was built with two-wire electrical service. Is there some solution to grounding my computer system, short of rewiring the whole house? I've been taking the precaution of unplugging every time I turn off the system. This makes any clock/time applications impossible.

Actually, I'm set up better with my computer in our travel trailer when we're hooked up to power in a trailer park. I must admit that I haven't tried this on a weekend vacation yet, but I will one of these days. Is there any feasibility to hooking up with battery (twelve-volt) power in a "dry" campsite?

Has anyone tried this fun combination—RVing with a computer?
Paul B. Brumbaugh, Inglewood, CA

Travelers' Aid
My wife is the owner of a travel agency, and I need to find some software packages for my Apple II that she can use in this business. Any help from fellow readers would be appreciated.
David Austin, Ames, IA

Just What Icarus Needed
My main profession involves aviation, flying all over the world at various times of the year. I would like to use my Apple II Plus in that endeavor. My goal is to find software that, given inputs of latitude/longitude, air speed, takeoff time, and so forth, will produce a hard copy of a flight plan of headings, distances between waypoints, time of flight, fuel used (given fuel consumption), and the like. In other words, a flight plan that can be used in the air. It would be nice to put in a database of navigational aids around the country and extract VOR or VORTAC data from it. If you're familiar with the Texas Instruments TI-59 aviation module, it's that data I'm seeking. That chip is more than four years old; so I would expect a state-of-the-art version for the microcomputer, but I haven't seen anything like that in my readings of many computer magazines.

If anyone can help me with this or direct me to someone who can, I'd certainly appreciate hearing about it through Open Discussion.
T. J. Venable, Lemoore, CA

Going Places
Can anyone recommend a transportation algorithm program that works? Osborne/McGraw-Hill's transportation program doesn't work quite right for me. Any suggestions?
Mark Yannone, Phoenix, AZ

Bitextual Transform
I wonder if any other readers can help me with a file-conversion question I have. I recently purchased my second Apple, a IIe, and the new *Apple Writer* written specifically for that machine. My problem is that the old word processor I used was *Apple Pie*, which creates binary files. *Apple Writer IIe* creates text files. Needless to say I have many binary files I'd love to convert to text files.
Mark J. Wolfson, Woodland Hills, CA

Gifts for the Gifted?
I am a teacher, and through a fund-raising program our school has been able to purchase a 64K Apple for our "gifted program." We are in need of any free or public-domain software, as our funds have now been used up. I would be interested in hearing from readers about any

sources of free programs, or a clearing house for students who want to exchange programs. Who can help?
Judith Juskowich, Morgantown, WV

Turtle Calling Machine
I would like to learn to write my own assembly programs and interface them with Logo. Where can I turn for this kind of help?
Douglas Clements, Kent, OH

ASCII Question
I have an Apple II Plus, and I was wondering if there is a way to print ASCII character codes past 96 without a printer, and without having to make any modifications in the computer?
Andrew Fishburn, Plattsburgh, NY

Go Softly into the Print
Perhaps this is old hat to you hackers, but after the search I've been through I thought it just might be helpful to some neophytes. These two programs will enable you to turn an Epson MX-80 printer on and off from Applesoft without the complicated procedure normally required.

```
10  REM  ****************************
12  REM  * MAKE EXEC 1 *
14  REM  ****************************
20  D$ = CHR$ (4)
30  PRINT D$; "OPEN PR ON"
40  PRINT D$; "WRITE PR ON"
45  PRINT "PRINT:PRINT" + CHR$ (34) +
    CHR$ (4) + CHR$ (34) + CHR$ (34) +
    CHR$ (80) + CHR$ (82) + CHR$ (35) +
    CHR$ (49) + CHR$ (34) + ":PRINT" +
    CHR$ (34) + CHR$ (9) + CHR$ (34) +
    CHR$ (34) + CHR$ (56) + CHR$ (48) +
    CHR$ (78) + CHR$ (34)
50  PRINT D$;"CLOSE PR ON"

10  REM  ****************************
12  REM  * MAKE EXEC 2 *
14  REM  ****************************
20  D$ = CHR$ (4)
30  PRINT D$;"OPEN PR OFF"
40  PRINT D$;"WRITE PR OFF"
45  PRINT "PRINT:PRINT" +
    CHR$ (34) + CHR$ (4) + CHR$ (34) +
    CHR$ (34) + CHR$ (80) + CHR$ (82) +
    CHR$ (35) + CHR$ (48) + CHR$ (34)
50  PRINT D$; "CLOSE PR OFF"
```

The procedure is to have *Make Exec 1* in memory and the disk you saved both programs on in drive 1. Put the disk to be copied onto in drive 2. Use the command *catalog,D2* (because *run* does not allow parameters), and then the command run. This will copy to the disk in drive 2 a text file named PR On.

You can then copy to other disks with PR On, or shift immediately to *Make Exec 2* with the command *Load Make Exec 2,D1*. Use *catalog,D2* to shift the default drive, and then use run to copy to the second disk with PR Off.

Now the commands *exec PR On* (D1 or D2) and *exec PR Off* (D1 or D2) will turn the printer on or off if the disk with the program on it is in the called drive. Parameters are sometimes optional, and this can be accomplished without disturbing the Applesoft program in memory.
Joe Fulford, Pacifica, CA

The Feasibility of Dreams
I have a hardware question that I would appreciate some comments on. After purchasing a Prometheus Versacard, I realized that the parallel function of the card can replace the printer card I am now using. However, I had been considering replacing my current card with the Super-MX interface card from Spies Laboratories, because of its superclean fonts. But, in a magazine review, I read that the print modes (and I assume the standard print modes are included) will operate only on one line at a time. This being the case, I envision either swapping out printer cards, or else having numerous connectors hang out the back of my Apple and having to swap them whenever I want some features of one board over another. This brought me to my idea.

Is it possible, without blowing something out, to "Siamese" two Centronics-type printer cards together by joining the cables so that each control and data line is matched—resulting in only one connector that can be left on the printer? In this way, either card could be selected by the pr# command, or a simple change in my word processor system program.

Is something like this feasible, or am I just dreaming of a simpler world? I would really like to hear from any readers who are familiar with this hardware. How about it?
Steve Nelson, Arlington, TX

Changes To Be Made
Help! I have a Centronics 739 printer and an Apple parallel printer card. I have found two major problems with this setup. First of all, the printer card defaults to forty columns. Every time I get a program that uses the printer, I have to change the program to send a "control-I 80n" to the printer. This is a pain but I can usually do it (I am still working on *VisiCalc*). Does anyone know how I can change this? I would like the card to default to eighty columns. I know machine language, and I have tried to change the memory of the printer card, but it seems to be ROM. I would rather not buy a new card. My other problem is finding a graphics-dump program for printer setup. I have tried two different programs and not one of them has had a setting choice that's worked with my printer. All the choices were for other printers, mainly Epsons. Does anyone know of a program that would work? My manual says the printer has graphics capabilities but tells little about using them. I'm really surprised that I haven't seen any articles about my printer in *Softalk*, yet I read about the Epson.
Adam Taub, East Rockaway, NY

Second Referenced and More
There is an inexpensive solution to Rodney Hixon's desire to teach Pascal to his Monroe High School students.

Apple Pascal, by Arthur Luehrmann and Herbert Peckham, published by McGraw-Hill, offers a good beginner's text for Apple-specific Pascal. I have found it to be effective in teaching me. If you want to avoid having to buy a second disk drive for each Apple at school, this book's for you, as it was written for use with a single-drive system. All examples and references are for single-drive situations. The Pascal Language System from Apple includes disks that allow booting and operating in a single-drive environment, and *Apple Pascal* teaches in that environment. I believe it will be time well spent to review a copy of that text. The only purchase necessary would be a language card.

This would be an inexpensive way to offer Pascal to your students. As you mentioned, there are applications that can be better solved with languages other than Basic.

To Tom Parker: *File Cabinet* is probably not the best choice for the database you're maintaining. Since you have it and have probably already spent a lot of time on it, I'll address that package.

I have an Epson printer that I use with *File Cabinet* and the Apple II Plus. The printer routines in *File Cabinet* are not correct for operating the Epson. You will need to alter about three lines in the program to have a match. Lines 5230 through 5300 have the printer routines and should read:

```
5230  PRINT D$"PR#1": REM D$ IS
      CTRL-D PR#1 IS PRINTER SLOT
5240  RETURN: REM TURNS ON PRINTER
      IN DEFAULT MODE
5250  PRINT D$"PR#1": REM D$ IS
      CTRL-D PR#1 IS PRINTER SLOT
5260  PRINT "80N": REM "CTRL-I 80N"
      CONTROL-I IS EMBEDDED
      BETWEEN THE FIRST QUOTATION
      MARK AND 80N. ALLOWS 80
      COLUMN OUTPUT TO THE
      PRINTER.
5270  RETURN
5280  PRINT D$"PR#1": REM D$ IS
      CTRL-D PR#1 IS PRINTER SLOT
5290  PRINT "80N": REM "CTRL-I 80N"
      CONTROL-I IS EMBEDDED
      BETWEEN THE FIRST QUOTATION
      MARK AND 80N. ALLOWS 80
      COLUMN OUTPUT TO THE
      PRINTER.
5295  PRINT CHR$ (15);: REM 132
      COLUMN OUTPUT (COMPRESSED
      MODE)
5300  RETURN
```

For your application, I would recommend the database program on the *Softdisk* bonus currently being distributed. The address of *Softdisk* is 3811 Saint Vincent, Shreveport, LA 71108. That database is freeform, allowing you to enter key words, phrases, dates, names of publications, authors, and any other pertinent data related to one of your news clippings. Then, you can call up any or all of them by asking for matches to words or phrases you supply. The reason this database would meet your needs better than *File Cabinet* is that the entire record is one string of up to 250 characters, and the string can contain any combination of characters/words you want. This would be useful in recalling a record. With *File Cabinet*, you have to define fields prior to establishing a file, and then you're rather constrained by these definitions.

Another database program I have found to be more powerful than *File Cabinet* is one written by Mark Pelczarski. It is available in *Cre-*

ative Computing, September 1982. The title of the article is "A Modular Database for the Apple." It is a disk-based random-access database and has a powerful formatting routine for printing your data. It also allows "and" and "or" search for up to eight criteria. I have moved all my data from *File Cabinet* to Mark Pelczarski's database.

For your application with the clippings, I believe the most appropriate database program would be the one available from *Softdisk*, but I am sure you would find the other one useful for other applications.
William G. Gentry, San Francisco, CA

Preseason Preparations
My high school football team has asked me to try to locate a database to run on the Apple II Plus that can be used on the field during play. Can anyone help? We would like to keep track of play options used by opposing teams and use this information on the field in making spot decisions on counterplays. It would also be valuable to keep track of statistics on opposing players, as well as on our own players. Have readers any suggestions for a database that could accomplish this?
Philip Arnold, Battle Creek, MI

A Dose of C
Softalk has consistently gone to great lengths glorifying such languages as Pascal, Forth, Ada, and even (horror of horrors) Basic. I have a basic reading knowledge of each of these languages, and can even dabble occasionally in 6502 assembler. However, anyone who has ever programmed on a bigger machine is bound to be frustrated with any eight-bit cpu, and such "user-friendly" languages as Pascal are not very useful for writing compilers and operating systems. Has no one come out with a C compiler for the Apple?

Simply put, C is the least complicated, fastest, and least obtrusive of all the compiled languages I've ever seen. Hence, it is the preferred language of most system programmers I know. While languages like Fortran and Pascal compile tons of information on any variable being passed to a subroutine, C passes the bare minimum. This means that it doesn't waste time checking that every reference to a subscripted array is in bounds. It also avoids the strict type-checking of Pascal and Ada, making it simple to pass addresses of functions as arguments, or to have a data type "pointer to a pointer to a pointer . . ." ad infinitum. In short, C allows the programmer full access to the innards of his machine without bothering him with the nitty-gritty of an eight-bit architecture.

If anyone knows of a software company marketing a C compiler, kindly let me know.
David Rabson, Cambridge, MA

Adaptable Apple?
I have been receiving information regarding software to go along with Apple II computers. Specifically, my interest is in computer graphics software. I do not own an Apple II yet because I would like to clarify several things first.

Can an Apple II be used in Israel and adapted for 220 volt and 50 Hz? Or is it available in that format in Israel or in Europe? Can the American software be used as is with 220 volt 50 Hz? If not, can it be adapted readily? Can the Apple software produced by Apple and others be adapted for other hardware made or used in Israel?

I plan to relocate to Israel soon and would appreciate the assistance and suggestions of Apple users that know these answers.
Joseph Ben-Israel, Chicago, IL

Classics Contest Contested
I was very disappointed in *Softalk*'s handling of the Softalk Classics Contest. The disappointment is due as much to the failure to print the winning entries as it is to the negative manner in which you portrayed my entry.

I feel very complimented with your initial statement that the entry "almost had us convinced," but you went on to take a statement out of the entry and use it to show why I didn't win. I don't see the purpose in doing that. In picking me out for what ultimately will be read as a condemnation, you wasted space that could have been better served by presenting the winning entry of either Alan Fedder or Shawn Smith.

Furthermore, I don't see the wrongness of the analogy. While I'm a teetotaler, my father is a vintologist, and he assures me that wine is often referred to as being "refined by time" in his circles. Since *Beneath Apple Manor* has been refined in the passage of time since it first came out, I think it is a perfectly fine analogy.

In retrospect, I should have said, "Like an apple cider that has become more refined with time, so has *Beneath Apple Manor*."

As usual, the letters column in the April issue was rife with interesting comment.

To Norman Jonston: Pirating software is wrong. It is difficult to compare software with reading material since one is interactive and the other isn't. It's quite possible to get use out of an extract from a book. An extract from a software program is usually just so much useless code. Photocopying extracts doesn't hurt sales. If the need for the material is extensive enough, the book will be bought rather than photocopied at the rate of ten cents a page.

I don't have any pirated programs in my library; but then again, because I'm cheap, I don't have many store-bought programs in the first place. The ones I have bought, with two exceptions, are copyable. Like Richard Ekblaw, I choose to buy only copyable software. I have the original *Apple PIE* word processor. It would have been easy to pass around complete copies of the program for a few dollars, but that's what helped drive Programma International to the ground to begin with. May I repeat, piracy is wrong!

To David B. Grott: You have to be reading the wrong magazine.
Gary MacPherson Mugford, Bramalea, Ontario, Canada

Busy Septuagenarian Sees a Difference
You have just proven, David G. Grott, that no matter how good a thing is, there will always be someone so blind that he will fail to see it. The four Apple texts received with my purchase, plus *Softalk*, were excellent in teaching my seventy-year-old mind to do taxes, keep track of my craft business, make music, create shapes, write machine language, and in many ways enrich my life. You have further proven to a former Schenectadian that Poughkeepsians are "different."
E. M. Frederiksen, Marietta, GA

Peek 1984-Plus
I am a dedicated reader of *Softalk*, and I'd just like to say that it's a wonderful period of technological history that we're living in today. Now I know all about nuclear arms and terrorism, but we must learn to think only optimistically. Our contribution (that of the microcomputer industry) will ultimately shape the future and determine our quality of life. Our vigor and enthusiasm will be looked upon in the same way as we view the creativity and dazzle of the early years of the silver screen.

I realize that we have many problems to solve, like software piracy. But if we can create the *VisiCalc*s and the *Wizardry*s and the *Screen Writer*s and the *Zork*s and the . . . why can't we create a subroutine to conquer the disputes we encounter today? If we don't find solutions to these problems today, future generations will end up with even more problems to solve.
F. Christopher Holsenger, Friendship, OH



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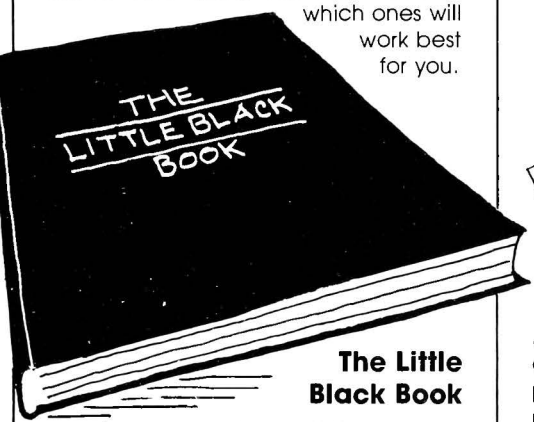
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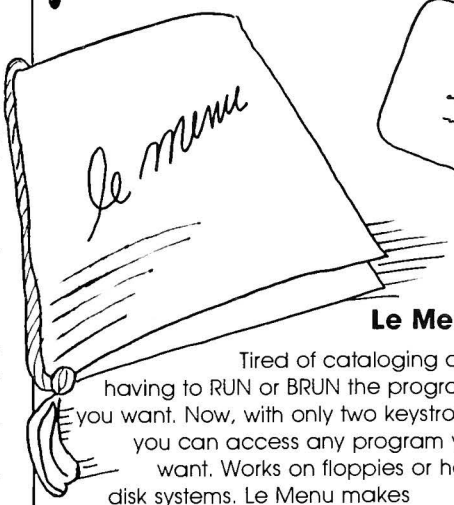
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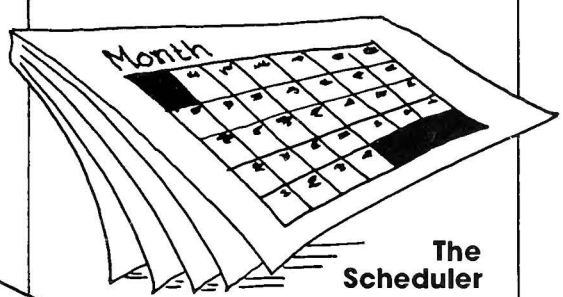
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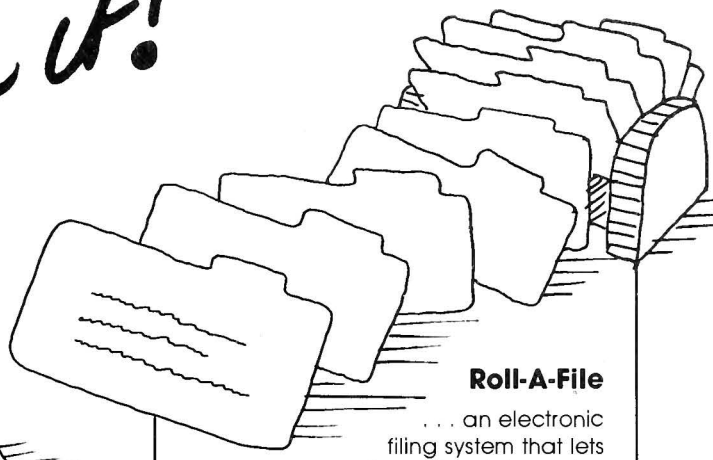
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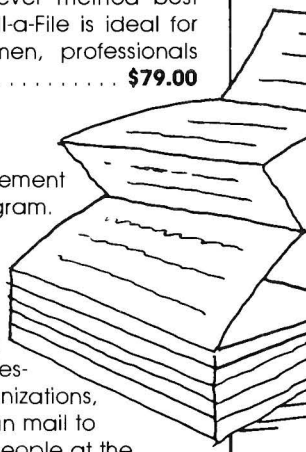
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BY DAVID HUNTER

EXEC AMDEK



WINDOW TO THE

The story of Amdek Corporation is fundamentally different from, and at the same time essentially the same as, most of the microcomputer-company stories that regularly appear in this magazine. It's a story that features an entrepreneur, a part-time consulting engineer, an energetic sales manager, and an island country called Japan.

Like a lot of other companies that have started up since the introduction of personal computers, Amdek is basically one individual's baby, though the business has long since passed the days of qualifying in anybody's book as a "garage business." Amdek is another friendly company run by one of the industry's most respected gentlemen—who started the firm with his own money, having left a secure spot in the everyday business world for the craziness of the young microcomputer industry.

The main difference between Amdek and other companies featured in the past is that the Illinois-based firm is not strictly an American operation. In fact most of the products Amdek offers are produced in Japan and Taiwan by independent manufacturing companies.

The Far Traveler. Go Sugiura, president and founder of Amdek, left his native Japan about twenty-three years ago. Since then, he has lived in Caracas, Venezuela, and the western suburbs of Chicago, following the same basic calling for six years at the first location and seventeen years at the latter.

The importing and selling of electronics products produced in Japan is a way of life for Sugiura—an exciting, hectic, sometimes risky way of life. Since the summer of 1977, Sugiura has been in business for himself, and the risks and excitement have doubled, and then tripled. In seven years Sugiura has gone from managing the sales office of a Japanese company to heading his own company—a journey that has had both rough turns and stretches of unbelievable progress.

Seventeen years ago in Caracas, Sugiura was in the right place at the right time. He was working in the business of importing different product lines from Japan.

"One of the companies I was dealing with wanted to open a sales office in the United States," Sugiura recalls, "but they didn't have qualified people at that particular moment.

"So they came to me and I saw that there was tremendous opportunity in the U.S.—the biggest market in the world—business opportunities and career opportunities. So I decided to move to the States."

This year Sugiura may be more thankful than ever that he made this decision; it has taken him far from his homeland and yet has brought him wealth, security, and the promise of more opportunities and even greater rewards in the future. Amdek is a company on the move.

Enter the Consultant. In the last two and a half years, Amdek has had a personnel increase of several hundred percent and a shift in emphasis that has turned the company into a purveyor of an exciting line of peripheral products for a number of different personal computers. Amdek's success has been realized through the efforts of many people, not the least of whom is the company's director of engineering Ted McCracken.

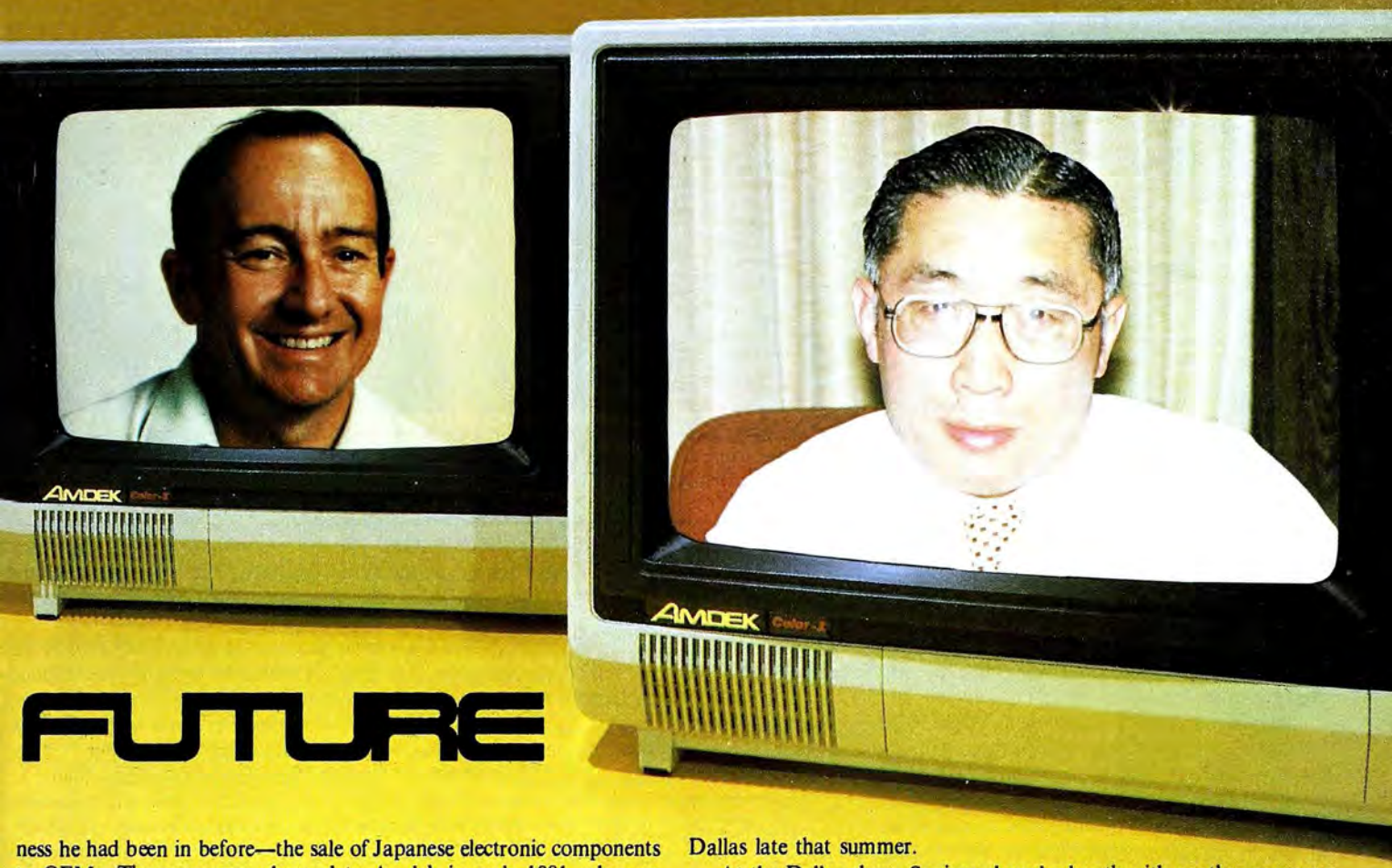
After earning the master's degree in electrical engineering from the University of Missouri at Columbia, McCracken worked for RCA designing disk drives for minicomputers. In 1971, RCA left the minicomputer business and McCracken soon ended up back in school in Missouri. While he earned his Ph.D., McCracken also worked at the University of Missouri, and after graduating he took a temporary faculty position there.

In 1976, when the first microcomputers were appearing, McCracken started a consulting group to design interfaces for minicomputers, specializing in Perkin-Elmer's line of business machines. Sometime that year, McCracken's and Sugiura's paths crossed for the first time, under less than ideal circumstances.

McCracken was consulting for a bank that was foreclosing on an electronics company. Sugiura had sold components to the company on an open account and never received payment. In the process of meeting with the bank, Sugiura met McCracken, and, despite the gloomy atmosphere at the time, a lasting friendship began. In the following year, Sugiura called on McCracken frequently for advice.

When he first struck out on his own in the summer of 1977, Sugiura called his company Leedex. It was basically a continuation of the busi-

The men behind the monitors. Go Sugiura, far right, is the president and founder of Amdek. Ted McCracken, center, a former computer store owner,



FUTURE

ness he had been in before—the sale of Japanese electronic components to OEMs. The name was changed to Amdek in early 1981, when an Ohio company called Ledex, which made connectors and small motors, voiced displeasure over the confusion that had arisen among some consumers. "We had no choice but to change it," says Sugiura.

Sugiura began thinking about importing monitors around the same time that McCracken saw his first Apple. "It was in June 1977, at the NCC in Dallas. Mike Markkula was demonstrating it and I thought it was a good little box," says McCracken. His own experiences gave McCracken an appreciation of how difficult it is to make a complete computer system, with a case, software, graphics, and so on.

Midwestern Dealer. McCracken had so much appreciation for the machine that he decided to open an Apple computer store. He flew to Cupertino and met with the folks there. Subsequently, he became the first Apple dealer in the state of Missouri, but not for long, as it turns out. McCracken says the store just never got off the ground.

One day McCracken got a call from Sugiura who was asking for advice, as usual, and a little more this time. Sugiura had found a monitor during his travels to Taiwan that he thought might interest Atari, which was just getting into the arcade business with its black-and-white *Pong* games. Sugiura asked McCracken for technical help before showing the monitor to Atari.

"It was obvious there was no way it would meet Atari's needs," says McCracken. "I told Go it wouldn't do, but if it was modified somewhat it would be good for the Apple."

The only other monitors available at that time for the Apple, besides owners' television sets, were the Sanyo nine-inch black-and-white models. Sugiura and McCracken decided that it might just be worthwhile to modify the design of the existing monitor, import the redesigned monitors in quantity, and sell them to Apple owners for a cheaper price than they'd pay for the Sanyo model.

After making modifications and improvements, Sugiura and McCracken took what they called the Video 100 monitor to the West Coast Computer Faire in the spring of 1978 and to a computer show in Dallas late that summer.

At the Dallas show, Sugiura shared a booth with another company for the modest fee of three hundred and seventy dollars for a ten-foot-by-ten-foot space. "We put the monitor on a desk with a character generator on the Apple and waited," says Sugiura. "Very surprisingly, there was a favorable reaction during the show."

Off on the Right Foot. Sugiura remembers his first production commitment to the factory in Taiwan for five hundred monitors as quite a gamble. In international purchases, everything is paid up-front. If the monitors didn't sell, Leedex would probably have folded. Luckily, the gamble paid off and that first batch of five hundred sold.

Through 1979 and 1980 Sugiura, with the help of McCracken on more or less a consulting basis, continued to pursue the microcomputer market. In the fall of 1980, Sugiura decided to introduce a color monitor—today's Color-I. Prior to this there had been great demand for a color monitor, but Sugiura had not been able to find a suitable model in his frequent trips to Japan and Taiwan.

From the time of its introduction, the Color-I was a hit and fueled Sugiura's further ventures into the color monitor business. By the end of 1980, Sugiura had more or less phased out the selling of electronic components and was concentrating on peripherals for microcomputers. McCracken stayed in Missouri, dividing his time between teaching at the University of Missouri in Rollo and consulting for Sugiura.

Each year, McCracken has devoted more time to Amdek. This year he finally "gave up" teaching for a while and took a year's leave of absence from the University of Missouri faculty. McCracken says he's planning to return to teaching but adds that he's having "too much fun right now to miss it."

Sugiura looked next at higher-resolution color monitors; eventually, he approached Hitachi about an RGB monitor they were manufacturing. At the time, Sugiura says, the retail cost had to be around a thousand dollars per monitor, and he said to himself, "Boy, there'll be nobody who'll pay a thousand dollars for a color monitor, but as long as we have a sample let's show it." This was just before the West Coast Com-

is now Amdek's director of engineering. Dan Rimes, left, never had a formal education in sales and marketing, but he's taken on those jobs at Amdek.





McCracken and Sugiura are pictured here on the top of Mt. Fuji. McCracken, who jogs up to seven miles a day, convinced Sugiura, who swims a mile a day, to climb to the top of Japan's famous volcano on one of their frequent trips to the island country. Sugiura, who was born in Japan and left the country twenty-three years ago, had never made the climb before. Sugiura and McCracken are in the business of importing products from the Far East, but they feel that the major technological innovations are still coming from the U.S.

puter Faire in early 1981.

Once again, Sugiura and McCracken were surprised at the favorable response. They left the show thinking they could sell perhaps five hundred RGB monitors a year. They also came away with the comments of Color-I users on their minds. A common complaint voiced at the Faire was that the Color-I did not work with any of the currently available eighty-column boards.

Soon after the favorable showing of the RGB monitor at the Faire, Sugiura made a commitment to the factory for five hundred units and at the same time got into the expansion board market with the Digital Video Multiplexor—a card necessary for the Apple II to interface with the RGB monitor. The DVM includes an eighty-column option and is one of the few Amdek products manufactured in this country.

The Color of the Beast. For a number of reasons, 1981 was the real beginning of Amdek's success. The RGB monitor (Color-II) really took off when IBM announced the IBM Personal Computer. This opened the door for a lower-cost RGB monitor (Color-III), which Amdek started selling in early 1982.

In November 1981 a key individual joined the Amdek staff in the person of sales manager Dan Rimes. Rimes, whose varied background included running his own microcomputer business and working for companies like Heath and Autotrol Technology, says that he had "a nice background in high-level graphics." One day he wrote a letter to Sugiura and introduced himself, laying out a possible marketing plan.

In the last year, Rimes and his growing staff of sales and marketing people have worked very hard to get Amdek's name known and accepted by consumers. "It's really exciting when people walk in a store and ask for Amdek by name. You have no idea what it took to achieve that. I still think of us as 'little Amdek.' "

Well, "little Amdek" has now expanded into four different locations and more than forty-five employees. The company is headquartered in the Chicago suburb of Elk Grove Village, where Sugiura and Rimes are based. McCracken has a team of eleven engineering personnel working with him in Rollo, Missouri, and last year Amdek opened two sales offices, one in Dallas and one on the West Coast in Costa Mesa, California. The latter location is also the main warehouse, which receives all the merchandise shipped from overseas.

Sugiura says there is a loose structure to the operation of Amdek because the company is still developing at a rapid rate. He has no vice presidents or board of directors officially, but that situation is bound to change. Jim Ray, formerly with Northwestern Industries, has just been hired to handle the finances, freeing Sugiura from the day-to-day problems he has dealt with admirably for so long.

Another key individual is Steve Wilson, who joined Amdek in November 1982 after working for RCS, a distribution company in Los Angeles. Wilson is the manager in charge of sales at Amdek's Costa Mesa sales office.

Musically Uninterested. In 1981, Sugiura began to work fairly closely with a company in Japan called Roland. Initially Amdek and Roland planned to do worldwide distribution together, but Sugiura says that halfway through the project the two companies went in different directions. There is still some confusion surrounding this story, because during the time the two companies were working together Roland set up a division called Amdek and then never changed the name when the two parted ways.

The difference in opinion, or direction if you will, centered on Roland's commitment to the music market, which Sugiura says "we didn't really have an interest in. We're strictly a peripherals company."

McCracken also found the idea of music systems unappealing: "From my standpoint—the technical side—what I know about music you could print on a fingernail. The Amdek company in Japan is also into lots of kits for hobbyists. Nowadays, the U.S. market for kits is dead,

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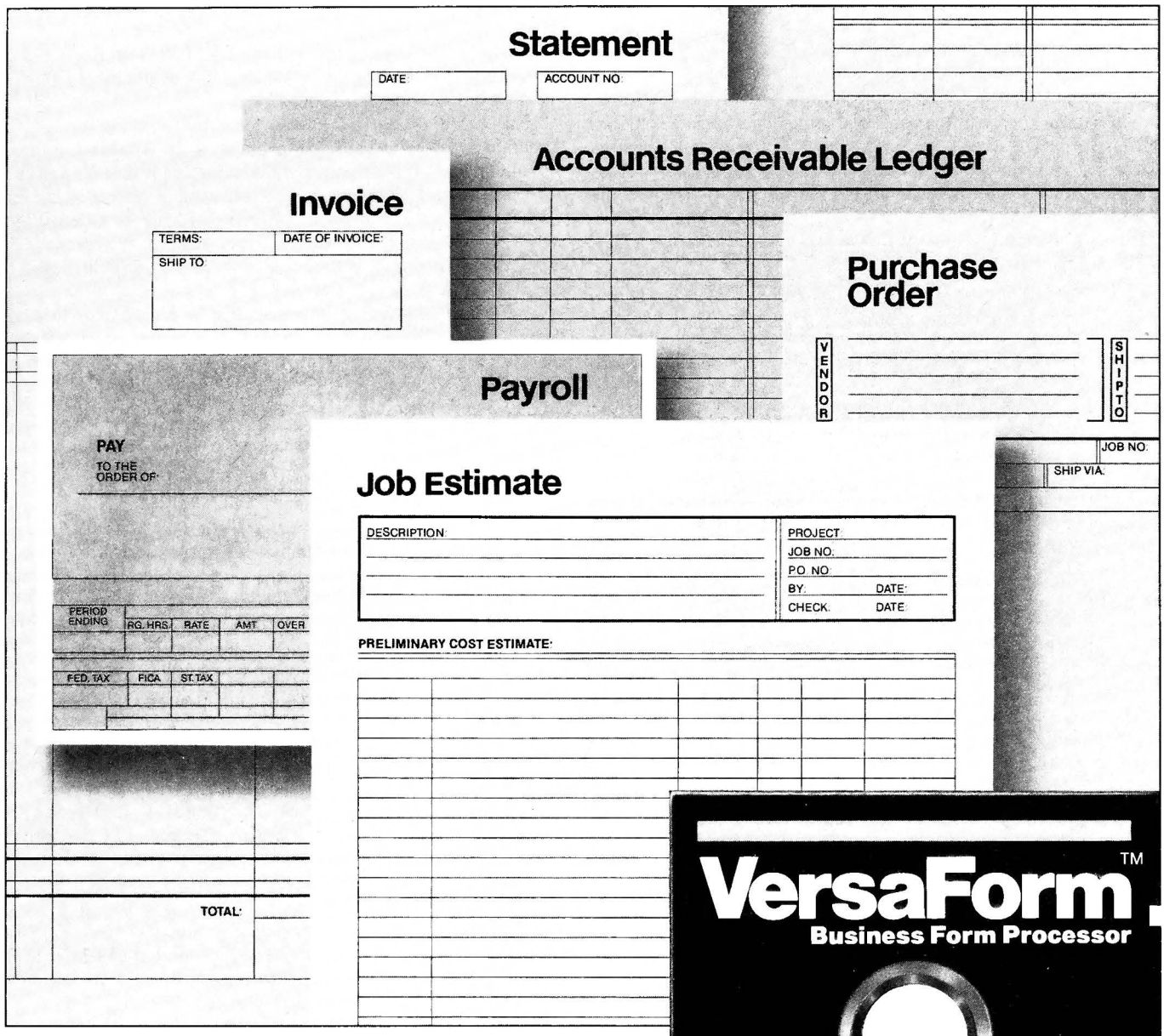
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dead, dead, dead. I told Go something to the effect of, 'We go into kits over my dead body.' "

Sugiura admits that the situation is confusing and so does McCracken. As it stands, there are still two Amdeks, though Sugiura's division doesn't market in Japan, and the Amdek in Japan doesn't market here. According to McCracken, Europe is the one place of possible confusion, and Sugiura's Amdek is planning to market heavily there in the not-too-distant future.

"But we're all on the same team," McCracken says. "It's just a matter of finding the best way to sort it out."

For the American Amdek, the affair was not a total wash. Sugiura did pick up a one-pen plotter—now known as the Model DXY Plotter—from the Japanese Amdek and has been selling it in the American market. He says there is always the possibility the two companies will do something together in the future.

Instinct for Survival. Amdek's gradual moves into plotters, DVMs, and now microfloppy disk drives is in response to the pressure the company is feeling from certain areas—it can't survive as just a monitor company, says Sugiura. The major computer manufacturers, such as Apple with its Monitor III, have got their act together and are starting to offer their own monitors.

The prevailing thought now among the three—Rimes, Sugiura, and McCracken—is that Amdek has to offer high-quality products that have a little something extra. This trend started with the added value of peripheral cards—complete with software—that were, and still are, sold with the RGB monitors.

Amdek is also starting to bring out more products that complement their monitors. Rimes refers to these new frontiers Amdek is exploring as cross-marketing—collaborating with third-party vendors. This month, Amdek is releasing DVM II, which is an upgrade of the DVM that includes at no extra charge the *Amgraph* business software, produced by Business & Professional Software, for creating graphs and charts. Users can also use the DVM II to upgrade from a monochrome monitor to the Color-II.

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Amdek is also coming out with the DVM 80e—an RGB, eighty-column-compatible card for the Apple IIe. Once again, the *Amgraph* package is included at no extra charge.

The Incredible Shrinking Disk. The most exciting product for the Apple that Amdek is just starting to ship is the Amdisk I, a three-inch microfloppy disk drive. Sugiura and McCracken realize it's a risky product, but the two are confident that it will achieve success on the market.

"There's a lot of confusion right now, with all the different kinds of sub-five-and-a-quarter-inch drives," says Sugiura. "Everyone is saying they have the standard, but we believe there is a possibility it will be the three-inch."

The Amdisk I drives are manufactured by Hitachi, and, McCracken notes, in Japan the three-inch drive is more or less becoming the standard. "Sony is the only company making three-and-a-half-inch drives. Companies like Mishusta, Cannon, and others are all making three-inch drives. Whether or not three-inch becomes the standard in this country, you're still going to see a lot of Japanese portable computers in the next few years with three-inch drives."

Both Sugiura and McCracken believe that Amdek is the only company actually shipping sub-five-and-a-quarter drives in the U.S. They are actually six months behind schedule, says McCracken. The original model Hitachi showed them had less than acceptable performance levels because of a problem with the read/write head. Amdek asked Hitachi to make modifications, and that delayed the product's release.

Two or three months ago, McCracken was still very skeptical about the three-inch drive, but lately he's feeling a little better about it. "Sony did a tremendous job of marketing and made it seem that this country wanted three-and-a-half-inch drives as the standard.

"They [Sony] tried to get the American National Standards Institute to rule on the microfloppy standard in favor of three-and-a-half-inch," McCracken explains. "ANSI rejected it because the Sony drives were not compatible with existing five-and-a-quarter-inch formats."

Flip-Side Coming Attractions. The Amdisk I plugs into the Apple controller card and can act as a primary or secondary disk drive. The magnetic media is housed in a nearly indestructible plastic case. The disks are double-sided and Rimes says it's not unlikely that we'll see some companies, particularly game publishers, using the other side of the disk to include a preview of upcoming products.

The three-inch disks themselves will seem a tad expensive at first—probably $6.99 each. Rimes says that the price will drop with time and that it could very easily have started at ten dollars.

At Comdex this April in Atlanta, Amdek announced that thirteen software companies—including some of the biggest names in Apple, Atari, and IBM software—would support the three-inch-disk format. Those companies are Broderbund, Sirius, Hayden, DataMost, Continental, TMQ, BPS, Sierra On-Line, Penguin, Synapse, Computer Systems International, Tab Books, and PC Software.

Three times a year Sugiura and McCracken travel to Japan and Taiwan to maintain contact with manufacturers and look for new products. "They always have something to show us," says McCracken. "We didn't just decide one day to sell a three-inch disk drive; Hitachi came to us and said, 'Would you like to market it?' There's a tremendous reservoir of products in Japan."

During every trip to Tokyo, McCracken makes it a point to walk around the Akihabara district, where the consumer electronics businesses and stores are concentrated. "It scares the heck out of me. In a sixteen-by-two-block area there are thousands and thousands of television sets, stereos, computers, everything imaginable. And there are always a million people, it seems, sorting through the goods.

"There is a momentum building in Japan, a computer momentum. It's going to be tough to compete with the Japanese on the international level. It's scary as heck how competent they've become so rapidly.

"The whole country is really getting cranked up for going big into consumer computer merchandising. And they're starting to make the right decisions on software. It's going to be tough sledding for some American companies when those Japanese companies start unleashing products.

"Of course I speak with a forked tongue," says McCracken, "what with three Datsun automobiles in my driveway and me working for a

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company that is importing Japanese products as fast as we can get them off the boat."

Over Here. According to Sugiura, the United States represents to Japanese industrial companies the single largest market in the world, and in order to grow those companies must come over here to sell their products.

"They do their homework to come up with marketable products and once they set a goal they go after the market as strongly as possible. Sometimes they'll get a little too aggressive and that will have a reverse effect. That's one of the things we see happening today.

"The Japanese think this is the country of unlimited potential and technology and strength that nobody in this world can match. But at the same time they kinda feel, well, that the U.S. has sat on that power a little too long. Things are too easy here.

"My observation has always been that the consumer in the United States compared to the consumer in Japan is just an angel," Sugiura continues. "American consumers are generally too understanding, too patient. . . . You can use a half dozen unprintable words to describe the consumers in Japan. They don't want to understand. They don't want to be patient. They just demand—more than what they're paying for.

"And that is a pressure felt by the dealers and the manufacturers. That's the big factor that has brought the Japanese products to the quality level they are now at. One of the most common comments I've heard from Japanese companies is, 'It's easy over here in the United States.' "

Sugiura goes on to say that the practices of some American dealers—those who claim to test each product received before putting it on the shelf—would be an insult to a manufacturer in Japan. "In Japan that's totally unheard of—the dealer not trusting the product.

"Over here you may buy a copier and think it's no big deal to pay ninety dollars for a service contract. It's self-admittance that this machine could possibly—probably—break down within the year. Of course there are a lot of factors—cost of labor and so forth—and I can understand that. But in Japan, when you pay three thousand dollars for a machine it's got to last a year or two.

"The basic attitude of the consumers in this country is not applying enough pressure to the manufacturing companies. Whenever consumers have a problem it's either a multimillion-dollar lawsuit against some major corporation or there's no real voice at all.

"In Japan if something doesn't work, they say so out loud. That's the pressure those manufacturing companies feel constantly."

Producing consumer electronic products in Japan is one thing; marketing them in the U.S. is another. To be a success, foreign firms have to have knowledge of the market, and that's where a company like Amdek is at an advantage.

"I've been in this business for almost seven years," says Sugiura. "The manufacturing companies in Japan appreciate our knowledge and marketing expertise."

Although he looks for new products in Japan, Sugiura believes that the major technological developments are still coming out of this country. The Japanese are strong at manufacturing and can always be expected to take existing products and make similar products with improvements. And Amdek will continue to take advantage of this situation.

Window to the Future. A salesman will by nature come up with catchy phrases and Rimes has come up with a fine description of Amdek's past, present, and future. "Monitors," he says, "are windows to a personal computer. And monitors for Amdek have been a window into other areas. Monitors have been the jumping-off point for a whole line of peripheral products."

This year will probably be the most crucial yet for Amdek. With new and challenging products on the market and more on the way, Amdek is taking chances. For Sugiura, McCracken, Rimes, and the rest of Amdek, 1983 should be exciting.

And, though there's always the unpredictable, Amdek has proven they have the talent and experience to adapt to the changing personal computer scene. ■

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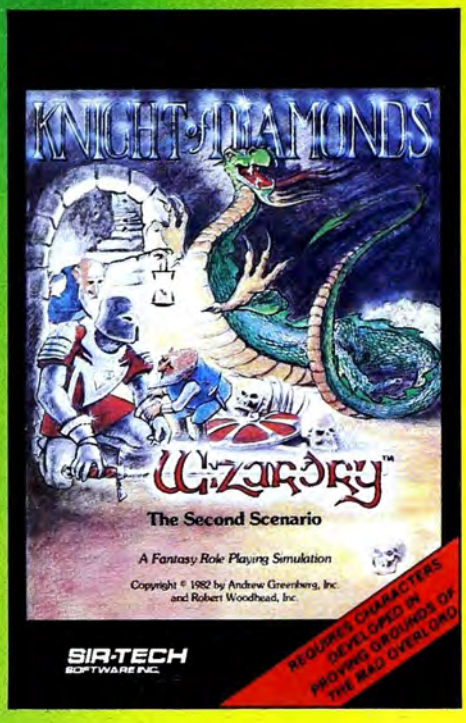
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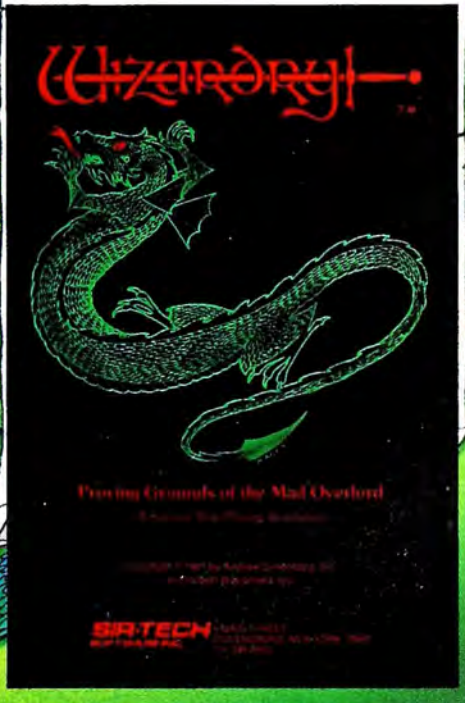
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VENTURES WITH VISICALC

BY JOE SHELTON

Ever wonder how the price of a restaurant entree is determined? What factors would you consider? Making this determination gets complex. An entree usually consists of three or more different types of food and often contains other, less obvious ingredients as well, such as spices, milk, butter, and so on. The size of the portions also affects the price, as does the labor involved in preparing the meal. Other overhead costs include rent, other wages, power, and so on. Finally, the profit must be incorporated. In short, the process is not as easy as just determining the cost of the food and adding a little profit.

This month we'll look at a simple template that a restaurant might use to calculate menu prices. If you aren't in the restaurant business, you might use the template at home to figure out how much you spend on meals and to help determine which meals are really economical.

In addition, everyone who uses *VisiCalc* is in a position to discover hints, short cuts, and new uses for it. The remainder of the column will be used to share some ideas that resulted from readers' responses to previous columns.

VisiCalc a Flambe. The template we're going to design will take into account only the actual costs of the ingredients and labor that go into the preparation of a meal, but it can easily be modified to include fixed costs as well.

First we must realize that every line item on the menu requires calculations similar to the ones we're going to develop. The ideal method would be to have all the line-item prices calculated on a single template. That way, the costs of various ingredients used in different entrees have to be entered only once.

To simplify matters, we're going to assume that the cost for each ingredient is based on the cost for the complete inventory of the ingredient. In an ideal world, a restaurant wouldn't run out of an ingredient before purchasing more of it. So the cost of an ingredient would be determined by the actual cost of the ingredient used, yet the inventory would have a different average cost. You could use average cost, but the only way to make this template truly accurate would be to determine ingredient cost by a standard inventory method such as first-in, first-out. Another option would be to average in the cost and amount of the current inventory with the cost and amount of the new inventory. We won't attempt that here. We'll just go with one cost per ingredient.

Swordfish Royale. Swordfish Royale is an exciting dish that combines the full flavor of grilled or broiled swordfish with a tangy sauce. A half grapefruit (color optional) serves as a counterpoint to the rich, meaty swordfish flavor. Fresh steamed asparagus and cottage fries round out the meal. A dry white wine is recommended.

Our recipe is for two diners. This is an incredibly tasty meal and surprisingly easy to prepare. The majority of the expense is for the swordfish, so the meal can be fairly economical.

Now boot *VisiCalc* and let's begin. If you were doing a master template for a complete menu, you'd start with the individual ingredients in a "variable" section that would include the name of the ingredient along with its current price and the amount of the measure. For example, you might enter flour at a price of five cents, with the measure being per ounce, or you might even enter the price per pound (bag) and then determine the individual measure prices from that. For example, if you paid $1.64 per pound for flour, a recipe calling for a cup would require you to calculate the price per pound divided by the number of cups in a pound. It is important to ensure that the base values for the ingredients in each recipe are the same. Until you are completely comfortable with the different conversions, you shouldn't calculate the price per cup in one example and price per ounce in another.

First, enter the information displayed in figure 1. If you have *VisiCalc Advanced Version*, you can set a wide enough column width in column A to permit the entry of the complete ingredient's name. If you do that, continue to enter the other data in the same cells shown in this article. That way, all cell references made in the article will be correct for you also. When you finish, delete the unnecessary columns and you'll have a completed template.

The next thing you'll want to enter is the costs of the different in-

	A	B	C	D	E	F	G	H	I
1		LABOR/HR	$9.00						
2									
3		INGREDIENT	COST	UNIT	AMOUNT	MEASURE	FOOD	TIME IN	TOTAL
4			/UNIT		USED		COST	MINUTES	COST
5		SWORDFISH		POUND	2	SLICES			
6		SALT		POUND	5	TSP			
7		BLACK PEPPER			1	SPRINKLE			
8		PAPRIKA			1	SPRINKLE			
9		BUTTER			5	TSP			
10		GREEN OLIVES			8				
11		GRAPEFRUIT			1				
12		ASPARAGUS			2				
13		BAKING POTATO			2				
14		OIL			3	TSP			
15								TOTAL COST:	

Figure 1.

INGREDIENT	PRICE	UNIT OF MEASURE
Swordfish	4.00	slice
Salt	.01	sprinkle
Black pepper	.01	sprinkle
Paprika	.01	sprinkle
Butter	.15	oz.
Green olives	.05	ea.
Grapefruit	.95	ea.
Asparagus	.67	ea.
Baking potato	.95	ea.
Cooking oil	.05	oz.

Figure 2.

gredients. Figure 2 is a list of example (totally inaccurate) costs. When actually using the template for your own costing, you'll of course want to enter your own costs.

First enter the costs in the appropriate cells in columns C and D. Next let's determine the appropriate food costs in column G. The formula in G5 is +E5*C5.

Replicate this formula through column G using relative reference. Now enter the time for cooking shown in figure 3 into the appropriate cells in column H. Notice that the time is entered only for the main items. If you wish, you can enter a minimal time for things like salt, but whether you do so will depend on just how precise you want the template to be.

Finally, we have to calculate the total cost—that is, the cost of the ingredients plus the cost of labor. Our formula will have to convert the labor rate from hours to minutes. The formula in I5 will be G5+(H5*(C1/60)).

Replicate this through column I. Note that G5 and H5 are relative references, but C1 is no change.

In I15 enter the formula to calculate the total cost: @SUM(I5. . .I14).

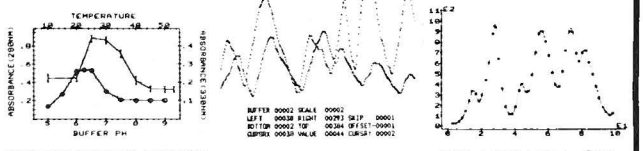
COURSE	TIME (minutes)
Swordfish	10
Cottage fries	10
Asparagus	5

Figure 3.

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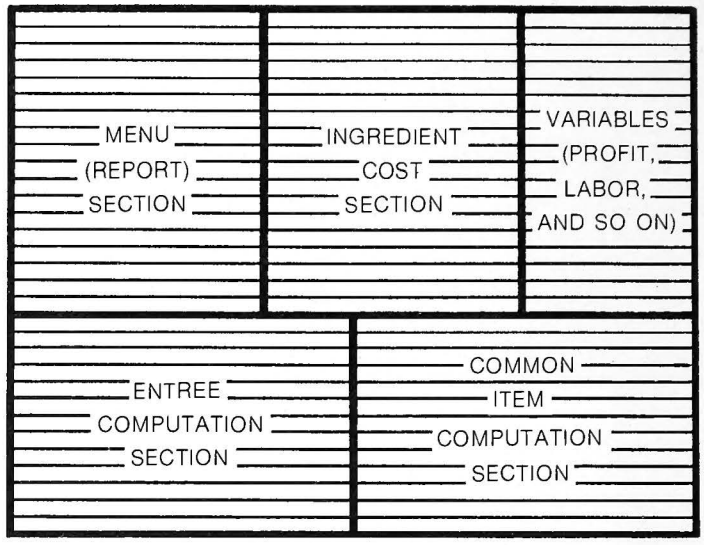


Figure 4.

We have now completed a basic template for determining the costs of a meal. To make it truly useful in a restaurant, fixed costs need to be included and the profit must be added in order to determine the final price.

As it stands, the template is very simple to design and complete. If we wanted to change it to calculate the prices of a number of different entrees, we'd have to lay it out in a different format. Most restaurants include the same item (a salad, for example) on different entrees. It's a waste of time to calculate the cost of a salad for every entree. Instead, the template can be structured so the cost of common items is calculated in a single location and then included in the cost of the entree by means of a single-line item.

If a restaurant wanted to computerize, the actual menu could be laid out in a menu "report" section, with the computational section located elsewhere on the template. In addition, all of the ingredients could be located in a single section. The final template layout might be similar to that in figure 4.

If you lay your template in the format illustrated in figure 4, be aware that you will have cell references from one section to another. You will probably want to do the final pricing calculations, including profit, labor, fixed expenses, and so on, in the menu section.

When designing a template that contains many sections, one of the most important concepts to remember is consistency. Do all specific calculations in the same section. Keep all variables in a separate section. Ensure that the report section is either all calculated formulas or all references to other cell locations where the actual calculations are completed. Using this method, you'll ensure that you minimize debugging and redesigning problems should the need for either arise.

The Recipe for Swordfish Royale

Wash and dry swordfish (one slice per person), cut one inch thick. Season generously on both sides with salt, black pepper, and paprika. Spread one side of each steak with butter and broil (butter side up) in a preheated broiler about two inches from flame. Cook slices for three minutes, turn, spread uncooked side with butter, and broil for four more minutes.

Melt three tablespoons butter (the real thing!) in a small saucepan. Add eight chopped green olives (with pimento) and heat well. Pour over fish just before serving.

One-half sliced presectioned grapefruit (per serving). Served on individual salad plate.

Slice one baking potato (per person) in numerous wedges. Wash in warm water and (important) dry completely on paper towels. Spread lightly with cooking oil and bake until done.

Clean and steam two asparagus spears per person.

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Readers' Response. Over the past few months, numerous readers have responded to challenges presented in this column or have written in with problems and suggestions.

In the December 1982 issue we defined a problem in which a formula would display ERROR if any of the cells referenced in the formula contained an error. In our problem, it was probable that there would always be some cells containing a divide-by-zero error. We wanted values to be displayed and the ERROR indications to be insulated from the display and any other results. Jon Torbert of Grants Pass, Oregon, Robert Breault (no address), and Martin Farkas of Chicago, Illinois, all responded with answers. The specifics aren't important, but each reader had solved the problem in a different fashion. None solved it in exactly the same manner as was shown in the January column. Torbert and Breault had very similar solutions, while Farkas took a different, more complex path. The important thing to note is that for most problems many solutions are possible.

Solving Problems. If you're having trouble finding a solution to a problem, there are a few guidelines you might keep in mind. First, remember that problems can usually be separated into two different categories, the first type being the application problem. What is it that you are really trying to accomplish? Can you define the problem and the variables completely? Do you know how to solve the problem on paper? If you can't answer these questions, you may be premature in turning to *VisiCalc*. Make sure that *you* know how to solve the problem before you ask *VisiCalc* to solve it.

The second type of problem is *VisiCalc*-related: You are able to write down the complete solution and define exactly how you want it solved, but you don't know how to make *VisiCalc* do what you want. This can be a difficult situation. It is even possible that *VisiCalc* can't solve your problem. This is where personal experience, the manual, the reference card, and outside information (such as this column) can help.

Constant readers will remember seeing the phrase *simple and elegant.* Put another way, KISS—keep it simple, stupid. That is usually the best thing to do when you're trying to solve a problem. The more complex the problem, the more you must endeavor to simplify the solution.

If you've reached a point of frustration, walk away from the problem for a while. Often taking a stroll in a park, doing something that takes your mind off the problem, or waiting a couple of days will facilitate the solution. You may find when you return that the answer has presented itself.

If all that fails, there's another way to proceed. First, try to break the problem into the smallest parts possible. Lay them out on paper in a simple mathematical or flow-chart format. Looking at the basic level of the problem often helps you find the solution. Then solve the problem in steps in your template. Once you're certain that you have the correct solution, you can combine various steps. For example, it might require a number of steps (cells) to solve a problem. Once you've found the solution, you might be able to combine two or more cells or formulas into a single cell. But if you had tried initially to complete both those steps in a single cell, you might never have succeeded.

If that approach doesn't work, write the problem and your solution in English (or the language of your choice). You normally communicate and think in your native language; so writing the solution will often allow you to rewrite it in *VisiCalc*'s language.

If everything fails, throw out your original idea and look to see if there is another way to approach the problem. Look at the reference card, or the manual, or to a friend for inspiration. Look at other templates you've completed to see if there are any similarities.

Breault pointed out another potential problem. In the same template that the challenge addressed, we completed a statistic that we labeled *Average/sales rep*. At the time, that seemed like a logical statistic that could provide our hypothetical sales manager with additional information. As Breault pointed out, the method used to calculate that information provided a statistic that was not very meaningful. And that is another thing to be aware of when using *VisiCalc*. It is very simple to develop ratios and analysis and then rely on them as gospel. It is easy to assume that the computer has developed irrefutable statistics. As the old computer tome says: "Garbage in, garbage out." Make certain that you really understand what your analysis provides before you risk making decisions based on it.

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Is it really June already? That may be so, but school doesn't let out for us. No way. We'll be here all summer with interesting pieces of information to make learning all this computer stuff a little less painful. But after we get through this month's session, we can all go outside and play, unless somebody makes us clean out the garage or mow the lawn.

The first thing we should clarify is who should be attending this class. Two months ago, we said that this column would be aimed toward people who are using the Apple IIe. That does *not* mean that we're alienating those who have the Apple II Plus, though. The things discussed here apply to both computers unless we say otherwise. In fact, the biggest difference between the two machines is appearance; the inner workings are very much the same.

That's one of the great things about the way the folks at Apple designed the IIe. They wanted to make a computer that included things that you used to have to pay extra for (more memory, lower-case letters, eighty-column-display handling), and they even added a few extra features. But they didn't want to make the IIe so different from the II Plus that it would become an entirely new machine. They wanted to make sure that most things that worked with one computer would also work with the other. This includes software, hardware, and people.

In short, most of the things we cover here will apply to both the II Plus and the IIe. The few things that work differently on each computer will be explained for each. This is especially true with the subject we'll be discussing this month—the Apple's anatomy.

The biggest differences between the II Plus and IIe are in the amount of memory each has; the II Plus has 48K of memory, and the IIe has 64K. Unfortunately, if you have only 48K, you can't load Integer Basic—you need 64K. If you want to have Integer Basic in your II Plus, you have to go to the store and purchase a language card, also known as a RAM card, which gives you 16K or more memory.

So, unless you have a total of 64K in your Apple, you can't do anything with Integer Basic programs, those preceded by the letter "I" in the catalog. Trying to run or load Integer Basic programs on a 48K machine will only result in a "language not available" message.

Here are two terms we should understand before we really get rolling:

Motherboard: It's also called the circuit board, or the main board. All it refers to is that big green board that's fastened to the bottom of the Apple with all the chips, resistors, diodes, and other electrical junk plugged into it. In other words, the chassis.

K: It stands for kilobyte; one K equals 1,024 bytes (no, you didn't miss anything; we'll explain bytes later on). You use this with a number in front of it: 16K, 48K, 128K. . . . Think of it as a unit of measure, just like gallons, dozen, or feet. K tells you how much memory you have.

Don't Touch Me There; It Turns Me Off. Before we even begin looking around inside the machine, you must promise to never, never, ever remove, insert, or otherwise alter any interface boards while the Apple is on. Interface boards (sometimes called peripheral boards or interface cards—no one really cares) include the controller card that your disk drive is plugged into, an eighty-column card you might have inserted, or perhaps the card the printer is plugged into.

There's no law that says you can't remove cards while the computer is on, but if you do decide to start tinkering around then, you do so at your own risk. If you're wondering what all the fuss is about and why we're spending so much time making sure you don't pull out or insert cards while the power is on, just ask anyone experienced with the Apple what happens if you do.

After they stop laughing, they'll tell you that it's sort of like changing spark plugs while your car's ignition is on. Just don't do it, okay?

When the people at Apple were designing the IIe, they knew that the pulling out and putting in of interface cards is a hazard that's not too obvious. So, they included a red light right next to slot 1 that lights up when the power's on. It's just an extra safety measure to let you know not to start messing with the Apple's insides until you switch it off.

Anatomy 101A. With power off, remove the lid of your Apple by lifting up on the rear corners of the lid. They snap open if you tug at them long enough. The first thing we're going to look at are the expansion slots, also called interface slots and peripheral slots. II Pluses have eight slots that lie parallel to each other along the rear of the motherboard, numbered 0 to 7. IIes also have eight. Slots 1 through 7 lie along the back, too; the eighth, or auxiliary slot, sits next to the power supply.

When you want to add devices to your Apple, the expansion slots are usually where you plug them in. Devices include disk drives, printers, modems (which let your Apple communicate with other computers via the telephone lines), and all sorts of cards that do all sorts of things.

Fortunately, the Apple doesn't read all the slots all the time. Getting things that are plugged into those slots to work is not much different from turning on the components of your stereo system. You can operate one of them, two of them, or as many of them at a time as you want. But just because they're plugged in doesn't mean they'll run; you have to indicate which ones you want to use.

Turning on the Apple, as we've seen, starts the disk drive going. Conventionally, the disk drive controller card goes in slot 6. Actually, you can have it sitting in any slot you prefer, except for slot 0 in the II Plus and the auxiliary slot in the IIe.

When the power is switched on, the Apple looks for the controller card, beginning with the highest-numbered slot and working its way down. As soon as it finds the controller card, it boots whatever disk is in the drive that's connected to drive one of that card. Thus, if you have more than one controller card plugged in, the Apple starts the drive that's in the highest-numbered slot and none of the others.

Because you can connect two drives to each controller card, you can have fourteen drives hooked up at a time if you have a card in each slot. One thing we should remember is that the IIe's auxiliary slot takes precedence over slot 3. So, if you have a card in the auxiliary slot, you shouldn't have anything in slot 3.

Pick a Slot, Any Slot. Just as the controller card conventionally goes in slot 6, slot 1 is usually where you hook up the printer, and slot 2 is where you usually put a modem. But these are just conventions; you can do it any way that pleases you.

For II Plus owners, slot 0 is usually reserved for language cards, also called RAM cards. You can plug in cards that give you Applesoft or Integer Basic (whichever one you don't have), or you can plug in RAM cards that give you extra memory space. The reason they go in slot 0 is that many RAM cards also connect where the upper left-hand RAM chip is—we'll talk about RAM in a few seconds—and slot 0 is the closest one to that chip.

The next organ inside the Apple we should look at is the microprocessor. This is the brains, or control center, of the computer; it's where all commands are executed. In the II Plus, the microprocessor is that long horizontal chip right below slots 3, 4, and 5. In the IIe, it's the long vertical chip just below slot 3. The Apple uses a 6502 microprocessor (6502B for the IIe), the best one on the market, depending on whom you're talking to.

For some unexplainable reason, owners of computers with different microprocessors always think theirs are the best. IBMers will fight to the death defending their 8088s; TRS-80 owners will stand tall when the Z-80 anthem is played; Atarians will claim their machines are just as good as Apples because they also use the 6502, but that's about as far as comparisons between the two go.

The 6502 really is a marvelous piece of engineering. It can perform more than half a million operations per second. Apple tells us that the 6502B in the IIe is a high-speed version of the 6502, but in simple applications who can really tell the difference between 500,000 and 501,000 operations per second? All the microprocessor really does is look at a spot in memory, perform whatever the instructions there say to do, move to the next spot in memory, perform those instructions, and so on. Sometimes instructions involve nothing more than taking two numbers, comparing them, and then going to a certain memory location based on those numbers.

Finally, we agree that the 6502 is the most powerful chip in the known universe. Okay, in the Apple at least. One important thing the 6502 doesn't have—and this is true of all microprocessors—is memory. That is, it can do those half-million operations seemingly at once, but it doesn't retain any information. Once things pass through the 6502, they're forgotten, and new ones come in. It's very much like a person with constant amnesia. He knows what he's doing at the time, but he forgets what he's done after he's done it.

Look, but Don't Touch. The next major organs we should understand are the ROMs. ROM stands for "read-only memory." Well, that's fine, but what does it mean? "Read only" means that you can read the information that's on these chips, but you can't write or alter anything on them. It's a one-way street. The II Plus's ROMs are located in the six sockets right below the 6502 microprocessor.

In the IIe, the ROMs are the two medium-sized chips that sit to the right of the two really long chips below the 6502. If you're not sure which ones they are, it says CD ROM and EF ROM above them on the motherboard.

ROMs, unlike the microprocessor, do have memory in them. In fact, all they are is memory, but not for us to use for storage. When ROMs are made, they don't have anything in them (just like blank disks). The purchasing guy from Apple buys a whole bunch of them from the ROM manufacturer, brings them back to Apple, and throws them all into the programmers' cage. Sometimes you might hear stories that the programmers eat these things, but that's all folklore; don't believe it.

It's the programmers' job to take the ROMs and put programs and other utilities on them for Apples to use. One of these programs is called the Monitor, short for system monitor. Don't confuse it with the monitor that you use like a television screen to watch what's going on; this one's quite different. The Monitor in ROM has several programs, or subroutines, in it. Perhaps the primary one is the start-up routine, the one that gets the system going when you flip on the power switch.

Also in the Monitor are little subroutines that other programs use. These subroutines look for information and move it to various places in the machine. They're sort of like mail clerks; they look at pieces of information, figure out their destinations, and then send them on their way. So, all the Monitor does is keep an eye on things, making sure all those pieces of data get to where they're going.

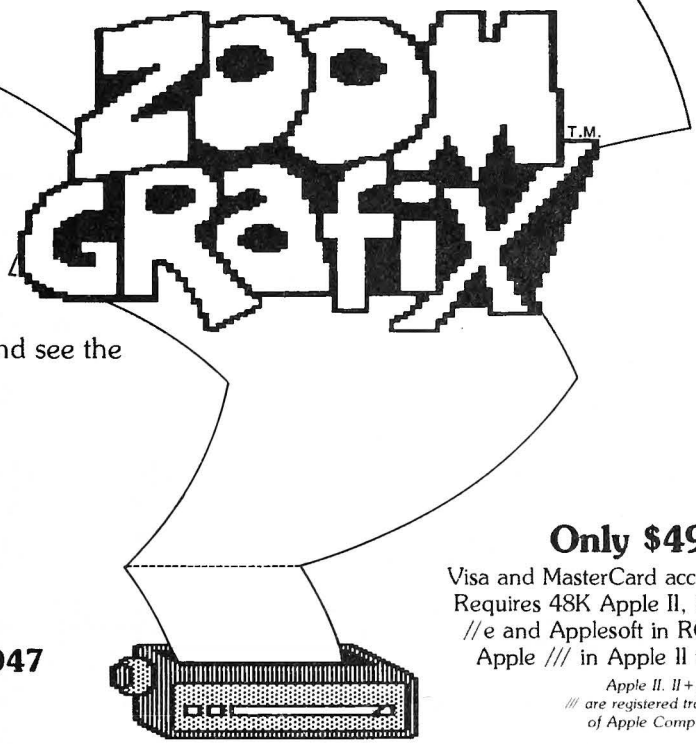
Parlez-Vous La Computer Language? There are also programs in ROM that translate input and other programs into a language the computer understands. Here's what we mean:

Turn on the Apple and load DOS from one of your disks. When you get the cursor, type *print 2 + 2* (remember to have the IIe caps-lock key down). The answer you get, hopefully, is 4. Now type *print "hello."* Be sure to put the quote marks around "hello." All done? The Apple does

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just what you told it to do—print the word *hello.*

The Apple doesn't recognize the English word *print*, just as a non-English speaker wouldn't understand it; the Apple understands only the language it was born with, called *machine language.* To meet the Apple's needs, ROM has language translators in it whose jobs are to take whatever comes into the computer via keyboard or a program and translate it into machine language.

One such translator is the Applesoft *interpreter.* When you run an Applesoft program, the interpreter reads and translates the program piece by piece. When the first chunk of information comes along, the interpreter translates it into machine language and sends it to the microprocessor; when the next piece of information comes along, it gets translated and goes to the microprocessor, and so on. It's the same way a foreign ambassador's interpreter works—he translates what is being said into a different language, word by word, as it's being said.

On the other hand, the *compiler* is a different kind of translator. The compiler takes a program, translates it into machine language, and then feeds the whole thing to the computer at once. The compiler can be compared to a book translator. Whereas the ambassador's interpreter translates things on the spot, the book translator rewrites the entire book in a different language before he lets anyone read it. Likewise, the compiler creates a machine language version of the original program for the computer to run.

It's not that clear to see, but, because of the different types of translators, compiled programs run faster than interpreted (Integer or Applesoft) Basic ones. When you run a Basic program, the interpreter has to intervene, translate statements one at a time, and then give each one to the computer. Compiled programs, however, are already translated; thus, the computer can read right through them and not have to wait for something to translate each statement first.

The third type of translator is called the *assembler.* Its job is much like the Basic interpreter, except that it translates assembly language into the computer's machine language. Assembly language is less readable than Basic to us humans, and it's just about the closest you can get to speaking machine language without having a microprocessor implanted into the brain. Because assembly language is that much closer to machine language, the translation process isn't as complex, and programs written in assembly run even faster than compiled ones.

Just to make things more confusing, ROMs are often referred to as "firmware." Hardware is all the rigidly constructed stuff that makes your computer run; hardware can't be altered to operate differently. It includes most chips on the motherboard, disk drives, printers, and other peripherals. Software is what makes the computer do things; it can be modified. You have software on disks and in ROM.

So, if ROMs are sort of like hardware (they're chips, right?), and they're sort of like software (they have programs to operate the computer, right?), then what are they exactly? "Firmware" is a nice compromise, and that's how people frequently refer to ROM.

We're RAMblin' Now. The last principal part of the Apple's anatomy we'll look at is called RAM, which stands for "random access memory." Random access means that we can have admittance to any location in that memory without having to go through all the ones that precede it. Even though the Apple can scan memory locations at the rate of several hundred thousand per second, being able to go directly to a specific one without going through the others does save a lot of time and is quite a luxury. Video games just wouldn't play as well without random access.

"Random access" is an accurate way to describe RAM, but it's not complete. Whereas ROM meant "read only," RAM means "read and write." That's just a fancy way of saying you can read the contents of the memory, and you can write or put stuff there, too. If you were with us back in April, you'll remember that we said booting a disk loads DOS into a corner of memory, and that the System Master disk loads Integer Basic into another corner of memory. Well, RAM is the memory where all those corners are.

For II Plus people, RAM resides in those three rows of eight chips (twenty-four in all) that are enclosed in a white box found right below the ROM chips. They're not too hard to miss; they take up about a third of the motherboard, and they all have "RAM" written below them. Each one holds 2K of memory; twenty-four of them give you a total of 48K.

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by Mark Simonsen

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*Similar to XLISTER on Utility City, BUT operatee in both directions at Machine-Language speed, directly from the LIST command. For-Next Loops and "If-Then's" are not called out, as they are in XLISTER.

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```
6000- 53 41 4D 50 4C 45 20 54   SAMPLE T
6008- 45 58 54 20 46 49 4C 45   EXT FILE
6010- 20 4C 49 53 54 45 44 20    LISTED
6018- 57 49 54 48 20 44 4F 55   WITH DOU
6020- 42 4C 45 2D 54 41 4B 45   BLE-TAKE
6028- 27 53 20 48 45 58 2F 41   'S HEX/A
6030- 53 43 49 49 20 44 55 4D   SCII DUM
6040- 50 20 46 45 41 54 55 52   P FEATUR
6050- 45 2E 2E 2E 2E 2E 2E 2E   E.......
```



Bonus Utilities: Any or all of the following enhancements may be hidden in memory, "unseen" until accessed—

CROSS REFERENCE: Displays existing variables, strings & line nos. on which each occurs—

```
A$: 100 200 250 300
X:  10 20 3000 3010 3020
Y:  50 3000 4000 5200
```

VARIABLE DISPLAY: Displays all program variables & strings with each one's current value—

```
A$ = "NOW IS THE TIME"
X  = 255
Y  = 3.14159
```

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Normal Applesoft Listing:

2-WAY VIDEO SCROLLING

(Hi-Res Picture Mover)

```
 90 HOME : HGR2 : POKE 768,160: POKE
    769,0: POKE 770,76: POKE 771
    ,44: POKE 772,254
100 FOR PG = 2 TO 3: POKE 230,PG
    * 32: CALL 62454: HCOLOR= 3
    + (PG = 3): FOR X = 0 TO 15
    9 STEP 5: HPLOT 0,X TO X * 1
    .8,159: NEXT X,PG: HGR
110 ST = 16384: GOSUB 2010:ST = 2
    4576: GOSUB 2010: GOTO 110
2000 POKE L,N - INT (N / 256) *
    256: POKE L + 1, INT (N / 25
    6): RETURN
2010 N = ST:L = 60: GOSUB 2000:N =
    ST + B191:L = 62: GOSUB 2000
    :N = B192:L = 66: GOSUB 2000
    : CALL 768
2030 POKE 50,63 + 192 * (ST = 16
    384): VTAB 21: PRINT  SPC( 1
    20): VTAB 22: PRINT " P=PICT
    URE #";: PRINT 1 + (ST = 163
    84)";";: GET A$: PRINT A$: IF
    A$ = "P" THEN  RETURN
```

Optional Improved Format:

2-WAY VIDEO SCROLLING

Each statement lists on a new line. Compare to the normal listing above.

```
 90 HOME
  : HGR2
  : POKE 768,160
  : POKE 769,0
  : POKE 770,76
  : POKE 771,44
  : POKE 772,254
100 FOR PG = 2 TO 3
  : POKE 230,PG * 32
  : CALL 62454
  : HCOLOR= 3 + (PG = 3)
  : FOR X = 0 TO 159 STEP 5
  : HPLOT 0,X TO X * 1.8,159
  : NEXT X,PG
  : HGR
110 ST = 16384
  : GOSUB 2010
  : ST = 24576
  : GOSUB 2010
  : GOTO 110
2000 POKE L,N - INT (N / 256) * 256
  : POKE L + 1, INT (N / 256)
  : RETURN
2010 N = ST
  : L = 60
  : GOSUB 2000
  : N = ST + B191
  : L = 62
  : GOSUB 2000
  : N = B192
  : L = 66
  : GOSUB 2000
  : CALL 768
2030 POKE 50,63 + 192 * (ST = 16384)
  : VTAB 21
  : PRINT SPC( 120)
  : VTAB 22
  : PRINT "I P=PICTURE #";
  : PRINT 1 + (ST = 16384)";";
  : GET A$
  : PRINT A$
  : IF A$ = "P" THEN RETURN
```

Listings scroll Up AND Down at high speed, for easy location of program code.

LONG CATALOGS feature fast 2-Way-Scroll too, speeding up location of file names. Hit the Left-Arrow Key to SCROLL BACKWARD, any-key to continue forward, or ctrl-C for a clean break.

2-WAY VIDEO SCROLLING

```
]CATALOG
DISK VOLUME 123
*A 009 HELLO
 A 010 MULTI-CAT
 A 052 SORTFILE
*A 010 KEY-CAT
*A 052 BYTE ZAP
 A 024 HI-WRITER
 B 034 BBROS LOGO
 A 050 WOWZO
 T 002 XLISTER
 A 062 DOS BOSS
 T 010 LETTER
 T 020 STATEMENT
 T 003 NAIL FILE
*A 052 ALPHA PLOT
*A 008 TEXTTRAIN
*A 009 BEAGLE MENU
*A 021 HANG PERSON
 B 034 GOOD PIC
 B 034 UGLY PIC
 A 020 BUZZWORD
*B 020 FID
 A 020 TEXT DUMP
 I 010 CITY DUMP
 A 009 NIFFUM
 B 000 HAIR GROW
```

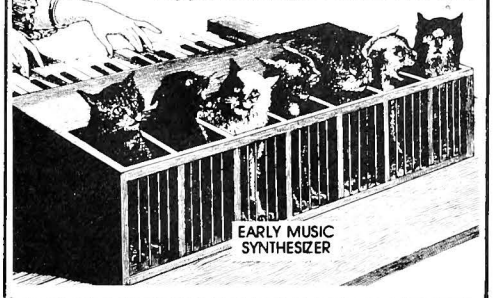


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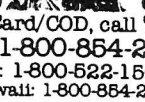
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For IIe students, RAM lives in that row of eight chips at the bottom right-hand corner of the motherboard. Each one has 8K of memory, so the eight chips give you a total of 64K.

Now, where does this RAM and ROM stuff leave us? Hopefully, only mildly confused. But if you're still having problems knowing the difference between the two, think of ROM as a school textbook. It's a place to store information, but all the information is already there; it was put there by the book publisher. You can read what's there as often as you need to, and it will be there forever. And, just like a textbook, you can't write, change, or erase anything in ROM either (actually, you can write in a textbook or tear the pages out, but you'll get scolded by the teacher, so don't do it).

On the other hand, RAM is like a composition book, or a diary. It's completely empty and can be used to put things in. You can write as much as you have space for, and you can also read what you've put there. Unlike ROM and textbooks, you can erase and modify the contents in RAM, too, just like you can change what you've written in your diary (this comes in handy when you want to remember things as you wish they had been, not as they really happened).

Bytes, Bits, and Other Hard Stuff. Perhaps the hardest part of learning about computers is understanding how they handle information. We'll touch on it briefly, just to make the summer miserable.

Believe it or not, the computer really understands only two things: something is, or something isn't. Yes or no. On or off. Pass or punt.

When it counts, it counts two numbers: 0 and 1, and that's all. The numbering system that uses only 0s and 1s is called the *binary system*; just as our decimal system has ten digits, 0 through 9, binary has two. And, because it's called the binary system, it just makes sense to call the digits binary digits.

This is where we tie everything in to computers. The smallest piece of information the Apple understands is a binary digit, or *bit* for short (*bi*nary digi*t*). A bit is either a zero or a one, signaling that something is or isn't. Here's one now: 1. Here's another: 0. Well, with just two states of existence, there's really not much that bits can do.

But if we combine them, say, eight at a time, we can do all sorts of things. We can make combinations such as 10010011, or 00001111, or 10101010. You can see that these groups of eight can signify a heck of a lot more than just two states of being. In fact, they can be arranged into 256 different combinations. It's the same as taking our decimal system and combining its digits to make numbers like 500,000 or even 2,254,828.

The Apple processes bits in groups of eight, just like the examples we just looked at. A group of eight bits is called a *byte*. Don't ask why it's spelled that way; no one knows. So even though 0 and 1 are the only values the computer really understands, they're handled only in groups of eight, or a byte at a time. This makes it look like the computer understands 256 different numbers.

Whenever we talk about computer memory, we rarely talk in terms of bytes. That would be like talking about distances between stars and planets in terms of feet and inches. It just doesn't mean much. Instead, we measure stellar distances in light years, and we measure computer memory in kilobytes. "Kilo" usually means "a thousand" to us, but in this case it's a little more than that. One kilobyte, or 1K, is equal to 1,024 bytes. Why? Because.

Remember, the computer is thinking in terms of two digits, and 1,024 is equal to two times itself ten times. In this case, ten was chosen because two times itself ten times (1,024) is the closest we could get to 1,000, a nice round number.

So, K is nothing more than a unit of measure, telling you how much memory something has. Someone telling you that "this computer has 48K" or that "this RAM card has 128K of extra memory" is not unlike a Tupperware ad describing different containers: "Capacities: seventeen cups, holds five pounds of flour," or, "This drip-free spout with hinged cap container holds up to two quarts."

No More Pencils, No More Books. And no more teacher's dirty looks. However, school's not out for summer. That's it for today, faithful ones. But don't forget to come back next issue; it'll be real hot outside, and we'll cool off with some lemonade and watermelon (bring your own). ■

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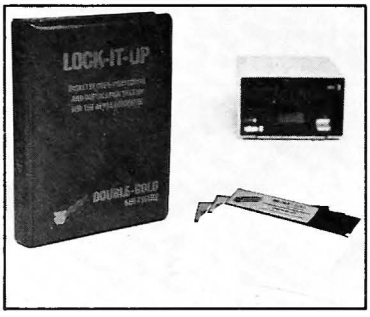
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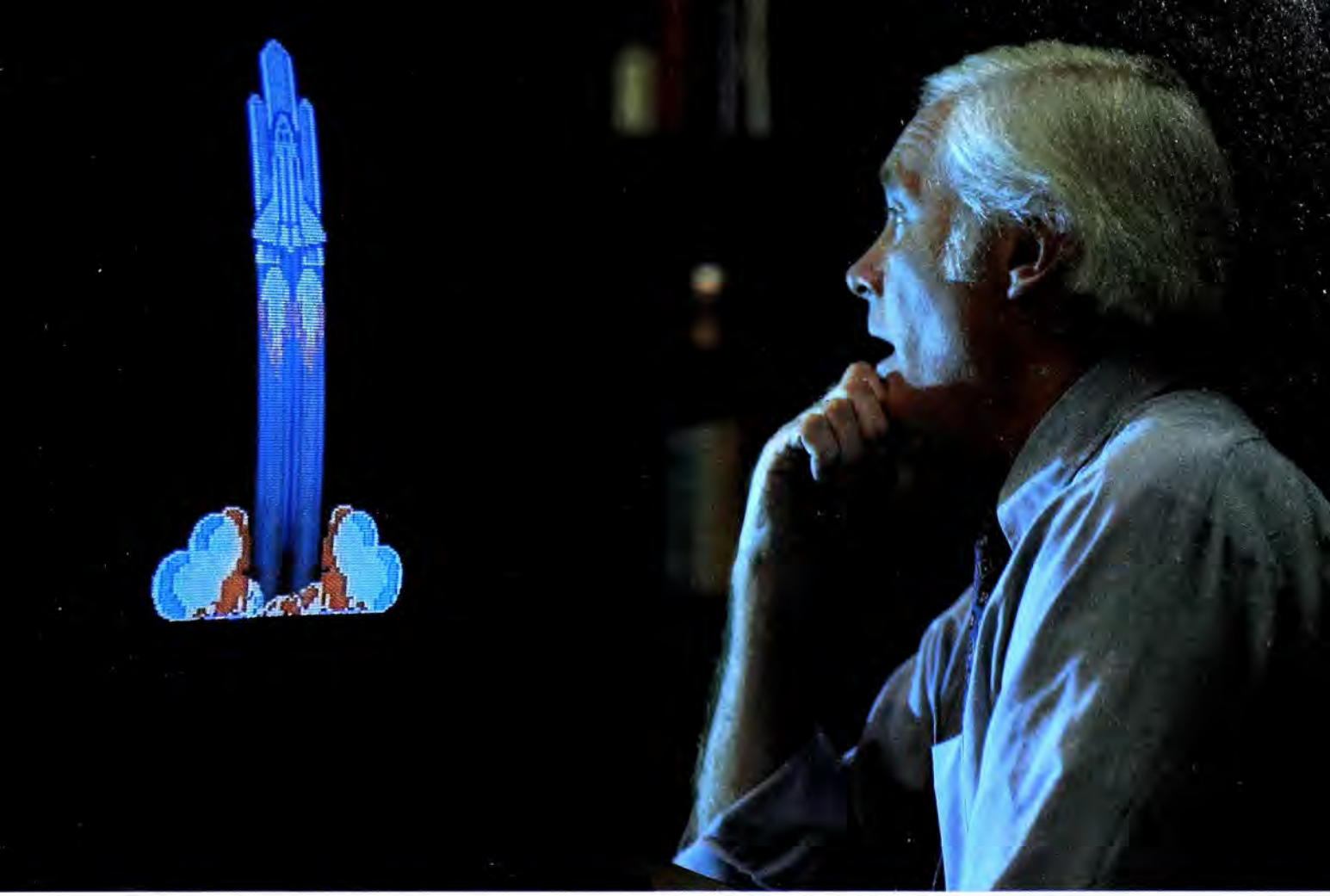
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REQUIRES: Apple Pascal and at least two disk drives.



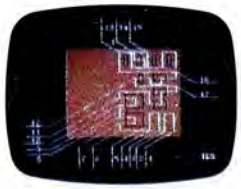
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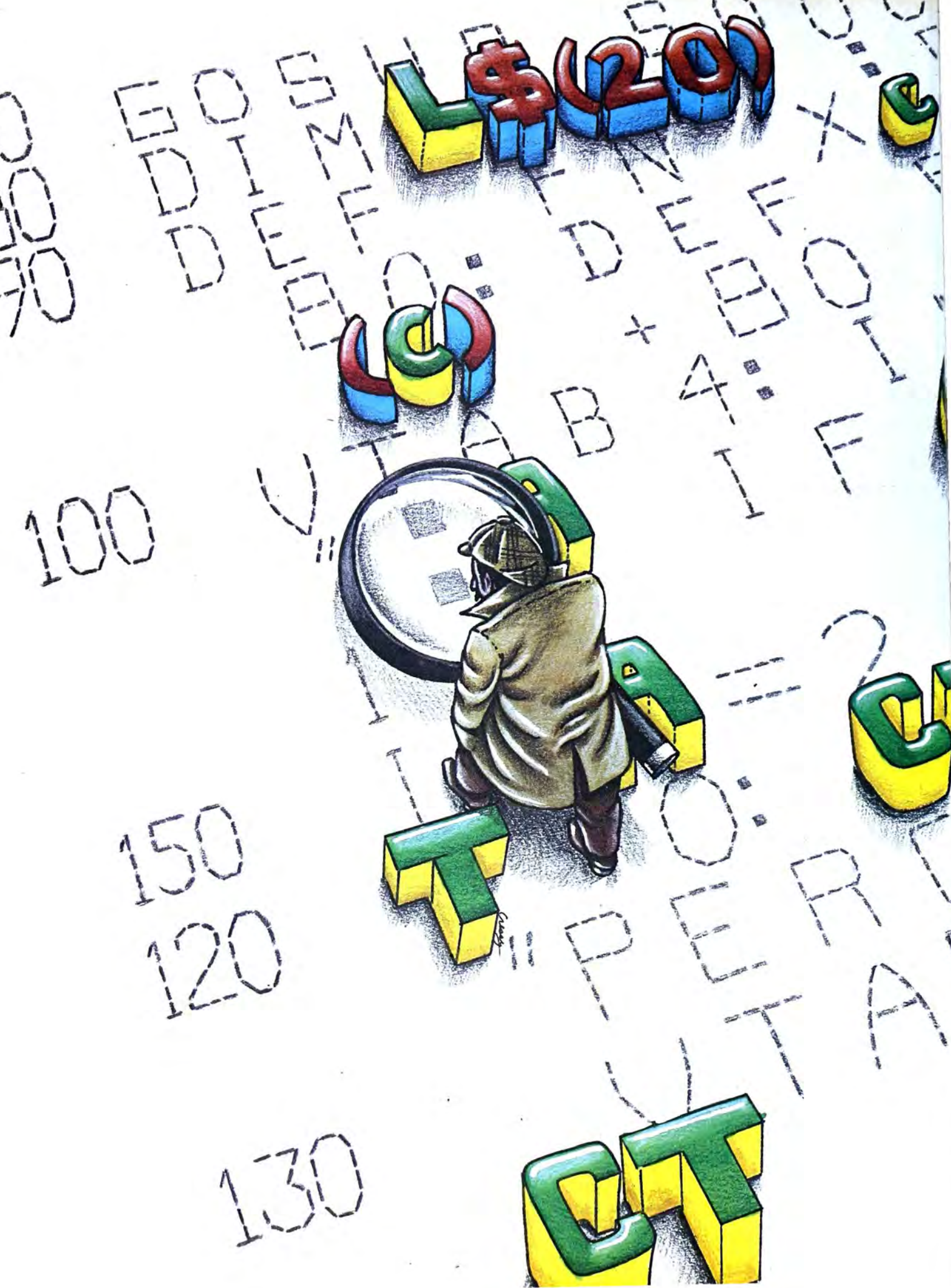
The Graphic Solution requires a 48K Apple II with ROM Applesoft and DOS 3.3.

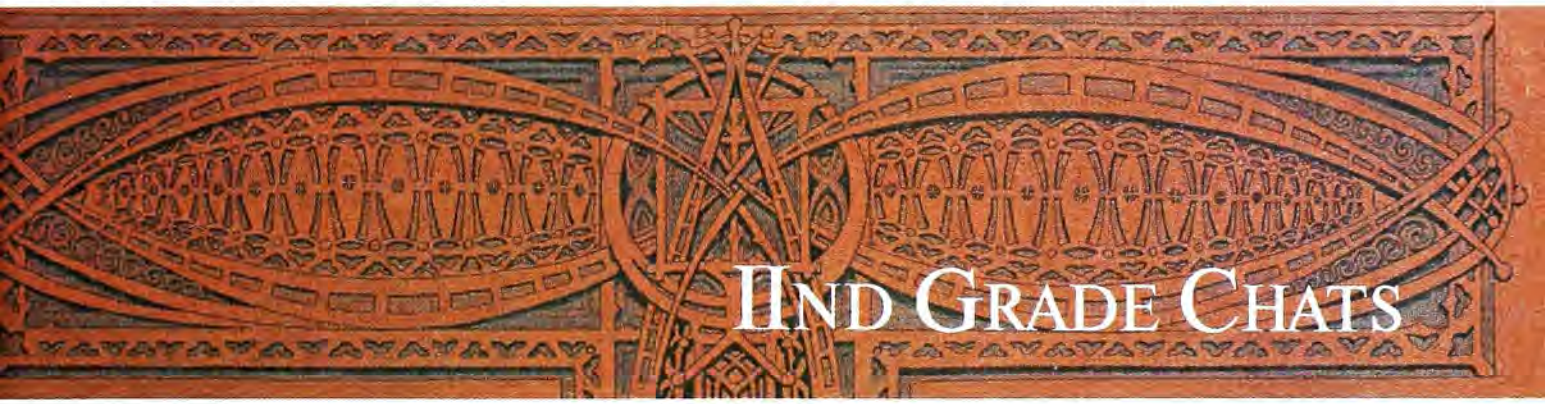
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Examining Applesoft Variables

by SCOTT SMITH

Like most Basic interpreters, Applesoft has no built-in capacity to produce variable lists as compiled languages do. This is unfortunate. Because all Basic variables are global, it's easy to reuse variable names accidentally and change the value of a critical variable in the process—especially in a somewhat lengthy program with many subroutines. A cross-reference variable list would make such bugs easier to discover. Such a list would display the variables in alphabetical order and list with them the numbers of the lines in which they occur. It's then an easy matter to spot recurrences of the same variable in two disparate sections of code.

Though an Applesoft program can be interrupted at virtually any point (with control-C, stop, end, or reset) and variable values can be displayed in immediate mode with print statements, it can be tedious to produce the entire variable list with current values by that method. A utility to do that job for you has obvious application in debugging.

To write utilities for variable values and line references, we need to know how Applesoft stores and indexes its variables. Though the Applesoft manual is enlightening as to how an Applesoft program and its variables are stored, an actual example can help you understand the data structure better. A necessary intermediate step is to write a program to display portions of memory. Because certain bytes might make the most sense expressed in hexadecimal, some in decimal, and others with their ASCII representations, this program should display any range of memory locations in all three of these modes. Key parameters to an Applesoft program and its variable list are given in hex (figure 1); so addresses need to be input in hex.

We'll call the program *Mem Display*. Hex input will be in one of three formats. A single address or a range will be displayed by inputs in the format *nnnn* or *nnnn.nnnn*. An input of just a period will display the contents of the next eight bytes from the last location displayed. The program takes in input in one of these three formats and converts the upper and lower bounds of the addresses to decimal. The appropriate bytes are peeked and displayed sixteen bytes at a time in all three modes. ASCII control characters have the up arrow prefix. *Mem Display* is in listing 1.

$67,$68	Pointer to beginning of program. Normally set to $0801 for ROM version, or $3001 for RAM (cassette tape) version.
$69,$6A	Pointer to start of simple variable space. Also points to the end of the program plus 1 or 2, unless changed with the LOMEM: statement.
$6B,$6C	Pointer to beginning of array space.
$6D,$6E	Pointer to end of numeric storage in use.
$6F,$70	Pointer to start of string storage. Strings are stored from here to the end of memory.

Figure 1. Key Applesoft parameters (from Appendix L).

The output is set up for a printer. To modify it for a forty-column screen, change the 16 to an 8 in line 198.

Listing 1. Mem Display.

```
198  NB = 16: REM NUMBER BYTES DISPLAYED PER LINE
199  DIM P(NB): REM P( )=PEEKED VALUES
200  REM INPUT ADDR
205  INPUT "ADDR? ";A$: IF A$ = "" THEN END : REM A$=ADDR
210  IF A$ = "." THEN D1 = D2 + 1:D2 = D2 + NB: GOTO 300
215  FOR I = 1 TO LEN (A$): IF MID$ (A$,I,1) = "." THEN 235: REM
     LOOK FOR '.'
220  NEXT I
225  A1 = 1:A2 = LEN (A$): GOSUB 400: IF E = 1 THEN PRINT
     CHR$ (7): GOTO 205: REM A1,A2=1ST, LAST CHARACTER OF
     HEX ADDRESS
230  D1 = D:D2 = D: GOTO 300: REM D1,D2=1ST, LAST DECIMAL
     ADDRESS
235  IF I = LEN (A$) THEN PRINT CHR$ (7): GOTO 200
240  A1 = 1:A2 = I - 1: GOSUB 400: IF E = 1 THEN PRINT CHR$
     (7): GOTO 200
245  D1 = D
250  A1 = I + 1:A2 = LEN (A$): GOSUB 400: IF E = 1 THEN PRINT
     CHR$ (7): GOTO 200
255  D2 = D: IF D1 > D2 THEN PRINT CHR$ (7): GOTO 200
300  REM DISPLAY MEMORY
305  PRINT :P1 = D1:P2 = D2:SP = 0: REM P1,P2=FIRST, LAST
     DECIMAL ADDRESS, SP=# SPACES
310  IF P2 - P1 > = NB - 1 THEN P2 = NB * INT ((P1 + NB) / NB) -
     1:SP = 4 * (P1 - NB * INT (P1 / NB)): REM IF RANGE > NB, DO
     NB AT A TIME
315  D = P1: GOSUB 500: PRINT H$".";:D = P2: GOSUB 500: PRINT
     H$: PRINT
320  FOR I = P1 TO P2:P(I - P1 + 1) = PEEK (I): NEXT I
325  GOSUB 600: GOSUB 700: GOSUB 800: PRINT : IF P2 > = D2
     THEN 200: REM IF ALL DISPLAYED
330  P1 = P2 + 1:P2 = P2 + NB:SP = 0: IF P2 > D2 THEN P2 = D2:
     REM IF NOT, DO NEXT NB
335  GOTO 315
400  REM CONVERT HEX A$ TO DECIMAL D
405  E = 0:D = 0: FOR J = A1 TO A2:C$ = MID$ (A$,J,1): REM
     E=ERROR FLAG, C$=CHARACTER
410  IF C$ > = "0" AND C$ < = "9" THEN C = VAL (C$): GOTO 425
415  IF C$ > = "A" AND C$ < = "F" THEN C = ASC (C$) - 55:
     GOTO 425
420  E = 1: RETURN : REM IF ERROR
425  D = 16 * D + C: REM ADD HEX DIGIT IN
430  NEXT J: IF D > 65535 THEN 420: REM IF ADDRESS > 4 HEX
     CHARACTERS
435  RETURN
500  REM CONVERT DECIMAL D TO HEX H$
505  H$ = ""
510  DV = INT (D / 16):R = D - 16 * DV: REM DV=QUOTIENT &
     NEXT DIVIDEND, R=REMAINDER
515  IF R > = 0 AND R < = 9 THEN R$ = STR$ (R): GOTO 525
```



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```
520  R$ = CHR$ (55 + R)
525  H$ = R$ + H$:D = DV: IF DV < >0 THEN 510: REM QUIT IF
     DIVIDEND 0
530  IF LEN (H$) = 1 THEN H$ = "0" + H$: REM WANT 2-DIGIT
     HEX
535  RETURN
600  REM PRINT DECIMAL
605  PRINT "DEC: " SPC( SP);
610  FOR I = 1 TO P2 - P1 + 1: PRINT P(I); SPC( 4 - LEN ( STR$
     (P(I)));: NEXT I: PRINT
615  RETURN
700  REM PRINT HEX
705  PRINT "HEX: " SPC( SP);
710  FOR I = 1 TO P2 - P1 + 1:D = P(I): GOSUB 500: PRINT H$;
     SPC( 4 - LEN (H$));: NEXT I: PRINT
715  RETURN
800  REM PRINT ASC
805  PRINT "ASC: " SPC( SP);
810  FOR I = 1 TO P2 - P1 + 1:C = P(I)
815  IF C = 0 OR (C > 26 and C < 32) OR C > 95 THEN C$ = " ":
     GOTO 830: REM PRINT SPACE
820  IF C < = 26 THEN C$ = "^" + CHR$ (C + 64): GOTO 830: REM
     PREFIX '^' FOR CONTROL CHARACTER
825  C$ = CHR$ (C) + " "
830  PRINT C$;: NORMAL : PRINT " ";
835  NEXT I: PRINT : RETURN
```

To see the Applesoft internal version of the first few lines of *Mem Display* itself, observe the output of *Mem Display* in figure 2. Applesoft programs start at the address pointed to by $67 and $68; remember, addresses are stored internally with the low byte followed by the high byte. Applesoft programs end at the address pointed to by $69,$6A (minus 1 or 2). Note the line numbers highlighted in the decimal row; two bytes are allotted for a line number (allowing line numbers to reach their Applesoft maximum of 63999). The two-byte line numbers are followed by the actual program statements. To help decipher the line images further, it's useful to have Appendixes F and K from the Applesoft manual handy.

Reserved words, listed in Appendix F, are recognizable by their decimal tokens.

Line 198 starts with the variable assignment *NB = 16*. All the characters in the command are stored in ASCII format except for the equal sign, which is a reserved word with the token 208. After the ASCII colon is the token 178, which means rem. This is followed by a space and the ASCII equivalents for each character in the remark.

The first byte in line 199 has a decimal value of 134, the code for dim; this is followed by the ASCII equivalents for P, (, 1, 6, and). By comparing several lines of code with their memory images, the following rules can be deduced about storing Applesoft programs internally:

1. The first two bytes of a line image form the address (in typical low-byte/high-byte fashion) of the next line image; hence $082E is the address of line 199, $0850 is the address of line 200, and so on. This facilitates quick searches through the program for line numbers.
2. The third and fourth bytes form the line number, also in low-byte/high-byte order (most apparent in decimal).
3. All bytes from the fifth on correspond to keyword decimal tokens, variable names, punctuation, and data.
   a. Any byte whose value is larger than 127 is a reserved word—it can be found in Appendix F of the Applesoft manual.
   b. Any byte whose value is less than 128 corresponds to a character in a variable name, punctuation, or data—the ASCII symbols are the tip-off.
4. Each line image ends with a byte of 0.
5. The last line image of a program is followed by two bytes of 0; this corresponds to a null pointer to the nonexistent next line.

Now that it's been determined what variables look like in the internal representation of an Applesoft program, the first utility, a variable cross-reference list, can be written. The basic idea is to search the program's line images for variable names—they must start with characters A through Z. The utility, *Variable Xref* (listing 2), assumes that the variable names in the program to be scanned are a maximum of two characters; this makes recognizing them much easier. A list of variable names will be kept. Each entry in the list is a string whose first four characters designate the variable name—for instance, Ibbb, B%bb, P(bb, AZ$(, where b indicates a blank space. The line numbers in which the variables occur are converted to a four-digit hexadecimal string and appended to each variable string (provided that that line is not already represented). Four-digit hex was chosen because it can represent all possible line numbers, and because that constancy makes it easier to read those line numbers later. When the program looks for a variable name string, a binary search is employed—if the name isn't found, a string representing that variable name is formed and inserted into the list.

Determining what is and what isn't a variable is not trivial. Though the first character of a variable name must be alphabetic, ASCII A through Z can also occur as literals in many places, like *print "This", A$="That", input "The other";A$*. Fortunately, in these cases, the letters are surrounded by quotation marks (ASCII decimal 34).

In the subroutine that determines variable names from their internal representations (*parses* the variables), variable QF (quote flag) is used to signify the beginning and end of a string literal; this facilitates variable name recognition. The only place where string literals can appear without quotation marks is in data and rem statements. Flag DF (data flag) is used to detect and skip data statements so such string literals will not be interpreted as variable names.

Digits between 0 and 9 pose a similar problem—besides possibly being the second character of a variable name, they can also be part of a line number (for instance, goto 200) or part of an integer or real constant (A = 200). This last observation suggests that another flag, GV

```
]RUN
ADDR? 67.6A

67.6A

DEC:  1   8   222 14
HEX:  01  08  DE  0E
ASC:  ^A  ^H      ^N

ADDR? 801.87F

801.80F

DEC:      44  8   198 0   78  66  208 49  54  58  178 78  85  77  66
HEX:      2C  08  C6  00  4E  42  D0  31  36  3A  B2  4E  55  4D  42
ASC:      ,   ^H          N   B       1   6   :       N   U   M   B

810.81F

DEC:  69  82  32  66  89  84  69  83  32  68  73  83  80  76  65  89
HEX:  45  52  20  42  59  54  45  53  20  44  49  53  50  4C  41  59
ASC:  E   R       B   Y   T   E   S       D   I   S   P   L   A   Y

820.82F

DEC:  69  68  32  80  69  82  32  76  73  78  69  0   78  8   199 0
HEX:  45  44  20  50  45  52  20  4C  49  4E  45  00  4E  08  C7  00
ASC:  E   D       P   E   R       L   I   N   E       N   ^H

830.83F

DEC:  134 80  40  78  66  41  58  178 32  32  80  40  41  61  80  69
HEX:  86  50  28  4E  42  29  3A  B2  20  20  50  28  29  3D  50  45
ASC:      P   (   N   B   )   :               P   (   )   =   P   E

840.84F

DEC:  69  75  69  68  32  86  65  76  85  69  83  32  32  0   95  8
HEX:  45  4B  45  44  20  56  41  4C  55  45  53  20  20  00  5F  08
ASC:  E   K   E   D       V   A   L   U   E   S               _   ^H

850.85F

DEC:  200 0   178 32  73  78  80  85  84  32  65  68  68  82  0   131
HEX:  C8  00  B2  20  49  4E  50  55  54  20  41  44  44  52  00  83
ASC:              I   N   P   U   T       A   D   D   R

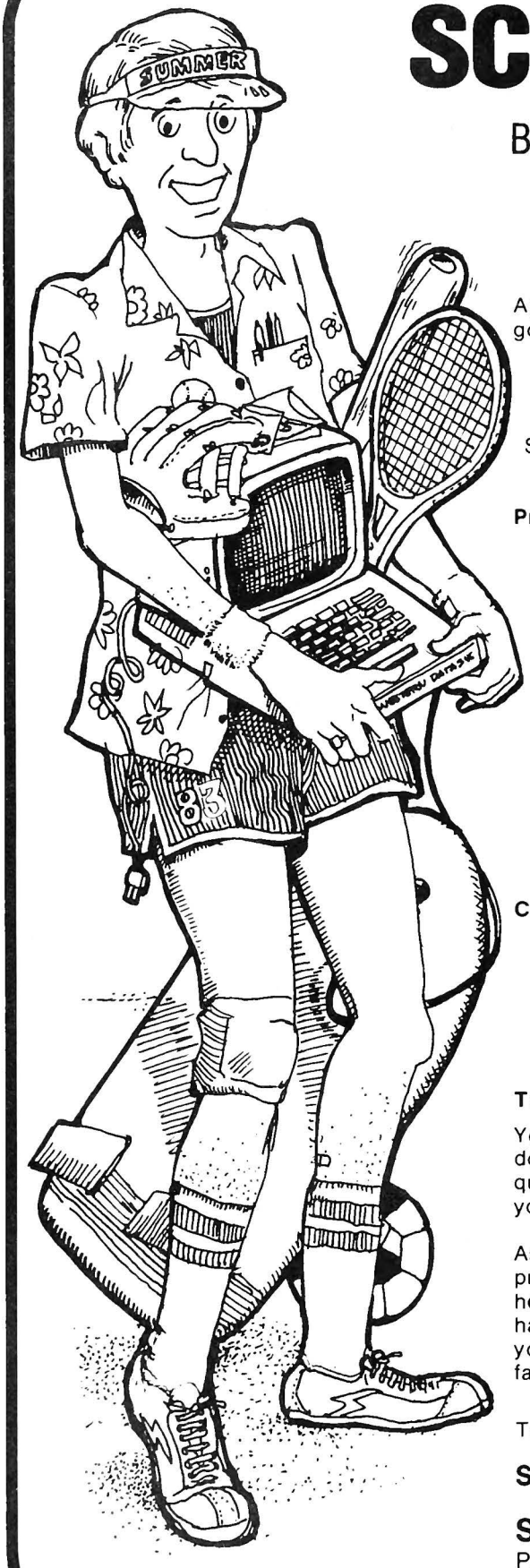
860.86F

DEC:  8   205 0   132 34  65  68  68  82  63  32  34  59  65  36  58
HEX:  08  CD  00  84  22  41  44  44  52  3F  20  22  3B  41  24  3A
ASC:  ^H          "   A   D   D   R   ?       "   ;   A   $   :

870.87F

DEC:  173 65  36  208 34  34  196 128 58  178 32  65  36  61  65  68
HEX:  AD  41  24  D0  22  22  C4  80  3A  B2  20  41  24  3D  41  44
ASC:      A   $       "   "           :               A   $   =   A   D
```

Figure 2. Internal version of *Mem Display*.



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Listing 2. Variable Xref.

```
62000 REM PRODUCE VARIABLE LIST
62005 DIM VS$(300):LV = 4:MX = INT ((255 - LV) /4):NV =
      0: REM  LV=LENGTH OF VAR NAME, MX=MAX # LINES
      IN VS$(), NV=# VAR STRINGS
62010 H$ = "67": GOSUB 62500:M = PEEK (D):H$ = "68": GOSUB
      62500:M = M + 256 * PEEK (D): REM M=CURRENT
      MEM LOC
62015 NL = 256 * PEEK (M + 1) + PEEK (M): REM NL=LOC OF
      NEXT LINE
62020 M = M + 2:PL = 256 * PEEK (M + 1) + PEEK (M):D = PL:
      GOSUB 62400:M = M + 1: REM PL=PRESENT LINE #
62025 GOSUB 62200: IF GV = 0 THEN 62080
62030 IF NV = 0 THEN NV = 1:VS$(NV) = V$ + H$: GOTO 62080:
      REM VS$()=VARIABLE STRING
62035 L = 0:H = NV + 1:X1 = 0: REM BINARY SEARCH FOR VS$()
62040 X = INT ((L + H) / 2): IF X = X1 THEN 62070
62045 IF V$ < LEFT$ (VS$(X),4) THEN H = X:X1 = X: GOTO 62040
62050 IF V$ > LEFT$ (VS$(X),4) THEN L = X:X1 = X: GOTO 62040
62055 IF LEN (VS$(X)) = LV + 4 * MX THEN L = X:H = X:X1 = X:X =
      X + 1: GOTO 62045
62060 IF LEN (VS$(X)) > 4 AND H$ < > RIGHT$ (VS$(X),4) THEN
      VS$(X) = VS$(X) + H$: REM ADD IF LINE NOT ALREADY
      THERE
62065 GOTO 62080
62070 X = X + 1: FOR I = NV + 1 TO X + 1 STEP - 1:VS$(I) =
      VS$(I - 1): NEXT I: REM INSERT NEW STRING INTO LIST
62075 VS$(X) = V$ + H$:NV = NV + 1: REM SET NEW STRING
62080 IF C < > 0 AND C < > 178 THEN 62025: REM IF NOT EOL
      OR REM
62085 M = NL: IF 256 * PEEK (M + 3) + PEEK (M + 2) < 62000
      THEN 62015: REM IF NOT END OF PROGRAM, KEEP
      LOOKING
62100 REM PRINT VARIABLE LIST
62105 INPUT "PRINTER ON?  Y/N  ";P$: IF P$ < >"Y" AND P$
      < >"N" THEN 62105
62110 IF P$ = "Y" THEN PRINT CHR$ (4);"PR#1": PRINT
62115 PRINT "VAR XREF LIST": PRINT
62120 FOR I = 1 TO NV: IF LEFT$ (VS$(I),4) < > LEFT$ (VS$(I -
      1),4) THEN PRINT LEFT$ (VS$(I),4)" ";: GOTO 62130
62125 PRINT SPC( 6);
62130 F = 4: FOR J = LV + 1 TO LEN (VS$(I)) STEP 4:H$ = MID$
      (VS$(I),J,4): GOSUB 62500: PRINT D" ";
62135 IF J - LV + 3 > = 15 * F THEN PRINT : PRINT SPC( 6);:F = F
      + 4
62140 NEXT J: PRINT : PRINT : NEXT I
62145 END
62200 REM PARSE FOR VARIABLE
62205 QF = 0:GV = 0:DF = 0:V$ = "": REM QF=QUOTE FLAG,
      GV=GOOD VAR FLAG, DF=DATA FLAG, V$=VAR NAME
62210 M = M + 1:C = PEEK (M):C$ = CHR$ (C): REM C,C$=ASCII
      CHARACTER AT NEXT LOCATION
62215 IF C < > 34 THEN 62235: REM IF NOT QUOTE
62220 IF GV = 1 THEN M = M - 1: GOTO 62295
62225 IF QF = 0 THEN QF = 1: GOTO 62210: REM IF OFF, TURN
      ON
62230 QF = 0: GOTO 62210: REM IF ON, TURN OFF
62235 IF QF = 1 THEN 62210: REM IF QUOTE FLAG ON, IGNORE
62240 IF DF = 1 THEN 62255: REM IF DATA FLAG ON
62245 IF C < > 131 THEN 62265: REM IF NOT DATA
62250 DF = 1: GOTO 62210: REM TURN FLAG ON
62255 IF C = 58 THEN DF = 0: GOTO 62210: REM TURN FLAG OFF
62260 GOTO 62280: REM SKIP
62265 IF C$ > = "A" AND C$ < = "Z" THEN GV = 1:V$ = V$ + C$:
      GOTO 62210: REM GOOD VARIABLE
62270 IF GV = 1 AND ((C$ > = "0" AND C$ < = "9") OR C$ = "%"
      OR C$ = "$" OR C$ = "(") THEN V$ = V$ + C$: GOTO
      62290: REM GOOD VARIABLE
62275 IF GV = 1 THEN 62295
62280 IF C = 0 OR C = 178 THEN RETURN : REM IF EOL OR REM
62285 GOTO 62210: REM IF NON-VAR-CHAR, KEEP LOOKING
62290 IF C$ < > "(" THEN 62210
62295 IF LEN (V$) = LV THEN RETURN
62300 FOR L = LEN (V$) + 1 TO LV:V$ = V$ + " ": NEXT L:
      RETURN
62400 REM DECIMAL D TO HEX H$
62405 H$ = "": REM H$=HEX STRING
62410 DV = INT (D / 16):R = D - 16 * DV: REM DV=QUOTIENT,
      DIVIDEND-TO-BE, R=REMAINDER
62415 IF R > = 0 AND R < = 9 THEN R$ = STR$ (R): GOTO 62425:
      REM R$=HEX DIGIT TO BE ADDED
62420 R$ = CHR$ (55 + R): REM HEX CHARACTERS A THROUGH
      F
62425 H$ = R$ + H$:D = DV: IF DV < > 0 THEN 62410
62430 IF LEN (H$) < 4 THEN FOR HH = LEN (H$) + 1 TO 4:H$ =
      "0" + H$: NEXT HH: REM H$ MUST HAVE LENGTH 4
62435 RETURN
62500 REM HEX H$ TO DECIMAL D
62505 D = 0: FOR HH = 1 TO LEN (H$):C$ = MID$ (H$,HH,1): REM
      LOOK AT EACH HEX DIGIT
62510 IF C$ > = "0" AND C$ < = "9" THEN C = VAL (C$): GOTO
      62520
62515 IF C$ > = "A" AND C$ < = "F" THEN C = ASC (C$) - 55
62520 D = 16 * D + C: REM ADD DECIMAL EQUIVALENT OF HEX
      DIGIT
62525 NEXT HH
62530 RETURN
```

(good variable), indicating that a good variable name is being parsed, should be used to allow digits to be included in variable names in the right circumstances.

This parsing subroutine starts at line 62200. The subroutine is called to find a variable name and will either return with one or signal the end of a line (EOL) or a rem. If a variable name is found, the variable list is searched and the proper action taken (either forming a new variable string or adding the line number to the variable string). If EOL or rem is found, the next line in the program is sought, and, if it's not larger than 62000 (the start of *Variable Xref*), the subroutine is called again.

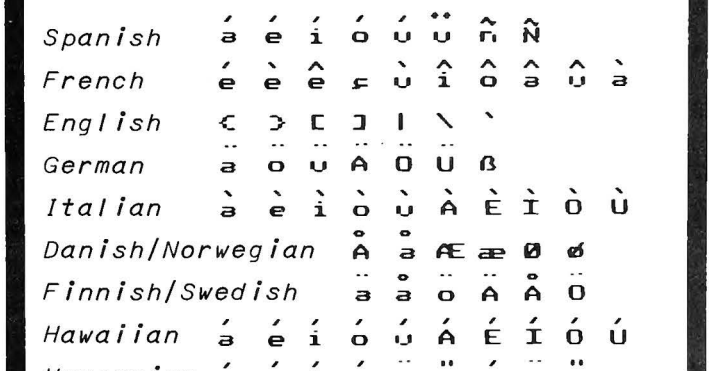
Variable Xref should be captured into a text file by typing it in, adding these lines, and running it:

```
10 D$ = CHR$(4) : N$ = "VARIABLE XREF"
20 PRINT D$; "OPEN"; N$
30 PRINT D$; "WRITE"; N$
40 LIST 100,
50 PRINT D$; "CLOSE"; N$
60 END
```


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```
VAR XREF LIST
A$    205 210 215 225 235 250 405
A1    225 240 250 405
A2    225 240 250 405
C     410 415 425 810 815 820 825
C$    405 410 415 815 820 825 830
D     230 245 255 315 405 425 430 510 525 710
D1    210 230 245 255 305
D2    210 230 255 305 325 330
DV    510 525
E     225 240 250 405 420
H$    315 505 525 530 710
I     115 125 130 135 215 220 235 240 250 320 610 710 810 835
II%   110
J     125 130 135 405 430
NB    198 199 210 310 330
P(    199 320 610 710 810
P1    305 310 315 320 330 610 710 810
P2    305 310 315 320 325 330 610 710 810
R     510 515 520
R$    515 520 525
R%(   120 130
R1    140
R2    140
S$(   115
SP    305 310 330 605 705 805
SS$   105
```

Figure 3. Output of *Variable Xref* for *Mem Display*.

Make sure there is no file named *Variable Xref* on the disk before you run this. Then, when you want to cross-reference a program in memory, type *exec Variable Xref* and *run 62000*. A sample run is shown in figure 3.

The program assumes that variable names consist of a maximum of two characters; if that's not the case, or if there are syntactical errors in the program being scanned, the results may not be accurate. If the program to be scanned needs more than three hundred variable strings (with sixty-two lines per variable string, variables may require more than one string), modify the dim in 62005. The program is not speedy; scanning *Mem Display* (1,708 internal bytes) took 105 seconds.

Besides verifying how programs are stored internally, *Mem Display* allows the format of the Applesoft variable lists to be verified. A description of Applesoft variable maps (page 137 of Applesoft manual) and Appendix L both declare that $69,$6A points to the start of the simple variable list, while $6B,$6C points to the start of the array variable list.

Adding the statements in listing 3 to *Mem Display* and dumping selected parts of memory (figure 4) will reinforce the information in the manual. $69,$6A points to address $103D. Displaying several bytes from that point reveals the simple variable list, in which entries are seven bytes long.

Listing 3. Additions to Mem Display for demonstration.

```
105  SS$ = "THIS IS " + "A STRING"
110  II% = 258
115  FOR I = 1 TO 4:S$(I) = "STRING #" + CHR$ (48 + I): NEXT I
120  DIM R%(3,2)
125  FOR I = 1 TO 3: FOR J = 1 TO 2
130  R%(I,J) = 4 * I + J
135  NEXT J: NEXT I
140  R1 = 23:R2 = 23.625
```

```
ADDR? 69.6A

69.6A

DEC:  61  16
HEX:  3D  10
ASC:  =   ^P

ADDR? 103D.106F

103D.103F

DEC:                                                    83  211  16
HEX:                                                    53  D3   10
ASC:                                                    S        ^P

1040.104F

DEC:  240 141 0   0   201 201 1   2   0   0   0   73  0   141 2   120
HEX:  F0  8D  00  00  C9  C9  01  02  00  00  00  49  00  8D  02  78
ASC:                      ^A  ^B                    I           ^B

1050.105F

DEC:  0   0   74  0   132 32  0   0   0   82  49  133 56  0   0   0
HEX:  00  00  4A  00  84  20  00  00  00  52  31  85  38  00  00  00
ASC:          J                           R   1       8

1060.106F

DEC:  82  50  133 61  0   0   0   65  128 9   148 141 0   0   65  49
HEX:  52  32  85  3D  00  00  00  41  80  09  94  8D  00  00  41  31
ASC:  R   2       =                 A       ^I                A   1

ADDR? 8DF0.8DFF

8DF0.8DFF

DEC:  84  72  73  83  32  73  83  32  65  32  83  84  82  73  78  71
HEX:  54  48  49  53  20  49  53  20  41  20  53  54  52  49  4E  47
ASC:  T   H   I   S       I   S       A       S   T   R   I   N   G

ADDR? 6B.6C

6B.6C

DEC:  215 16
HEX:  D7  10
ASC:      ^P

ADDR? 10D7.112F

10D7.10DF

DEC:                                                    83  128 40  0   1   0   11  0   0
HEX:                                                    53  80  28  00  01  00  0B  00  00
ASC:                                                    S       (       ^A      ^K

10E0.10EF

DEC:  0   9   230 141 9   220 141 9   210 141 9   200 141 0   0   0
HEX:  00  09  E6  8D  09  DC  8D  09  D2  8D  09  C8  8D  00  00  00
ASC:      ^I          ^I          ^I          ^I

10F0.10FF

DEC:  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   210
HEX:  00  00  00  00  00  00  00  00  00  00  00  00  00  00  00  D2
ASC:

1100.110F

DEC:  128 33  0   2   0   3   0   4   0   0   0   0   0   0   0   0
HEX:  80  21  00  02  00  03  00  04  00  00  00  00  00  00  00  00
ASC:      !       ^B      ^C      ^D

1110.111F

DEC:  0   0   0   5   0   9   0   13  0   0   0   6   0   10  0   14
HEX:  00  00  00  05  00  09  00  0D  00  00  00  06  00  0A  00  0E
ASC:          ^E      ^I      ^M              ^F      ^J      ^N

1120.112F

DEC:  80  0   92  0   1   0   17  0   0   0   0   0   135 32  0   0
HEX:  50  00  5C  00  01  00  11  00  00  00  00  00  87  20  00  00
ASC:  P       \       ^A      ^Q

ADDR? 8DC8.8DEF

8DC8.8DCF

DEC:                                    83  84  82  73  78  71  32  35
HEX:                                    53  54  52  49  4E  47  20  23
ASC:                                    S   T   R   I   N   G       #

8DD0.8DDF

DEC:  52  52  83  84  82  73  78  71  32  35  51  51  83  84  82  73
HEX:  34  34  53  54  52  49  4E  47  20  23  33  33  53  54  52  49
ASC:  4   4   S   T   R   I   N   G       #   3   3   S   T   R   I

8DE0.8DEF

DEC:  78  71  32  35  50  50  83  84  82  73  78  71  32  35  49  49
HEX:  4E  47  20  23  32  32  53  54  52  49  4E  47  20  23  31  31
ASC:  N   G       #   2   2   S   T   R   I   N   G       #   1   1
```

Figure 4. Internal variable lists of *Mem Display*.

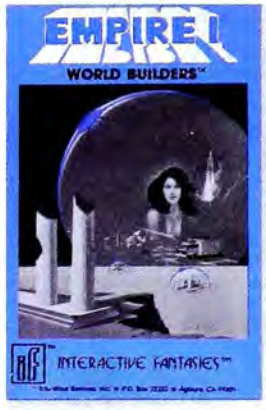
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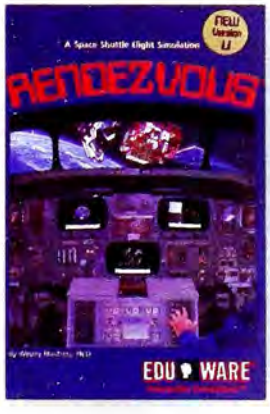
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The first variable is SS$ (the first byte is S; the second byte is S with the high bit on—the exact reverse of the Applesoft manual). Its length is sixteen, it's stored at $8DF0 (note the contents at that location), and the other two bytes are 0. The second variable is II% (both bytes are I with the high bit on—subtract 128 or $80 to get ASCII I). Its value is 256 * (high byte) + (low byte); the other three bytes are 0. The third, fourth, fifth, and sixth simple variables are I, J, R1, and R2, but let's postpone discussing real values for a paragraph and look at array variable storage (but note that the next simple variable is A$, from the original *Mem Display*).

The address pointed to by $6B,$6C, $10D7, is the beginning of the array variable list. Displaying the first few entries there shows that S$ (first byte S, second byte null with high bit on) is the first array variable. The next two bytes form the displacement ($28) to the next array variable (note that $10D7 + $28 = $10FF, where the entry for R% starts). The next byte reveals the number of dimensions (1 for this variable), and the following two bytes (high byte, low byte) indicate the default dimension size of 11. Each trio of bytes after this is length/low byte/high byte for each subscript, indicating the length of each string and the location where it's stored. As mentioned, the next array variable is R%, dimensioned 3 by 2; the offset to the next array variable (P from *Mem Display*) is $21. R% has two dimensions, the sizes being 4 and 3 (3 + 1 and 2 + 1 to allow a 0 subscript in both dimensions). Multidimensional arrays are stored with the rightmost index ascending slowest; the array is stored with the subscripts in the order 0-0, 1-0, 2-0, 3-0, 0-1, 1-1, 2-1, 3-1, 0-2, 1-2, 2-2, and 3-2. The values are stored high byte, low byte and can be verified with the expected values from the program.

Storage of real variables is tricky. Simple variable R1 (listing 3) has an assigned value of 23. It's stored (figure 4) with an exponent of $85 (133) and the first byte of the mantissa is $38. The value (exponent − 129) is an exponent of 2; call this value EX (= 4). The mantissa is a displacement to be added to 2∧EX (= 16), with the following procedure: Convert the mantissa to binary (in this case, $38 becomes 0011 1000) and move the "binary point" EX + 1 places from the left to the right (to the left if EX + 1 is negative). The binary displacement 0011 1000 becomes 00111.000 (= 7; the rest of the mantissa, consisting of 0s, can be ignored); this added to 2∧EX gives 23. Similarly for R2. Its displacement with the binary point moved is 00111.101, which would add 4 + 2 + 1 + 1/2 + 1/8 to the base of 16.

Once these points are understood, writing the utility to print the present values of a program's variable list is possible. This utility, *Variable List* (listing 4), should be captured (use the same method as was used to capture *Variable Xref*, but change N$ to "Variable List" in line 10) and can be put in memory with exec either before or after the original program's execution without disturbing the variable list—but must be executed with a *goto 63000* (*run 63000* would wipe out the very list the utility is to print). It searches both simple and array variable lists; determines from the name if a variable is real, integer, or string; and uses what we've discovered about how variables are stored to print the variables. See figure 5 for a sample run. *Variable List* itself uses only variable names that end in 9; this allows it to detect the end of both variable lists (when it finds one of its own). This means, of course, that the user's program cannot have any variable names containing 9.

Listing 4. Variable list.

```
63000  REM VARIABLE LIST
63005  PRINT : INPUT "PRINTER ON? < Y/N > ";P9$: IF P9$ < > "Y"
       AND P9$ < > "N" THEN 63005
63010  IF P9$ = "Y" THEN PRINT CHR$ (4) "PR#1"
63015  L9$(1) = " ":L9$(2) = "%":L9$(3) = "$":V9$ = "": REM
       L9$()=LABELS, V9$=VAR NAME
63020  A9 = 0:B9 = 0:C9 = 0:D9 = 0:E9 = 0:F9 = 0:G9 = 0:I9 = 0:J9
       = 0:K9 = 0:L9 = 0:M9 = 0:N9 = 0:P9 = 0:S9 = 0:T9 = 0:V9
       = 0:W9 = 0:X9 = 0:Y9 = 0: REM ENTER TO SIMPLE VAR
       LIST
63100  REM SIMPLE VARIABLE LIST
63105  L9 = 256 * PEEK (106) + PEEK (105) − 7: REM L9=LOC IN
       SIMPLE VAR LIST
63110  L9 = L9 + 7:V9 = PEEK (L9):W9 = PEEK (L9 + 1): IF W9 =
       ASC ("9") OR W9 = ASC ("9") + 128 THEN 63200: REM
       V9,W9=1ST,2ND BYTES OF VAR NAME; IF END OF LIST ...
63115  IF V9 < 128 AND W9 < 128 THEN L9 = L9 + 2: GOSUB
       63400: PRINT CHR$ (V9); CHR$ (W9)" = ";D9:L9 = L9 − 2:
       GOTO 63110: REM VAR IS REAL
63120  IF V9 > = 128 AND W9 > = 128 THEN PRINT CHR$ (V9 −
       128); CHR$ (W9 − 128)"% = "256 * PEEK (L9 + 2) + PEEK
       (L9 + 3): GOTO 63110: REM VAR IS INT
63125  PRINT CHR$ (V9); CHR$ (W9 − 128)"$ = ";:N9 = PEEK (L9 +
       2): IF N9 = 0 THEN PRINT CHR$ (34); CHR$ (34): GOTO
       63110: REM VAR IS STRING
63130  L9 = L9 + 2: GOSUB 63500:L9 = L9 − 2: GOTO 63110
63200  REM ARRAY VARIABLE LIST
63205  L9 = 256 * PEEK (108) + PEEK (107): REM LOCATION OF
       ARRAY VARIABLE LIST
63210  V9 = PEEK (L9):W9 = PEEK (L9 + 1): IF W9 = ASC ("9") OR
       W9 = ASC ("9") + 128 THEN PRINT CHR$ (4)"PR#3": END
63215  IF V9 < 128 AND W9 < 128 THEN T9 = 1:V9$ = CHR$(V9) +
       CHR$ (W9): GOTO 63230: REM ARRAY IS REAL, T9=TYPE
       OF ARRAY
63220  IF V9 > = 128 AND W9 > = 128 THEN T9 = 2:V9$ = CHR$
       (V9 − 128) + CHR$ (W9 − 128): GOTO 63230: REM ARRAY
       IS INTEGER
63225  T9 = 3:V9$ = CHR$ (V9) + CHR$ (W9 − 128): REM ARRAY
       IS STRING
63230  M9 = L9 + 256 * PEEK (L9 + 3) + PEEK (L9 + 2):K9 = PEEK
       (L9 + 4):L9 = L9 + 5: IF K9 >10 THEN PRINT "DIMENSION
       >10": STOP : REM M9=ADDR OF NEXT ARRAY,K9=# DIM
63235  FOR I9 = K9 TO 1 STEP − 1:K9(I9) = 256 * PEEK (L9) +
       PEEK (L9 + 1):L9 = L9 + 2: NEXT I9: REM K9()=SIZE OF
       EACH DIM
63240  F9 = 0:C9 = 0: REM F9=FLAG THAT ARRAY ELEMENT
       PRINTED, C9=ORDINAL POSITION − 1 IN ARRAY
63245  ON T9 GOTO 63250,63270,63290
63250  REM REAL ARRAY
63255  GOSUB 63400: IF D9 = 0 THEN 63265
63260  GOSUB 63600: PRINT D9
63265  L9 = L9 + 5: GOTO 63310
63270  REM INTEGER ARRAY
```

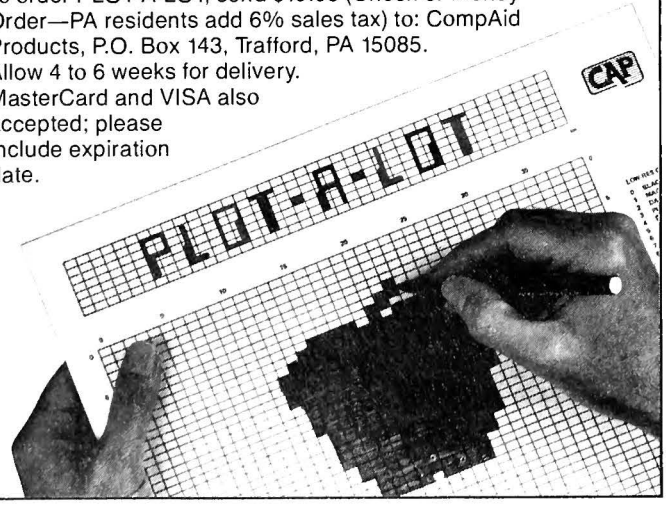

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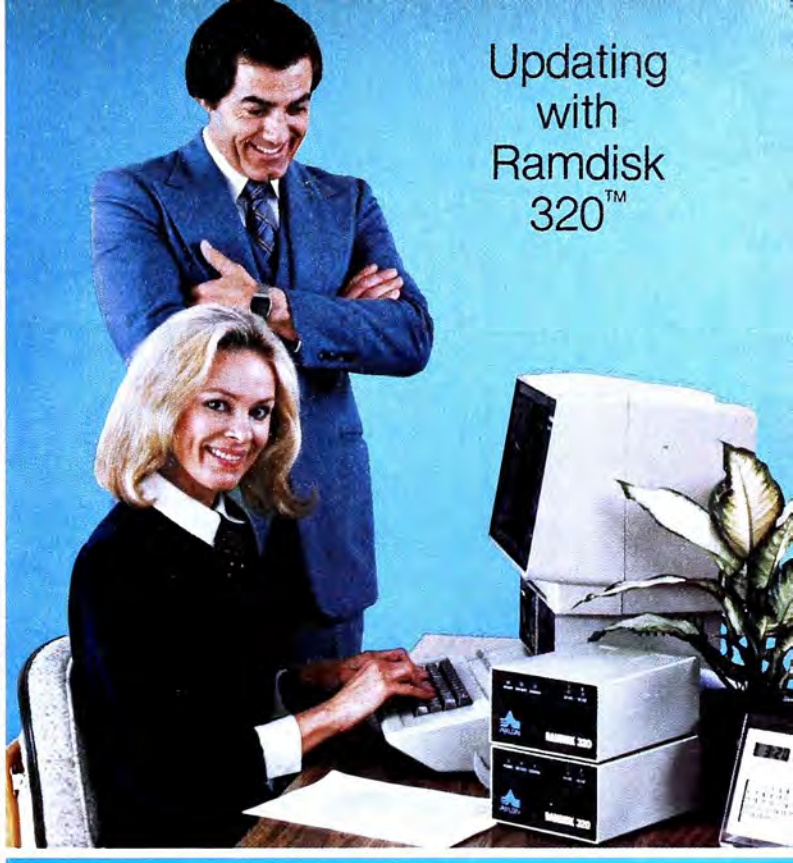
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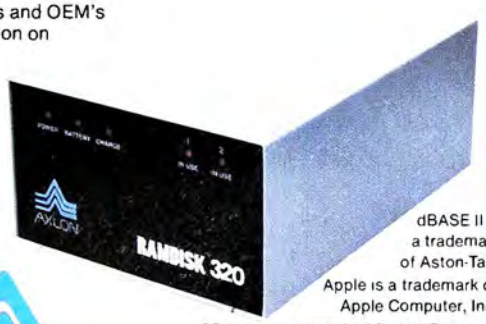
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```
63275  D9 = 256 * PEEK (L9) + PEEK (L9 + 1): IF D9 = 0 THEN
       63285
63280  GOSUB 63600: PRINT D9
63285  L9 = L9 + 2: GOTO 63310
63290  REM STRING ARRAY
63295  N9 = PEEK (L9): IF N9 = 0 THEN 63305
63300  GOSUB 63600: GOSUB 63500
63305  L9 = L9 + 3
63310  IF L9 < M9 THEN C9 = C9 + 1: GOTO 63245: REM IF MORE,
       INCR ORDINAL POSITION
63315  IF F9 = 0 THEN PRINT V9$;L9$(T9)"()": REM PRINT IF
       ENTIRE ARRAY NULL
63320  L9 = M9: GOTO 63210
63400  REM CONVERT REAL VAR TO DECIMAL
63405  E9 = PEEK (L9) - 129:D9 = 2 ^ E9: REM E9=EXPONENT,
       D9=DECIMAL
63410  FOR I9 = 1 TO 4:D9 = D9 + PEEK (L9 + I9) * 2 ^ (E9 + 1 - 8
       * I9): NEXT I9: REM ADD IN BYTES OF MANTISSA
63415  RETURN
63500  REM PRINT STRING, LENGTH AT L9
63505  A9 = 256 * PEEK (L9 + 2) + PEEK (L9 + 1): PRINT CHR$
       (34);
63510  PRINT CHR$ ( PEEK (A9));:N9 = N9 - 1: IF N9 > 0 THEN A9
       = A9 + 1: GOTO 63510: REM PRINT EACH CHAR
63515  PRINT CHR$ (34): RETURN
63600  REM PRINT VAR NAME AND SUBSCRIPTS
63605  PRINT V9$;L9$(T9)"(";:G9 = C9:Y9 = 0:F9 = 1: REM G9
       STARTS AS ORDINAL POSITION - 1, Y9=SUBSCRIPT
       POSITION
63610  Y9 = Y9 + 1:X9 = K9(Y9):S9(Y9) = G9 - X9 * INT (G9 /
       X9):G9 = INT (G9 / X9): IF Y9 < K9 THEN 63610: REM
       FIGURE SUBSCRIPTS
63615  FOR I9 = 1 TO K9: PRINT S9(19);: IF I9 < > K9 THEN PRINT
       ",";: REM PRINT SUBSCRIPTS
63620  NEXT I9: PRINT ") = ";
63625  RETURN
```

There is one tricky aspect to *Variable List*. Because array elements (or pointers to string elements) are stored linearly, an algorithm is needed to figure the subscripts from the ordinal position of the element they represent. One-dimensional arrays are no problem; the value (ordinal position − 1) is the single subscript sought. Multidimensional subscripts are harder; consider the first twenty-four elements for an array dimensioned 2 by 3 by 4 and their respective subscripts (figure 6). This table suggests that after dividing (ordinal position − 1) by the size of each dimension in turn, the remainders are the subscripts, and the quotient becomes the next value to be divided by the next dimension size; this continues until the last subscript is found. For instance, if 18 is 1 less than the ordinal position, 18 / 3 leaves a remainder/subscript of 0, and 6 is to be divided next by 4; 6 / 4 leaves a remainder of 2, the second subscript, and 1 is to be divided by 5; this leaves a remainder/subscript of 1. If (ordinal position − 1) is 18, this represents the array element R%(0,2,1). In *Variable List*, K9 is the number of dimensions, and K9(1) through K9(K9) is a list

```
SS$ = "THIS IS A STRING"
I1% = 258
I = 4
J = 3
R1 = 23
R2 = 23.625
S$(1) = "STRING #1"
S$(2) = "STRING #2"
S$(3) = "STRING #3"
S$(4) = "STRING #4"
R%(1,1) = 5
R%(2,1) = 9
R%(3,1) = 13
R%(1,2) = 6
R%(2,2) = 10
R%(3,2) = 14
```

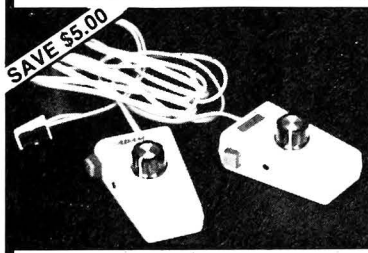
Figure 5. Output of *Variable List* (of modified *Mem Display*).

Ordinal Position − 1	Subscript of Dimension 1	Subscript of Dimension 2	Subscript of Dimension 3
0	0	0	0
1	1	0	0
2	2	0	0
3	0	1	0
4	1	1	0
5	2	1	0
6	0	2	0
7	1	2	0
8	2	2	0
9	0	3	0
10	1	3	0
11	2	3	0
12	0	0	1
13	1	0	1
14	2	0	1
15	0	1	1
16	1	1	1
17	2	1	1
18	0	2	1
19	1	2	1
20	2	2	1
21	0	3	1
22	1	3	1
23	2	3	1

Figure 6. The first 24 ordinal positions of an array dimensioned 2 x 3 x 4.

of the size of each (remember, each size includes the 0 subscript for that dimension). S9(1) through S9(K9) will be the subscripts derived from the ordinal position minus 1); this latter value is kept by C9, to which G9 was originally set. Y9 is the position of the subscript desired and starts at 1. Line 63610 implements the algorithm. ◨

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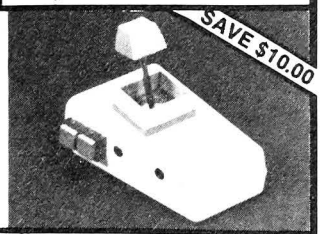


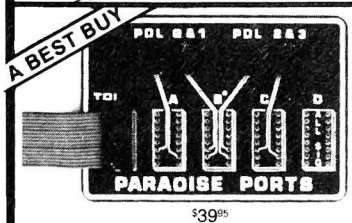
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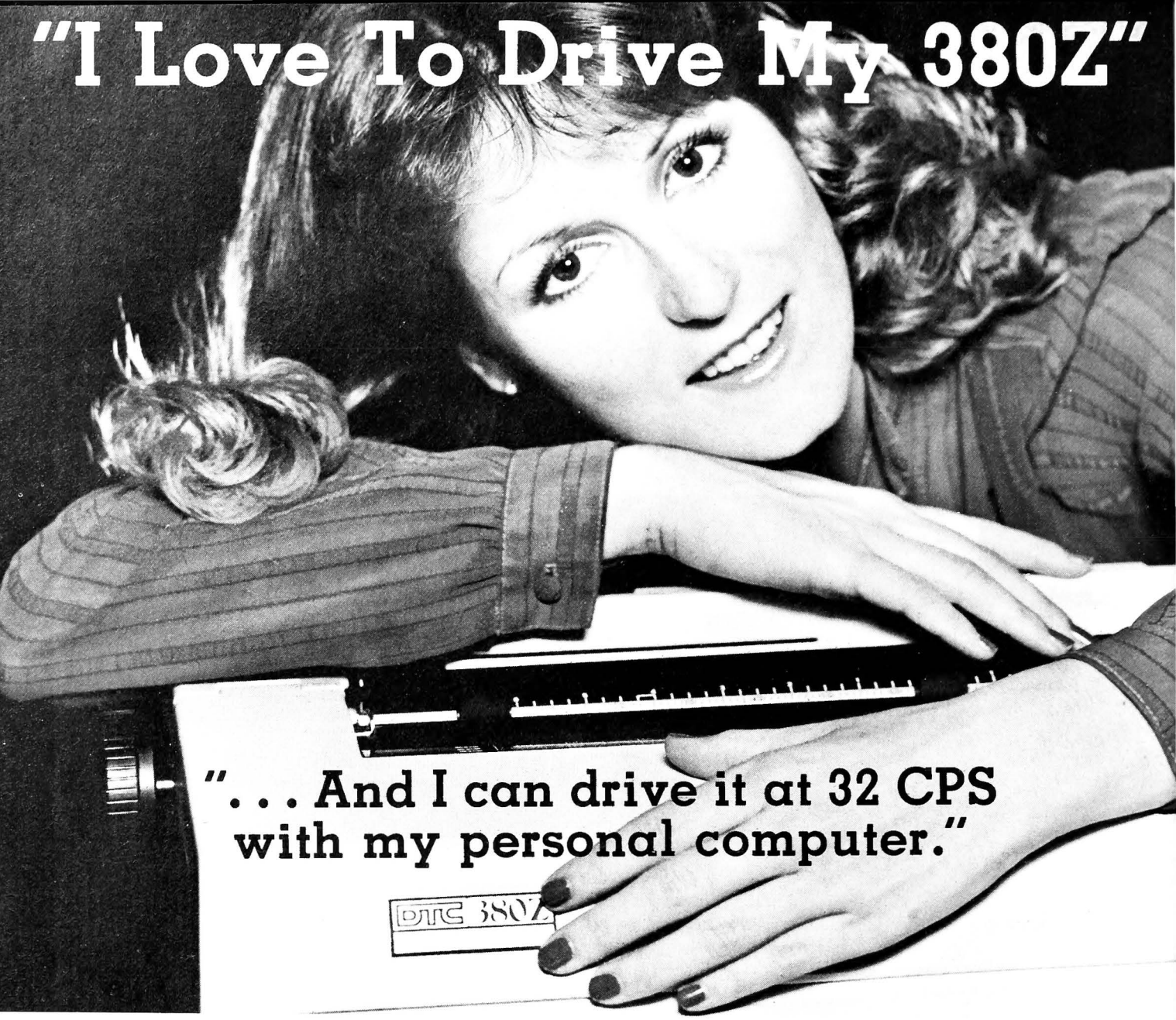
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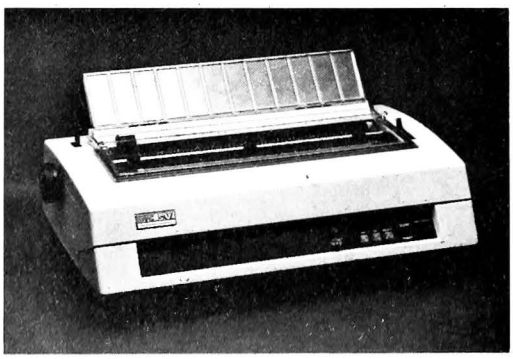


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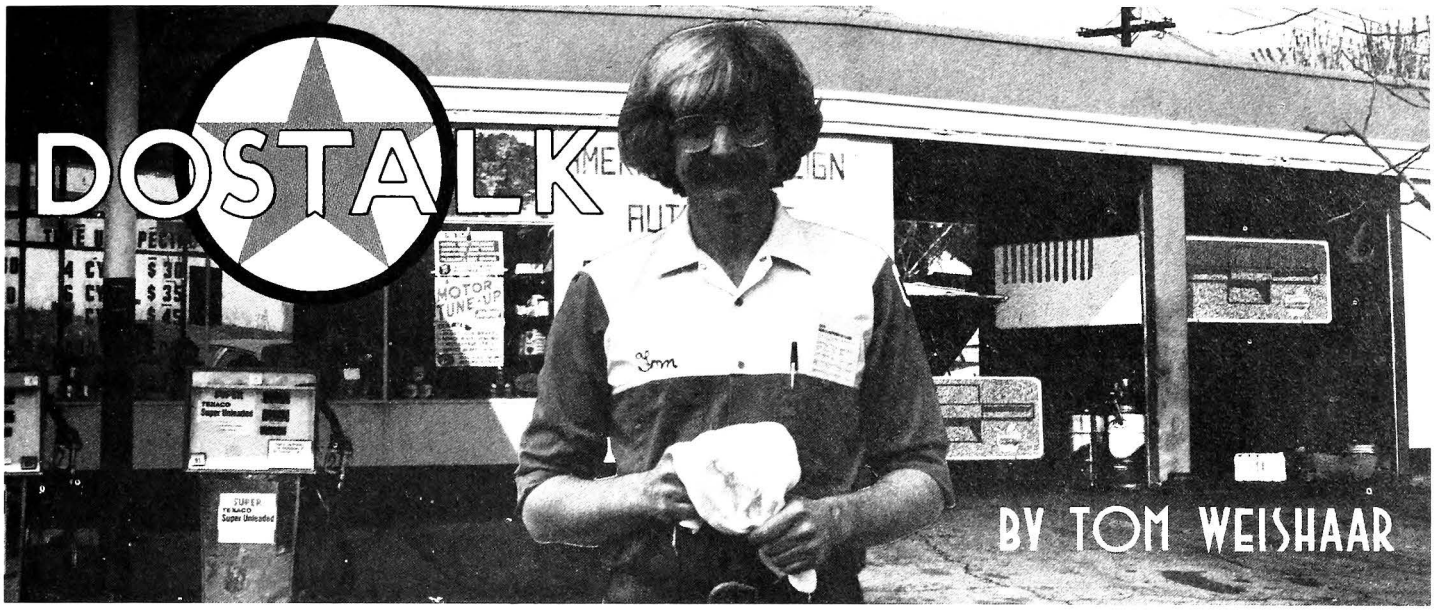
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Last month we were discussing why Apple DOS is the most widely used disk operating system in the world. This month we are going to continue looking at DOS as an operating system. And we'll go exploring in your Apple's basement. We'll also take a close look at the DOS commands *mon* and *nomon.*

We left off last time after looking at how Uncle DOS intercepts all messages and commands from you or the program you are using. DOS looks for messages that might be meant for him in a sleepy-headed sort of way, ignoring any message that doesn't buzz his alarm with a return and a control-D.

We discussed how DOS's method of tapping the Apple's *I/O links* to intercept these messages isn't just a trick. It is a correct and elegant use of a fundamental characteristic of the Monitor, the operating system built into every Apple.

The Monitors Three. What we didn't talk about last month was that three slightly different versions of the Monitor have been used by Apple. The Integer Basic Apple II came with the Apple System Monitor, which is usually called the "old Monitor" these days. Integer Basic Apple IIs were manufactured from 1977 through mid-1980.

Sometime around the beginning of 1980, Apple introduced the Apple II Plus, which came with Applesoft Basic and the Autostart Monitor. Production of this model ceased in January of this year, when the Apple IIe was introduced with yet a third version of the Monitor. However, as far as Uncle DOS is concerned, the Apple IIe's Monitor is a duplicate of the Autostart Monitor.

But there are several differences between these newer Monitors, which were written with DOS in mind, and the old Monitor, which wasn't. The newer Monitors will automatically start up or boot a disk when the computer is turned on. The standard Integer Basic Apple will not. In fact, very early versions wouldn't even accept Basic or DOS commands until after you pressed the reset key. Then you had to type in a control-C to start up Basic and a pr# command to start up DOS.

A second important difference between the old Monitor and the newer versions is the effect that pressing reset has on DOS. With the newer Monitors, pressing reset usually stops whatever program is running and returns you to Basic, with DOS untouched.

With the old Monitor, however, reset disconnects DOS. The DOS addresses in the I/O links we talked about last month are replaced with the addresses of the Monitor's own input/output routines. Early Apple owners usually use the "three-dog" technique to reconnect DOS. More about this later.

Consorting with the Monitor. While the newer versions of the Monitor are clearly improvements in terms of ease of use, the old Monitor was a friendly gammer in her own way. When you turn on one of the older Apples and press reset, the screen fills up with miscellaneous characters. In the bottom left-hand corner there is an * and a flashing prompt.

The asterisk is the Monitor prompt, just as] and > are the Applesoft and Integer Basic prompts. When the asterisk prompt is on your screen, a whole set of Monitor commands is at your disposal. These commands let you inspect what's in your Apple's memory, change the values at certain bytes, move things around, and more.

These commands are beyond the scope of this column. If you are interested in learning more about using the Monitor directly, the *Apple II Reference Manual* is a good place to start. This book was in the box with Apple IIs and Apple II Pluses. It is an extra-cost option with the Apple IIe.

If you'd just like to visit the Monitor, perhaps only to say you've met, enter this command from Basic:

```
CALL -151
```

To return to Basic, press reset or control-C. Since the advent of the Apple II Plus, which includes the Autostart Monitor, Apple users haven't seen much of the old Monitor. But she was always very quick and responsive, though a little difficult to talk to (always so cryptic!).

Things That Go Bump in the Night. There's a word coming up in a sentence or so that may scare you. Given fair warning, you should have the courage to stay to see it, rather than running away like it was a spider or something. The word is "vector." Try not to think of the fear that gripped you when your high school physics or math teacher used this word. It means something else in our context anyway.

Vector is derived from a Latin word that means "to carry." In assembly language, a vector is a specific, defined memory location a program can jump to that will then carry the program to a subroutine it wants to use. Vectors are used with subroutines that don't have a specific, predetermined, permanent address in memory.

Uncle Apple DOS, for example, doesn't really have a permanent home. While DOS is usually found in the memory area starting at byte 40192 (in hexadecimal that's $9D00) and going on up to 49151 ($BFFF), it isn't necessarily so. DOS was designed to run on Apples with as little as 16K of memory. On a 16K Apple the memory area starting at byte 40192 is nothing but thin air. So on Apples with less than 48K of memory, DOS installs itself at the highest available address.

Since we did away with Apples having less than 48K in this column a couple of months ago, you might think that DOS has found a permanent home. But beware. Many users like the idea of moving DOS up into the language card area. Several software packages on the market now include programs designed to do this—particularly the high-speed DOS packages we talked about in March.

Down the Cellar Steps. Since DOS doesn't have a permanent home, it always files a change-of-address notice in what is known as the *page three vector table* when it starts up. This table is always found at memory locations 976 ($3D0) to 1023 ($3FF), as shown in the Apple memory map.

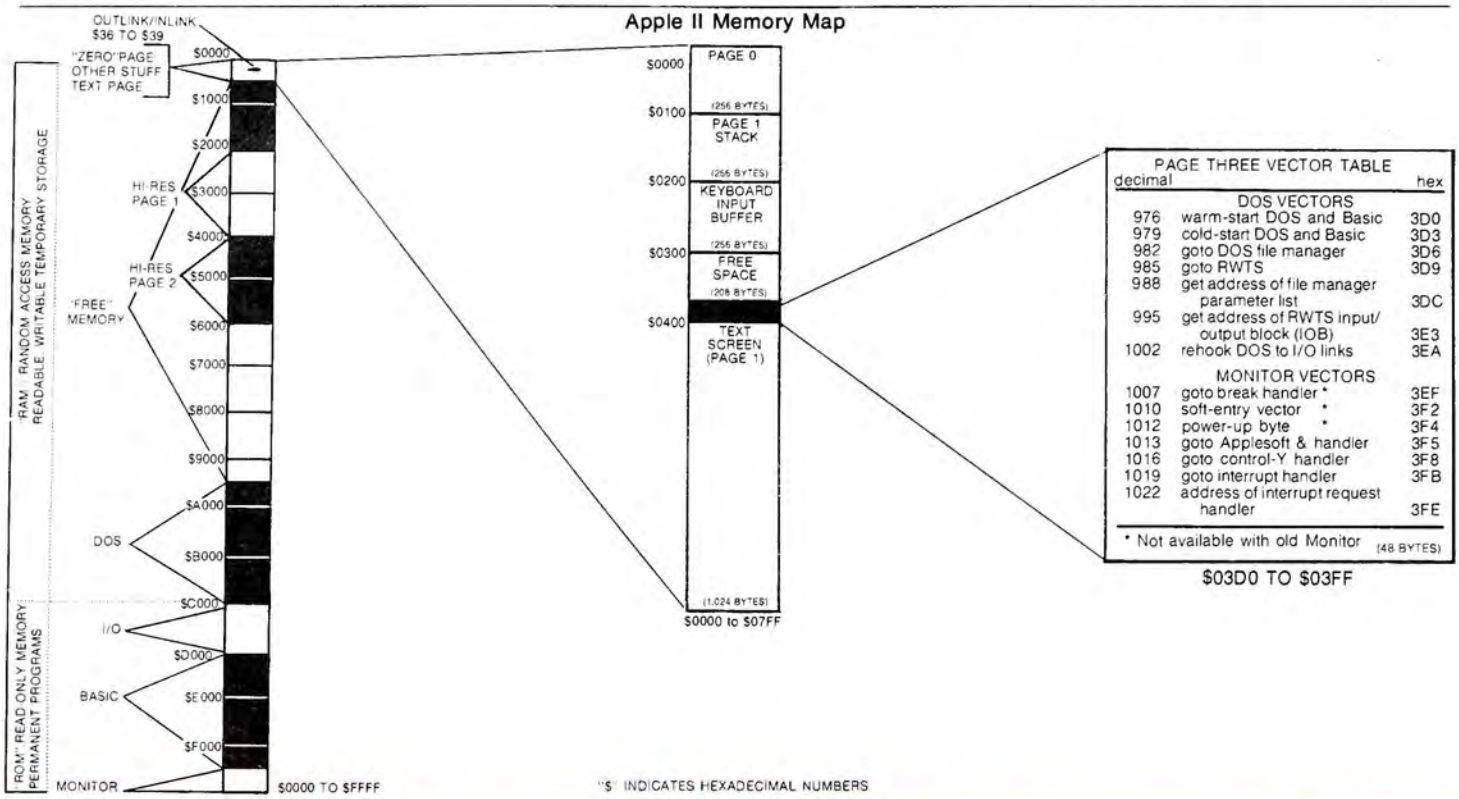
This month's figure is a lot like last month's. This time, however, it has a better view of the very beginning of your Apple's memory. This area is special. Think of it as your Apple's basement. It's a place one

doesn't go very often, but there's lots of neat stuff stored there and it's fun to explore.

The first 256 bytes of memory, from byte 0 ($0000) to byte 255 ($00FF), are called *memory page zero.*

Assembly language programmers often think of the Apple's memory as having 256 pages. The left two digits of a hexadecimal address indicate the memory page—the right two digits the memory byte. For example, we mentioned earlier that DOS usually starts at $9D00. This is the same thing as "page nine-D, byte zero."

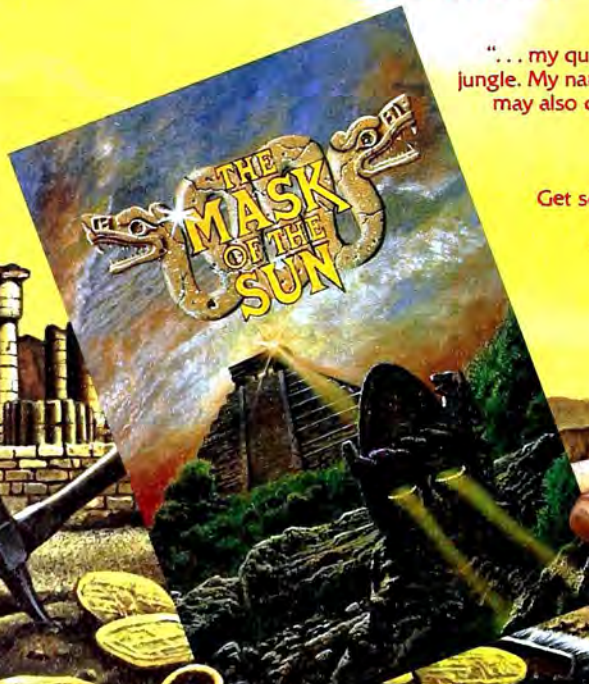
Page zero is endowed with special powers on computers such as the Apple that use the 6502 microprocessor. So is page one. Basic and the Monitor use these pages constantly and keep a lot of interesting num-



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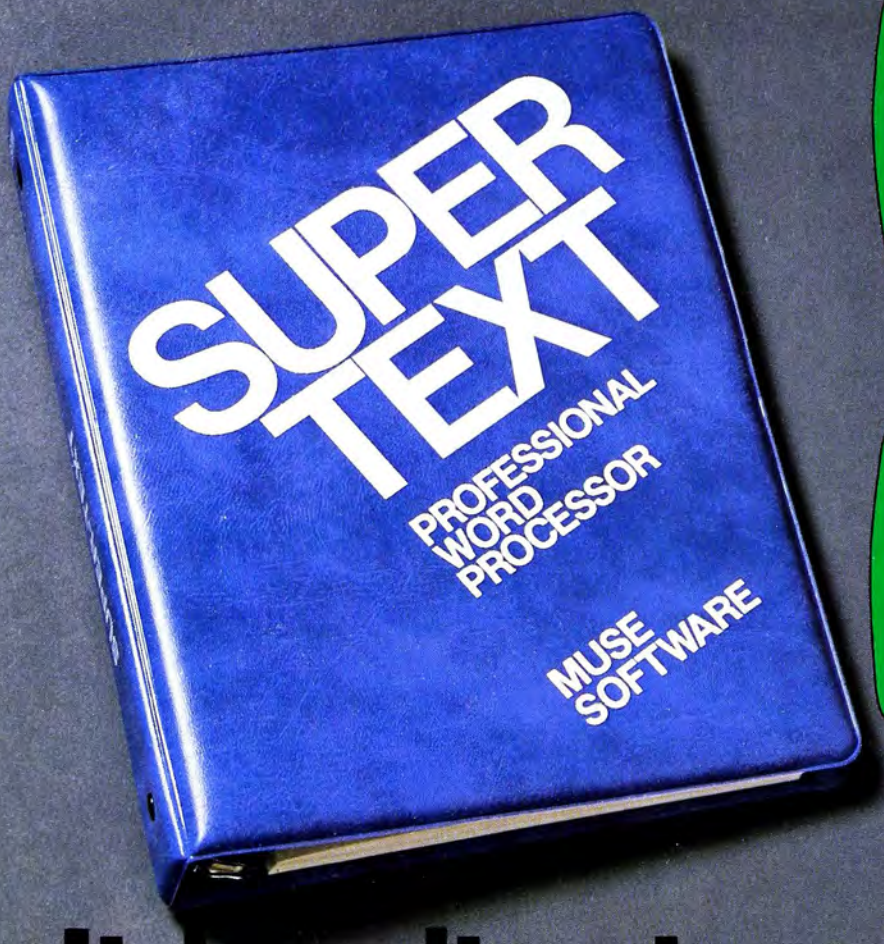
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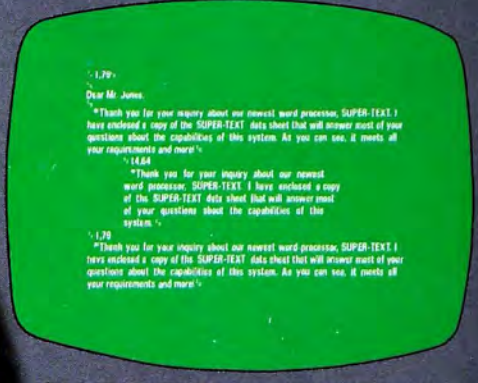
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bers and flags there.

Page two is used by the Monitor as a *keyboard input buffer.* As you type a line into your computer, the line is saved in this area as well as displayed on your screen. When you hit return, DOS and Basic, each in turn, examine the contents of this buffer, hoping to find a syntax error. If one of them is successful, he will be happy to beep your speaker. Otherwise, your command will be executed.

Skipping over page three for a moment, note that pages four through seven are where characters that are to appear on your screen are placed. Your computer's circuits scan this area many times each second. On each scan the numerical contents of this area are translated into characters and placed on a video signal. What you see on your screen is the end result of this miracle.

The order in which characters are stored in this area has been described as "Byzantine," "Kafkaesque," and "all mixed up." While the screen's first forty characters are stored in the first forty bytes of this area, just as you might expect, the second line starts at byte 128. It's the ninth line that starts at the forty-first byte.

The Page Three Vector Table. Going back now to page three, we find that most of it is empty. This empty space is often used by assembly language programmers for short programs they don't want Basic to step on. Basic doesn't use this area. Looking at the rightmost part of the figure, however, you can see that the last forty-eight bytes of page three are packed with information. This is the page three vector table.

Even though the table is written as assembly language instructions, you don't have to be an assembly language programmer to use it. The following paragraphs will contain examples of using the table from Basic and from the Monitor.

The table has two major parts, the first part containing vectors that will carry your program into some useful areas of DOS, the second part consisting of vectors that the Monitor itself uses. Most of the vectors in the second part are of little interest to us here. They have to do with redirecting your computer to handle Applesoft ampersand commands, interrupts (something only special peripherals such as clock cards can do), and so on.

The Soft-Entry Vector. One important vector in the Monitor's half of the table, however, is known as the *soft-entry vector.* This vector isn't available with the old Monitor—it was one of the things added for the sake of DOS in the Autostart Monitor. The soft-entry vector tells your Apple where to go after you press the reset key.

In Apples with the old Monitor, pressing reset always disconnects DOS and dumps you in the Monitor, with an asterisk on your screen.

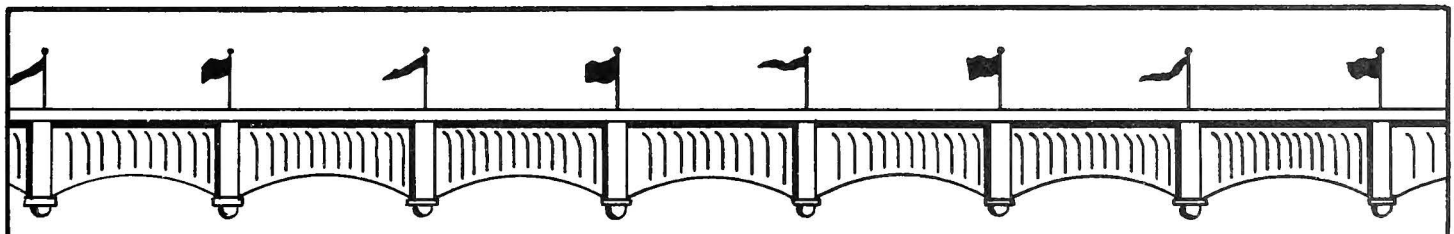
But on autostart Apples, pressing reset tells the Monitor to take a look at byte 1012 ($3F4). If this byte, called the power-up byte, contains the proper value, the Monitor will jump to the address stored in the soft-entry vector. This address is usually 40383 ($9DBF), which is the DOS warm-start address.

But if, on the other hand, the power-up byte contains an incorrect value, the Monitor will proceed to reboot DOS. When you first turn on your Apple, this value is always incorrect. Thus the Autostart Monitor will always boot DOS as part of the automatic reset cycle you initiate by turning on your computer.

If you want your computer to reboot DOS when you press reset, all you have to do is change the value in the power-up byte. If you want your computer to do something besides a DOS warm start when you press reset, put the address of the assembly language routine you want to jump to in the soft-entry vector, then set the power-up byte to the correct value by calling 64367 ($FB6F). The routine at this location in the Monitor corrects the power-up byte.

Remember that none of this works on Apples with the old Monitor. A call to 64367 in the old Monitor usually sends you somewhere over the rainbow.

The DOS Vectors. Now let's look at the DOS half of the page three vector table. It begins with a jump to the DOS warm-start address, just as the soft-entry vector normally does. A DOS warm start does several things: It resets the language card, if available, to the language in use the



Roger Wagner Fan Appreciation Day

Time to get out those handkerchiefs. As tear-jerkers go, the end of **E.T.** was nothing compared to this one. If you cried like a baby during the Who's Farewell Concert, then get prepared to weep buckets.

This month, Roger Wagner is bidding a fond farewell to 6502 assembly language. After thirty-three seasons of Assembly Lines, Wagner is hanging up his assembler and moving on to other challenges. It's enough to make one start blubbering like a Yankee fan on the day the "Clipper" stepped down.

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last time DOS was cold-started; resets the I/O links so DOS can see all incoming and outgoing messages; executes a nomon command; and jumps to the warm-start routine of the Basic language you are using.

At the end of a warm start you will find a Basic prompt and a flashing cursor on your screen. Any program you had in memory before the warm start will still be there. If DOS had become unconnected for some reason it would now be reconnected.

Users of Integer Basic Apples with the old Monitor are usually very familiar with this warm-start vector. As mentioned earlier, pressing reset on one of these computers disconnects DOS and leaves you in the Monitor, with an asterisk on your screen. Entering the Monitor command *3D0G* causes the computer to jump to the DOS warm-start vector, which reconnects DOS and restarts Basic. The 3D0 part of this command is the hexadecimal address of the warm-start vector, and the G is the Monitor equivalent of goto. So much for the famous three-dog procedure.

The second vector in the page three table points to the DOS cold-start address. A DOS cold start takes a look at and remembers which Basic language is active; updates a language vector table inside DOS itself; resets the I/O links so DOS can see all incoming and outgoing messages; executes a nomon command; and jumps to the cold-start routine of the Basic language you are using (this erases any program in memory).

When Basic puts its prompt on the screen, DOS regains control, remembers it was in the middle of cold-starting itself, and stakes claim on some space it uses for what is known as *DOS buffers*, resets the address of the highest memory location (himem) Basic can use so Basic will honor the DOS buffer claim, and checks to see if DOS was just booted. If not, the cold start ends here. After a boot, on the other hand, DOS will also post notice of its main entry-point addresses in the page three vector table and run your hello program.

After a call to the DOS cold-start vector you will find yourself in Basic, with any program you had in memory gone. Note that once DOS has been booted there is nothing you can do to make it update the page three vector table. This is so that changes you make manually to the table will stick.

Meet the File Manager and Mr. RWTS. The next four vectors in the page three table carry you into the interior reaches of DOS itself. A call 982 wakes up the DOS *file manager*. The file manager studies the *file manager parameter list*, which is a table of numbers inside DOS, and executes whatever action is indicated there.

Calling the file manager directly is fairly dangerous, since you don't usually know what is in his parameter list unless you have filled it in yourself. But to prove the page three vectors really work, do a *catalog* and follow it immediately with *call 982*. Your catalog command sets up the parameter list. Your call 982 takes advantage of this setting.

We cannot emphasize too much that call 982 doesn't always give you a catalog of your disk. It will sometimes destroy files. In a few months we'll show you in detail how to fill in the file manager parameter list yourself. If you just can't wait that long, get a copy of *Beneath Apple DOS* by Don Worth and Pieter Lechner. Otherwise, forget you ever read about call 982.

The next vector takes you directly to the part of DOS called RWTS. This is the part of DOS that actually turns on your disk drive, moves the arm inside it to the correct track, and transfers data between your disk and your computer. RWTS is controlled by numbers you place in a table called the *input/output control block*, or IOB.

Regular readers may remember Bert Kersey's discussion of how to use RWTS directly in the October 1982 DOStalk. Both *Beneath Apple DOS* and your DOS manual contain further information.

The next two vectors in the page three table are not actually vectors at all but very short assembly language routines that can give you the address of the file manager parameter list and the IOB. Since you must know where these tables are to use the file manager or RWTS, and since the tables do not have a permanent home address, the page three vector table includes these directions for finding them.

Egad, There's More. The final vector in the page three table, call 1002, carries you to the subroutine inside DOS that reconnects DOS to the I/O links. Any time DOS becomes disconnected from the I/O links it will cease to function. Even a simple catalog command will give you a syntax error. To reconnect DOS in this situation you need only call 1002.

Another way to use this vector is with the Monitor command 3EAG control-C. This is an alternate way to get back to Basic after an old Monitor reset. It has the advantage of not turning off any mon settings you may have made, which the DOS warm start does.

There is one other way many programs use the page three vector table. That is to find the location of DOS itself or to confirm that the program is running on an Apple with at least 48K of memory.

The standard procedure for this is to peek at location 978 ($3D2). If the value stored at this location is less than 157 ($9D), it indicates that the computer being used has less than 48K of memory. If the value at byte 978 is equal to 157, the computer has at least 48K and DOS is in its normal location.

If the value at byte 978 is greater than 157, you have at least 48K of memory to play with, but look for Uncle DOS in the language card area.

Monitoring the Monitor on Our Monitor. Linguists like to belittle computer terms such as "input" and "output." Talking about computers would be a little easier, however, if we came up with more words like these that have specific meanings. Instead we seem to pick out some mellow-sounding word and use it for everything. "Monitor" is a good example.

First we have the Apple operating system we've been talking about. That's the Monitor. Then we have the televisionlike screen you look at. Apple likes to call that a monitor too. And then, of course, there's the DOS mon command, which also means—you guessed it—monitor.

Mon lets you watch some types of information flowing between DOS and your program. Normally this particular type of information doesn't appear on your dingbat.

The information consists of commands your program sends to DOS—the ones that begin with a control-D; input from the disk to your program that is associated with a read or exec command; and output from your program to the disk that is associated with a write command.

DOS lets you choose to monitor any combination of commands, input, and output. The circumstances under which you would want only one or two of these and not all of them are quite limited. According to the DOS manual, the proper syntax for the mon command is

```
MON C,I,O
```

The C, I, and O parameters may be given in any combination or order. Some genius long ago discovered that DOS doesn't really care if you type the commas or the space with this particular command. Since by dropping them and reversing a couple of the parameters we can make this command both pronounceable and something other than monitor, let's call it monico.

Debugging the Debug Bug. The chief use for monico is debugging your programs. It allows you to chaperone DOS and Basic as they dance together.

You can turn off monico with nomonico. Turning monico off allows DOS and Basic to dance a little faster and keeps all kinds of stuff off the screen that could confuse a user of your program.

Uncle DOS seems to enjoy sneaking off unchaperoned. Nomonico is the natural state of DOS. Programmers using monico sometimes have trouble with it. The problem is that it mysteriously gets turned off almost as fast as they can turn it on.

The culprit here is the nomonico that DOS does automatically every time it is warm or cold-started. This means every time you press reset on newer Apples (common when debugging programs) or do an fp or int or three-dog, monico will be nomonicoed.

If this bugs you, spray the following pokes into DOS:

```
POKE -25129,234
POKE -25128,234
POKE -25127,234
```

The value 234 is the machine language code for NOP (no operation). Three of these at this strategic location ($9DD7-9DD9) will keep Uncle DOS dancing in full view.

We've accomplished a lot this month—renaming the mon command and all. But the midnight oil is about burnt out. We'll have to leave further explorations for later. See you next time. ∎

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Buttonwood Apples

BY KEN LANDIS



In the last few issues, we've examined programs that use analytical tools to help investors make decisions. But sometimes other elements must be accounted for or included in the decision-making process. These range from income sheltering and maintaining a balanced portfolio to plain emotion (often called "profit taking" or "loss cutting," depending on how an investment has performed).

Each investor has different reporting needs. One may require only a capital-gains calculation to use in figuring income tax, while another may want a full running summary of portfolio status. An investor who wants a fair amount of portfolio status information may want to consider purchasing a stock portfolio accounting system.

The value of a portfolio accounting system is twofold. First, it simplifies and structures record keeping. Second, it processes portfolio information quickly and accurately and provides valuable reports. These reports are a help in computing tax liability, making buy or sell decisions, and tracking the performance of overall portfolios and individual securities.

In this issue, we'll examine such a portfolio accounting system—Smith Micro Software's *Stock Portfolio System.*

Stock Portfolio System, Smith Micro Software (Box 604, Sunset Beach, CA 90742; 213-592-1032). $185.

Backup policy: Backup provided with warranty registration.

System requirements: any 48K Apple II or a 128K Apple III; one or two disk drives. Printer and modem optional. Apple IIs must use the Hayes Micromodem II; Apple IIIs call for the Hayes Smartmodem.

The Stock Portfolio System (*SPS*) is designed to provide reports that will help investors manage their portfolios. But what is a portfolio? To some of us it is one, two, or three stocks. But are stocks all? No. In addition to stocks, a portfolio can contain bonds, money market funds, and options. *SPS* can account for all of these securities; many of the other portfolio accounting packages on the market can't. So if you're holding a diverse portfolio and haven't been able to find a package that can account for your various securities, *SPS* may be for you.

SPS is menu-driven. From the main menu you have access to three secondary menus. The first of these allows you to enter buy, sell, and settlement information, deposits, and so on to the database; the second enables you to initialize data disks, start databases, and so on; and the third is the report section.

A fourth choice available on the main menu is the Dow Jones terminal mode. *SPS*'s rudimentary terminal program allows the user to log on to Dow Jones automatically and then to use the Apple as a dumb terminal. This terminal program is a nice feature, but for the heavy user of the nonquote databases on Dow Jones, a dedicated terminal program with a memory buffer and disk storage of received information is preferable.

Unique functions that *SPS* provides are the ability to print out reports, by either calendar year or fiscal year, to set margin requirements used in your various trading accounts, and to supply your own effective tax rate for ROI calculations.

Once program installation has been taken care of, the investor is ready to start building the portfolio data files. The first thing to do is to initialize a data disk using the utilities that are included in the *SPS* package. These utilities allow you to do data disk initialization, database creation, new-year carry-forward (for tax purposes), and data disk backup.

SPS requires the investor to initialize all data disks using the *SPS* initialization utility. Disks that have been initialized using init will have to be reinitialized.

When *SPS* initializes a disk, it stores the present year's date, which will appear on all *SPS*-generated reports. It's a good idea, suggests the author, to note the year on the disk label.

The database-creation utility builds the database format for a portfolio file. The initial database is built using all the transactions or investments to date excluding options. Options are added later via the options-entry sequence on the update menu. If information is being entered after the beginning of the taxable year, the investor can enter all previous closed-out transactions as sells. *SPS* will assume that all current holdings are settled (paid for).

SPS prompts you to supply not only security information such as price, date bought, number of shares, and commission costs, but accounting information. The program can track the open balance in multiple disbursement accounts—money market, certificate of deposit (or CD), checking, and so on—and up to three different margin accounts. Margin account number one is dedicated to stock purchases that have a 50-percent-margin requirement. Accounts two and three are provided for bond purchases, where margin requirements may vary.

The new-year-carry-forward utility is used at the close of the year to transfer all the active securities to a new database. All the current year dividend fields are cleared to zero. The existing dividend balance is summed to the prior year dividend balance and then brought forward as prior year dividends. All the monthly interest income and expense fields are also cleared to zero. The carry-forward utility does not overwrite the existing database; instead it transfers active information forward to a new data file.

The *SPS* backup utility does two things. It makes a backup copy of your database and it purges all deleted records in the process. The purging feature helps keep *SPS* data disk usage to a minimum, increasing the number of securities that can be maintained on a data disk.

Portfolio Update. The *SPS* portfolio databases are updated using the routines listed on the update menu. The update module is not loaded into memory during the initial boot. When the user selects this module, the disk drive is activated and the module loaded.

SPS offers seven update functions. The transactions processed in this module are new security purchases, security sales, dividends received, bond interest received, stock splits or dividends, cash account/margin updates, options-transactions processing, and security-closing-date processing. The program prompts the investor to supply all the required information for the particular transaction being handled.

The record maintenance feature is also accessible from this menu. Having selected records maintenance mode, the investor can modify any of the information provided during database creation, purge records,

post margin account interest expense, and print out a detailed ticker-symbol list of the securities carried in the database.

Two interesting features of *SPS* are the way it processes closing information and how it handles options.

Investors who purchase or sell securities normally have five to seven days before payment is made to the broker. (This process is known as closing.) *SPS* prompts the investor to tell it where the funds are to be drawn from. If a purchase is made on margin, the program checks the margin account equity for sufficient funds. If sufficient equity is not available to pay for the purchase, *SPS* automatically checks the primary money market fund for the balance needed. If the necessary funds aren't available in the money market account, the system issues a message telling the investor how much money is due the broker.

SPS is designed to handle options purchases, options sales, and the writing of options on your own securities. If you write an option, the program finds out how many shares you own of the underlying security. If that number of shares is insufficient to support the writing of the option, *SPS* will not process the transaction.

Portfolio Reports. Everything discussed so far regarding *SPS*—database creation, updating, and maintenance—is performed to support the report capabilities of the program.

The portfolio reports/status menu is activated by selecting option number three on the main menu. Like the update module, this module is not loaded into memory during the initial boot. Once the user selects the option, the disk drive is activated and the module loads in twenty to twenty-five seconds.

To produce reports reflecting the current value of the portfolio, the most recent prices of the securities in the portfolio must be entered. The investor may enter these prices manually, getting them from the local newspaper, the *Wall Street Journal*, or *Barron's*, or may fetch them automatically from Dow Jones.

During the quotes update, all options records are reviewed and updated. If an option you wrote has expired, the underlying securities record will be updated to reflect its new, unencumbered status. *SPS* also checks to see if any securities were due to be closed on or before the date you're running the report. If so, and the process close option on the update menu has not been run, you'll be instructed to run it before proceeding. This must be done to ensure that the proper margin and cash balances are being maintained. The author refers to this as maintaining the "financial integrity of the database." A very apt description.

Assuming that the investor made all the required entries to the database through the update menu and then posted the latest quotes through the quote entry routines at the beginning of this module, the *SPS* reports are ready to run. The reports can be printed to the screen or routed to a printer for hard copy. Certain reports show different information on the display than they do in the hard-copy format. We'll note these differences on a report-by-report basis.

The seven *SPS* reports cover current portfolio status, individual security status, tax year profit and loss, dividend income, interest income/expense, long-term status, and dividend/bond interest-due status.

Current Portfolio Status. This is a comprehensive listing of the portfolio's current components, showing current market value, margin, and money market account status where applicable (see exhibit 1). The hard-copy reports include a percent-change column. When the report is displayed on-screen, the investor is warned that an option is thirty days or less away from expiration. This warning message is not displayed on the printed report, however.

The second part of the current portfolio status report is the cash account status report (see exhibit 2). This report shows the current balance for all cash accounts maintained by *SPS*.

Individual Security Status. This report shows all the pertinent data available on a given security. If you've bought the same security more than once, you can specify which transaction you want displayed, that all transactions be displayed, or that a composite average of all the holdings be computed and displayed. If an option has been written against the security, the option information is shown. *SPS* computes and displays the current or actual return on the investment, depending on whether the security is sold. The estimated gain or loss after taxes is also computed and shown on-screen.

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CURRENT PORTFOLIO STATUS
FOR J. Q. INVESTOR
AS OF 10/22/82

(1) PURCH TYPE	INVEST TERM	(2) SECURITY NAME	NO. OF SHARES	PURCHASE PRICE/SHR	(3) CURRENT PRICE/SHR	GAIN/LOSS PER SHR	PERCENT CHANGE
M	SHORT	APPLE COMPUTER	200	14.25	26.13	11.88	83
B	LONG	XEROX 8.2% 1982	1	65.00	75.00	10.00	15
C	SHORT	*RCA CORPORATION	200	19.88	23.50	3.63	18
M	SHORT	INT'L BUS MACHINES	100	67.88	73.38	5.50	8
O	SHORT	TRW CORPORATION Jan 50	200	4.00	6.25	2.25	56

MARGIN ACCOUNT DATA

ACCOUNT % REQ	EQUITY $	% EQUITY	PURCHASING POWER
50	8598.75	88.67	7500.00
30	270.50	39.49	216.67
25	0.00	0.00	0.00

SUMMARY DATA

PORTFOLIO PURCHASE VALUE	15062.50
PORTFOLIO CURRENT VALUE	19262.50
TOTAL UNREALIZED GAIN/LOSS	4200.00
TOTAL UNREALIZED SHORT-TERM GAIN/LOSS	4100.00
TOTAL UNREALIZED LONG-TERM GAIN/LOSS	100.00

Exhibit 1.

(1) C stands for cash purchase, M for margin purchase, O for option purchase, and B for bond purchase. **(2)** The security name is preceded by an asterisk if an option contract has been written against the security. If the security is an option (TRW Corp.), it is followed by the expiration month. If the security is a bond, it is followed by the number of shares. **(3)** If the security is a bond, the purchase price per share is the purchase price divided by ten; the current price per share is the current price divided by ten.

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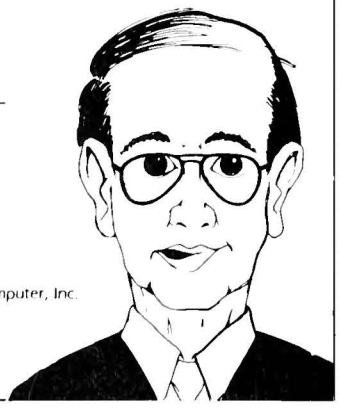
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Tax Year Profit and Loss Report. This report is used to compute your federal income tax liability on your stock transactions. See exhibit 3.

Dividend Income Report. This function generates a year-to-date dividend report. The investor may choose either a summary or a detail report. The summary report compresses all payments into a single line display per stock record. The detail report displays each payment. The information included on the report is the date paid (if detail, each date; if summary, the last date paid), the amount paid, the stock name, and the total dividends paid within the reporting year (fiscal or calendar), as of the date of the report.

Interest Income/Expense Report. This report can also be generated in either a summary or a detail format. The interest expense is derived from the margin accounts. Interest income is computed from all interest-bearing securities carried in the portfolio (cash, bonds, CDs, and so on). The income and expenses are displayed in monthly totals, with an annual total also shown.

The results of this report must be posted manually to the database through the update menus for both income and expenses. This menu choice also generates an interest-income-by-account report that shows the source of interest income, the amount paid to date, and the total interest paid to date.

Long-Term Status. This report displays any investments that will go long term within the next thirty days. The report can be used to help investors fine-tune their investment strategies to meet a targeted tax position.

Dividend/Bond Interest Due Status. This report gives the investor a complete list of all dividends and bond interest due within the next thirty days. It is useful in planning cash flow and position.

Overall. Overall, the Smith *Stock Portfolio System* is a good program. The system processes information at an acceptable speed and the reports and screens it generates are nicely laid out.

The system could stand improvement in some areas. On one of the screens, when new information was presented, not all the old information was erased, which made the screen a little hard to read. In addition,

CASH ACCOUNTS STATUS
FOR J. O. INVESTOR
AS OF 10/22/82

ACCOUNT TITLE	ACCOUNT NUMBER	BALANCE
MONEY MARKET:		
DREYFUS	22-222-123	2199.52
CERT. OF DEPOSIT:		
BANK OF AMERICA	9999-999	10600.00
BANK ACCOUNTS:		
1ST FEDERAL S & L	5555-55	1363.35
2ND STATE BANK	3333-33	615.96
TOTAL CASH		14778.80
TOTAL ALL INVESTMENTS		34041.30

Exhibit 2.

NAME: J. O. INVESTOR SS# 999-99-9999

PROFIT/LOSS STATEMENT
FOR 1982
AS OF 10/22/82

SECURITY NAME	# OF SHARES	PURCHASE DATE / SELL DATE	TOTAL COST / PROCEEDS	GAIN / SHORT	LOSS / LONG
OEA CORPORATION	200	08/10/82	3079.27		
		10/01/82	4700.00	1620.73	
VAN DORN CORPORATION	100	06/21/80	1630.21		
		11/06/82	1975.00		344.79
			NET GAIN/LOSS	1620.73	344.79

NET PROFIT/LOSS(SHORT + LONG) FOR 1982 1965.52

Exhibit 3.

the documentation, while accurate, could be slightly more comprehensive, explaining the subtleties of the system a little more fully. For example, if you're entering the ticker symbol of a stock to generate a report, you have to press return to show the computer you're finished. This is fairly standard. But if you're prompted for a Y or N response, you don't have to press return. If you do, and you're in the report section using the display, the report will be written to the screen and then erased because the program interprets that carriage return as your signal that you're through looking at the report.

It would also be preferable if the hard-copy reports contained the same information as the display, since many people tend to use hard copy instead of the video display for stock reports. The way the system is set up right now, users relying exclusively on hard copy miss the valuable option-expiration warnings that *SPS* issues.

Moving backward through the menu structure is achieved by means of control-C; most programs use the escape key. As this is becoming a fairly standard convention, it would be nice to see it incorporated into *SPS*. The control-C works the same way, but many people hesitate to use it because they're afraid it will cause a break in the program's execution (control-C is a standard "break" or halt character in Applesoft).

The program should also allow the investor to automatically post interest income and expenses to the database after using the interest income and expense report as an edit list. Unfortunately, we human beings have a tendency to make input errors that can significantly affect the portfolio evaluation reports.

A pet peeve: Some error messages you may get when you run the program refer you to the DOS manual. It's been said before and bears repeating: A program should be completely self-documenting. It should not refer you to another manual.

SPS is a good accounting tool. The author appears to be receptive to the suggestions of users. The second edition is a quantum jump in features and functionality over the initial release, and based on this it's reasonable to expect that the program will continue to improve as it matures. The author charged a minimal fee to his existing users when the second edition was released, and this policy will almost certainly hold in the future. *SPS* is definitely a program that diversified investors should see. It has the potential to make the world they live in a little simpler. ◨■

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In the recent bull market, from 7/82 to 11/82, the most attractive 10%, led by MCI, Tandem, NME, and Mitel, gained 45% while the DJIA rose only 29%.

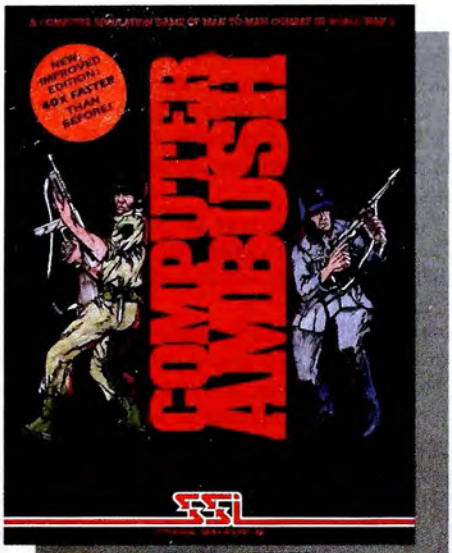
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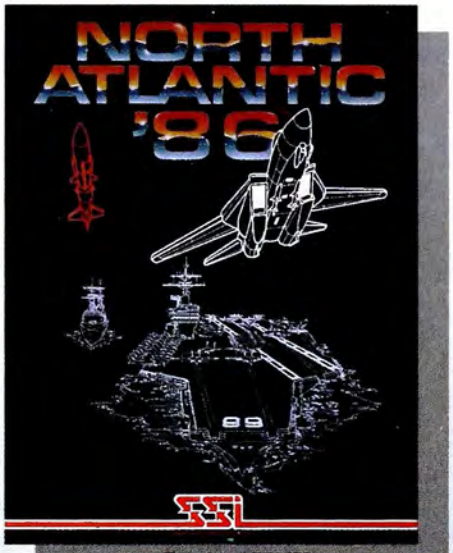
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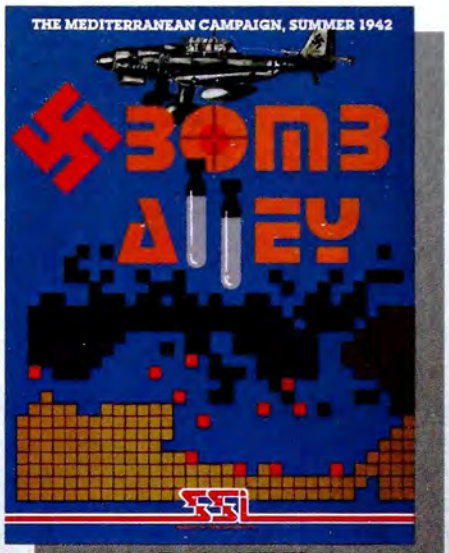
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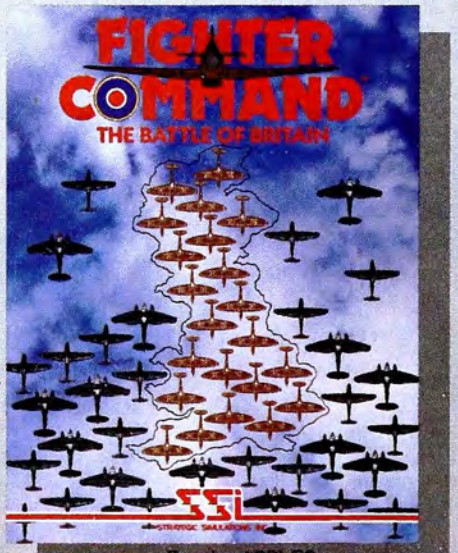
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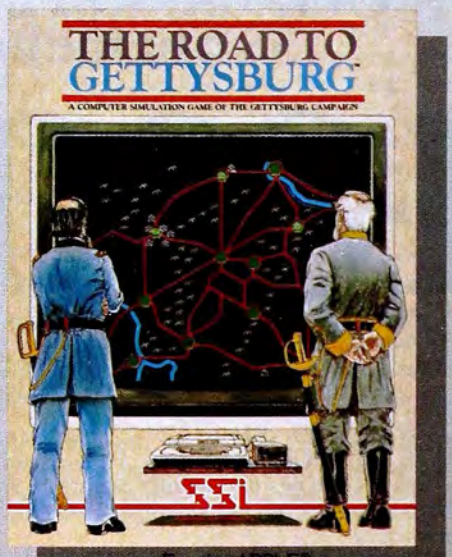
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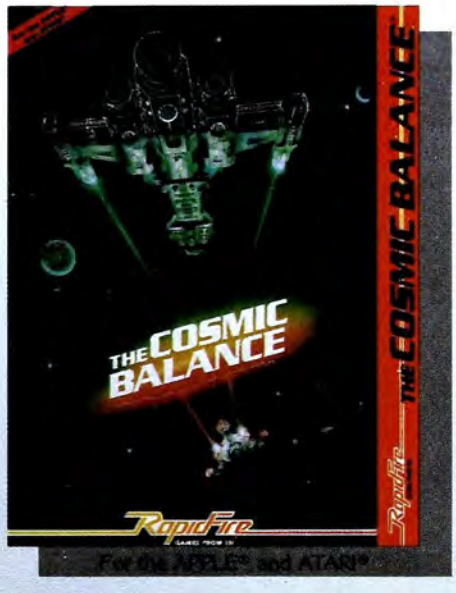
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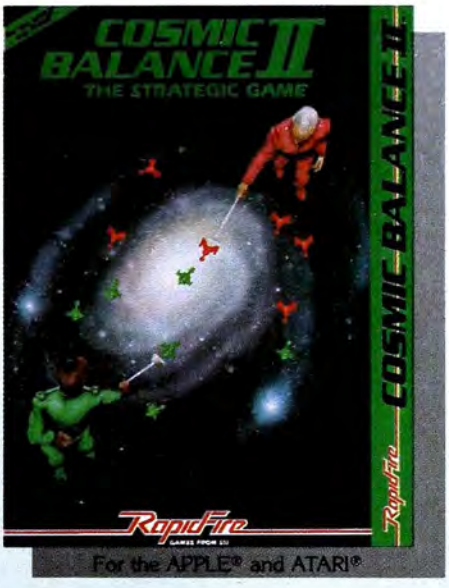
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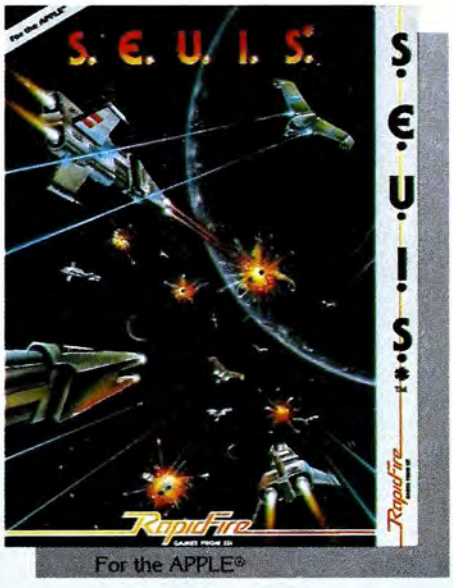
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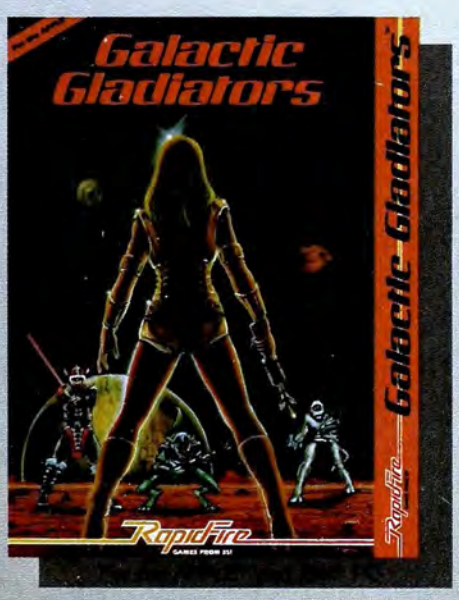
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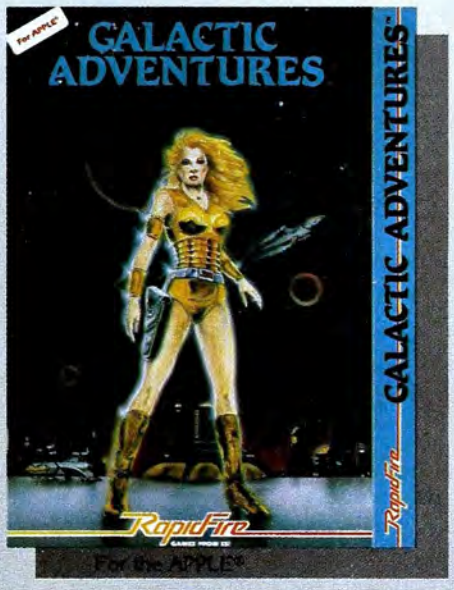


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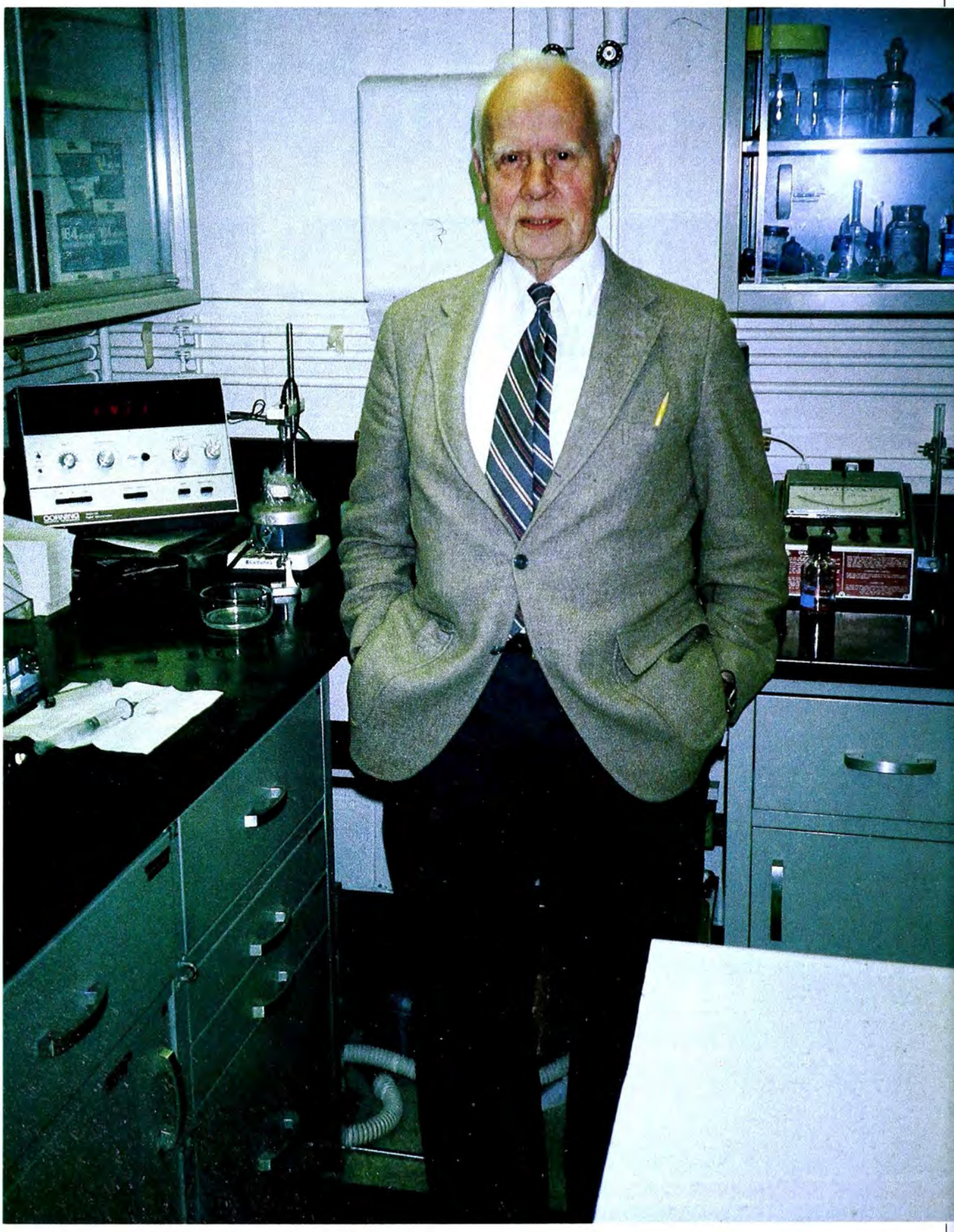
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CORNING

GEORGE STIBITZ

Still Ahead of His Time

BY ROE R. ADAMS III

He called it the Model One. It consisted of two large racks of electrical relays, each eight feet tall, five feet across, and a foot thick. Its memory was one thirty-second of one kilobyte, enough to store about five words. It cost twenty thousand dollars to build.

It is U.S. patent number 2,668,661, the world's first binary computer, registered in 1939 to Dr. George Stibitz.

Today George Stibitz uses an Apple.

Seventy-nine and Going Strong. "Boring and unproductive" is Stibitz's assessment of retirement, so he has no part of it. At seventy-nine, he's hard at work at Dartmouth Medical School in Hanover, New Hampshire. As professor emeritus of physiology, he's involved in expanding the horizons of modern medicine, assisting on several difficult projects concurrently.

Multitasking isn't a new experience for Stibitz. During the past forty-six years, in addition to his regular work, he's had more than fifty books and articles published. His expertise has not gone unnoticed. In 1974, he was selected to write the entire thirty-three-page history of mathematics for the fifteenth edition of the Encyclopaedia Britannica.

A graduate of Denison University with a Ph.B. in applied mathematics and of Cornell with a Ph.D. in physics, George Stibitz wasn't always an inventor. His revolutionary computer was his solution to a problem he observed at Bell Labs, where he was involved in studying the magneto-mechanics of telephone relays.

In 1937, the telephone company was starting to use complex numbers, which involve the concept of *i*; *i* is the square root of minus one. Values for filters and transmission lines were all expressed in terms of complex numbers and Ma Bell employed thirty people full time to do complex number operations using desk calculators. Complex division with those bulky calculators was quite a chore; ten separate operations were required to do one division.

Appalled by the sheer waste of time required to perform those manual operations, Stibitz began looking for ways to shorten the process. It occurred to him that the relays he was working with might hold the solution to the problem. Each of the electrical relays was five inches long and an inch and a half wide, a long way from the size of a modern chip. Stibitz believed that, if it could use binary notation, a calculator could be built using the telephone relays.

Stibitz had studied binary notation in school, in *Crystal's Algebra*, the book that had popularized the concept. George Boole, developer of Boolean algebra, had originated the binary system in the 1850s.

Binary notation involves the expression of numbers in either 0 or 1 format. The number 43, for example, is written as 101011. Since the relays used by the telephone company were either on or off, binary suited the relays perfectly. On became 1, and off was 0.

Brain Food. Working at home on his kitchen table, Stibitz experimented with the idea of building a primitive logic machine using the telephone relays. The initial problem was just getting two integer numbers to add together and to have the answer represented by the states of two light bulbs. One plus one equals ten in binary, so only the left bulb should light. Two plus one equals binary eleven, so both bulbs should light.

When Stibitz got his home model working, he took it to his boss at Bell Labs. Despite being impressed by the machine's potential, the manager wondered if any machine could ever handle anything as sophisticated as complex numbers. During that period, it was generally thought that, though machines were all right for simple numbers, only humans could understand anything as abstract as complex numbers.



The Model One started operations in 1939. Stibitz felt confident using the relays; the failure rate for the contacts on each relay was a microscopic one in ten-to-the-minus-eleventh power. With its thirty-two-byte (not kilobyte) memory, the computer could store six eight-digit numbers at one time. To relate that to an Apple, consider that, if you had that much memory left for text in your word processor, you'd be able to store about five average words.

But the Model One was impressive at the time. The workers could input the numbers in standard digital notation via regular telephone teletypewriters. The computer used a basic two-by-two matrix to determine complex values. The left bank of relays coped with values of i, while the right bank did the integer calculations. Once each side was resolved, the two banks were integrated. The machine took care of translating the answers back into digital form for the people to read. In business, the machine was considered a great success: It cut the daily process-



George Stibitz gazes into an electron microscope surrounded by the scope's meters and readouts. Stibitz is working on a voice board to have an Apple read the meters out loud so that the researcher can give full attention to what's happening on the other side of the eyepiece.

ing time by two-thirds.

Distinguished Admirers. The scientific community had yet to be reckoned with. When the New England Math Society gathered at Dartmouth University in September 1940 for its annual meeting, Stibitz took the opportunity to present his computer. He set up a remote communication between the computer in New York City and a teletypewriter being operated in Hanover, New Hampshire. The computer's ability to perform complex number operations astounded the distinguished attendees at the conference.

The significance of the operation being performed remotely via telephone lines, however, attracted little notice from the mathematicians. Yet Stibitz's remote presentation was, in fact, the birth of telecommunication. Eventually, his colleagues did take note: At a similar meeting in 1977, Stibitz became the first recipient of the IEEE Emanuel R. Piore Award for outstanding achievement in the field of information processing.

Only one Model One was built. Stibitz immediately began work on the Model Two. He was convinced that a computer could handle polynomials and general algebraic equations, and the new computer would serve as his research lab. But the Model Two was to take a different route.

There is no time for pure research when the world is at war. Every project's existence depends on its ability to support the war effort. At the beginning of World War II Stibitz was loaned to the Navy for a top-secret project: to design a machine that could perform ballistic calculations and control antiaircraft fire automatically.

The Model Two became that machine. In the process, necessity bore unexpected offspring: error trapping and the use of punched tape. Stibitz designed the computer to take in and put out the ballistic data via punched tape. The machine received the raw data from a radar installation tracking a target, analyzed it, and determined a smooth curve—something the infant radar couldn't produce.

Recognizing erroneous data, the Model Two would throw it out and use trigonometry to determine correct flight patterns. It performed the averaging in a mathematical atmosphere simulating three-dimensional space. The output was then used to control antiaircraft guns automatically.

Twenty-five-Grand Second Try. Naturally, the Model Two required much more memory than the One to perform such functions, and it had it—nearly twice as much: one-twentieth of one kilobyte. By the time Stibitz completed it in 1943, the Model Two—at a cost of twenty-five thousand dollars—sported other improvements over the Model One. By design, a cluster of Teletype printers and tape punchers used for output enabled the computer to run unattended more than 80 percent of the time.

"To process a large run, we just turned on the computer Friday evening," Stibitz remembers. "When we came in Monday morning, there was a wastebasket or two filled with tape printout." The high-volume tape input led Stibitz to develop the now-familiar large-roll computer tapes.

The Aircraft Artillery Board recognized immediately the importance of Stibitz's computer to the war effort—and it wanted an even better machine. The Board commissioned Stibitz to build a sophisticated Model Three at an accelerated pace. Stibitz and thirty people assigned to the project completed the job in 1944.

With a giant one-seventh-kilobyte memory, the Model Three actually contained ballistic tables in memory. The computer could take the three-dimensional averaged data, compare it against the tables, and adjust the antiaircraft guns. So sophisticated was the procedure that the guns could be accurately aimed to lead the planes, increasing greatly the success of this defense.

The Model Three incorporated floating-point arithmetic and jump program instructions. The cost of building it soared to about one hundred thousand dollars. It was about to be put into general production

when the war started winding down.

Four for the Swabbies. Meanwhile, Stibitz had begun building the Model Four. Especially designed for the seagoing Navy, the Four could perform all the functions of the Model Three while on a moving ship. The science of ballistics gets complicated when the guns are not on firm ground. The ship's pitching and yawing posed a challenge, but Stibitz remembers only one serious problem: "It was the bell that the Navy installed above the watch officer's desk. Every time the computer went down, which happened frequently at first, it was the watch officer's responsibility to jump up and go out to find out what had happened to it. Of course, as he had no computer experience, he could do nothing but stare at the machine until I got there."

Just before the war ended, the government had Stibitz design a very large computer. The Model Five was comprised of ten thousand relays, had a full two kilobytes of memory, and resembled a telephone exchange. The machine occupied a whole building and cost half a million dollars to build.

After the war, Stibitz worked as a consultant in applied mathematics for both the government and the private sector. He developed the first electronic computer for commercial application in 1947 and worked on the development of the giant Edvac computer during the late forties. Later, he served on the National Research Council's Committee on Large-Scale Computers.

In 1964, Stibitz joined Dartmouth Medical School. Using his inventiveness and his unique perspective as an applied mathematician, Stibitz has assisted in many medical breakthroughs. He did much of the original computer analysis of dosage levels for radioactive implants in 1967. The following year, he designed a random gate computer for biomedical applications and developed a computer model for biological networks. Among his recent achievements is the development of the technique needed to measure the rate of diffusion through the slits in the body's capillary walls.

Synthesized Mathematicians. Applied mathematics is a rare discipline—a special way of thinking. Applied mathematicians are synthesizers; they can perceive relationships among widely scattered facts across many scientific fields. This special kind of thinking is well illustrated in an incident that occurred recently in Stibitz's work. A resident pharmacologist had a problem with binding chemicals to molecular blood plasma. Although the pharmacologist had compiled large amounts of data, he had not been able to determine the binding coefficients.

"When I started analyzing all that data, familiar patterns began to emerge," Stibitz remembers. "I recalled some work I had done for a metallurgist who was trying to bond different metals. It turned out that the methodology that solved the metallurgist's problem was exactly the same as that needed for the pharmacologist's problem."

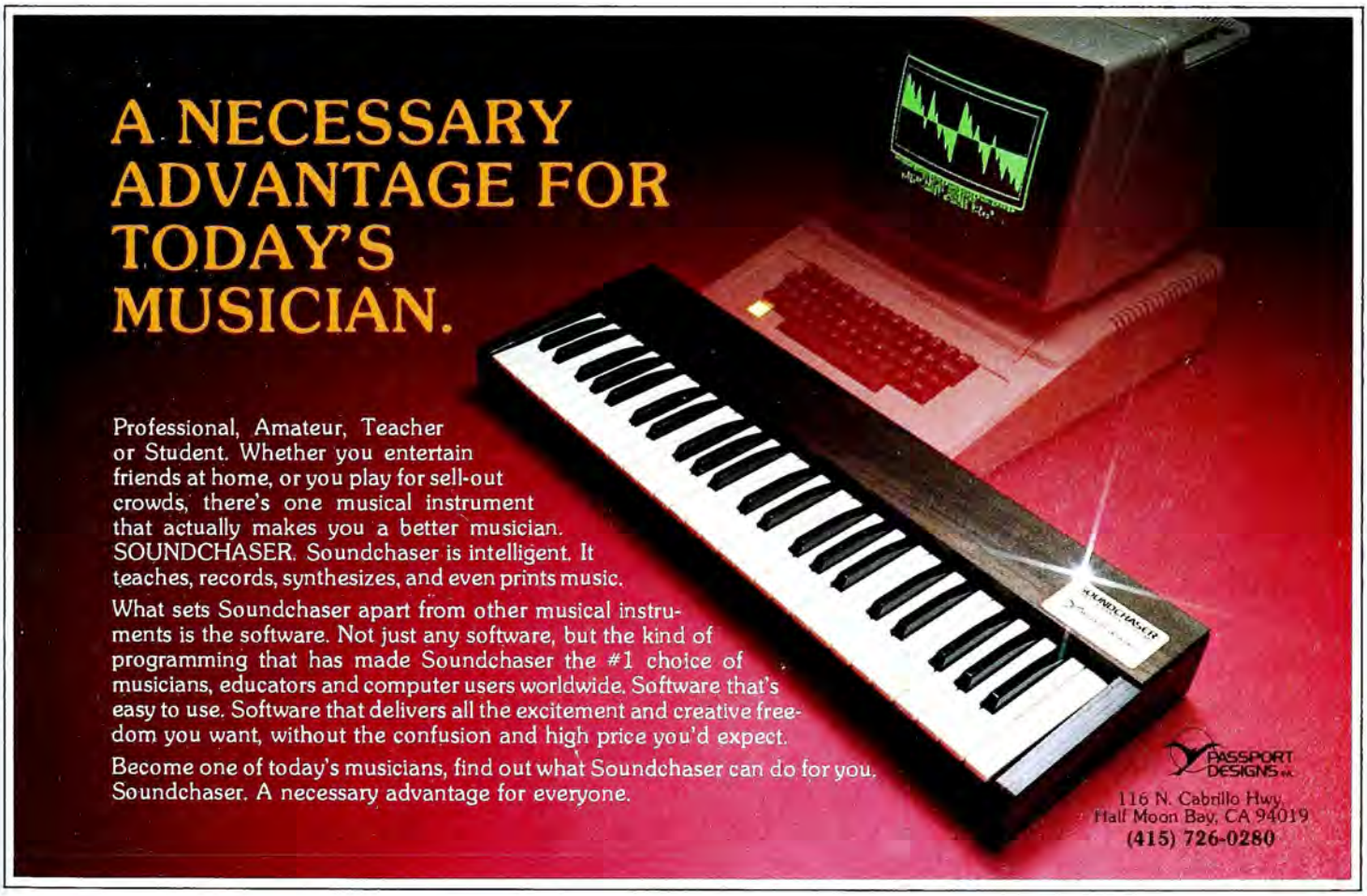
Perhaps nothing has changed more over the years than the computers Stibitz uses in his work. Today, George Stibitz uses an Apple.

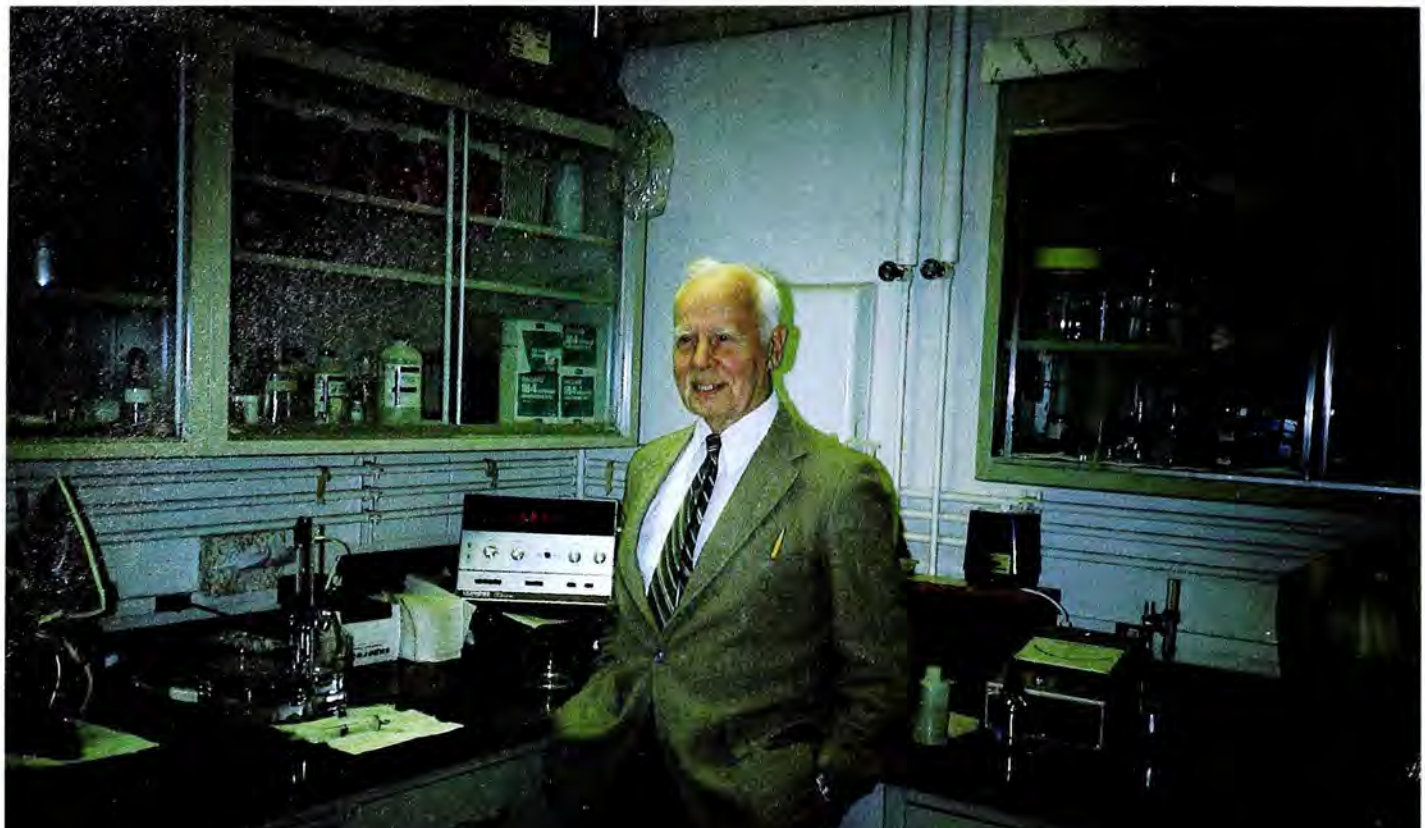
A project he's pursuing with Dr. Frances McCann involves electron microscopic biology. At the level of visual amplification attained with an electron microscope, things move extremely fast. State-of-the-art equipment requires that the experimenter constantly switch attention between the dials and the microscope.

Stibitz and McCann are changing the state of the art, using a voice board in the Apple to provide information about the sample's environment aurally to experimenters, enabling them to concentrate on what they are observing without missing vital changes in the sample's situation.

Not long ago, Bill Budge played a role in a Stibitz project, this one with Dr. Miguel Marin-Dadilla. For years, doctors had been studying two distinct microscopic brain cells. One cell was referred to as a basket cell; the other was a double-tufted cell. The two cells bore little resemblance to each other.

Marin-Dadilla was convinced that the two cells were really one. He speculated that what everyone was seeing were two planes of the same cell: one view of the top and one view of the side. But the theory was impossible to verify under an electron microscope; the preparation of the slide required slicing the cell, and as soon as the cell was sliced, the second perspective vanished!





Softalk photos by Roe R. Adams III

His invention of the Model One computer in 1937 recently earned Stibitz a place in the National Inventors' Hall of Fame. Built from telephone relays, the Model One was the first computer to use the concept of Boolean algebra, translating numbers from decimal to binary and back again. These days Stibitz and his wife Dorothea program their grocery shopping on an Apple.

Budging It. Stibitz solved the mystery. Using Bill Budge's *3-D Graphics Package*, Stibitz entered all the data into his Apple. The Apple responded by producing a graphic three-dimensional view of the brain cell. The rotating option allowed Stibitz to demonstrate conclusively the validity of Marin-Dadilla's theory.

Stibitz's medical research continues on his Apple at home. Working with Dr. Marsh Tanney, an expert on respiration, Stibitz is developing a mathematical model of silkworm respiration.

During his rich life, Dr. George Stibitz has earned thirty-four patents on his inventions. But it took just one of these inventions, officially registered as "Complex Computer"—the Model One—and forty-four years for the world to recognize publicly and specifically the achievements of this very special man.

On February 13, 1983, George Stibitz was inducted into the National Inventors' Hall of Fame. The Hall, started in 1973 by the Federal Patent and Trademark Office, honors inventors who have a U.S. patent representing a significant contribution to the welfare of the people of the United States.

Stibitz joins inventors Thomas Edison, Alexander Graham Bell, the Wright Brothers, Eli Whitney, Henry Ford, and not many others in the Hall of Fame. Like the inventions of each of these men, George Stibitz's invention changed the world; from the binary computer a new era is emerging.

It seems that much of the media would like us to think of the computer age as the realm of the very young. It isn't. Few people have integrated computers so completely, easily, and comfortably into their lives as George Stibitz and his wife Dorothea. They don't chatter about all the things their Apple can do—they use it. For work, for learning, for daily living.

Saturday mornings find the Stibitzes together at the Apple planning their weekly shopping. Stibitz has written a program that displays every item in the grocery store they frequent, aisle-by-aisle, showing the products exactly as they sit on the shelves. The Stibitzes browse through their electronic supermarket making selections. When they're finished, the computer totals up the prices of their choices and prints out a flow chart for shopping.

Other members of the household are avid Apple observers, at least when it's running the shopping program.

"The minute the printer stops printing on Saturday mornings, our two dogs begin racing around the room. They know it is time to go for a car ride to the grocery store!"

Dorothea Stibitz, an accomplished cellist and choir singer, uses the Apple for her music, practicing at home with the help of the *MicroMusic* package. Recently, the Apple came in handy when her choir group selected an atonal Bartok piece. Dorothea found some of the music jumps difficult to follow. Her husband, who has composed music in the past, input the Bartok piece into the Apple; then she was able to learn the parts easily.

Although he no longer composes, George Stibitz enters his favorite pieces into the music system and enjoys listening to the Apple's renditions. He also uses the Apple in research for graphic relief mapping. Just now, he's excited about trading in his old Apple II for a IIe.

When Stibitz built his Model One forty-four years ago, he wasn't looking for glory or setting out to create a world-shaking invention. He was merely attacking an office problem with every tool available to him and solving it the best way he knew how.

Not all of us can invent new computers or change the way the medical world looks at brain cells. But, thanks to Stibitz—and Babbage and Burroughs and Wozniak — we have a marvelous tool with which to attack our daily problems, to solve them, and generally to make our lives simpler and richer.

That's what Stibitz was after at Bell Labs, and what he's after on Saturday mornings.

Let's take the hint. ■

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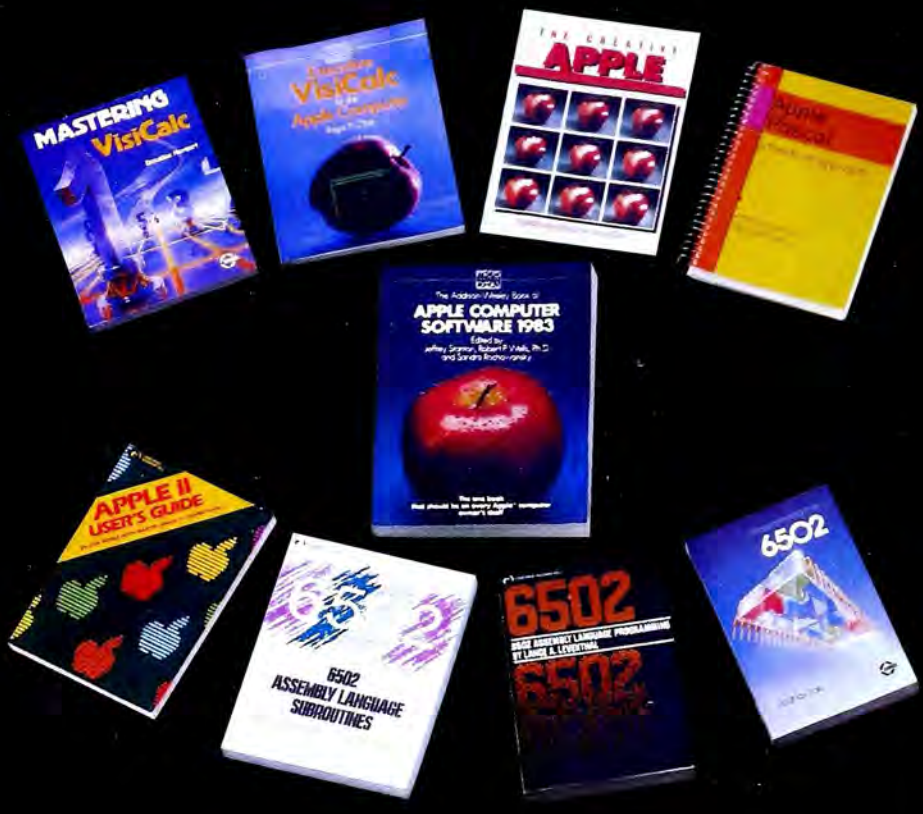
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All About Applesoft

by Doug Carlston

Last month we outlined an educational program called *Flash Card*, which could be a useful tool for memorizing a large number of definitions, such as when one is learning a foreign language. We suggested that people try to work from the outline to create their own Applesoft programs—after all, even if you know all the vocabulary in the world, the only way to learn any foreign language is by trying to speak it.

This month, we are going to work through one solution. It is not the only solution or even necessarily the best one; just as there are a thousand ways to express a single concept in English, so there are at least a thousand ways to program any routine in Applesoft. The important thing is that you understand how to tackle such an assignment—how to break it down into manageable pieces, program the pieces, and then assemble them into a single, functioning whole.

Let's start out by converting last month's outline into a main menu routine for our new program. It might look like this:

```
20  GOTO 500

497  REM ********************
498  REM *** MAIN MENU ***
499  REM ********************
500  A$ = "FLASH CARD PROGRAM": GOSUB 50
505  VTAB 6: INVERSE : HTAB 8: PRINT "EDIT FUNCTIONS":
     NORMAL
510  PRINT TAB( 12)"A(DD WORDS": PRINT TAB( 12)"R(EMOVE
     WORDS"
520  PRINT TAB( 12)"E(DIT WORDS"
530  PRINT : INVERSE : HTAB 8: PRINT "DISK FUNCTIONS":
     NORMAL : PRINT : PRINT TAB( 12)"L(OAD FROM DISK"
540  PRINT TAB( 12)"S(AVE TO DISK"
550  PRINT : INVERSE : HTAB 8: PRINT "STUDY FUNCTIONS":
     NORMAL : PRINT : PRINT TAB( 12)"V(IEW LIST": PRINT
     TAB (12)"F(LASH CARDS"
560  VTAB 22: GET A$
570  AN$ = "ARELSVF"
580  FOR X = 1 TO LEN (AN$): IF A$ = MID$ (AN$,X,1) THEN AN =
     X:X = LEN (AN$): NEXT : ON AN GOTO
     600,700,700,900,1000,1100,1200
590  NEXT : GOTO 560
```

Now let's take a look at what we did. First of all, we left a little room at the very beginning of the program to define permanent variables, dimension arrays, and the like. Then we jumped all the way down to line 500, where we put the main menu routine, since it's a good idea to reserve a couple of hundred lines near the beginning of a program for frequently used subroutines (they run faster if they are close to the beginning of the program).

Line 500 calls the first of the subroutines that we will write, a short sequence that will put a title at the top of the page so that the program user can always tell what's going on.

Lines 510 through 550 just print the outline on the screen, using inverted text for the section headers. Then lines 560 through 590 use a branching routine that we have called on before to send program control off to the various functions listed in the outline.

Next let's add that title-printing subroutine:

```
49  REM * PRINT TITLE *
50  POKE 34,0: HOME : PRINT K" WORDS": VTAB 2:L = LEN (A$):
    HTAB 20 - L/2: INVERSE : PRINT A$: NORMAL : PRINT :
    POKE 34,2: RETURN
```

Let's see how this works. Poke 34, as you may remember, sets the top window on the text page. When address 34 is set to 0, you can move all the way to the top of the screen, using a command like home. When it is set to a number between 1 and 23, the top window border is moved down the screen, and anything printed above this border is protected—in other words, it won't disappear if you type *home* or type fifty lines of code. Only the area within the window will scroll when you hit the bottom of the page.

In this subroutine, the number of flash cards entered into the program to date is printed in the upper-right-hand portion of the screen and a title is printed in the center of the next line down. The window is then lowered to protect the top two lines with a poke 34,2. This keeps the title line from scrolling off the screen accidentally.

The htab formula is just a very simple way of centering any string on the page. Basically, all you do is tab to the middle of the screen (20) and then back up half the length of the string you are printing. In order to use this subroutine, just load A$ with any title you choose (no longer than forty characters) and gosub 50.

Let's move on. The first item on the main menu that we will want to write is the add-to-list section. Writing this part first will allow us to add words and their definitions to the storage arrays so that we have some data to test the program with as we go along. Testing as you develop a program is very important, since even the keenest mind may not always be associated with nimble fingers. If you have entered as much of the program as we have discussed thus far, try it. Run it. You can't do any harm, and if you've typed anything in incorrectly, you'll find out in a hurry.

Here's the data-entry part of the program. Note that we had to dimension some arrays in order to store our data:

```
10  DIM ENG$(1000),FR$(1000),WRNG%(1000):D$ = CHR$ (13) +
    CHR$ (4)

600  HOME : IF S1$ = "" THEN GOSUB 30: REM ** A(DD TO LIST **
605  A$ = "ADD VOCABULARY": GOSUB 50
610  PRINT S1$;: INPUT ": ";A$: IF A$ = "" THEN 500
620  ENG$(K) = A$: PRINT : PRINT S2$;: INPUT ": ";A$: IF A$ = ""
     THEN 500
630  FR$(K) = A$:K = K + 1: PRINT : PRINT : GOTO 610
```

First we set up two arrays capable of holding up to 1,000 words or phrases each (and since this was originally intended as a vocabulary builder for foreign-language study, the arrays got named ENG$ for English and FR$ for French). We also set up a parallel integer array called WRNG% to let us keep track of the ones we guess wrong.

The add-vocabulary routine itself is simplicity exemplified.

Line 600 checks to make sure we have identified the data file we are working with (if we haven't, the variable S1$ won't have been defined yet, and so we will be shipped off to the subroutine at line 30 to com-

plete the necessary preliminary work).

Line 605 sets up the title for the section. Line 610 is the beginning of the section that accepts words and their definitions. Imagine that you are dealing with flash cards. The variable S1$ represents the label for what you put on one side of the card. S2$ represents the label for the second side of the card. If you were learning French, S1$ could be "English" and S2$ could be "French." In that case, line 610 would print on the screen:

```
ENGLISH:
```

and would wait for your input. If you didn't enter a word at all but just pressed the return key, then line 610 would assume that you were finished entering data and would transfer control to the main menu once again.

Line 620 stores the information you entered into the array ENG$(K), where K is a counter that keeps track of how many flash cards we have used. The line then prints the label for the flip side of the flash card and awaits input:

```
ENGLISH: please
FRENCH:
```

Again, if you just press return without entering anything, the program assumes that you have finished entering data and returns control to the main menu. Otherwise, control drops to line 630, where your input is stored in FR$(K) and K is incremented. The program then loops back on itself, so that you can continue entering data until finished.

Let's think about that subroutine at line 30 that picks out our labels (English and French in the example). For various reasons that will become clear only later (if at all), we not only want to load in the two labels, but we also want to record how long each label is and then pad out the shorter label with preceding blank spaces until both are the same length. This will make it easy to print word pairs that look like this:

```
CLASSICAL GREEK: panta hrei
        ENGLISH: all things are in flux
```

instead of like this:

```
CLASSICAL GREEK: panta hrei
ENGLISH: all things are in flux
```

Now how could anybody pass up a stylistic improvement like that! Anyway, here is the routine:

```
29  REM ** NAME DISK FILE **
30  PRINT "ENTER SIDE 1 LABEL (E.G. ENGLISH)": PRINT "OR
    <RETURN> TO SEE DISK CATALOG": PRINT : INPUT ": ";S1$:
    IF LEN (S1$) > 15 THEN S1$ = LEFT$ (S1$,15)
32  IF LEN (S1$) = 0 THEN PRINT D$"CATALOG": PRINT : GOTO 30
30  L1$ = LEFT$ (S1$,1)
35  PRINT : PRINT "ENTER SIDE 2 LABEL": PRINT : INPUT ": ";S2$:
    IF LEN (S2$) > 15 THEN S2$ = LEFT$ (S2$,15)
36  L2$ = LEFT$(S2$,1):L1 = LEN (S1$):L2 = LEN (S2$):LN =
    L1 * (L1 < L2) + L2 * (L2 >= L1)
37  IF L1 < L2 THEN FOR X = 1 TO L2 - L1:S1$ = " " + S1$: NEXT
38  IF L2 < L1 THEN FOR X = 1 TO L1 - L2:S2$ = " " + S2$: NEXT
39  HOME : RETURN
```

There are those who will feel that this subroutine is needlessly complex. Nevertheless, let's take it apart and see what it does. Line 30 asks for the label for side one of the flash card. If the label is longer than fifteen characters, it shortens it to fifteen characters.

Line 32 checks to make sure you entered a label. If you just pressed return, it prints the disk catalog and then jumps back to the beginning of the subroutine.

Line 33 takes the first letter in the label stored in S1$ and stores it in L1$. For example, if S1$ were "English," then L1$ would be set equal to "E."

Line 35 gets the label for side two of the flash card and truncates it to fifteen characters. Line 36 puts the first letter in the second label into L2$ and sets L1 and L2 to the lengths of the two labels. LN is set equal to the longer of L1 and L2, using logical operators. All of these values will be used in various screen formatting routines throughout the rest of the program.

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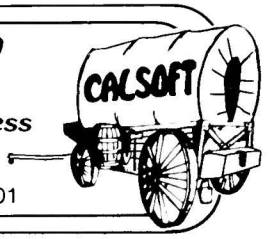


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Lines 37 and 38 flesh out the shorter of the two labels with preceding blanks so that both end up the same length.

The data-input section is now finished and ready for testing. However, to test it fully, we need to be able to view the array that we are trying to store our data in, just to be sure that everything is being put where we hope. Therefore, let's skip around a little bit and do the next-to-last section next, the one entitled "view list" in the main menu:

```
1100  KT = 0: HOME : IF K = 0 THEN VTAB 8: HTAB 11: PRINT "NO
      WORDS IN MEMORY": GOSUB 60: GOTO 500
1110  A$ = "VIEW VOCABULARY": GOSUB 50
1120  PRINT : FOR X = 0 TO K - 1: PRINT S1$": "ENG$(X): PRINT
      S2$": "FR$(X):KT = KT + 1: PRINT
1130  IF KT = 6 THEN PRINT : GOSUB 60:KT = 0
1140  NEXT : IF KT <> 0 THEN GOSUB 60
1150  GOTO 500
```

This section is very straightforward. KT is an internal counter used only in this section. Its purpose is to divide the vocabulary into groups of six. Whenever the counter reaches 6, line 1130 jumps to a pause subroutine and resets the counter to 0. We need the pause subroutine to keep the entire vocabulary from scrolling by on the screen far faster than we could read it.

Here's what the pause routine might look like:

```
59  REM * PAUSE *
60  VTAB 23: HTAB 8: INVERSE : PRINT "PRESS ANY KEY TO
    CONTINUE": NORMAL : WAIT - 16384,128: IF PEEK ( - 16384)
    = 155 THEN POKE - 16368,0: POP : GOTO 500
61  POKE - 16368,0: VTAB 23: CALL - 868: RETURN
```

We have used the wait command like this before. You could just as easily use a get A$ command—the only difference is that wait doesn't leave a flashing cursor on the screen.

The end of line 60 should ring a few bells too. This is an escape-hatch provision. Suppose that you have entered 943 vocabulary words and definitions into the program. You then tried to hit F to start the flash card routine, but your nimble fingers somehow struck the V by mistake. Are you to be consigned to viewing all 943 words, six at a time for the next five minutes? No! Of course not! We have built in a way out. All you have to do is press the escape key.

A quick look at the Applesoft manual will tell you that escape is the same as CHR$(27) to the Apple. If you press escape, location -16384 in the Apple will read the ASCII code of the key you pressed, plus 128. In this case, that equals 27 + 128 or 155. If a quick peek at this location reveals a value of 155, we can back-door our way out of the subroutine by jumping directly to the menu at line 500. Before we do this, however, we had better remember to pop the subroutine return address off the stack, or else we are asking for trouble. (Remember, never leave a subroutine except by way of a return statement—but if you must, as here, cancel the gosub return address by use of the pop command.)

Enough of the program is finished now that we can really do some testing. If these two sections test out, we can move on to the next items on the agenda. Let's do the save-to-disk and load-from-disk routines next—it will save us from having to reenter a database every time we want to test another function of the program:

```
900   HOME :A$ = "READ DATA FROM DISK": GOSUB 50: REM **
      READ LIST **
905   GOSUB 30
910   ONERR GOTO 960
920   PRINT D$"OPEN"S1$"-"S2$: PRINT D$"READ"S1$"-"S2$
930   INPUT K
940   FOR X = 0 TO K - 1: INPUT ENG$(X),FR$(X): NEXT
950   PRINT D$"CLOSE"S1$"-"S2$: POKE 216,0: GOTO 500
960   IF PEEK (222) = 5 THEN PRINT "NO SUCH FILE AS "
      S1$"-";S2$: PRINT D$"DELETE"S1$"-"S2$
970   PRINT "ERROR": GOSUB 60: GOTO 950
1000  HOME : IF S1$ = "" THEN GOSUB 30: GOTO 500: REM **
      SAVE LIST **
1005  A$ = "WRITE DATA TO DISK": GOSUB 50
1010  PRINT D$"OPEN"S1$"-"S2$: PRINT D$"WRITE"S1$"-"S2$
1020  PRINT K
```




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```
1030  FOR X = 0 TO K - 1: PRINT ENG$(X);",";FR$(X): GOTO 1035
1035  NEXT
1040  PRINT D$"CLOSE"S1$"-"S2$: GOTO 500
```

Both of these routines are pretty simple. The first thing that we save out or read in is K, the number of flash cards we have created. Then we use K to write out or read in the correct number of entries into the two data arrays.

For simplicity's sake, we won't let people choose the name of their data files. Instead we'll construct a file name made up of the labels for the two sides of the flash card, separated by a hyphen: English- French.

The delete and edit sections of the program look suspiciously like the similarly named sections of the mailing list program we wrote a couple of months ago. Let's take this section one part at a time:

```
700  HOME : IF S1$ = "" THEN GOSUB 30: REM ** R(EMOVE FROM
     LIST **
705  IF AN = 2 THEN A$ = "DELETE WORDS FROM LIST": GOSUB
     50: GOTO 710
706  A$ = "EDIT WORDS IN LIST": GOSUB 50
710  VTAB 5: HTAB 10: PRINT "SEARCH:": PRINT : PRINT
     TAB(12);L1$"(" RIGHT$ (S1$,L1 - 1): PRINT TAB( 12);L2$"("
     RIGHT$ (S2$,L2 - 1): PRINT : PRINT
712  GET A$: IF A$ < > L1$ AND A$ < > L2$ AND A$ < > CHR$
     (13) THEN 710
715  IF A$ = CHR$ (13) THEN 500
716  C = 1: IF A$ = L2$ THEN C = 2
```

Lines 700 through 706 check to see if we have a data file in memory; and, if we do, they then put the right title line up on the screen. The value AN is determined in line 580 of the main menu part of the program. If we selected the delete option, the second item on the menu, then AN will be equal to 2. If we selected edit, the third item on the menu, then AN will be equal to 3. If AN is equal to anything else, your computer is behaving irrationally and should be strictly reprimanded.

Basically, the way both edit and delete function is this. First we design a routine to find the vocabulary pair that needs working on. We do this by looking for a phrase or part of a phrase on one side of the flash card or the other. Then we jump to another routine that either deletes or edits that particular flash card.

Lines 710 through 716 determine which side of the flash card to search. As usual, we have included an escape hatch in case you got into this routine by accident and want out.

Once we have decided to search side A or side B, we need to find out what word or words we are looking for. We could write a very simple input routine that required us to enter the data precisely on any particular line and then searched for that. However, that is probably not a good idea, since the edit function will often be used to correct misspellings and the like, and it is often difficult to remember exactly how you misspelled a particular word.

```
720  HTAB 12: INPUT "SEARCH FOR: ";I$: IF I$ = "" THEN 500
725  FOR X = 0 TO K: IF C = 1 THEN A$ = ENG$(X): GOTO 730
726  A$ = FR$(X)
730  GOSUB 40: IF F = 0 THEN 750
```

Lines 720 to 740 set up two general variables—the search string, I$, and the string to be searched, A$. We use a simple input statement to enter the search string from the keyboard. The searched string is chosen from side A or side B of the flash cards. We look at the appropriate side of each card, one at a time, until we find a match. For example, if our search string is "port," and we are looking on the English side of the following flash cards, the program will select pair three:

```
ENGLISH:  carry
 FRENCH:  porter

ENGLISH:  poor
 FRENCH:  heureux
```


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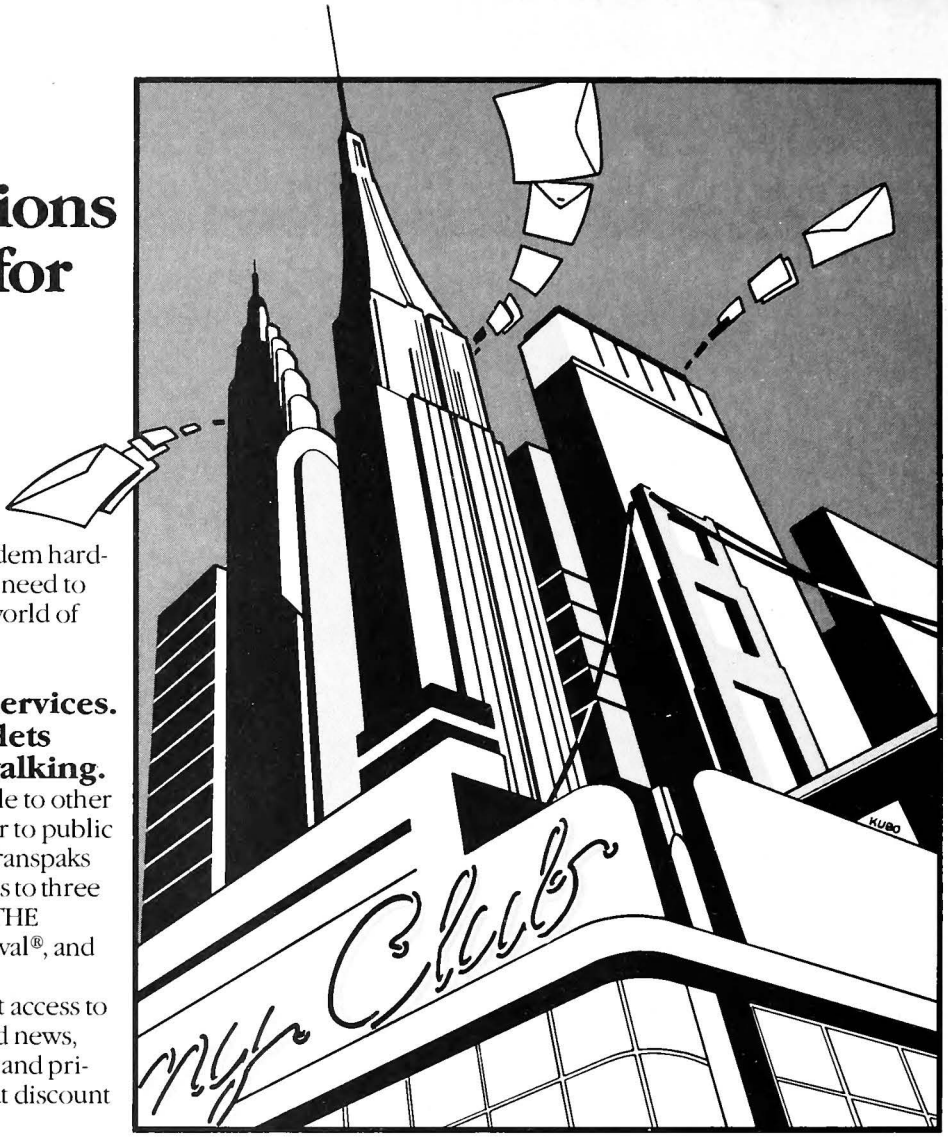
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```
ENGLISH:  report
FRENCH:   pommes de terre frites
```

If, on the other hand, we had been checking the French side, we would have stopped at the first pair.

Here's the rest of the program.

```
740  HOME : VTAB 6: PRINT S1$": "ENG$(X): PRINT S2$": "FR$(X):
     PRINT : PRINT "IS THIS IT?";: GET AN$: IF AN$ = "Y" THEN
     760
745  VTAB 8: CALL - 958
750  NEXT : PRINT : INVERSE : PRINT "NOT FOUND": NORMAL :
     PRINT : GET A$: GOTO 500
760  IF AN = 2 THEN ENG$(X) = ENG$(K - 1):FR$(X) =
     FR$(K - 1):K = K - 1: GOTO 500
770  HTAB 1: PRINT "PRESS < RETURN > TO LEAVE AS IS": VTAB
     PEEK (37) - 3: HTAB LN + 1: INPUT ": ";A$: IF A$ < > "" THEN
     ENG$(X) = A$: GOTO 780
775  VTAB PEEK (37): HTAB LN + 3: PRINT ENG$(X)
780  HTAB LN + 1: INPUT ": ";A$: IF A$ < > "" THEN FR$(X) =
     A$: PRINT : GOTO 800
790  VTAB PEEK (37): HTAB LN + 3: PRINT FR$(X): PRINT
800  CALL - 868: PRINT "IS THIS CORRECT?";: GET AN$: IF AN$
     < > "Y" THEN 770
810  GOTO 500

40   T = 0: REM * INSTRING SEARCH *
     A$ = SEARCHED STRING
     I$ = INSTRING
     F = SUCCESS FLAG
41   F = 0:J1 = LEN (A$):J2 = LEN (I$): IF J2 > J1 THEN T$ = A$:A$
     = I$:I$ = T$:T = 1: GOTO 41
42   IF J1 = 0 OR J2 = 0 THEN RETURN
43   FOR L = 1 TO J1 - J2 + 1: IF MID$ (A$,L,J2) = I$ THEN F = 1: L
     = J1 - J2 + 1
44   NEXT : IF T THEN T$ = A$:A$ = I$:I$ = T$
45   RETURN

1200 REM ******************
1210 REM FLASH CARD ROUTINE
1220 REM ******************
1230 HOME : IF K = 0 THEN VTAB 8: HTAB 11: PRINT "NO WORDS
     IN MEMORY": GOSUB 60: GOTO 500
1240 A$ = "FLASH CARD DRILL": GOSUB 50
1250 VTAB 5: HTAB 10: PRINT "DRILL FROM:": PRINT : PRINT
     TAB( 12);L1$"(" RIGHT$ (S1$,L1 - 1)" TO " RIGHT$
     (S2$,L2): PRINT TAB( 12)L2$"(" RIGHT$ (S2$,L2 - 1)" TO "
     RIGHT$ (S1$,L1): PRINT : PRINT
1260 GET A$: IF A$ < > L1$ AND A$ < > L2$ AND A$ < > CHR$
     (13) THEN 1250
1265 IF A$ = CHR$ (13) THEN 500
1270 C = 1: IF A$ = L2$ THEN C = 2
1280 HOME : VTAB 12:KT% = 0
1290 A% = RND (1) * (K - .5): IF WRNG%(A%) < > 0 THEN 1310
1300 GOTO 1330
1310 KT% = KT% + 1: IF KT% < 10 THEN 1290
1320 FOR X = 0 TO K - 1: IF WRNG%(X) = 0 THEN A% =
     X:X = K: NEXT : GOTO 1330
1325 NEXT : GOTO 1400: REM GOT THEM ALL RIGHT
1330 IF C = 1 THEN A$ = ENG$(A%):B$ = FR$(A%): GOTO 1345
1340 A$ = FR$(A%):B$ = ENG$(A%)
1345 HTAB 1: IF LEN (A$) < 39 THEN HTAB 20 - LEN (A$) / 2
1350 PRINT A$: PRINT
1355 HTAB 1: IF LEN (B$) < 35 THEN HTAB 18 - LEN (B$) / 2
1360 INPUT ": ";AN$: PRINT
1365 IF AN$ = "XXX" THEN AN$ = "": GOTO 500
1370 IF AN$ = B$ THEN HTAB 16: INVERSE : PRINT "CORRECT":
     NORMAL :WRNG%(A%) = 1: GOSUB 60: GOTO 1280
1380 HTAB 6: INVERSE : PRINT "WRONG. THE CORRECT
     ANSWER IS:": NORMAL : PRINT : HTAB 1: IF LEN (B$) < = 38
     THEN HTAB 20 - LEN (B$) / 2
1390 PRINT B$: GOSUB 60: GOTO 1280
1400 FOR X = 0 TO K - 1:WRNG%(X) = 0: GOTO 500
```

See if you can follow this on your own; we'll talk about it (and discuss our last project) next month. And, once you've got this tool finished, use it. It's a wonderful way to learn a foreign language.

As an incentive, next month's column will be written entirely in French. ◨

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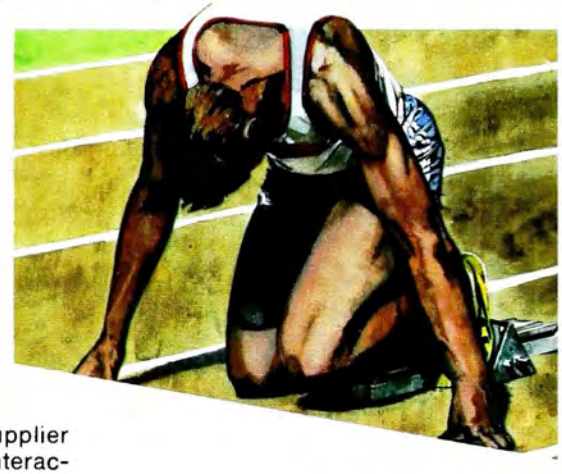
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The Schoolhouse Apple

by Jean Varven

Fifty-three percent of all schools in the United States had at least one microcomputer for instructional use by January 1983, according to a national study conducted by the Center for Social Organization of Schools at Johns Hopkins University. At the elementary level, micros are largely employed as "cost-effective means of increasing the rate at which students learn the rules of arithmetic computation and proper English usage," and much of the software on the market reflects and supports this emphasis. Meanwhile, secondary schools, which have more microcomputers than elementary schools, tend to use their micros to teach students about computers and to teach them how to program in Basic. So do elementary schools that have had computers for two or three years.

In both elementary and secondary schools, according to the study, there's a consistent decline in microcomputer use for drill and practice and a parallel increase in microcomputer use for teaching programming as schools gain micro experience. This may be so, researchers suggest, because schools that have experimented with using computers for drill and practice and for programming and instruction about computers have found the second approach more fruitful. Or perhaps timing had something to do with it. Perhaps, "schools became disenchanted with the drill-and-practice software available at the time and have not ventured back to examine more recent software products that schools that more recently became microcomputer owners have been able to use at least somewhat successfully," the Hopkins study suggests.

This thought-provoking information and more is contained in the first of a series of newsletters published by the Johns Hopkins group and funded by the National Institute of Education. The study being discussed is based on a probability sample of more than twenty-two hundred public, private, and parochial elementary schools across the country, and the newsletters are intended to communicate preliminary findings.

As the Johns Hopkins researchers point out, plenty of us talk about how microcomputers affect students, teachers, and the educational process but few have scientifically investigated their impact. The researchers don't claim that their own survey is such an investigation; rather, its purpose was to find out from a representative sample of microcomputer-using teachers what effects microcomputers have had on their schools.

Most of the information on how micros are being used in the schools was obtained from individuals who had been identified as "the primary computer-using teacher" at each school. As of April 7, 68 percent of those surveyed had responded by completing an eighteen-page questionnaire.

Many teachers reported that the main impact microcomputers have had is social. More enthusiasm for schooling, a greater tendency for students to work without a teacher, and more instances of students helping each other were among the trends mentioned.

Future reports will address such questions as which people have most significantly influenced their school's acquisition of micros, how much micros are actually being used (and by whom), and how teachers deal with microcomputers in organizing instruction in the classroom setting. Other possible topics include what kinds of computer-related training computer-using teachers find essential.

This kind of information is bound to be of considerable interest and real value to people who care about the use of computers in education. To find out more about the study or to be placed on the mailing list to receive copies of this informative series of publications, contact Dr. Henry Jay Becker, Project Director, Center for Social Organization of Schools, The Johns Hopkins University, Baltimore, MD 21218.

The Future Is Now. It's refreshing to hear for a change about the positive effects microcomputers are having right now in education. More often, it seems, we're told only that knowing how to use computers (or not knowing how to use them) will make a difference in young people's careers and lives "later on." If it's true that microcomputers are helping students feel more motivated to learn, more capable of learning on their own, and more inclined to help each other, then micros are making a real difference in the present. And, it seems realistic to expect that they'll continue to be a significant positive force in the future.

The positive effect that computers can have on education and on how students see themselves makes one finding of the Johns Hopkins survey all the more disturbing. As previous studies have shown, lower-income public school districts are much less likely to have school microcomputers. The statistics the study obtained help bring this situation home. "Whereas two-thirds of public schools in the better-off districts have microcomputers, only 41 percent of the schools in the least wealthy districts have any."

One group that would like to see more equitable access to microcomputers is Technology Education Research Centers (TERC), a nonprofit educational computing organization in Cambridge, Massachusetts. Writing in the most recent issue of the group's quarterly publication, *Hands On!*, TERC director Robert Tinker expressed concern over the fact that lower-income students, female students, and students with special needs often have very limited access to computers and computer-related instruction.

In response to this situation, Tinker announced, TERC is forming an information clearinghouse on the equity issue. By establishing the clearinghouse, TERC hopes to find out about relevant articles, individuals, and projects already addressing the problem. The group is also eager to establish contact with people who are thinking about the equitable distribution of microcomputers and want to make it happen.

The overall aim, explains Tinker, is to bring together people, ideas, and information in order to translate concern into constructive action. Consequently, the group is also interested in knowing how respondents might be willing to participate in an effort to improve the wide-scale access to microcomputers.

To share your opinions, ideas, experiences, and frustrations with regard to this issue, write to Technology Education Research Centers, 8 Eliot Street, Cambridge, MA 02138.

California Apples and Maybe More. If the 1982 Technology in Education Act had passed, most of the schools in the country would probably have at least one Apple by now. The bill, introduced by Oakland, California, congressman Fortney H. "Pete" Stark, would have allowed Apple Computer and other manufacturers to give micros to schools in return for a tax credit. Apple had pledged to donate some seventy-five thousand Apples to U.S. public and private primary and secondary schools if the bill went through.

As most folks know, the 1982 bill languished in the lame-duck session of Congress and was never passed. But the issue is far from dead. According to David Beaver of Apple, HR 701, a federal bill "virtually identical to last year's bill," has been reintroduced by Pete Stark. Because it is a tax bill, HR 701 will have to go through the Ways and Means Committee before it can move any further through the legislative process. Understandably, Apple and many others involved in education have high hopes that things will go better this time around.

As it is, schools in California will be getting Apples from Apple anyway. Because of AB 3194, a California bill written by former assemblyman Chuck Imbrecht and signed into law by former governor Jerry Brown, Apple is gearing up to be able to put one computer in every public elementary, junior high, and high school in California and one in every tax-exempt private school with more than one hundred students

enrolled. State-certified private special-education schools and selected schools operated by county offices of education will also be eligible to benefit from the program. The only real restriction seems to be that the computer a school receives must stay in the school itself, rather than being moved into a district computer center or other off-site situation.

After arrangements have been worked out with the various school districts, each of an estimated ninety-two hundred schools in California will be able to get a free IIe, with monitor and disk drive, along with *Apple Logo* and other software direct from Apple. In addition, schools will get discount coupons from some twenty-five top vendors of Apple-compatible products and special dealer support.

As a recent *Wall Street Journal* article pointed out, a significant number of schools that have computers are not using them very effectively, if at all. Some computers sit on the shelf, and some teachers that originally had high expectations about the difference computers would make now feel misled or disillusioned. The reasons for this situation vary. Some schools bought expensive hardware only to discover that it isn't what they really need and doesn't do what they thought it would. Some schools have computers but no money at all for software. Some have computers and software but no staff members with the information, guidance, and experience necessary to use them and to work with students effectively. And some schools that have a computer, some software, and some experience are still asking themselves in frustration, "What difference can a single computer possibly make to so many children?"

Aware of these kinds of problems and concerned about teacher training issues, Apple is making a real effort to handle its giveaway program responsibly. First, explains Apple Computer's Steve Scheier, the company is sending letters to all eligible schools and educational institutions informing them of the program. And by the time the program is publicized, authorized Apple dealers at approximately one hundred sixty dealer locations throughout California will be set up to offer initial orientation and support to the new computer-owning schools.

Apple has also arranged to distribute a number of helpful publications to all participating schools. In addition to providing information about software, these publications will give teachers some suggestions about how to use the computer immediately in practical and useful ways.

As Scheier describes it, Apple's California giveaway program is, in some ways, "a grand experiment." It's also, it seems, Apple's way of setting up a partnership with schools that should, in the long run, make a positive difference in the educational experiences of California kids.

According to David Beaver, Apple is also looking at the California giveaway as a trial program. California represents one-tenth of the nation in terms of schools. The experience of having conceived, organized, and carried out a state program of this size will, Beaver feels, give Apple valuable knowledge of how best to manage and follow through on a major, countrywide computer giveaway program. In addition, he says, the folks at Apple are excited about the things they're learning from teachers and others. To be sure, there will be lots of ideas and information that can be shared with people all over the United States.

Of course, Apple is hoping that the Federal Ways and Means Committee will talk to teachers and other program participants to find out how the California program actually worked. If federal representatives like what they learn, and if they see the result as a significant indicator of Apple's ability to organize such a program, perhaps the national computer giveaway bill will have a different fate this year.

There's nothing Apple would like better than to give Apples to tens of thousands of schools around the country. Here's hoping that's exactly what they get to do.

It's the Real Thing! More and more often these days, educators in various settings are using "real software"—that is, applications software—in the classroom. Students at the elementary school and junior high levels are learning word processing, while junior high and high school students are being introduced to database and spreadsheet programs. In keeping with this trend, the Minnesota Education Computing Consortium (MECC) has released two products intended for use with

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Softerm file transfer utilizes an easy to use *command language* which allows simple definition of even complex multiple-file transfers with handshaking. Twenty-three high-level commands include *DIAL, CATALOG, SEND, RECEIVE, ONERR, HANGUP, MONITOR* and others which may be executed in immediate command mode interactively or from a file transfer macro command file which has been previously entered and saved on disk.

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Online Update Service

The Softronics Online Update Service is provided as an additional support service at no additional cost to Softerm users. Its purpose is to allow fast turnaround of Softerm program fixes for user-reported problems using the *automatic patch facility* included in Softerm as well as a convenient distribution method for additional terminal emulations and I/O drivers which become available. *User correspondence* can be electronically mailed to Softronics, and *user-contributed* keyboard macros, file transfer macros, and host adaptations of the Softrans FORTRAN 77 program are available on-line.

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business education students in grades nine through twelve.

Word Processing on the Apple is a package of supplementary materials designed to be used with Apple Computer's *Apple Writer I* (which must be purchased separately). The package consists of a sixty-nine-page teacher-student manual. Extra copies of the forty-three-page student manual portion can also be purchased. It contains six self-instructional lessons on how to use *Apple Writer I* and thirteen practical word processing problems designed to give users experience with entering, editing, and printing *Apple Writer*-generated letters and manuscripts.

The Electronic Spreadsheet is designed to introduce business education students to *VisiCalc* (which must be purchased separately). The teacher-student manual introduces *VisiCalc* commands by means of a tutorial and provides practical sample problems to solve using *VisiCalc*. Templates to use in working out some of the problems are available on disk, and separate copies of the student portion of the manual can also be purchased.

MECC announced these new products in a recent issue of USERS Newsletter. To find out more about these materials and others, contact MECC, 2520 Broadway Drive, Saint Paul, MN 55113. To be added to the newsletter distribution list send your name and address to USERS Newsletter at the same address.

MECC has also announced a series of instructional computing workshops for educators to be held June 27 through 30 at Minneapolis, Minnesota's, Hilton Inn. The first, Creating a School District Instructional Computing Plan, is intended for those who are involved in planning their school district's implementation of computers. Factors such as curriculum, equipment, courseware, staff training, and budget will be discussed, and planning guidelines will be suggested. The second workshop, Planning In-Service Training in Computing, is designed to give educators who are responsible for in-service training in instructional computing the perspective and practical ideas they'll need to plan and implement a successful program.

The final workshop, Overview of MECC Computer Literacy Instructional Models, proposes that integrating computer use into various subject area classes is "perhaps the most effective way to foster computer literacy in students." Participants will get hands-on experience with twenty-six mathematics, science, social studies, and computer studies programs now available from MECC, as well as suggestions as to how to integrate them into the curriculum. (The new programs, which were developed by MECC under federal funding, are in the public domain; they'll be available from MECC for the cost of reproduction and shipping.)

For workshop information, call (612) 638-0626.

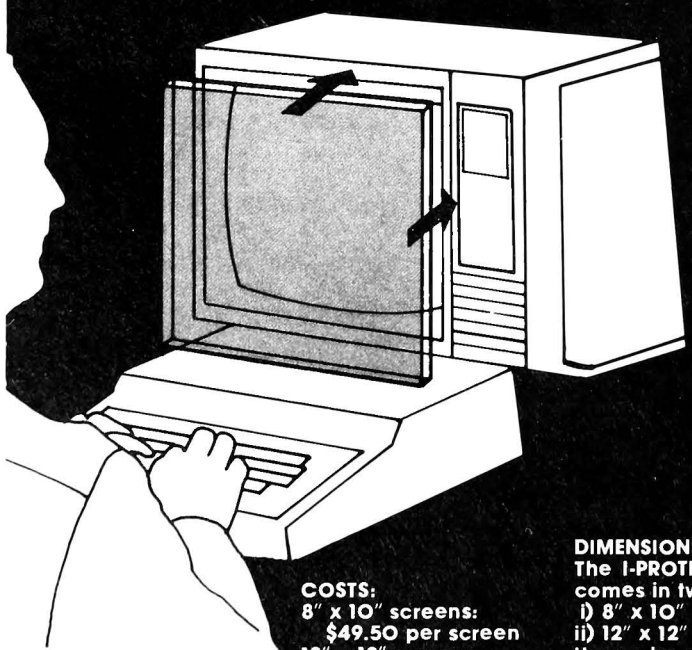
Kids' Corner Magic Crayon. By Carol Clark. So what's magic about a computer imitating a crayon? Wouldn't your kids (and your pocketbook) be better off if you just splurged on the box of sixty-four and let the budding artists run wild?

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But first, the basics. *Magic Crayon* allows kids to draw pictures on the lo-res screen in a number of colors by means of single-keystroke commands. Movement up, down, left, right, and diagonally is accomplished by hitting single keys according to one of two possible preselected command configurations. Additional command keys include C for color change, E for erase, R for remember a picture, P for put a picture on-screen, and S for stop. There are also commands for moving without

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GROWN-UP GAMEWARE

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drawing and for continuing to draw after having made a move to another location on-screen. Sticky labels that come with the program can be affixed to the keys so that commands will become associated with the appropriate keys. In addition, hitting the question mark key, shifted or unshifted, activates the help option; users who can remember this much should have little trouble with the program.

Magic Crayon has four levels of operation. At the first, instructions are presented in picture form. Directional movement is possible at this level, but diagonal movement and moving without drawing are not permitted. Level 2 is just like level 1, except that the instructions are presented in words rather than pictures. At level 3, diagonal movement and movement without drawing are possible, and at level 4, the ability to change the screen location of a picture becomes available.

Magic Crayon has only a few commands. This makes the program easy to use, but there are some tradeoffs in terms of power and flexibility. It would be nice, for instance, if *Magic Crayon* offered erase and unerase commands; artists don't always get what they're aiming for the first time and should be allowed to change their minds without having to start completely over.

On the plus side, *Magic Crayon* incorporates an easy-to-use, highly flexible class management system. The program is set up so that lots of children (as many as fifty) can use it easily. By means of this system, parents and teachers can create or edit a roster, establishing different skill levels for different children so that the program comes up on the level appropriate to their abilities to read and conceptualize; change the command keystroke configuration; and limit or eliminate sound. This program also allows an adult to look at or delete pictures, allocate disk space, and record the roster on another Kids' Corner disk. (*Magic Crayon* is the first program in a planned series.)

If you're in the market for a program similar to Logo, you'll probably prefer *Delta Drawing* (or one of the Logos) over *Magic Crayon*. But if you're looking for a carefully put together, inexpensive program by which to introduce your students or your own children to the computer, *Magic Crayon* has a lot to recommend it. What the program lacks in sophistication, it makes up for in the quality and charm of its on-screen tutorial and the clarity of its brief manual; both are tailor-made for first-time computer users. The "trouble-shooting" section of the manual, which describes possible problems and offers explanations and solutions, is especially helpful.

If all you want to be able to do is draw pretty pictures, real crayons still come out ahead of this program—they're cheaper, and they offer more colors and more freedom. What is special about *Magic Crayon* is the way it illustrates and makes use of what a computer can do.

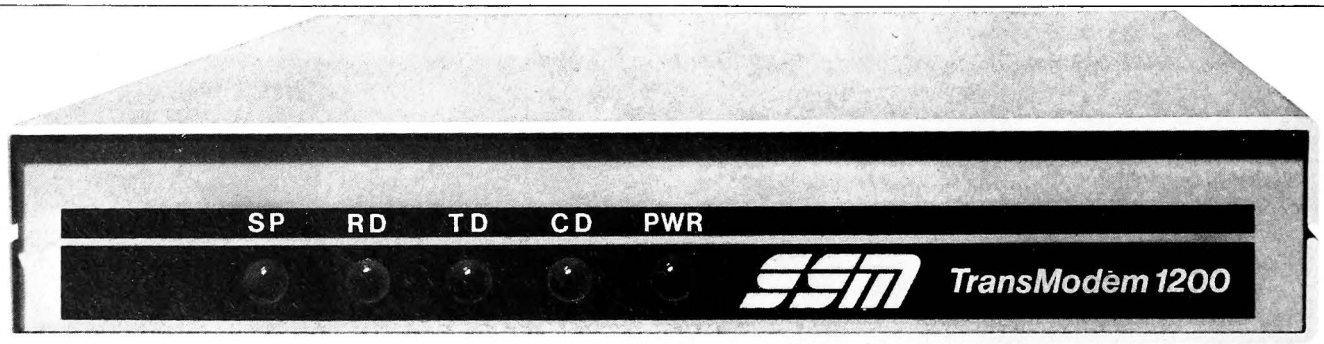
Kids' Corner Magic Crayon, by Carol Clark, C & C Software (5713 Kentford Circle, Wichita, KS 67220; 316-683-6056). $35.

Author, Author. It's not too late to enter Krell Software's 1983 educational software contest. Would-be software authors have until November 30, 1983, to submit their original work for consideration.

According to the company, entries will be judged on "originality and suitability for instructional use" and should "demonstrate an advance in the art and science of educational software." Broad general categories of the competition are art, humanities, and philosophy; social sciences (which includes economics, political science, psychology, anthropology, and sociology); math and natural sciences; and Logo and other topics. The "other topics" category includes such things as programming aids for the disabled, languages, and vocation-education software.

Entries will be judged by a "panel of educators and experts in educational software," and Krell will award thirty first prizes of $500 worth of Krell software, thirty second prizes of $300 worth of Krell software, and thirty third prizes of $200 worth of Krell software. Authors can win in more than one category and those who do will receive prizes for all categories in which they win. Authors retain rights to their own material.

For more specific information about the contest, contact Krell Software Corporation, Department 44, 1320 Stony Brook Road, New York, NY 11790. ■



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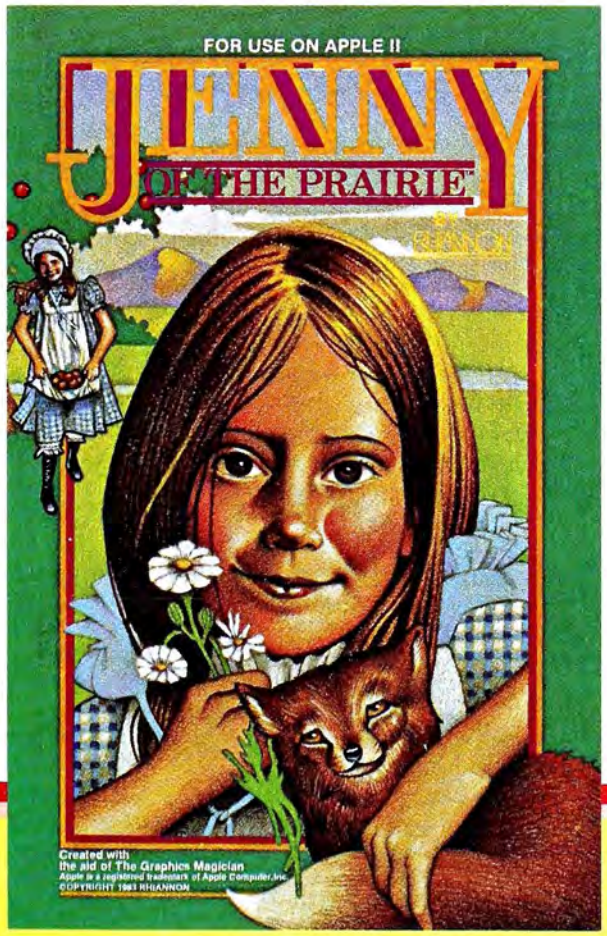
2190 Paragon Drive, San Jose, CA 95131 408/946-7400

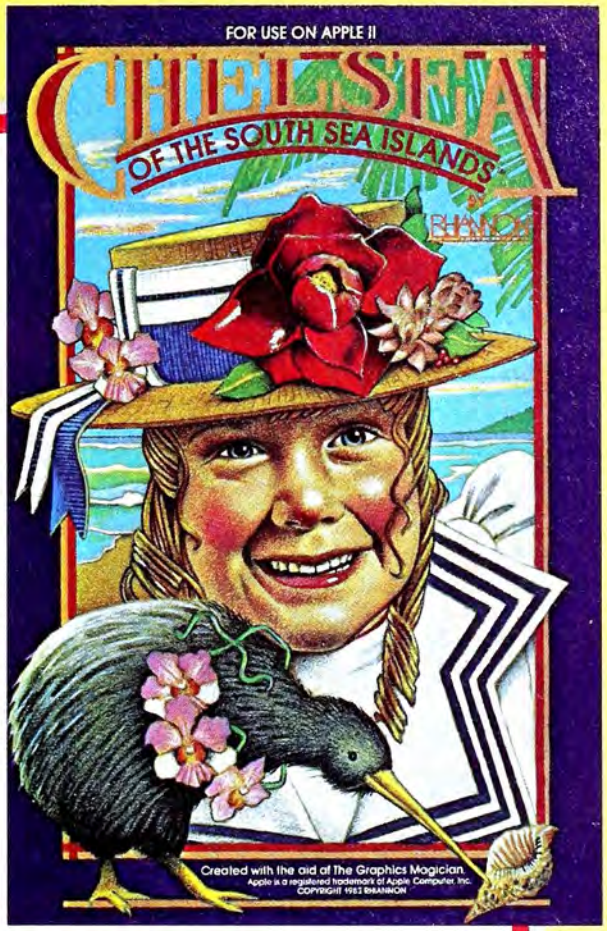
Rhiannon joyfully announces computer games for girls.

NOW, it is possible for children to explore the wonderment and fascination of computers in a meaningful way. Each distinctive game:

- portrays believable characters as real children
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- values keen observation and memory over speed
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Computer games by RHIANNON invite creativity, exploration and reverence for life. RHIANNON games combine factual accuracy with striking graphics.





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™ is the story of a spunky pioneer girl who becomes separated from her covered wagon train and must face the advancing winter alone. Jenny's job is to gather nature's provisions from a hazardous environment.

™ is a 19th century British girl who becomes stranded on a small Pacific island, while traveling from New Zealand to boarding school in England. With her pet Kiwi, she explores for native treasures and confronts tropical dangers.

™ loves to wade through the tall grasses to watch the gigantic Woolly Mammoth, but her extended existence depends on seasonal patterns of gathering food and medicinal plants. Clair's skillful fire-tending and use of tools can ward off immediate perils.

™ takes over responsibility for maintaining a reclamation project at a sun baked desert outpost. The blazing sun provides plentiful solar energy, but also threatens the fragile life forms she has pledged to protect.

Watch your child smile as she moves her new friends about the unfolding landscape. Watch her discover the world with her pals Jenny, Chelsea, Clair and Lauren.

Ask at your computer retail store, or write us. $34.95. 3717 Titan Drive, Richmond, Virginia 23225. Dealer inquiries welcome. Copyright 1983 RHIANNON.

RHIANNON

COMPUTER GAMES FOR GIRLS

Announcing
The best 6502 Assembler in the World

ORCA/M™

Now. The kind of high-level support you'd only expect to find on a main frame. ORCA/M (*Hayden's Object Relocatable Code Assembler for Micros*) lets you develop sophisticated applications with the speed and ease of a high-level language, yet retain the control and efficiency that only assembly language can give.

Here's what ORCA/M gives you:

The Assembler

Macro language features:
- Conditional assembly of source and macro files
- Separate source and macro files
- Nestable macros
- Parameter mid-string and string search functions
- Symbolic parameter assignment
- Numeric, string, and boolean type parameters
- Parameter subscripting
- Global communication between macros
- Macro expansion loop control
- Count, length and type parameter-attribute functions

Extensive Macro Libraries

Memory Constant Declarations:
- Integer
- Character
- Four-byte Integer
- Hexadecimal
- Floating Point

Relocatable object module generation

Fast assembly directly to disk

Program segmentation:
- Selectively assemble individual subroutines
- Global and local scope of symbols

The Linker

Produce executable binary files from relocatable object modules

Link routines from library files

Link subroutine re-assemblies

Define a new origin for previously assembled code

Invoke at assembly time or by command

Subroutine libraries:
- Floating point and double-precision routines
- Transcendental functions
- Hi- and lo-res graphics
- Multiple-precision integer math
- Input and output

The Editor

Co-resident screen editor:
- Global search and replace
- Block move
- Entry of non-keyboard characters

Supports lower case adapters and shift-key modification

80-column: horizontal scrolling with 40-column displays

The System

Monitor: transparent control of system from one command level

Extended Disk Commands:
- File copy
- File undelete
- Catalog sort
- Wildcard filenames

Disk ZAP: Built-in disk sector editor

Optimized DOS 3.3 compatible operating system

Operating system interface:
- Supports a variety of configurations
- User-modifiable to allow linkage of custom drivers for peripherals

64k RAM supported, 48k required

This unique array of features and functions speaks for itself: the power of **ORCA** is unsurpassed.

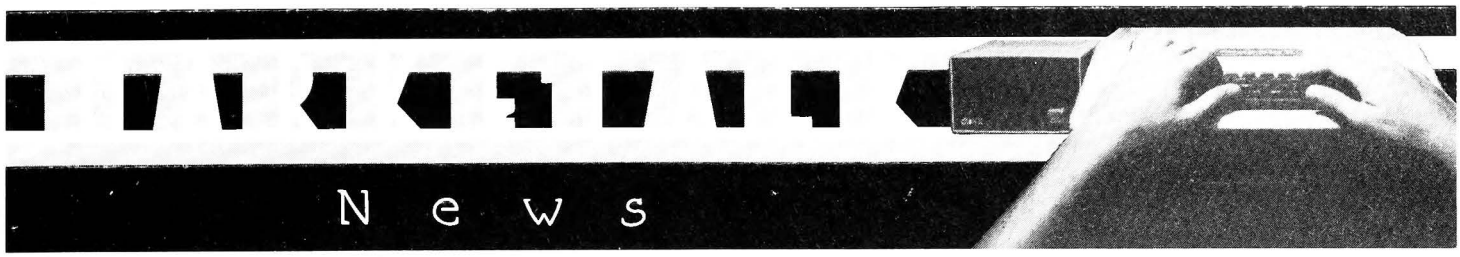
All features are documented clearly and extensively. Source listings for the subroutine and macro libraries, as well as the operating system, are included.

ORCA. If you're serious about developing 6502 software, it's the one to have.

Available from your local dealer, or call:
800-343-1218
(In MA call 617-937-0200)
ORCA/M: 21609
Apple II disk, 48k, DOS 3.3
Two drives and 64k recommended

Introductory Price: $99.95

HAYDEN SOFTWARE



Unless otherwise noted, all products can be assumed to run on either Apple II, with 48K, ROM Applesoft, and one disk drive. The requirement for ROM Applesoft can be met by RAM Applesoft in a language card. Many Apple II programs will run on the Apple III in the emulator mode.

☐ Play game; play game. Lose game; lose game. That's the way *Double Trouble* plays. The latest release from **Bez** (4790 Irvine Boulevard, Suite 108B, Irvine, CA 92714; 714-752-3888) is five games in one, but you play two of them at a time. One joystick controls both games at once. Only the skilled will be able to maneuver through each game without upsetting the play of the other. Independent eye coordination a plus. $15.

☐ *Computers: A Comprehensive Guide* is a sixty-four-page compilation of more than eight hundred microcomputer books published to date. The books are arranged by twenty-six topics ranging from philosophical to practical. From **Yes! Bookshop** (1035 Thirty-first Street N.W., Washington, DC 20007; 202-338-2727). $2.

☐ **N-Squared Computing** (5318 Forest Ridge Road, Silverton, OR 97381; 503-873-5906) has introduced three stock-market-analysis programs for the investor or analyst. *Market Illustrator* consists of two programs for plotting, smoothing, and comparing all types of financial data. One program charts price, volume, and on-balance volume for stocks and commodities. The second program uses split-screen displays for comparing data with the program's indicators. $195. *Market Analyzer* lets you create and compare complex market indicators. Included functions are exponential smoothing, arithmetic averaging, ratios, sums, differences, transforms, and time-lag analyses. Indicators such as the trading index (TRIN) and advance decline line (ADL) are generated in seconds. $295. *Stock Analyzer* includes all major technical analysis functions for detailed study of individual stocks. Its capabilities include high/low/close/volume displays with linear or semilog auto scaling, price/volume indicators, relative strengths, momentums, smoothing, and averaging. $295.

☐ A video board that provides the IIe with RGB (red/green/blue) video signals is available from **Telemax** (780 Lorraine Drive, Box 339, Warrington, PA 18976; 215-343-3000). You can use the board with eighty-column text so that color graphics and text are displayed on one RGB monitor. Choose any of eight colors for your text, and put it on any of eight colors of background. $169.

☐ Continuing its line of business software, **El Dorado Software** (549A Castro Street, San Francisco, CA 94114; 415-626-0588) is offering three programs. *50/50* produces forms for management reports ranging from cost analysis and distribution comparisons to vehicle maintenance and work record reports. $60. *Calc-Kit* integrates data from different spreadsheet files. It also lets you vary column widths and type styles during printing. $100. *In the Mail* is a set of professional business letters. $60.

☐ **Random House** (7370 S. Yale Avenue, Suite 103, Tulsa, OK 74136; 800-331-5469) has new courseware in several areas. *Word Blaster* requires students to exercise their understanding of graphophonemic, syntactic, or semantic cues. Each *Word Blaster* program contains nine lessons divided among three levels: below, at, and above grade level. The program contains 540 different sentences divided into seven levels of reading difficulty. For students in grades two through seven. $150. *Fundamental Punctuation Practice* includes more than thirty lessons in basic punctuation skills. It includes a diagnostic placement test and covers commas, conjunctions, subordinate clauses, semicolons, and other areas that cause a lot of confusion. $135. *Galaxy Math Facts Game* puts students at the helm of a spaceship located in the far reaches of space. Their mission is to return to Earth safely, while avoiding black holes, Klingons, and star fields. Only their quick, total recall of basic math facts will help them complete the mission. The game covers addition, subtraction, multiplication, and division. Five additional *Galaxy* missions include place value, fractions, rounding and estimating, decimals, and integers. For grades one through eight. Each of the six missions may be purchased separately at $34.50 each; complete set, $147. *Grand Prix* gives students the opportunity to compete in a challenging Grand Prix race. The object here is to win the Grand Prix by quickly recalling the basic math facts. Six math programs cover the same subjects as *Galaxy Math Facts*, and each can be purchased separately at $34.50 each; complete set, $147. For school administrators, *Customized Instruction Management System* (CIMS) lets the local district quickly set up a computerized record-keeping system based upon the local curriculum. The program automatically scores tests and makes it possible for a teacher to obtain easily a variety of relevant reports for progress reports. It holds up to ten classes of thirty-four students per class and can be expanded. Requires two disk drives. $750. *CIMS* can be expanded to let you install a card reader to score tests. *Card Reader* makes test results available either as a screen display or in printed format. Results may be obtained by objective and test number or in alphabetical order. The program has an option for the teacher to control the number of times a student may enter a card for the same test. Starter pack includes two thousand cards. $135.

☐ **Associated Technology** (Route 2, Box 448, Estill Springs, TN 37330; 205-837-4718) has announced a guidebook called *How To Become a Successful Technical Consultant*. The text includes detailed discussions on such topics as fees, ethics, professional advertising practices, setting business goals, writing contracts, and finding clients. $25.

☐ *IDS* (Integrated Development System) is an Applesoft utility from **R. R. Michaels** (Box 565, Leesburg, VA 22075; 703-777-1933) that develops easy-to-use input procedures, manages disk files, and produces formatted printlines. The package includes a menu-driven editor program to define full-screen forms, disk record layouts, and printline formats. *IDS* lets you develop applications using Applesoft. You can experiment with screen layouts and report formats, decide which variables you want to use, and define disk record structures. Then you can design your application without worrying about complicated procedures. $85.

☐ **John Wiley & Sons** (605 Third Avenue, New York, NY 10158; 212-850-6497) has published *Microcomputers: A Parent's Guide*. The book helps adults become computer-literate. It helps you select computer hardware and software, evaluates publications, and describes a wealth of other information that heightens the educational value of personal computers. $8.95.

☐ **NEC Home Electronics** (1401 Estes Avenue, Elk Grove Village, IL 60007; 312-228-5900) is the sole distributor of the newly developed 8023 ribbon cartridge. The ribbons are designed for NEC's PC-8023A bidirectional eighty-column printer, and they're compatible with Apple's dot-matrix printer. Each package contains two ribbon cartridges. $19.95.

☐ *Computerized Investing* is a bimonthly publication of the **American Association of Individual Investors** (612 N. Michigan Avenue, Chicago, IL 60611; 312-280-0170), a nonprofit group formed to assist individuals in becoming effective managers of their own assets through programs of education, information, and research. Subscription is $44 per year; $22 per year for members of AAII.

☐ The Buffered Grappler+ is the latest addition to the Grappler interface series from **Orange Micro** (1400 N. Lakeview Avenue, Anaheim, CA 92807; 714-779-2772). The board is compatible with the II, II Plus, IIe, and III computers and has twenty-three printing features and a 16K upgradable buffer. You can store your text in the Buffered Grappler+ for printing while you use the computer for other things. $239.

☐ Keep your disks grease-and-grime-free with the Scotch 7440 head cleaning kit from **3M** (Box 33600, Saint Paul, MN 55119; 612-733-9572). Cleaning solution is dispensed in individual packets. The kit contains two

cleaning disks and enough fluid for thirty cleanings. $33.30.

☐ If you ever need to mail a disk, the All Clear Mailer from **Blackbourn** (10150 Crosstown Circle, Eden Prairie, MN 55344; 612-944-7010) might be what you're looking for. Each one holds up to three disks in a dustproof clear container. Disks can be identified at a glance through the clear vinyl. Available in 5 1/4 and 8-inch formats. 5 1/4-inch, $.89 each; 8-inch, $1.09.

☐ **Microkart** (3198-H Airport Loop Drive, Costa Mesa, CA 92626; 714-556-2252) has introduced three workstations and two table-top printer stands. The workstations are designed to complement existing office designs. They're available in oak, teak, and walnut finishes. $129.95 to $169.95. The table-top printer stands are designed for most compact printers. $32.95 to $39.95.

☐ If writing applications on your Apple for the IBM Personal Computer is your thing, check out the PCPI 88Card from **Personal Computer Products** (16776 Bernardo Center Drive, San Diego, CA 92128; 714-485-8411). It comes with 64K of memory; with it, developers can write IBM pc applications on their Apples under MS-DOS. The 88Card also includes MBasic; CP/M-86 is an option. $595.

☐ **Strobe** (897-5A Independence Avenue, Mountain View, CA 94043; 415-969-5130) has introduced the Strobe 200 Graphics Plotter. It features an efficient paper-loading system and an innovative pen holder that allows you to use a wide variety of pens. $795. Parallel interface card, $85. *Enhanced Business Graphics Package* is Strobe's new spreadsheet graphics program. It automatically converts information for spreadsheet programs to colored, hi-res pie charts, bar charts, and other graphic representations. The program features automatic proportioning of up to fifteen pie chart segments, eliminating the need for you to calculate individual chart values. Additional alphanumeric text can be added. Requires CP/M. $195.

☐ **Inmac** (2465 Augustine Drive, Santa Clara, CA 95051; 408-727-1970) has developed an asynchronous line driver that transmits error-free data at distances up to fifteen miles. The EIA Line Driver converts data to low-level signals that travel easily over phone wires. At the fifteen-mile range, the driver transmits at up to 1200 baud; at under four miles, transmission rates can be as fast as 9600 baud. $195.

☐ El Cid is a computer interface for the Compugraphic CompuWriter Jr. I and II phototypesetters. The interface makes the typesetting machine look like a printer to the computer. El Cid has a soft switch that lets you activate the interface from software control. From **Data Frontiers** (Box 92423, Rochester, NY 14692). $599.

☐ **The Porter Company** (35 Rand Place, Pittsford, NY 14534; 716-385-1438) has announced *Problem Solving Strategy Training* (PSST), an instructional program with 450 verbal problems in sets of ten. It leads the student through a problem-solving process as it presents typical verbal problems. The program also provides practice in the mathematics of problem solving while forcing the student to develop a strategy for problem solving. $24.95. *Keyboard Familiarization Training* introduces the Apple keyboard to children and teachers. It doesn't teach typing skills or programming, but it gives the student confidence in using the keyboard. $19.95. *Word Matching Game* is a computer version of Concentration, with an educational twist. As many as twenty words can be hidden behind closed windows, and the player has to match the words based on given instructions. $23.95.

☐ **Chromatic Communications** (Box 3249, Walnut Creek, CA 94598; 415-945-1602) has begun delivering *The Personal Computer—An Industry Source Book*. Directed toward dealers and distributors, the book contains more than twenty-five hundred listings of domestic and foreign companies and information on their products, locations, and contacts. $42.50.

☐ The Model 2300 EPROM Programmer from **Software Specialties** (305 Larchway Drive, Springboro, OH 45066; 513-748-0471) lets you program EPROMs without having to remove the cover of your computer. No external plug-in modules are needed, and it draws all its power from the Apple. You can use it with an RS-232 interface card to download data into the computer's memory from another machine. The 2300 fits into any slot from 1 to 7 and has ten programming switches plus twenty-four-pin and twenty-eight-pin insertion sockets. $429.

☐ Touch typing is the objective of *Keyboarding*, a typing program from **Merit Audio-Visual** (7 W. Eighty-first Street, New York, NY 10024; 212-787-4766). For Apple IIe, $34.95; for Apples without lower-case letters, $29.95. *Concentration Builder* teaches the basics of programming. You learn procedural thinking by moving the cursor across the screen to modify existing sketches or to create new ones. $34.95.

☐ **Digipac Computer Consulting** (907 River Street East, Prince Albert, Saskatchewan S6V 0B3; 306-764-1707) has released *The Attendance Desk*, a program designed to handle attendance recording procedures for large and small secondary and elementary schools. The program records up to five different absence and late categories. It generates automatic notices to parents at selected numbers of absences. The program is also a comprehensive database for other school information. Requires two disk drives. $320.

☐ To remedy your *dBase II* function deficiency, *dBRx* might be what you need. The *dBRx* system is a package of *dBase II* and machine language routines designed to increase the function capabilities of *dBase II*. The package adds to *dBase II* the math functions sine, cosine, arc tangent, log, exponent, and square root, with precision to nine decimal places. Available from **Gryphon Microproducts** (Box 6543, Silver Spring, MD 20906; 301-946-2585) in eight-inch disk form. $150.

☐ *The Cheap Assembler* is a mnemonic assembler from **Thunder Software** (Box 31501, Houston, TX 77231; 713-728-5501). The system lets you have unlimited length labels, free field programming, text editor with ten commands, character insertion and delete, line insertion and deletion, and explanatory debugging messages. You can edit, assemble, and run a program without ever leaving the system. The program is not copy-protected. $20.

☐ **Total Logic Corporation** (Box 416, Fort Collins, CO 80522; 303-226-2688) has announced the LA-100, a hardware and software system that converts the Apple into a sophisticated logic analyzer. $795.

☐ *Micromover* is a data transfer program that sends any Apple II file over the phone lines via modem, without converting it to a text file first. Data compression cuts transfer time. The program has one menu with one-character commands. It works under DOS 3.2, 3.3, or a combination of the two. You only need to purchase one copy, as it transfers a copy of itself to the distant end if needed. From **DAB Systems** (9116 Rockefeller Lane, Springfield, VA 22153). $50.

☐ Here's a guy who'll help you with special printing from within *Apple Writer II*. Bill Inman (1851 Roberts Road, Medford, OR 97501) has developed a program that causes the printer to go into condensed, enhanced, double-width, double-strike, italics, and graphics modes without the usual trouble associated with the control-V command. Three keystrokes do it all. You can get it for $8.95.

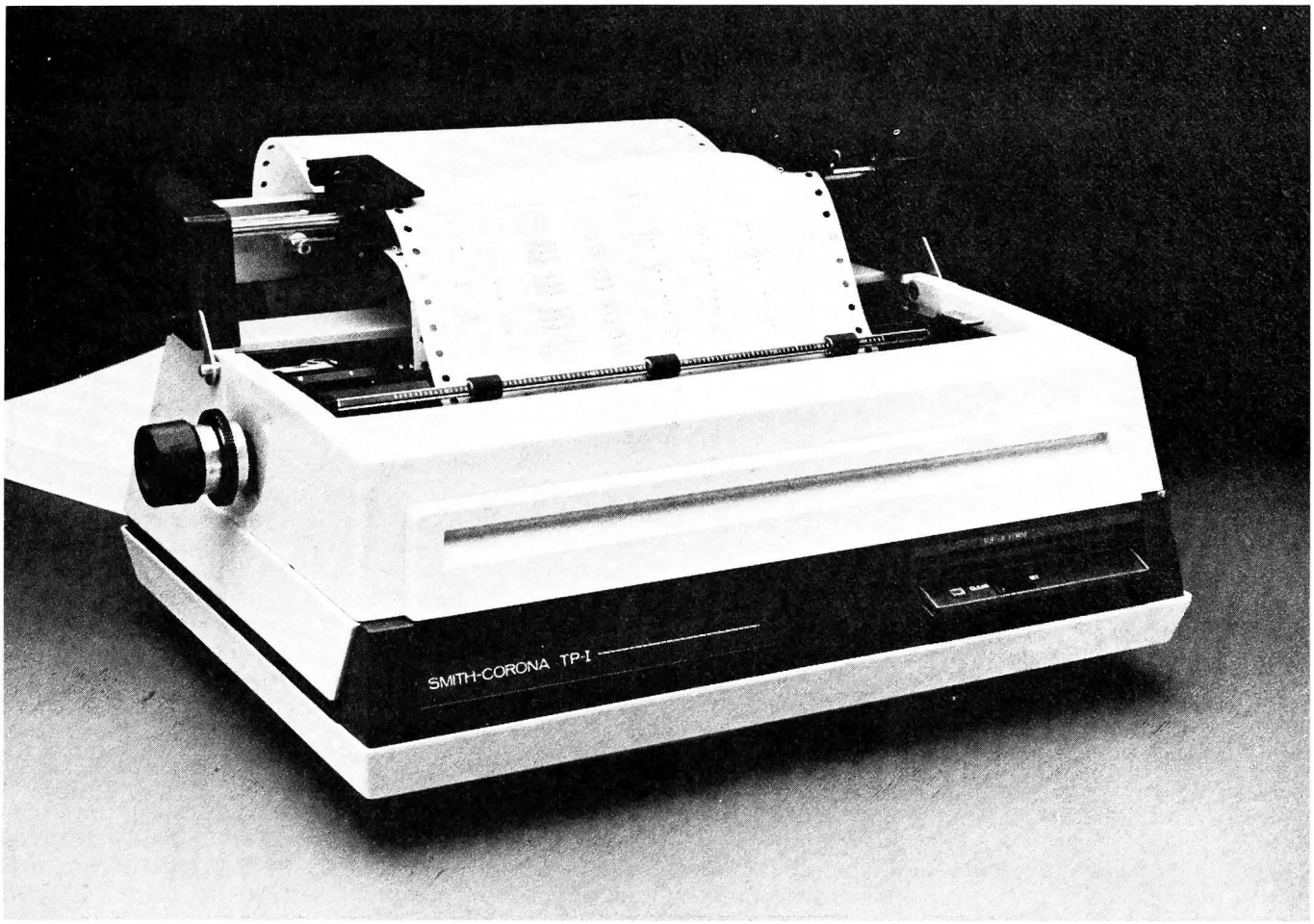
☐ Up and at 'em, farmers! *All About On-Farm Computing* is a 128-page book written for the farmer who is just getting started with the computer. It provides information for someone who is considering buying a computer and for someone who already owns a computer and wants to make better use of it in operating a farm business. Included are directories with addresses and phone numbers of more than three hundred university agriculture specialists, more than sixty software providers, and sources for more than two hundred software programs. From **AgriData Resources** (205 W. Highland Avenue, Milwaukee, WI 53203; 800-558-9044). $19.95.

☐ Free: **Silicon Valley Systems** (1625 El Camino Real, Belmont, CA 94002; 415-593-4344) is giving away more than $1 million worth of its word processing and educational software to public schools in an effort to foster computer literacy. If you want some, just write to Silicon Valley Systems stating the name of your school, school district, quantity and type of computers in use, and the contact person. For more information, contact Peggy Johnson at SVS.

☐ A hardware/software attachment, called Burple, that adds Burroughs TD830/MT983 and B-20 emulation capabilities to the II Plus and III is now available from **Midwest Data Source** (1010 Nimitz Road, Cincinnati, OH 45230; 513-231-2023). The Burple provides integrated asynchronous, synchronous, direct connect, and daisy chaining capabilities. It lets you tap into the Burroughs mainframe database, manipulate data, process information on a local level, and transmit the data back to the Burroughs computer. $995.

☐ *Write Away*, a word processor from **Midwest Software Associates**

Smith-Corona makes a good deal better. With a $50 rebate.



The Smith-Corona® TP-I™ daisy wheel printer with optional tractor feed.

Ever since the Smith-Corona TP-I was introduced, it's been a great success with critics and users. And it's been a good deal at its low price.

Now, it's a better deal than ever. Because now you can get this high-quality, low-cost printer for even less.

Buy a Smith-Corona TP-I letter-quality printer any time between June 1 and July 31, and Smith-Corona will send you a $50 refund.

Of course, what you'll be getting is more than a good deal. Because the Smith-Corona TP-I is a printer with the same excellent print quality as found on the finest office typewriters.

The TP-I handles letter and legal sized paper. And with the new tractor feed option, the TP-I can handle both fanfold and single sheet paper—without ever having to remove the tractor feed!

The TP-I is very simple to operate. It's compatible with most personal and home computers and available with either standard serial or parallel data interface. And, unlike many printers, the TP-I is made in America.

There's a choice of state-of-the-art daisy wheels to give you a wide variety of fonts. (At $7.95 each, you can easily afford several.)

So if you're in the market for a high-quality, low-cost daisy wheel printer, get the Smith-Corona TP-I. Get it now and make a good deal a good deal better—with a $50 rebate.

Please send me more information on the Smith-Corona TP-I daisy wheel printer.

Name_____ Title_____

Company Name_____

Business Address_____

City_____ State_____ Zip_____

Type of Business_____

Mail coupon to:
Jerry Diener—V.P. Sales, Smith-Corona
65 Locust Avenue
New Canaan, Connecticut 06840

Smith-Corona

(Box 301, Saint Ann, MO 63074; 314-997-6470), includes a mail merge and form letter feature. Also included are utilities allowing you to create mailing lists from popular databases. The program supports an array of formatting commands that allow you to create almost any type of document. It's unprotected and creates ordinary DOS text files, which are read into the 28K (or larger) buffer much faster than you'd expect. *Write Away* also recognizes all popular eighty-column cards, including those for the IIe, without the need for a separate configuration routine. $175.

☐ **Computer Listings of Employment Opportunities** (CLEO) (2164 W. 190th Street, Torrance, CA 90504; 213-618-0200) is doing its part to reduce unemployment. CLEO is a free service aimed at those seeking technical careers. For the price of a phone call, technical professionals from across the country can view job listings and apply for jobs on-line by calling CLEO. The database is updated daily. To have access to CLEO, dial (213) 618-8800 (modem); 300 baud, full duplex. For assistance, call (213) 618-1525.

☐ *Nibble Investor* is a software package for those interested in tracking the performance of their stock portfolios. The program gives investors quick and accurate access to stock price and performance and stock transaction volume through the use of hi-res graphics and printed reports. The program combines information of weekly stock quotation summaries with its ability to track stock performances over extended periods. *Nibble Investor* is available from **Nibble** (Box 325, Lincoln, MA 01773; 617-259-9710). $29.95.

☐ **Orange County Technology Associates** (29 Tanglewood Drive, Irvine, CA 92713; 714-559-5381) has come out with Disk-Lock, a plug-in multilevel security device that offers you computer data privacy. Disk-Lock, once installed, can be used only by users with authorized passwords. The device encrypts and decrypts files to keep curious tinkerers out of what's none of their business. It supports DOS, Pascal, CP/M, Personal Computer Products's Applicard, Advanced Logic Systems's Z Card, and Microsoft's Z-80 Card. You can also use it with hard disks and the Hayes Micromodem II. $345.

☐ *HyperTyper* is a typing aid for offices, schools, and homes. It rids you forever of that awful hunt-and-peck method that so often hinders word processing. Children may use *HyperTyper* as a game while they learn typing proficiency. You need CP/M to run it. From **Digital Marketing** (2363 Boulevard Circle, Suite 8, Walnut Creek, CA 94595; 415-938-2880). $49.95.

☐ *Pascal for the Apple* from **Prentice Hall** (Englewood Cliffs, NJ 07632; 201-592-2347) is an introduction to Pascal as a first computer language. Using this 496-page book and an included disk concurrently, the reader is placed in an interactive Pascal environment with the computer. The book takes you through procedures, iteration, decision making, and recursion in Pascal programming. Arrays, records, sets, and the assignment statement are all covered. Requires two disk drives, Pascal software, and a language card. $33.

☐ *Power-of-Words* interacts with students through humor, sounds, and graphics to make word learning an entertaining game rather than a chore. This program from **Funk Vocab-Ware** (4825 Province Line Road, Princeton, NJ 08540; 609-921-0245) goes beyond teaching word memorization; it enhances students' language background and enables them to identify easily and learn new words they come across daily. Each volume includes two hundred words to be learned plus hundreds of synonyms, antonyms, prefixes, and suffixes. $49.95.

☐ FOLLK (Friends of Lisp/Logo & Kids) is a nonprofit membership organization promoting the use of microcomputers as independent educational alternatives. FOLLK is dedicated to bringing learning languages such as Logo and Lisp to persons of all ages, interests, and computer-expertise levels. Projects include a newsletter, curriculum advising for educators, an electronic bulletin board system, group and individual workshops, and a hotline service. Contact **FOLLK** (254 Laguna Honda Boulevard, San Francisco, CA 94116; 415-753-6555) for information.

☐ Need help learning *VisiCalc*? From **Osborne/McGraw-Hill** (2600 Tenth Street, Berkeley, CA 94710; 415-548-2805) comes *VisiCalc Made Easy*, a tutorial. The 200-page book presents hands-on lessons that introduce *VisiCalc*'s format and commands. The first section introduces the basic skills needed to build a worksheet; the second part examines editing commands; the third section covers advanced uses. $12.95.

☐ The International Software Databank is an on-line source of microcomputer software information. The system cross-references available software by system requirements and type of industry to help you find software that fits your needs. Information on purchasing software is given. Search time is usually under five minutes. A printed version of the ISD databank, *The Software Catalog*, is also available from **Elsevier Science Publishing** (52 Vanderbilt Avenue, New York, NY 10017; 616-668-2049, 800-223-2215). Catalog, $69; on-line connect charge, $60 per hour.

☐ The latest in the *Early Games for Young Children* series from **Counterpoint Software** (Suite 140, Shelard Plaza North, Minneapolis, MN 55426; 800-328-1223) is *Early Games Music*. Designed for kids four to twelve, this series of games serves as an introduction to the basics of music. The program teaches children how to create melodies, introduces them to notes of treble and bass clefs and keys of the piano. *Kaleidoscore* lets them combine their music with colorful graphic designs. $29.95.

☐ Now for some printers and related items: **Transtar** (Box C-96975, Bellevue, WA 98009; 206-454-9250) has introduced a serial version of its model 130 daisy wheel printer. The 130S gives you exceptional letter-quality printing and a full range of word processing functions. The 130S is compatible with all major word processing packages that use existing Diablo routines. The printer has thirteen DIP-switch-selectable features. $950. Transtar now has a bidirectional tractor for its 130 series of daisy wheel printers. The tractor fits serial and parallel printers, accepts paper up to 15 inches wide, and offers a 13 1/4-inch printing width. $149.

☐ The **Forth Interest Group** (Box 1105, San Carlos, CA 94070; 415-962-8653) has compiled *The Best of Forth Dimensions*, a quick and inexpensive look at *Forth Dimensions*, the bimonthly nonprofit publication of the group. $1.

☐ **Micro General Corporation** (1929 S.E. Main Street, Irvine, CA 92714; 714-557-3744) is marketing PC Weighmate, a microcomputer scale system that turns your Apple into a complete electronic postal, shipping, and counting scale for business or office use. It consists of a twenty-five-pound-capacity scale that plugs into any slot, and a disk that contains rate tables and zone charts for all classes of domestic and international mail, Express, United Parcel Service, and Federal Express. $695.

☐ **WattsOut** (2020 South Oneida, Suite 201, Denver, CO 80224; 303-759-3880) helps you get rid of unsightly static cling. Their product is also called WattsOut, and when it's attached to a ground, you just touch it to rid yourself of static electricity that can cause incorrect data entry, circuit damage, or memory loss in the computer. It comes with a sixteen-ounce bottle of antistatic spray. $9.95.

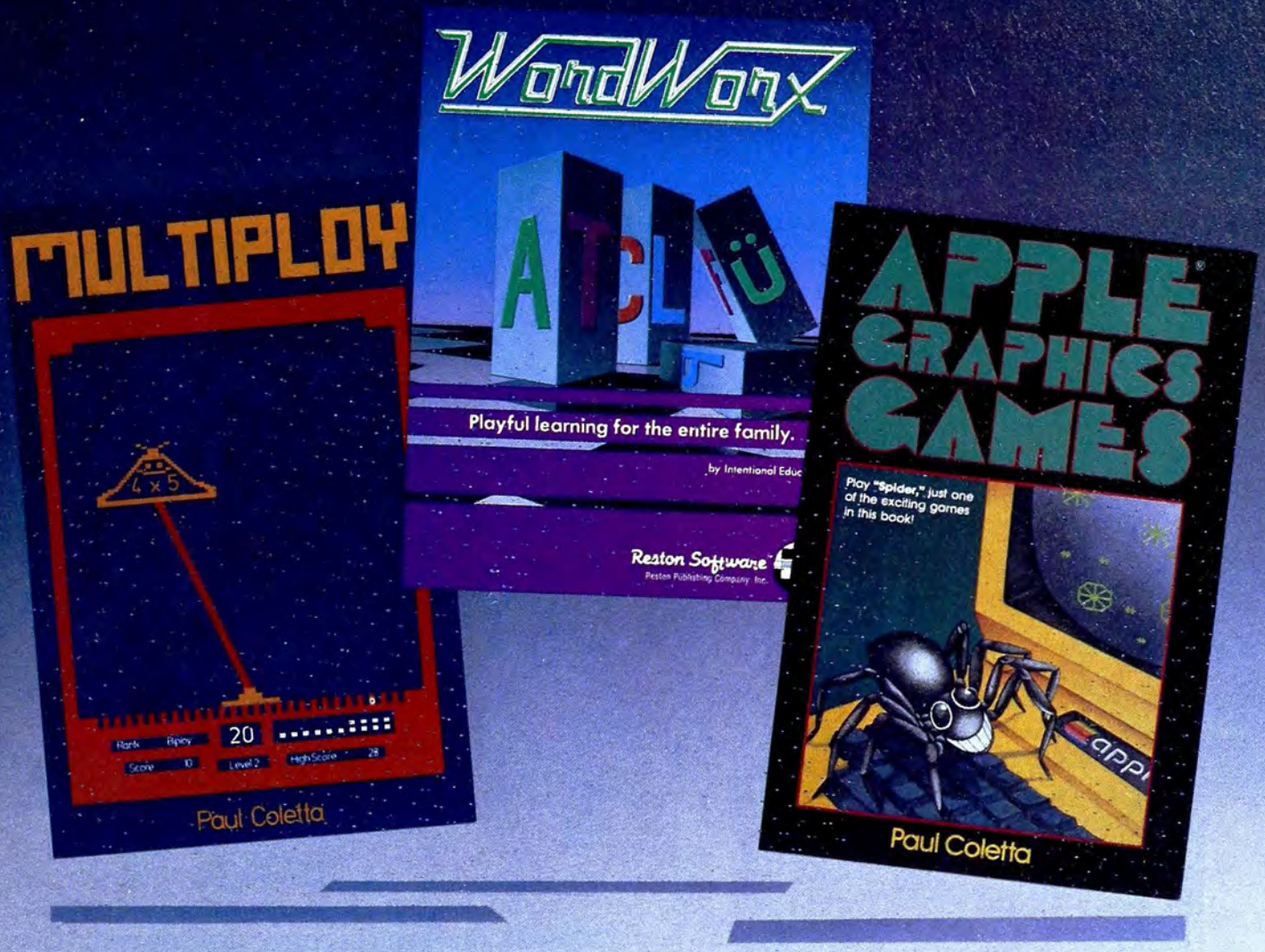
☐ *Address/Dialer* (Marketalk News, April 1983) from **Christopher Systems** (2775 Glendower Avenue, Los Angeles, CA 90027; 213-664-4880) is also available in a Hayes Micromodem II version. $59.

☐ Each disk in *Family Bible Fun* from **Sparrow Distribution** (8025 Deering Avenue, Canoga Park, CA 91304; 800-423-5052; 213-703-6599 in California) has word puzzles, guessing games, and recall quizzes. Available games are *Know Your Bible, Parts I* and *II*; *The Prophets*; *Life of David*; and *Life of Christ, Parts I* and *II*. $29.95 each.

☐ The 1983-84 third edition of *The Blue Book for the Apple Computer* is available from **WIDL Video Publications** (5245 West Diversey, Chicago, IL 60639; 312-622-9606), and it is huge. This 914-page edition lists forty-six hundred products and seven hundred twenty manufacturers. At the end are more than one hundred pages of indexing, including a keyword index, an enlarged numerical and alphabetical source index, and a larger alphabetical title index than before. $24.95.

☐ As the debut game from **Sagebrush Software** (39 Carriage Place, Urbana, IL 61801; 217-328-5916), *It's the Pits* puts you in charge of the Grimpets, who just want to eat a few plums. But the predatory Wirlybats won't leave the little creatures alone! $29.95.

☐ The EduFun! division of **Milliken Publishing** (1100 Research Boulevard, Saint Louis, MO 63132; 314-991-4220) has released its WordFun! series of educational software games. WordFun! games make use of color, sound, graphics, and animation in building various skills, including suffixes, word structure, spelling, synonyms, antonyms, and compound words. In *Snake-O-Nyms*, the player's goal is to find a synonym for a



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given word. The player hops his frog through the possible matching words and accumulates points when the frog lands on the correct match. *Word Flip* challenges players to match root words with different endings. Two games; one disk. $34.95. In *Sky Writer*, players choose two root words to create a compound word that fits the definition at the top of the screen. Players use a plane to match the words, but with a limited amount of fuel. *Pop' R Spell* reinforces spelling skills in six vocabulary levels. A secret word appears at the top of the screen, each letter represented by a popcorn kernel. The player has thirty seconds to pop letters and spell the word. Two games, one disk. $34.95.

☐ **Desktop Computer Software** (303 Potrero Street, 29/303, Santa Cruz, CA 95060; 408-458-9095) has reduced *Graph 'n' Calc* (Marketalk News, May 1983) from $249 to $199.95.

☐ Fed up with just staring at the Apple III? **FlipTrack Learning Systems** (526 N. Main Street, Box 711, Glen Ellyn, IL 60137; 312-790-1117) has come up with an audio cassette tutorial, *How To Operate the Apple III*. The package contains four audio cassettes, one program disk, and a fully indexed operator's guide. Designed for the computer novice, the course stresses learning by doing. $95.

☐ *Alphabet Beasts & Co.* is the second in the Classic Family Software series from **Software Productions** (2357 Southway Drive, Box 21341, Columbus, OH 43221; 614-486-3563). For learning the alphabet, the child presses any letter and a picture of a mythical beast appears with an amusing poem. Pressing the letter calls the letter up on-screen. For learning numbers, pressing a number causes a number to be written on the screen; then a fire-breathing dragon flies in, making a happy dragon appear in the shape of the number. Included is a recess mode for children to create their own creatures. $29.95.

☐ **Jor-And** (Box 9180, Glendale, CA 91206; 213-247-6658) has debuted with *Secret Agent: Mission One*, an adventure with hi-res graphics. You are humanity's last hope as you race against time to stop an evil scientist from taking over the world with his awesome weapon. The game features animation and sound. $32.95.

☐ **Sir-tech Software** (6 Main Street, Ogdensburg, NY 13669; 315-393-6633) will let you wait a little longer for the next *Wizardry* scenario. In the meantime, they've come up with *Police Artist*, a pack of three games that draw more than one million different faces. In *Police Lineup*, you have to pick the culprit's face from a lineup of shady characters. Be careful or the wrong man goes free. *Police Artist* calls upon your ability to remember the culprit's face while you reconstruct it. *Off Duty* lets you draw an endless number of faces by choosing your own facial parts. $34.95.

☐ **Advent Products** (965 North Main Street, Orange, CA 92667; 714-997-0800) makes converting your system data a little less troublesome. Advent offers a complete CP/M-format-conversion service among the following machines: Apple with CP/M, Kaypro II, IBM with CP/M-86, Osborne I, Northstar, HP-125, TRS-80 Models I and III, Xerox 820, NEC 8001, and more. Conversions are $25 per disk on orders of fewer than ten, and $20 for orders of ten or more. Additional copies of converted disks are $5 each.

☐ *Music Programs for the Apple Computer* is a directory of computer-assisted instructional materials in music. The directory holds descriptions of one hundred twenty-three software programs, thirteen hardware systems including synthesizer boards and keyboards, forty-six suppliers and their addresses, and eighteen additional sources of information. Available from Denis C. Moreen at the **College of Notre Dame** (Department of Music, Belmont, CA 94002; 415-861-2871). $5.

☐ **Eco-Tech** (2990 Lake Lansing Road, East Lansing, MI 48823; 517-337-9226) is marketing its ALIS line of instrumentation and control systems for the Apple. ALIS/A12 provides sixteen channels of twelve-bit precision analog input. $1,517. ALIS/A08 supports sixteen channels of eight-bit, single range analog output. $1,149. ALIS/AO contains two channels of eight-bit precision analog output. $841. ALIS/DIO provides thirty-two digital I/O channels, four sixteen-bit counters, and seven external triggers with interrupt support software. $1,600.

☐ *Copram−M* is a data processing system designed to assist the practicing physician in medical practice management. It's a totally turnkey system written in Apple Business Basic, unprotected for customization by the physician. *Copram−M* consists of twenty-five different programs, and all information is stored in random-access files for fast search. The system requires a 256K Apple III, hard disk with five to twenty megabytes of storage, and a printer. From **Computerized Professional Accounts Management** (20631 Deer Bluffs Drive, Chillicothe, IL 61523; 309-274-2251). One-time licensing, $4,000.

☐ **Aardvark Software** (783 North Water Street, Milwaukee, WI 53202; 414-289-9988) has released an enhanced version of *Estate Tax Plan*. Designed for accountants, attorneys, insurance agents, trust officers, and financial planners, the program allows estate tax problems to be solved quickly. The program calculates several reports: gross estate, estate tax liability, liquidity analysis, present value analysis, deferred payment of estate taxes, and more. The program requires CP/M, 64K, and two disk drives. $750.

☐ The *SX-51 8051 Cross Assembler* from **Allen Systems** (2151 Fairfax Road, Columbus, OH 43221; 614-488-7122) is a software package that allows MCS-51 software development on the Apple. You get an editor and assembler. The editor lets you create assembler source programs and conventional text files. The assembler generates a program listing and the object code. $55.

☐ The AgDisk *Swine Management Series One* is available from **Harris Technical Systems** (624 Peach Street, Lincoln, NE 68508; 402-476-2811). For small and large hog producers, the series includes programs for swine-ration analysis, feeder-pig analysis, hog-selling decisions, and a sow productivity calculator. $140.

☐ **Pro/Pac** (14925 Memorial Drive, Suite 105, Houston, TX 77079; 713-496-1179) has unleashed *PCP* (printer control program), a program that lets you set up a dot-matrix printer to print boldface type, compressed characters, variable line spacing, slashed zeros, elongated characters, and other modes. The program gets rid of the need to enter strings of printer control codes in order to change printing modes. Completely menu driven, the program sends control codes at the touch of a key. $24.95.

☐ *Data Bank* is a multifunction database management system from **Flowersoft** (564 Tara, Manteca, CA 95336; 209-239-2116). Its features include global math functions; multilevel searches and sorts; editing flexibility; a form generator for printing forms, mailing labels, checks, invoices, or forms of your own design; and the ability to create new files from existing data. $170.

☐ **Microcomputer Accessories** (400 South Beverly Drive, Suite 214, Beverly Hills, CA 90212; 213-273-0133) has designed a storage system for your disks that combines modern styling with roll-top elegance. The Rolltop 100 will store at least one hundred 5 1/4-inch disks. The body is made of molded plastic, and the rolltop is smoked bronze. $36. Locking model, $45.

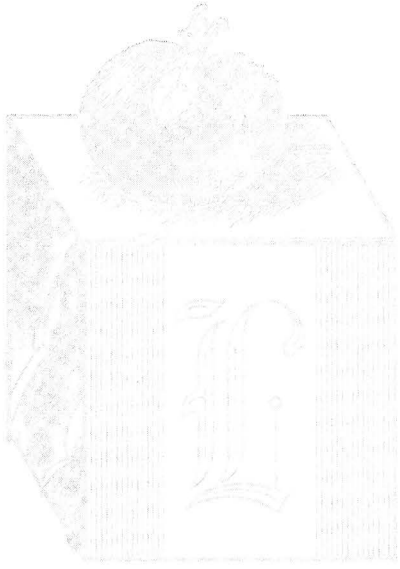
☐ *The Computer Camp Book* is two books in one. It's a manual on how to start your own computer camp and a comprehensive guide to computer camps. The book tells children, teenagers, and parents what to look for in a computer camp and includes lesson plans and sample programs in addition to teaching hints. Information on organizing, staffing, promoting, and operating a camp is given in this book from **Yellow Springs Computer Camp** (8327 Sheridan Lane, Eden Prairie, MN 55344; 612-937-2066). $12.95.

☐ Misinformation department: If you're under the impression that *Preschool IQ Builder 2* from **Program Design** (95 East Putnam Avenue, Greenwich, CT 06830; 203-661-8799) is priced at $295, be informed that it's really $23.95. *Preschool IQ Builder 2* consists of six lessons that teach children to recognize and match small and capital letters, words and numbers.

☐ *Diskinvoice System* handles billing for almost any business that sends out up to three hundred invoices per month. It's an invoice/accounts receivable package written in Applesoft so you can customize and make a backup of the program. You can choose to see all the invoices in a given file, just the overdue bills, or only those sent to a specific customer. From **Broadway Software** (642 Amsterdam Avenue, Suite 136. New York, NY 10025). $55.

☐ **The Boston Company** (One Boston Place, Boston, MA 02106) has added a new feature to *Micro PMS*, its portfolio management system. The feature is Performance Graphics, which gives investors hi-res-graphics displays of the performance results of their portfolio and charts of

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popular market indexes or securities. Four types of charts are available: single-series graphs, two-series comparison charts, indexed comparison charts, and relative value charts. The price for *Micro PMS* is still $595.

☐ You can turn your Apple into an intelligent terminal with *TermExec* from **Exec Software** (201 Waltham Street, Waltham, MA 02173; 617-862-3170). The terminal program features long file capture and send, a full screen editor, backscrolling to review saved information, exec files to replace long command sequences, and help commands and menus. $49.95.

☐ Low-cost computer disk duplication and formatting services have been introduced by **Omni Resources** (4 Oak Pond Avenue, Millbury, MA 02527; 800-343-7620; 617-799-0197 outside Massachusetts). Services feature reproduction of fifty to ten thousand 5 1/4-inch or 8-inch disks within two weeks with 100 percent copy verification of programs and formats. Omni also provides private label, sleeve, and box packaging, and it offers copy protection schemes. $1.85 per disk.

☐ **Universal Software** (1551 North Prospect Avenue, Milwaukee, WI 53202; 414-277-0600) has debuted with *Mutant*, a different kind of maze game. You don't eat your enemies; you spit at them! A viewing window lets you see selected parts of the maze, and your invisipower gets you through when the action gets nasty. $29.95.

☐ **School Management Systems** (5973 Nandina Street, Sweet Home, OR 97386; 503-367-4747) produces a large comprehensive line of public school finance and information management software. Programs handle various tasks such as accounting, student record and billing, attendance, and other business-class-related programs. Programs require CP/M.

☐ *Automated Telephone Office Management* (ATOM) is a telephone management system from **Tooni Communications** (255 W. Ninetieth Street, New York, NY 10024; 212-362-3853). It runs on the III and lets managers know who and where their people are calling, time of day, duration of calls, and their cost. *ATOM* can store sixty thousand calls, or two hundred thousand on a Profile hard disk. The system prices local, direct dial, WATS, 800, tie line, and foreign exchange calls. *ATOM* also uses graphics to produce charts of telephone traffic. $4,500.

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$59.95

☐ **TeleTypesetting** (224 Nickels Arcade, Ann Arbor, MI 48104; 313-761-7664) has developed an interface and accompanying software called MicroSetter that lets you use your Apple as a typesetter. Currently available are interfaces for Compugraphic Jr., models I and II. $695; software manual, $25.

☐ Give your Apple sight. The MicronEye is a complete vision system from **Micron Technology** (2805 E. Columbia Road, Boise, ID 83706; 208-383-4000). Capable of 256-by-128 resolution and operating speeds of up to fifteen frames per second, the MicronEye transmits images into the computer's memory for image display/analysis or storage to disk. Applications include program animation, security, automated process control, digitizing, robot vision, and text recognition. $295.

☐ ComRiter CR-II is a daisywheel printer with a 5K buffer that lets you reproduce original and multiple copies of documents stored in its memory. The buffer can store up to three pages of data. Average printing speed is twelve characters per second, printing bidirectionally. From **Comrex International** (3701 Skypark Drive, Torrance, CA 90505; 213-373-0280). Under $700.

☐ The *Arcade Machine Utility Pak II* is a tool from **The Zivv Company** (6035 North Maplewood Avenue, Chicago, IL 60659) for people using Broderbund's *Arcade Machine*. The utility lets you delete the title page so the game can be played immediately, save your created game in a nonprotected format, and link several games together so the background changes with each level. $60. Also from Zivv is *Revolution Reading Game*, a program that Zivv says will allow you to teach children to read in ninety days. $95.

☐ LINC (1875 Morse Road, Suite 215, Columbus, OH 43229; 614-263-2123) publishes a directory listing products of more than one hundred companies. It's called *The SpecialWare Directory*, and it lists instructional, administrative, professional, and evaluation/testing materials for special education. $10.

☐ It's Canada's First Annual Computer Fair, and it's being held June 23-26 at the International Centre in Toronto. Manufacturers will be exhibiting the newest of their microcomputer hardware, software, and peripherals. A special feature will be "Computer Career Opportunities," a section for people interested in pursuing a career in the computer industry. For information, contact **Hunter Nichols** (2282 Queen Street East, Toronto, Ontario M4E 1G6; 416-690-9666). Admission: adults, $5; students/seniors, $3; group rates available

☐ **Data Express** (4009 Pacific Coast Highway, Torrance, CA 90505; 213-326-8440) has announced its stock market analysis and news program, *MIPS* (market and information plotting system). *MIPS* provides a connection to the Dow Jones database for historical and current quotes and current news. Local history files of up to forty issues for two hundred trading days are maintained on disk. Data gathering and presentation is completely automatic. Requires two disk drives and a Hayes Micromodem II. $350.

☐ The **University of Michigan School of Library Science** (580 Union Drive, Ann Arbor, MI 48109) has announced the availability of the *Personal Bibliographic System*, a program that compiles, formats, and arranges bibliographies. It's a specialized word processor and database for producing neat, correct, printed bibliographies. The features include a screen editor, variable length fields and records, allowance for notes and annotations, standard punctuation of citations, alphabetic or user-defined arrangement of citations, Boolean search capabilities, and more. Requires 64K, eighty-column display, two disk drives, and a printer. $250; demo program, $75.

☐ If you happen to be in Australia this summer, you might like to know that the Electronic Computer Games and Toys '83 Exhibition will be presented at the Sydney Entertainment Center in Haymarket, August 18–21. Organized by the **Industrial Presentations Group** (4/389 Victoria Avenue, Chatswood NSW 2067, Australia; 02-412-4377).

☐ With AgriStar, an agricultural information and computing network, you can receive the latest in agricultural news, future prices, the stock market and weather reports, analysis and recommendations, news on new products, and government reports. For complete information, contact **AgriData Resources** (205 W. Highland, Milwaukee, WI 53203; 800-558-9044; 800-242-6001 in Wisconsin; 414-278-7676 in Canada). Average charges are less than $100 per month.][■

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IF YOU'RE CONFUSED ABOUT BUYING A PERSONAL COMPUTER, HERE'S SOME HELP.

Computers come in two parts.

One part is the "hardware," the machinery itself. The other is the "software," which tells a computer what to do, the way a driver tells a car what to do.

Without software, a computer can't do anything. And vice versa. You have to buy both.

Buy the software first.

Since the reason you're buying a computer is to get the capability the software gives you (remember it's the software that tells the computer what to do), it makes good sense to pick the software first.

Start by making a list of the things you want the computer to do. Possibilities include word processing, inventory control, accounting, graphics, recordkeeping—you name it, there's probably software that does it.

Next take your list into a computer store and ask the salesperson to demonstrate software that will do the things you want.

Even though you'll need a computer for the demonstration, keep in mind the computer is just a vehicle. The software is the driver. Once you've decided on software, picking the rest of the computer system will be that much easier.

The simpler the better.

Some people will tell you that software has to be complicated to be powerful. Nothing could be further from the truth.

Good personal software should be, as the computer people say, "friendly." Meaning that it helps you do what you want to do without getting in the way.

Good software keeps the complications in the computer, where they belong. And keeps the capability at your fingertips. It's that simple.

Simply see for yourself.

You can read any number of interesting books and magazines about personal computers. You can ask your friends who have them.



Or look at all the sales literature you can get your hands on.

But as helpful as that can be, there's no substitute for a live demonstration.

When you do go shopping, we recommend you take a look at the PFS® Family of Software.

Designed the way we think a software family should be: simple, straightforward and powerful.

Currently there are four software packages in the family: PFS:WRITE, PFS:FILE, PFS:REPORT and PFS: GRAPH, with more on the way. Here's a little more about each of them.

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PFS:WRITE is ideal for people who want to make their writing time more productive. It displays what you write on your computer screen so you can make revisions as you compose.

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And when you're through revising, WRITE shows you "on-screen" just how your document will look when it's printed. So there are no surprises afterwards.

WRITE also works with most popular software programs, including the PFS Family of Software.

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PFS:FILE. The simplest way to get organized.

FILE is basically a paper filing system without the paper. So you can record, file, retrieve and review information in a fraction of the time it takes with a conventional filing system.

With FILE, you arrange your information on a "form" you design yourself. And when you need to track something down, FILE sorts through your records electronically. It lets you retrieve information in a variety of ways so you can be as selective as you want.

PFS:REPORT. The simplest way to sum it all up.

REPORT is a powerful analysis tool that works with FILE.

REPORT sorts through your files and retrieves the information you're looking for. Then assembles it all into one report, so you can analyze, plan and make better-informed decisions.

REPORT is also good at math. It quickly sorts through columns of numbers and performs calculations, so you won't have to.



PFS:GRAPH. The simplest way to spot trends.

GRAPH is ideally suited for professionals who need charts or graphs in a hurry.

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The Perfect Horse

BY MICHAEL FERRIS





The triangular-shaped head diminishes rapidly to a small and fine muzzle that can be held in the palm of a hand. The long, delicately curved nostrils run upward and project outward. They dilate greatly when in action or excited.

The eyes are set far apart and are large, lustrous, and full of fire when aroused. Intelligence is shown by the brain capacity, a slight protrusion over the eyes. The cheekbones are set low and wide. The ears point and are set evenly together.

The head is lean, well-chiseled, and shows energy, courage, and nobility. The neck is long and arched, set high and run well back into the shoulders.

Common markings are stars, strips, or blaze faces, white stockings, socks, or partial markings on one or more legs.

More than forty thousand years ago, in the Cenozoic era before the dawn of recorded time, a subspecies of horse stood majestically apart from its three coarse-blooded brothers.

High-stepping and spirited, the distinctive anatomy of Equus agilis was sketched on limestone walls by cave-dwelling hunters, right alongside its prehistoric rivals: Equus tarpanus, the chestnut gray horse of Russia; Equus prezewalskii, the steppe horse of central Asia; and Equus robustus, the slow, cold-blooded horse of the European flatlands.

Equus agilis was the hot-blooded horse of the South that inspired the first equestrian crush in those early Cro-Magnons who saw it drink the wind as it ran. Today, new winds are being stirred by a spirited subspecies of electronic animal—the Apple. Can a spirited micro be tamed?

Three thousand years ago, Equus agilis claimed the high, dry plains of Asia Minor as its turf. In the warm deserts of Arabia, the Bedouins tamed the animal—prized for its beauty, alertness, and speed—and they were the first to breed it. The Arabian has existed without marked change since the time of Mohammed in the seventh century. Its ancient features have been preserved by centuries of selective breeding.

That's why black Arabian horses are so rare today: Blacks absorbed heat in battle, an undesired characteristic among the Bedouin desert fighters. Considered evil, the color was bred out centuries ago.



Above: Mrs. C, as she is known to the crew on the farm, nuzzles up to a foal in the stable, just after the young horse and his mother have been put in for the night. Below: In the trophy room of the Chauncey home, a converted stable now called Equestrian Manor, Deedie Chauncey shows some of the saddles she's ridden on. Her first saddle, an English with no horn, is in the collection.

The breeding of fine Arabians has long been the passion of sultans, kings, presidents, and industrial potentates. General George Washington bought Ranger, the first recorded purebred in America, to stand at stud in 1765. Sultan Abdul Hamid II presented President Ulysses Grant with two stallions, Leopard and Linden Tree. President Teddy Roosevelt sponsored an Arabian desert quest for horses in 1906.

Cereal baron W. K. Kellogg bred Arabians, as did Ann McCormick, the wife of International-Harvester king Fowler McCormick, and chewing-gum magnate Phillip K. Wrigley, on his Catalina Island ranch off the coast of California. Recently such celebrities as Wayne Newton, Merv Griffin, Mike Nichols, William Devane, Burt Reynolds, and Kareem Abdul-Jabbar have all been smitten by Arabianitis, both for the romance of it and the finance.

Sales of top-quality Arabians topped $28 million last year. Several top stallions have gone for one million each, although the average price for a good horse is $180,000. In his lifetime, a national champion stallion can be worth up to twenty million in stud fees.

It is generally accepted that Arabians became an investment to be reckoned with soon after Scottsdale horse breeder Tom Chauncey bought Naborr, a Russian-bred Polish Arabian, at a public auction of the McCormick estate in 1969. The nineteen-year-old stallion went for an unheard-of $150,000, an amazing price for a horse of that age and three times what he was thought to be worth. Russian-bred Arabians were considered unacceptable stock at the time.

Twelve years later, it took a little friendly persuasion to get Tom Chauncey to reckon with an Apple. He's still not completely sold, his wife Deedie can see the benefits firsthand, and the Apple does what it's told. Situation pending.

Son of a Good Value. Naborr proved to be worth far more than his purchase price for the Chauncey farm. Still standing at stud is Kaborr, the son of Naborr, known for his beauty and outstanding showy attitude. Some impressive titles he's racked up include Champion of Europe, and he's won the Double Canadian National Championship and U.S. National Championship in reserve, all awarded in 1979. In 1981, Kaborr received a Legion of Supreme Merit award alongside the Chaunceys' grand broodmare and all-time show champion, Mi Toska. Their outstanding offspring, Mi Kaborr, Mi Kaborra, and Miss Toska, all share their father's famous look of quality.

When horse people write about horses, pedigree symbols always accompany a name. For example, Naborr is spelled *Naborr, the asterisk denoting foreign birth. Kaborr is spelled Kaborr+++, denoting achievement points won in the show ring. Mi Toska is spelled Mi Toska+++.

All very official, and let no horse go misrepresented. It's a system that has served well and good for decades—and one that is about to change.

"The asterisk is being dropped because of computers," says Deedie Chauncey, lifetime horsewoman and day-to-day manager of husband Tom Chauncey's Arabians. "They will accept only nineteen letters for a horse's name, and the asterisk is considered a letter in the computer's alphabet." It's being deleted as a concession to progress.

Inconvenient, yes. Regrettable? No. The Arabian breeding industry has proven itself no stranger to progress. Mini and microcomputers are just . . . well, next. Tamed or wild, for business or gaming. Strictly business around Arabians.

The casing is sculpted low and wide, with the power unit distributing the weight unevenly, favoring the left. Its profile seems aerodynamically carved, although it was never designed to fly.

Above a chopped lower front, the keyboard centers neatly in four rows; the keys are generous and smooth to the touch. A square of light glows when the unit is activated, and it remains on while in use.

The curved lid is removable; inside is a finely chipped board, with eight slots and ample vents. Memory is shown by chip capacity, installed in increments of 16K.

The color is always beige.



There are more than three hundred horses stabled on the Chauncey farm—three hundred Arabians and one Apple, because "something is done to a horse every day," says Deedie Chauncey, "and we were getting buried under paperwork." Each something done must be recorded, updated, billed, or cross-checked. Foaling fees, vaccinations, worming, bloodlines, grazing fees, insurance, branding, registration, sales—the flurry of paperwork that makes horse farming a business.

A recognized expert in breeding, Deedie Chauncey's time is better spent consulting on bloodlines than it is shuffling papers. Articles under her byline have appeared in *Saddle & Bridle*, *Arabian Horse Journal*, *Arabian Horse World*, and *Arabian Horse Times*. She likes to say she's been in the business for fifty-seven years—horses are in her blood. As a little girl, she used to "ride like an Indian" on her father's cattle ranch on Catalina.

Tell a Friend. "The Apple came well-recommended," she says; after it proved itself drawing up contracts in the sales barn, it was put to the business in the administrative offices. The woman who actually runs the Apple around the track every day is Cherie Johnson, executive secretary.

The II Plus, a printer, and two disk drives sit in the corner of her office, a paneled room trimmed in red and blue prize ribbons. A microfilm projector and sheets of microfiched pedigrees stand nearby. A window looks out on two miniature horses, Geranium and Geronimo, grazing in a fenced yard.

Conditioning horses to keep them top-shape investments is half the business of the Chauncey farm. Horses are groomed and exercised daily, some muscled up with special feeding programs. Training horses to run, gallop, trot, and pose for competition is the other half.

Accounts receivable for around seventy client horses are handled by the BPI module. One difference: The horse's name and registration are entered first. A push of a button shoots Johnson an alphabetical list of all the horses boarded and who owes money. The Chaunceys' own ranch horses are also set up on BPI accounts so there is a constant record of foaling fees for breeding and farrier fees for shoeing. BPI also handles the stud fee billing. Accounts can be referenced by the name of the stallion.

Health records for each horse are kept on *VisiDex*, which Johnson likes because "you can call up anything you want." Two sheets per horse show routine health progress. Vaccinations, worming, and farrier records are kept here, as is information for the cross-referencing of bloodlines. The program is indexed by symbols like *P* for Polish blood and *NM* for Naborr mare, the premier bloodline.

Formatted pages that go into the show records book are also done with *VisiDex*. Cross-referenced by horse or show, lists of judges, a horse's placement, and entry fees can be called up. Although the prize money can be as low as fifteen dollars, each ribbon won is valued at five hundred dollars. The real value is the plus sign following a horse's name.

VisiDex also holds contracts for horse sales or accounts payable. They are called up by date and printed when payment is due.

Reports of insurance on individual horses are processed using *Magic Window*; the program holds required information on policies covering 236 horses. It also holds freeze-branding records. Permanent registration numbers for registered Arabians are frozen in the neck of each horse.

At the time of a show, blank show records are printed with *VisiDex*, giving a list of classes a horse can compete in, like English, western, or ladies' side saddle; jumping, halter, or costume competition. These days, horses must specialize in events. One horse does not win all.

The state of Arizona requires that a hauling certificate accompany any horse on the road. *Magic Window* keeps a list of the current status of all horses for these pesky yellow cards.

Current lists of foals on the farm are also kept via *Magic Window*. Records are cross-referenced when it comes time to name the new horse. Naming horses is a huge job for Deedie Chauncey. No potential moniker goes unconsidered. "Sometimes I even resort to reading road signs. A name can be a tool. Imagine a big stallion with a ridiculous name."

Although proficient in all the previously mentioned software, Johnson is a self-confessed computer yo-yo. "I don't know beans about programming," she says, "but running a computer isn't too hard. If I can do it, anybody can." Her familiarity with computers goes back to her last job, traffic director at KOY Radio in Phoenix, where she worked with a Marketron mainframe.

Any problems Johnson has are referred to trouble-shooters at the local ComputerLand. "They're my resident helpers; I've had to call them once or twice." One of those times the problem wasn't the machine. "It was me," she says. Entering some Greek symbols baffled her, until ComputerLand personnel talked her through it over the phone. Like a lot of folks, Johnson gets lost when the talk turns to internals like ROMs, RAMs, and clock speeds. "But when they start talking keyboard, I'm okay," she says.

Her first day on the Apple began a year ago with a note on the computer that said, "All set to go—have fun." "I spent the first couple of weeks playing with the machine and learning from my mistakes," says Johnson.

The Apple manual was Greek to her, but the *VisiDex* manual was a breeze. "It's written in honest-to-God English; it's very easy to understand." BPI also has a workbook and sample disk that she found to be a good confidence builder.



On the wall of Deedie Chauncey's office, a map of the farm shows horses at pasture each day. Colts are in blue and mares are in pink, but on a busy day the colors sometimes get mixed up.

The Apple at the Chauncey farm didn't get where it is on the strength of its business acumen. The note to Johnson was written by Bill Pereira, a fellow horse breeder who first brought the Apple onto the Chauncey farm.

Barnstorming Apple. Pereira, acting in the role of sales consultant, sold a skeptical Tom Chauncey on purchasing a little Apple power. "We first used the Apple at the Naborr Generation Sale in 1982," he says. "It was originally only a convenience device to close deals before people left the arena."

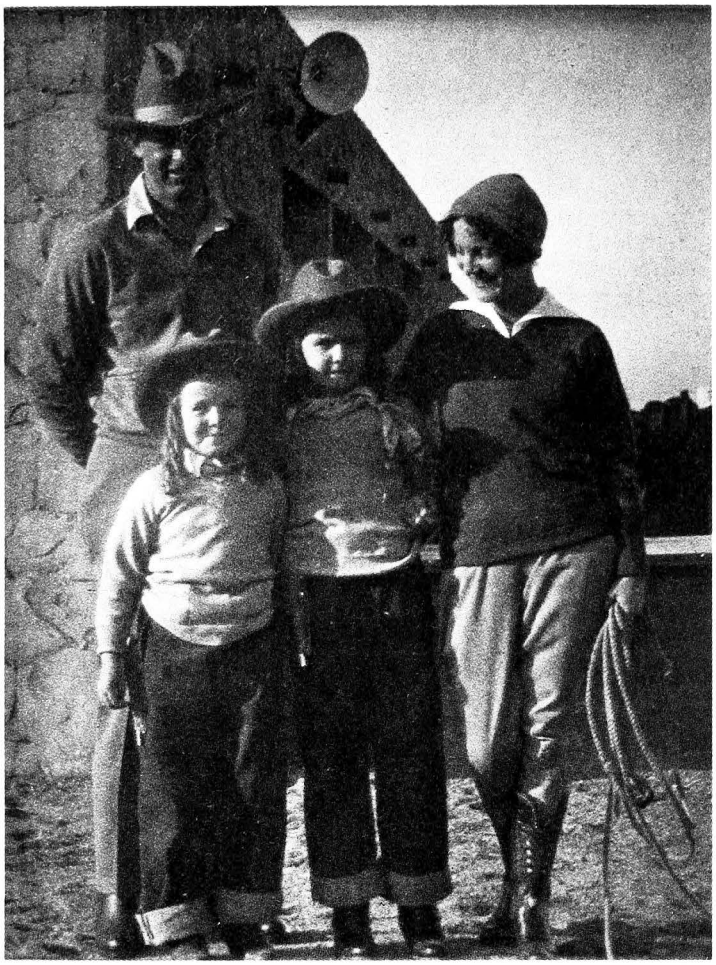
To emphasize the importance of that convenience: The Naborr sale generated six million dollars' worth of sales. One hundred horses were processed in four hours using a Pereira-created program that computed payments and made up a contract in thirty seconds. "Previously it was done with a handful of people on calculators, trying to get names and addresses correct at the same time. A real madhouse," says Pereira.

He had seen the farm's future—and a little arm-twisting computerized it. "The Chauncey operation was getting so big, with so many horses, that I could see a fairly substantial increase in outside business. It was getting to where it seemed silly not to have a computer."

Pereira has had Apples on his own farm, Pereira Arabians in Santa Ynez, California, since 1979. Among his more than one hundred horses is Toi Soldier, his number one sire, a blood-brown bay marked with a star and three white stockings.

After suffering through some used boards in several new Vector micros, as well as inflexible software, Pereira traded up to the Apple five years ago. "I first got into computers for their spreadsheet capability. The BPI software also looked like it could be adapted to running a breeding farm.

"Since financial people can come and go, I figured, as a small-businessman, I should get to know how to do it myself—and I did on the Apple." He's since turned his finances over to an outside firm, but the Apple still gets two to three hours of work a day, handling his mailing list on



Young Deedie Wrigley, the littlest one on the left in the cowboy hat, at the Arizona Biltmore stables with her father Phillip, sister Helen, and her mother Blanche Schreiner. Photo was taken in 1934. Her grandfather built the hotel.

the old *Apple Post*, sales forecasting using *VisiCalc*, and a breeding database courtesy of *VisiFile*.

Pereira actually owns three Apples; two are backups. "We're out in the hinterlands, where it's dusty and the quality of power is bad. I've got voltage regulators and all that." So far, he hasn't had to use either backup—the main Apple has been performing without a hitch for over a year now.

"I wasn't a computer person," he says, and it took him three years to figure out how to care for the Apple in the wild. "Now I'm an Apple person. I don't really know why, I just like the looks of 'em." He's going to hold on to his II Plus out of pride, despite the new enhanced version. "Besides, I've got five thousand dollars' worth of programming I might have to change."

While Apples are keeping the Chauncey and Pereira farms in good condition, the two official registries of the Arabian horse business, growing too big too soon, have gone directly from manual to mini operations, skirting micros almost altogether.

When the first American stud book was opened in 1908, with the founding of the Arabian Horse Club Registry of America, the documentation of American Arabians was established. This country now claims more purebreds than all other countries combined.

Known as the guardians of the breed, the Registry maintains a closed stud book: The only way to produce a purebred Arabian is by mating a registered purebred stallion and mare that have pedigrees stemming from the purebreds of the Arabian desert. This means maintaining registers and transfers on two hundred seventy thousand horses—paperwork that includes foaling dates, pedigrees, foreign sources, colors, sex, and the names and addresses of ninety thousand owners.

It's no wonder the Registry's *American Stud Book* is now computerized. The foreign stud books, representing an additional eight to nine thousand horses, are temporarily handled by an IBM pc. Future plans: micro access to the Registry's data files via modem.

While the American Registry ensures that no hanky panky slips into the Arabian's bloodline, the International Arabian Horse Association has the job of promoting the breed. They sponsor the annual U.S. National Championship Horse Show, horsedom's major event. The International Registry's show records, membership, and registration are now handled by a Data General mini. Ratings of horses shown are determined by the computer from the green cards turned in by the judges.

Back on the Chauncey farm, the biggest in the world, the major horse files already take up four disks. When they first went Apple, there was no horse software available, so Pereira improvised some. Now several financial packages are advertised in the pages of the Arabian trade journals.

One of them is *Champ*, a database management and security system that runs on a Point-4 mini or Televideo micro, designed by a neighboring horseperson up the road from the Chaunceys. The other is the whole shootin' match—accounting, breeding, and record-keeping—created to run on the Apple.

The lone Apple and the BPI, *Magic Window*, and *VisiDex* software



Cherie Johnson gives a hands-on demonstration of Apple power. Ribbons and plaques lining her office have been won by Chauncey horses in competition.

may be in the twilight of their career on the Chauncey farm. "It's not the ideal setup," says Deedie Chauncey, "but, so far, it's done the job." She eventually sees a hard disk configuration and one of the new comprehensive packages in its place. Which package remains to be seen.

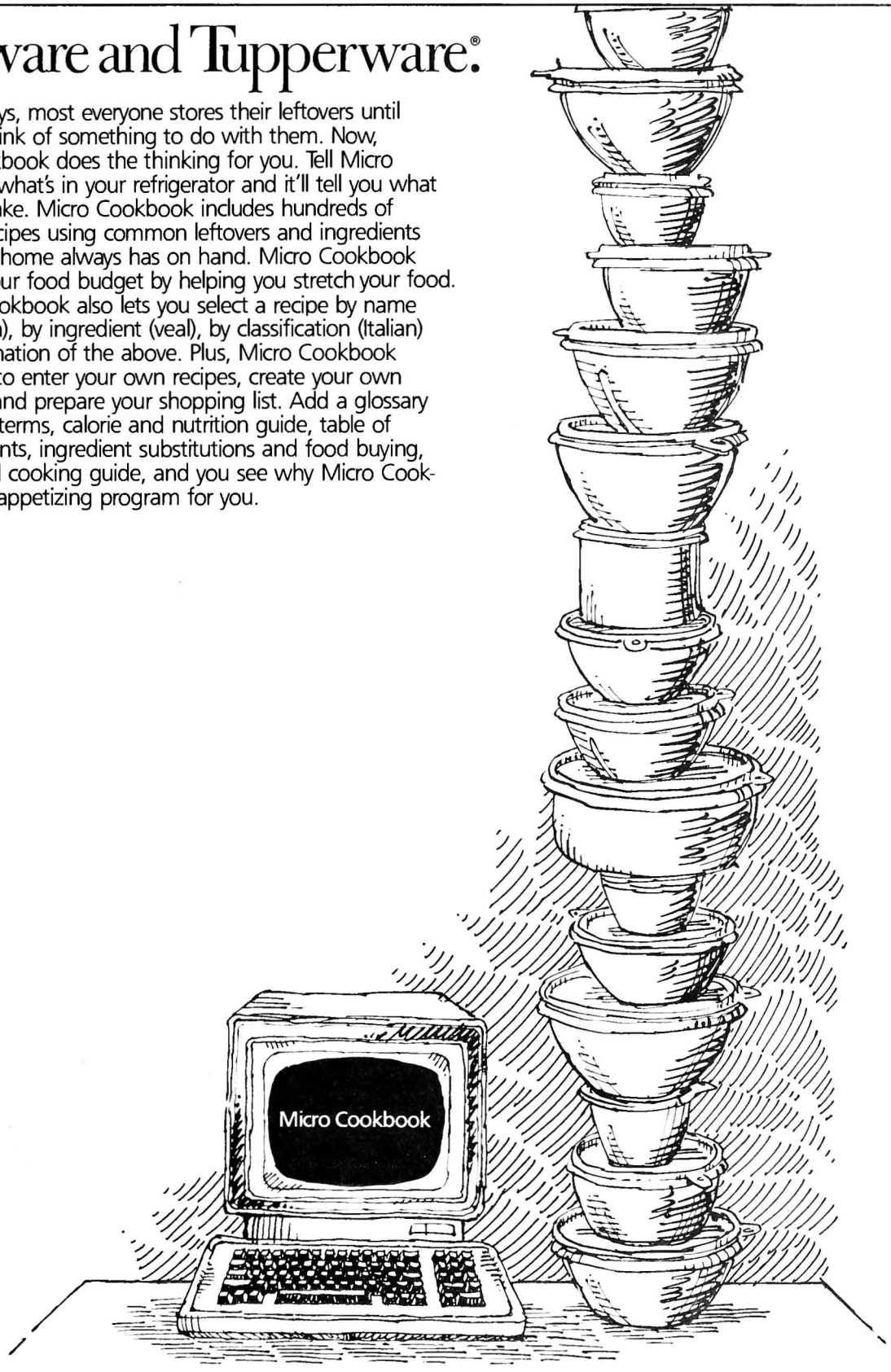
Maybe without any arm-twisting this time, it will be a new IIe and the Apple package. The first Chauncey Apple came well recommended. The next one will have to prove itself.

Not unusual. It's a situation the Apple was made for. ◨

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THE BASIC Solution

By Wm. V. R. Smith

This month's Basic Solution presents *Time Clock Calc*, a program that will accurately track the amount of time a person or company spends on a task. The high-cost world we live in has caused most of us to desire our compensation for work to be as accurate as possible. If you own a business, you can appreciate the ability to track the time spent by your employees accurately.

The following Basic program presents a one-week blank time-card form to be filled in by the user. The program uses fourteen in/out time slots, broken up into seven groups or days (with two slots each that allow for punching out at lunch breaks). Each of the slots has a total-time-worked column, and each of the seven groups (or days) also has a total-time-worked column. A total-time-worked value is presented at the bottom of the right-hand column.

All the time-worked values are updated as you enter new time values. The final, and possibly the most important, feature of the system is the ability to figure total pay from the total time worked and the pay rate.

The wage-per-hour value (or rate) may be entered in two ways, the fastest method being to press the letter R at any time during the program. The second method is to move the time cursor to the bottom of the time sheet. Either method will cause an input prompt requesting the rate per hour.

If you enter the pay rate first, it will automatically update with the new in/out time values. You may also clear the time sheet at any time by pressing the letter C.

The program uses an inverse bar or cursor to indicate the position of the time value to be entered. The left and right arrows are used to move the cursor up and down the sheet.

Good luck with your programming.

```
1   REM ********************
2   REM TIME CLOCK CALC
3   REM ********************
5   CLEAR
10   DIM I(14,2),T(14),B$(14,2)
15   D = 1
20   FL = 1
30   FOR X = 1 TO 14: FOR Y = 1 TO
     2:B$(X,Y) = "--:--": NEXT Y: NEXT X
100   REM SETUP
110   HOME : HTAB 15: PRINT "IN";: HTAB
     23: PRINT "OUT        HOURS
     WORKED";
120   PRINT "FIRST";: GOSUB 300
130   PRINT "SECOND";: GOSUB 300
140   PRINT "THIRD";: GOSUB 300
150   PRINT "FOURTH";: GOSUB 300
160   PRINT "FIFTH";: GOSUB 300
170   PRINT "SIXTH";: GOSUB 300
180   PRINT "SEVENTH";: GOSUB 300
200   PRINT : HTAB 17: PRINT "TOTAL
     HOURS";: HTAB 36: PRINT "00.0"
210   PRINT : HTAB 17: PRINT "HOURLY
     PAY"
220   PRINT : HTAB 17: PRINT "TOTAL
     PAY";: HTAB 32: PRINT " $ 0.00"
250   GOTO 400: REM END OF SETUP
300   REM **********************
301   REM *
302   REM * BLANK TIME SUBROUTINE
303   REM *
304   REM **********************
305   HTAB 14: PRINT "--:-- - --:--       0.0"
310   HTAB 14: PRINT "--:-- - --:--       0.0
     00.0"
320   RETURN
400   REM **********************
401   REM *
402   REM * INPUT TIME IN
403   REM *
404   REM **********************
405   N(1) = 14:N(2) = 22
410   REM
420   P = P + 1: IF P > 2 THEN P = 1:D = D
     + 1: IF D > 14 THEN  GOSUB 2000
430   VTAB D + 1: HTAB N(P): INVERSE :
     PRINT B$(D,P);: NORMAL
440   GOSUB 600
450   IF T$ <>"B" THEN 480
460   GOSUB 550
465   IF P = 2 THEN P = 1: GOTO 430
470   P = 2:D = D - 1: IF D < 1 THEN D = 1
475   GOTO 430
480   IF T$ <> "F" THEN 495
485   GOSUB 550
490   GOTO 410
495   IF T$ <> "R" THEN 515
500   GOSUB 550
505   GOSUB 2000
510   GOTO 400
515   B$(D,P) = T$:I(D,P) = MW
520   GOSUB 550
525   IF I(D,1) = 0 OR I(D,2) = 0 THEN 540
530   IF I(D,2) < I(D,1) THEN I(D,2) = I(D,2)
     + 720: GOTO 530
532   W = I(D,2) - I(D,1)
535   T(D) = W: IF T(D) < 0 THEN T(D) = 0
540   GOSUB 1000: GOTO 400
549   END
550   VTAB D + 1: HTAB N(P): PRINT
     B$(D,P);: RETURN
599   END
600   REM **********************
601   REM *
602   REM GET TIME VALUE AND
603   REM RETURN IN T$ AND IN
604   REM MW  (MINUTES WORKED)
605   REM *
606   REM **********************
610   REM SET WINDOW
615   T = 0:MW = 0
620   VTAB 22: HTAB 1: PRINT "TIME
     :    :    ";: HTAB 8
630   HN = 1:H(1) = 0:H(2) = 0
640   GET V$
```


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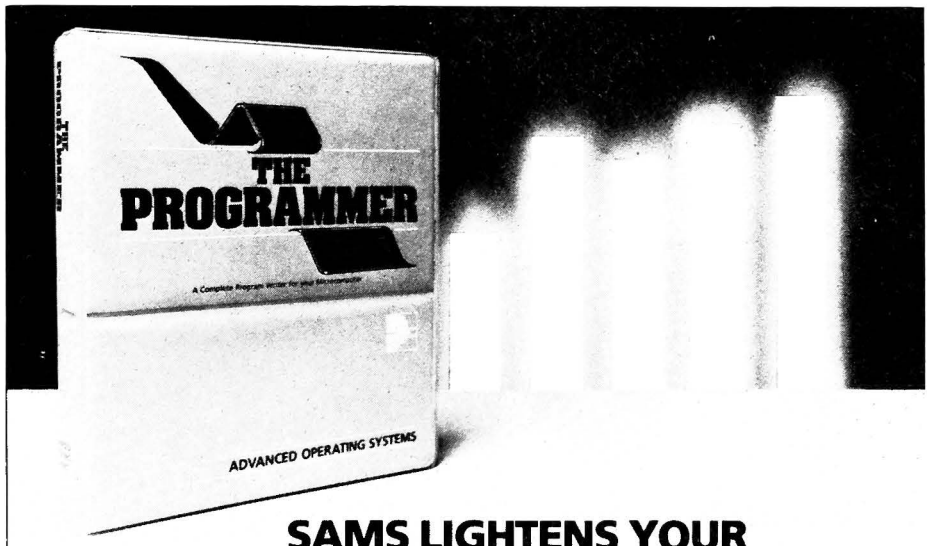
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```
645  IF V$ = CHR$ (8) THEN T$ = "B": GOTO 899
647  IF V$ = "R" THEN T$ = "R": GOTO 899
648  IF V$ = CHR$ (21) THEN T$ = "F": GOTO 899
650  IF V$ = ":" THEN 695
653  IF V$ = ";" THEN 695
655  IF V$ = "C" THEN GOTO 1
660  IF V$ = "0" THEN T = 0: GOTO 680
665  IF V$ = CHR$ (13) THEN T$ = "F": GOTO 899
670  T = VAL (V$): IF T = 0 THEN 600
680  H(HN) = T:HN = HN + 1: IF HN > 3 THEN 600
690  PRINT V$;: GOTO 640
695  IF HN <> 2 THEN 700
696  HTAB 8: PRINT " ";T;
700  REM ********************
701  REM *
702  REM * GET MINUTES
703  REM *
704  REM ********************
705  PRINT ":";
710  MN = 1:M(1) = 0:M(2) = 0
720  GET V$
730  T = VAL (V$)
740  IF V$ = "0" THEN 760
750  IF T = 0 THEN 600
760  M(MN) = T:MN = MN + 1
770  PRINT V$;
775  IF MN = 3 THEN 790
780  GOTO 720
790  REM
800  IF HN <> 2 THEN 830
810  T = H(1):H(1) = 0:H(2) = T
830  T$ = STR$ (H(1)) + STR$(H(2)) + ":" + STR$ (M(1)) + STR$ (M(2))
840  HW = H(1) * 10 + H(2):MW = M(1) * 10 + M(2)
850  MW = HW * 60 + MW
860  IF VAL (T$) > 24 THEN 600
870  IF VAL (T$) = 0 THEN 600
889  RETURN
890  T$ = ""
899  RETURN
1000 REM ********************
1001 REM *
1002 REM * CALC TOTAL HOURS FOR
1003 REM * DAY AND WEEK
1004 REM *
1005 REM ********************
1010 DM = T(D)
1012 GOSUB 1030
1015 VTAB D + 1: HTAB 29: PRINT D1;D2;".";D3;
1018 IF D / 2 <> INT (D / 2) THEN OS = 1: GOTO 1020
1019 OS = - 1
1020 DM = T(D + OS) + T(D): GOSUB 1030
1022 IF OS = 1 THEN VTAB D + 2: GOTO 1026
1025 VTAB D + 1
1026 HTAB 36: PRINT D1;D2;".";D3
1029 GOTO 1050
1030 D1 = INT ((DM / 60) / 10)
1032 D2 = INT (DM / 60):D2 = D2 - D1 * 10
1034 D3 = INT ((DM / 60) * 10):D3 = D3 - D1 * 100 - D2 * 10
1040 T = INT ((TM / 60) * 10) / 10
1045 RETURN
1050 REM
1058 TM = 0: FOR X = 1 TO 14:TM = TM + T(X): NEXT X
1060 T1 = INT ((TM / 60) / 10)
1065 T2 = INT (TM / 60):T2 = T2 - T1 * 10
1070 T3 = INT ((TM / 60) * 10):T3 = T3 - T1 * 100 - T2 * 10
1080 VTAB 17: HTAB 36: PRINT T1;T2;".";T3;
1090 GOSUB 2035
1200 RETURN
2000 REM ********************
2001 REM *
2002 REM * INPUT RATE AND CALC
2003 REM * TOTAL PAY AND PRINT
2004 REM *
2005 REM ********************
2010 D = 1:P = 1
2020 VTAB 19: HTAB 35: INVERSE : PRINT "$$.CC";: NORMAL
2030 VTAB 22: HTAB 1: INPUT "DOLLARS AND CENTS ";R$:R = VAL (R$)
2033 VTAB 22: HTAB 20: PRINT "                    "
2035 VTAB 19: HTAB 23:V = R: GOSUB 5000
2037 HTAB 40 - LEN (V$): PRINT V$
2040 RM = R / 60
2050 TP = TM * RM:TP = ( INT (TP * 100) / 100)
2060 VTAB 21: HTAB 22:V = TP: GOSUB 5000
2070 HTAB 40 - LEN (V$): PRINT V$
2099 VTAB 22: HTAB 1: PRINT "                    ";: REM 34 SPACES
2100 RETURN
5000 REM
5500 REM ***********
5501 REM * DOLLAR FORMAT
5502 REM ***********
5510 A = ABS (V):FA$ = "": IF V < 0 THEN FA$ = "-"
5520 A1 = INT (A):A2 = (A - A1 + 1.001) * 100
5530 V$ = "    $" + FA$ + STR$ (A1) + "." + MID$ ( STR$ (A2),2,2)
5540 RETURN
```

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Which makes it a thing of beauty. And a joystick forever.



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Old Faithful Silentype® has now been joined by New Faithfuls, the Apple Dot Matrix Printer and the Apple Letter Quality Printer.

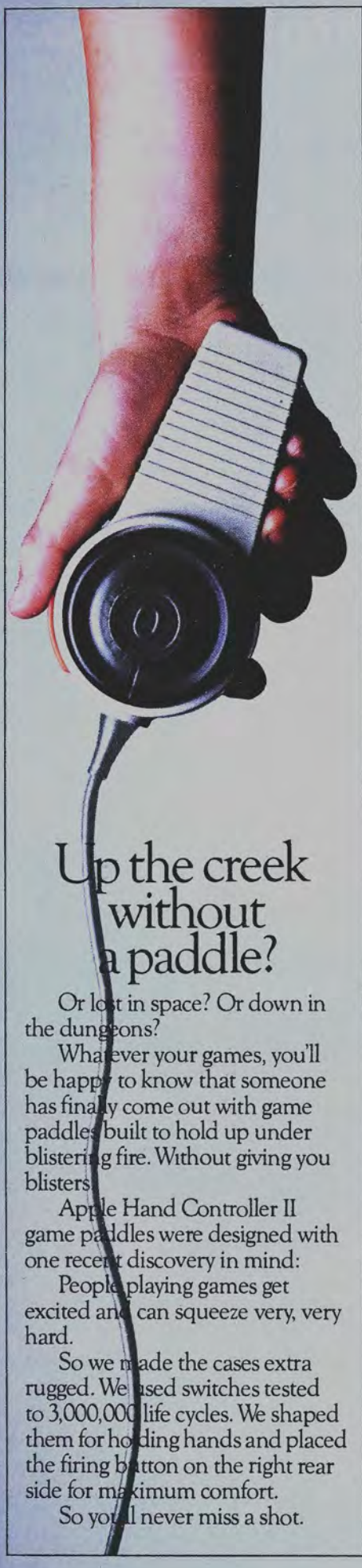


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Up the creek without a paddle?

Or lost in space? Or down in the dungeons?

Whatever your games, you'll be happy to know that someone has finally come out with game paddles built to hold up under blistering fire. Without giving you blisters.

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People playing games get excited and can squeeze very, very hard.

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If you work with so much data or so many programs that you find yourself shuffling diskettes constantly, you should take a look at Apple's ProFile,™ the personal mass storage system for the Apple III Personal Computer.

This Winchester-based 5-megabyte hard disk can handle as much data as 35 floppies. Even more important for some, it can access that data about 10-times faster than a standard floppy drive.

So now your Apple III can handle jobs once reserved for computers costing thousands more.

As for quality and reliability, you need only store one word of wisdom:

Apple.



Launching pad for numeric data.

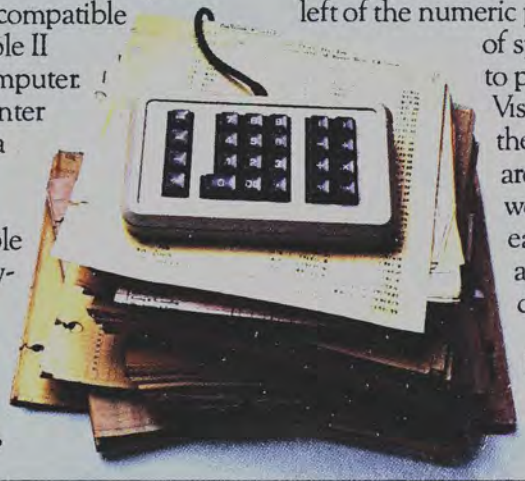
Good tidings for crunchers of numerous numbers:

Apple now offers a numeric keypad that's electronically and aesthetically compatible with the Apple II Personal Computer. So you can enter numeric data faster than ever before.

The Apple Numeric Keypad II has a standard calculator-style layout. Appropriate, because unlike some other keypads, it can actually function as a calculator.

The four function keys to the left of the numeric pad should be of special interest to people who use VisiCalc.® Because they let you zip around your work sheet more easily than ever, adding and deleting entries.

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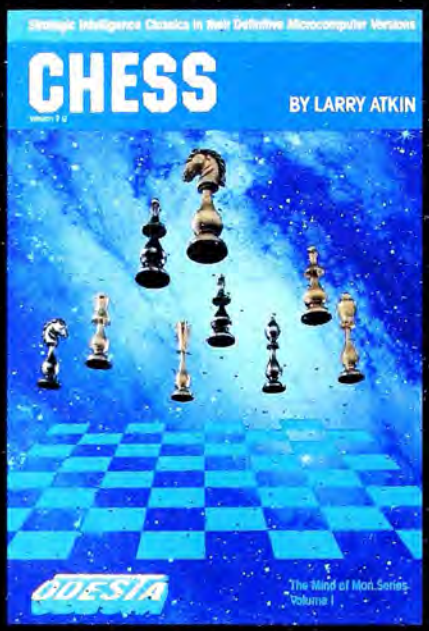
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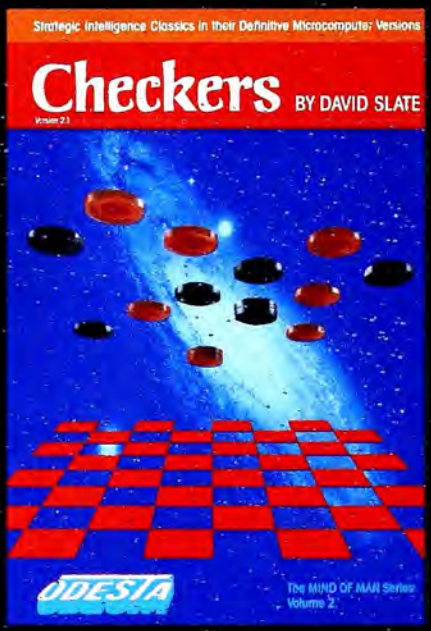
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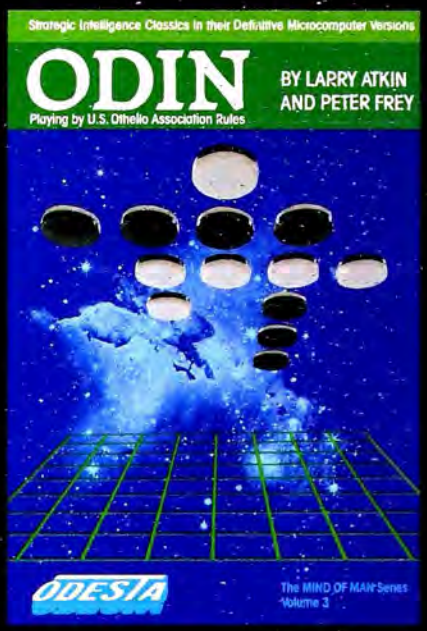
THE PEOPLE BEHIND THE PROGRAMS

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Authors of the Northwestern University 4.7 Computer Chess program; Winners of the World Computer Chess Tournament, 1977-1980; Winners of 8 North American Computer Chess Championships between 1970 and 1979; Two of the world's authorities on machine intelligence.

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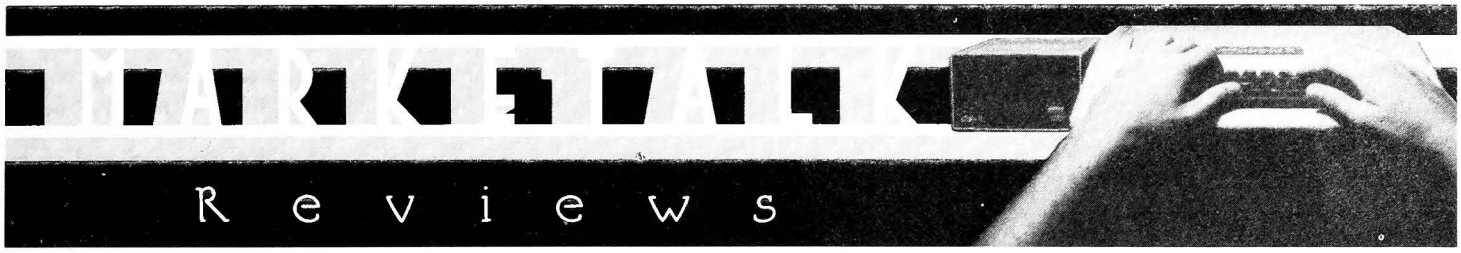
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For Apple II, Apple II Plus 48K disk systems, and Atari 48K disk systems. Odin is also available for TRS-80 Model 1 & 3 32K disk systems.

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Unless otherwise noted, all products can be assumed to run on either Apple II, with 48K, ROM Applesoft, and one disk drive. The requirement for ROM Applesoft can be met by RAM Applesoft in a language card. Many Apple II programs will run on the Apple III in the emulator mode.

Graph'n'Calc III, by Don Williams/Marton Inc. *Graph'n'Calc* goes right to the heart of the question of the nature of the medium we deal with when we sit before a microcomputer. Most of us, perhaps by default, use it as an extension of the written word. We hook a printer up to the Apple, and, when we have something really edifying or important, we dump it to the printer.

That action leaves the real question unaddressed, however. Is the microcomputer a written or a visual medium? Is it James Michener or Walter Cronkite? Is it both, or possibly neither?

The fact that word processing is the number one use of microcomputers, with database management a distant second, does not close the door to further consideration. Among the points to ponder: When we use the Apple, it communicates to us by way of video. The images we ask it to use mimic the written word, but the medium is video.

The old journalism saw is that a picture is worth a thousand words. If that's true, and if the Apple communicates as easily graphically as it does alphanumerically, then it seems incumbent on the users to reconsider the nature of the medium.

Perhaps the question doesn't arise because we aren't accustomed to having a visual medium at our fingertips while on the job. Memos aren't illustrated. A list of potential vendors and their pricing isn't illustrated. Sales figures for last month normally aren't illustrated. Leonardo da Vinci isn't needed by business.

But if there were such a tool. . . . It might not draw cartoons to replace mailing labels, nor paint the *Mona Lisa* as a representation of the creditworthiness of a large customer. But it just might reduce those thousands of words and numbers that represent a business to a series of graphic representations that would be easier to understand.

Graph'n'Calc is aimed in that direction. As its name implies, it's a graph and spreadsheet program. As its name also implies, graph is primary and spreadsheet is strictly secondary.

What its name doesn't hint at is the power in this business forecasting tool. Author Don Williams has a modicum of expertise in the field. He was with IBM for several years and is the author of *Desktop Plan.* What he's done in *Graph'n'Calc* is take business forecasting into the visual medium. In so doing, he's overlaid the basic graphing and spreadsheet functions with sophisticated statistical modules that would take days to build into *VisiCalc* or *Multiplan.*

In an era when more is better, Williams has taken the opposite approach. His spreadsheet is strictly limited to ten rows and one hundred columns. If that seems unnecessarily constraining at first glance, it actually works out to be more than enough space for serious forecasting purposes. *Graph'n'Calc* isn't intended to compete with the big guys in financial modeling. You can't enter your entire general ledger for the past umpty-ump years into the model and play "what if."

What you can do is take the key numbers out of the general ledger and actually watch while *Graph'n'Calc* first analyzes the trend of the numbers, then measures the correlation of the real numbers against adjusted numbers, extrapolates your numbers for future reporting periods, and, if necessary, adjusts those numbers for seasonal variations.

In some ways, it might be legitimate to look at *Graph'n'Calc* as a forerunner of the next generation of business software. VisiCorp has us all sold, and rightfully so, on the value of determining "what if." But the very nature of the question *VisiCalc* addresses implies a lack of information on which to base decisions. That's not necessarily the case in a business environment. Often, there's voluminous data documenting past history. *VisiCalc* is competent at extrapolating that past history into future possibilities. *Graph'n'Calc* is superb at performing the same function. *Graph'n'Calc*'s strength is addressing the question of "what's probable."

As an experiment, a set of real monthly sales numbers, shortened to remove the last twelve months of real data, was entered into *Graph'n'Calc.* The program was then asked to perform all its wonders and extrapolate the given data into the next twelve months. The results were eerily accurate, as if the software or the microprocessor were sneaking looks at the withheld data.

Graph'n'Calc determines these extensions of data with a series of sophisticated invokable statistical functions. Given a historical base, the program can find trends, apply them to the future, adjust the numbers for seasonal variations, and test the accuracy of the projections with exponential smoothing techniques.

That would be dandy enough in a spreadsheet program, but this one goes further by drawing it all out graphically. You can get line charts, bar graphs, stacked bar graphs, pie charts, and practically everything else except a Yogi Bear animated cartoon. The graphic features are smooth and easy to use and work readily with a dot-matrix printer.

Printing the graphs gives a permanent hard-copy record of the progression of the model—showing which alternatives promise the most or what's in store for the next six months for various product lines.

Graph'n'Calc gives you even more. You can save each graph to disk and then set up a slide show, with the graphs flashing on screen either at



your command or at preset intervals during a presentation. This ability to prepare the data easily for visual presentation should make *Graph'n'Calc* a favorite among managers needing to sway their vice presidents and directors.

Desktop Computer Software has gone the full route to give Apple III owners a usable product. It's even included *Fundamentals of Forecasting*, a book published by Reston Publishing Company, to give the beginner a sound foundation.

Graph'n'Calc is a dandy product that would be even dandier if it weren't so slow. It's written in Basic. Much of the lost time is in disk access; a hard disk would significantly speed up access time.

By itself, *Graph'n'Calc* goes a long way toward reversing the trend of using the Apple III as merely an extension of the printed medium. It's a useful and friendly adjunct to any business or department and should find its niche. ART

Graph'n'Calc, by Don Williams/Marton Inc., Desktop Computer Software (303 Potrero Street, Suite 29-303, Santa Cruz, CA 95060; 408-458-9095). $199. Apple III; a color monitor and dot-matrix printer will maximize use of the program.

Microbe. By Robert C. Clardy and Alan H. Zalta, M.D. Synergistic Software describes *Microbe* as "an anatomical adventure." What *Microbe* really is is another graphic tour de force from Robert Clardy.

Microbe is designed to be a challenging game of shrewd deduction and quick reflexes. It is even more challenging as an educational simulation of modern medical diagnosis and treatment. *Microbe* will test science students from high school to medical school. For physicians, *Microbe* offers first-rate excitement and a fascinating perspective while refreshing their medical knowledge.

Based loosely on the classic science-fiction movie, *Fantastic Voyage*, *Microbe* takes the user into a world as strange and alien as any imaginable: the inside of the human body.

The date is January 14, 1990. A secret government project has finally reached fruition: A miniaturization device to reduce anything safely to microscopic size has been perfected. Minisubs, designated microbes, have been constructed. Crews of specialists are prepared to be injected into critically ill patients, embarking on life-saving medical missions within the human body.

The player is the captain of one of these revolutionary microbes in the service of the new science of miniaturization surgery. The crew, consisting of a navigator, a technician, and a physician, are miniaturized with the sub, which is equipped with a laser, an X-ray device, and a complete store of modern drugs. The microscopic ship and team are injected into the vein of a critically injured patient. Use the sophisticated tools wisely and the patient may survive. Make a mistake and the patient can die—or the crew can be killed. The challenge of using combined talents to save a life is only the beginning.

Microbe may be played by one to ten players. In order to assist group role-playing, manuals are included for each of the roles. In addition, the documentation makes extensive use of charts, drug tables, and medical information. During group play, players work as a team. Less information is provided by the microbe's on-board computer to compensate for the human players.

The player may select background level of play from gamer to physician. Game skill levels are also selectable. Provision has been made for using *Microbe* with several voice synthesizers, too.

The game begins by your selecting a patient from cryogenic sleep. A description of the injuries or illness of the patient and the patient's past medical history are provided; these influence your mission.

You monitor the mission on a master view screen showing either a hi-res map of your location in the human body or an outside view from the microbe's perspective. Beside the master screen are gauges showing vital information such as fuel supply, air supply, and so on. Your mission is to reach a particular area of the body, perform the appropriate medical procedure, and leave via the eyes. That's right, the eyes.

Difficulties and dangers you encounter range from unforeseen hemorrhages, clogged arteries, and tumors to attacks by foreign viruses and bacteria. The body itself considers the craft a foreign invader and its defenses may attack at any moment.

The graphics are first-rate. Liberal use of hi-res animation provides excellent views of the interior of the human body. Wait till you watch the body's white blood cells swarm in to attack! Should the patient suffer a medical emergency, you'll be the first to know it: During a seizure the screen appears to shake. Now that's realism.

Microbe is a rich treat for the mind and the senses. It is fast-paced and exciting and requires quick reflexes and even quicker thinking. But it is as an educational tool that *Microbe* shines brightest. The game is medically accurate. It makes an excellent tutorial for medical students learning the interior workings of the body. In each case study, the student must determine the correct medical responses to each crisis. Full medical terminology is used throughout—which at first causes frequent diving for the manuals to understand what is occurring. *Microbe* will probably find its way into many medical school courses and be a favorite after-hours game at hospitals. WHH

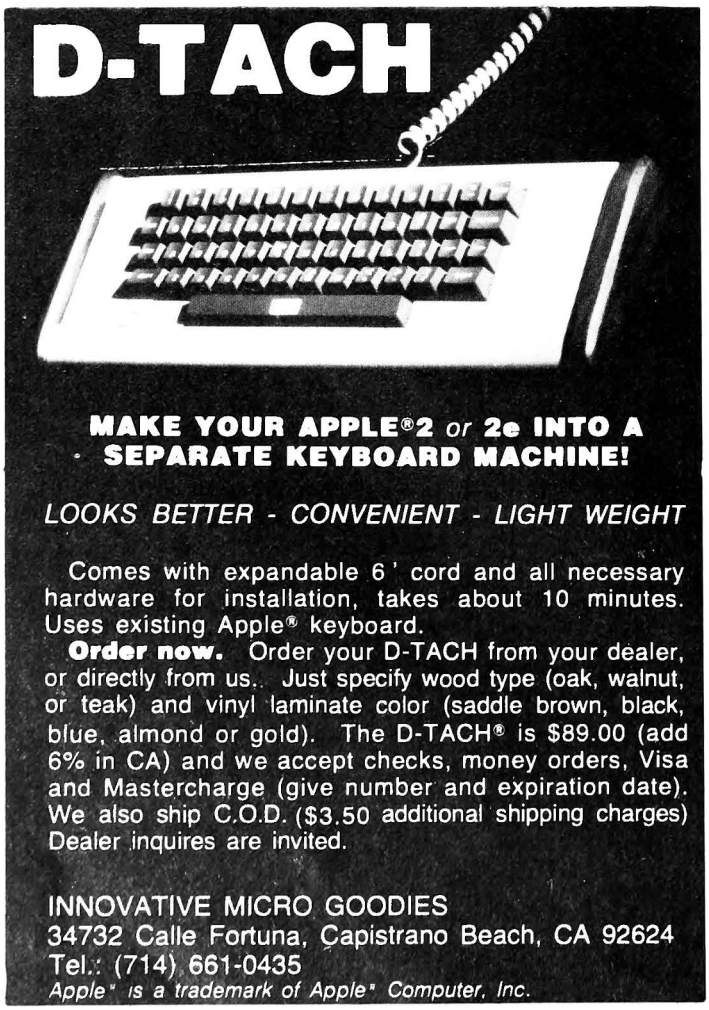
Microbe, by Robert C. Clardy and Alan H. Zalta, Synergistic Software (830 North Riverside Drive, Suite 201, Renton, WA 98055; 202-226-3216). $44.95.

Mockingboard. If you compare a game on the Apple with its equivalent on an Atari 800 or Commodore 64, probably the greatest difference you'll notice will be the sound.

A program on the Apple creates sound by tweaking the speaker at various rates. To be sure, some very interesting sounds can be created in that way, but generating such sounds takes up all the 6502's attention. The Atari and Commodore have dedicated digital-to-analog sound chips. That's why they can play *Frogger* music all the time, while your Apple plays only a bar or two, and only when your frog gets squashed.

Fortunately, the Apple is an infinitely upgradable machine. When it comes to sound, a Mockingboard in your Apple lets it sing as sweetly as any computer on the market. And talk too.

To be specific, there are four different boards that call themselves Mockingboard. The two basic boards are Sound I and Speech I. Sound I is capable of an impressive range of sounds. Some examples on the demonstration disk include trains, guns, lasers, oceans, explosions, and a very credible helicopter. Speech I uses a Votrax speech chip in a better way than Votrax was able to use it. The Mockingboard speech sounds synthesized, but it is very precise and easy to understand. The other two



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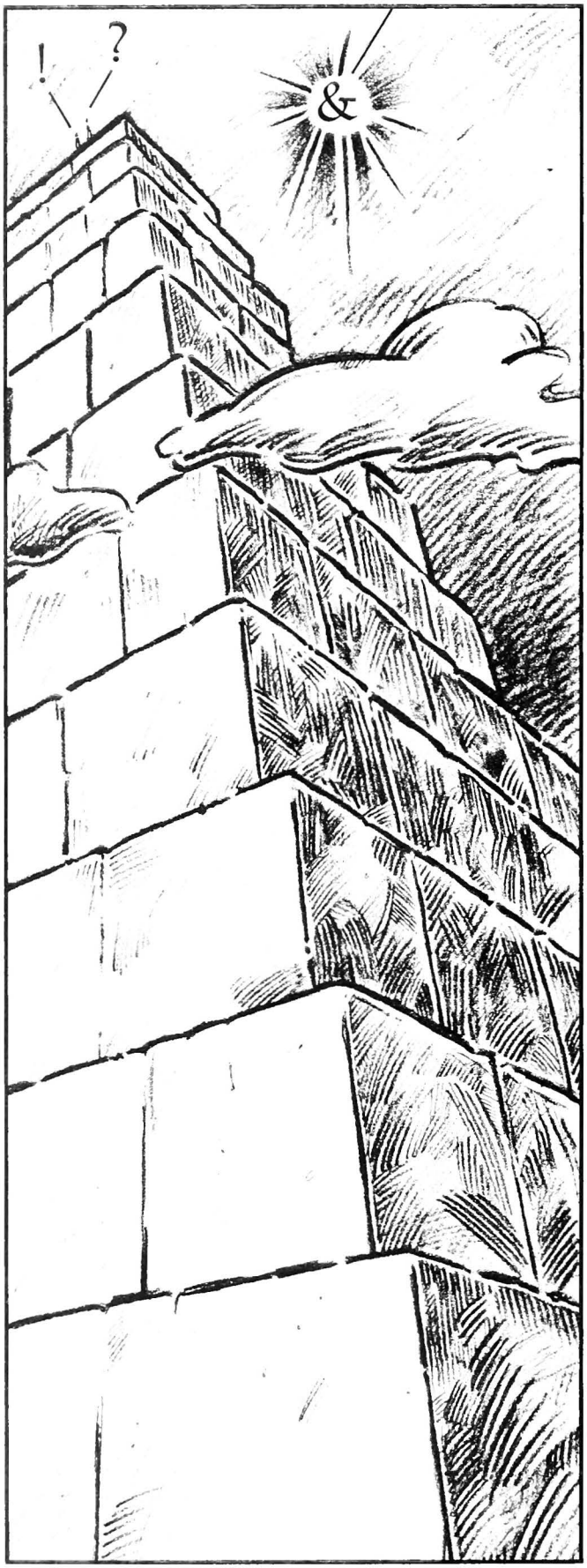
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[1]Softalk Magazine, August 1982



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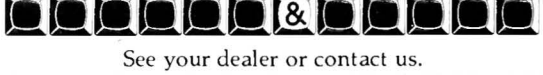
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DEALERS INVITED

boards are Sound II, which is the equivalent of two Sound I boards, and Sound/Speech I, a combination of the two basic boards. Each of these combines the functions of two boards on one, and each uses dual speaker output, making stereo sound possible.

Trouble is, it isn't much easier for the beginner to program the Mockingboards for sound than it is to program the Apple speaker. The manual has a lot of talk about registers, resets, and routines, none of which answers the simple question, "How do I make it go zap?"

Hard-core hobbyists will probably be able to make some sense out of the documentation after a bit of trial and frustration. But what about the rest of us? Well, that's where the brilliance of Sweet's support strategy reveals itself. Obviously, games that are written to make noise through the Apple speaker will leave the Mockingboard songless, so Sweet is going to the publishers and getting them to put Mockingboard sounds in their games. In some cases, Sweet is going as far as writing the routines and providing them merely for the credit line. The result: A lot of games already put out Mockingboard sounds, provided there's a Mockingboard there to play them.

Which raises a profound philosophical point: If a program has Mockingboard sound routines, and there's no Mockingboard to run them, how do we know they make a noise? DD

Mockingboard, Sweet Micro Systems (150 Chestnut Street, Providence, RI 02903; 401-273-5333). Sound I, $99; Speech I, $149; Sound II, $199, Sound/Speech I, $299.

Pick That Tune. By Randall and Mary Swearingen. The champagne punch is going flat, no one's touched your unique minced clam and horseradish canapes, and the conversation has descended to sporadic, lethargic observations on the current state of the economy and the situation in the Middle East.

Hey, guys and gals! How about a few rounds of *Pick That Tune*?!

Yes, the peculiar institution known as the party game has made the transition from the gas-lit gazebo into the computer age just as smooth as you please, carving out its reassuring, bland, comfy, homey genre amidst all the sophisticated, high-tech, whiz-bang game software surrounding it. Apparently, it will never die.

Pick That Tune is a hardy exemplar of the breed, accommodating ten players at a whack and providing for as many variations on the simple act of matching notes to song titles as one could wish for. You attempt to guess the identity of the melody in question from a list of five possible candidates after hearing one to twenty-five notes. A one-note bid is worth 250 points; each additional note is worth ten fewer points. After you choose your category—pop, country-western, television, or children's (additional categories available on separate disks)—you can decide whether you want a point penalty for wrong guesses (and, if so, should it be one-quarter of the points bid, one-half, or full penalty) and if "none of the above" should be on the list of title choices. All the possible permutations of these options result in sixteen game variations for each song category and a rather lengthy boot-up.

In play, the game makes every attempt to be as fair as any referee could be in a competition like this. The player bidding to guess the tune in the fewest notes for the most points gets to go first. If, however, everyone chooses to bid the same number of notes, the player whose name happened to be entered first will always get the first shot at the next one. As none of the songs in any category are exactly obscure, this could cause problems, especially in the children's songs category—like a knock-down, drag-out after a three-player game ends with a score of 1,300–24–0. Make sure the kids understand the bidding procedures, all nicely spelled out in the documentation.

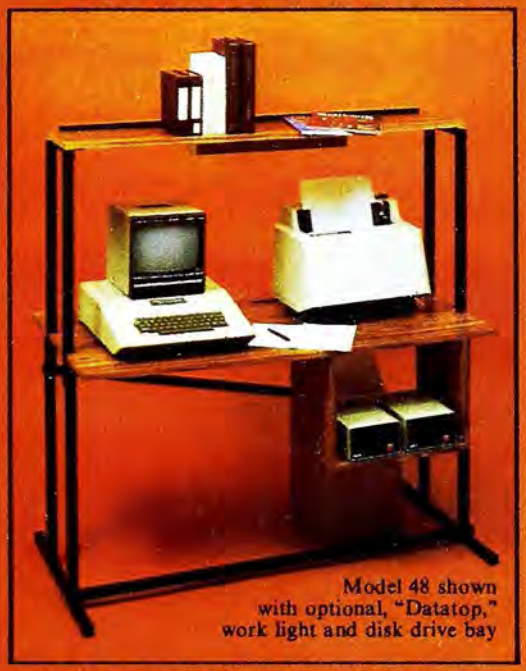
Also nicely spelled out is a rather delightful cutthroat option, which you can take after the previous (lower-bidding) player has guessed wrong. In this "power play," you waive your original bid and guess the tune based on the notes the preceding player heard, getting a shot at his higher score.

Still, no one is likely to get frustrated in this game. The only real requirement for play is to have dwelt upon this earth for a while. (It could get a lot tougher with the passage of time—in ten years, how many people will recognize the theme from *Starsky and Hutch*? For that matter, how many can now?) The real challenge lies with the sound capability of

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[1] Model 32 comes without a printer slot

[2] All tops for models 32, 39, 48 come with built-in cord slot and notches for "Datatop", unless customer specifies otherwise

[3] "Datatop" shelf clears "Compu-table" top by a maximum of 22"

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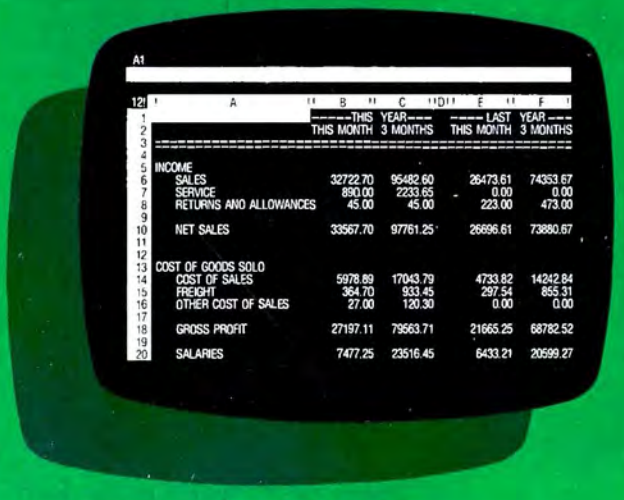
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the Apple, which can take the first four notes of songs you've known all your life and make them into something wonderfully new and strange.

But when Uncle Waldo is asleep under the lampshade, or nobody wants to hear *Led Zeppelin IV* even one more time, or pin the tail on the donkey raises your anxiety level to an unacceptable degree, this is the way to go. AC

Pick That Tune, by Randall and Mary Swearingen, Swearingen Software (6312 West Little York, Suite 197, Houston, TX 77088). $29.95.

Micro Cookbook. The kitchen of the future is what *Micro Cookbook* is all about. Enter available ingredients and the Apple responds with an index of applicable recipes. "What's for dinner?" is one question the computerized cookbook never hesitates to answer.

In *Micro Cookbook*, Virtual Combinatics has put together the ultimate in user-friendly programs. Not only is *Micro Cookbook* completely menu-driven, but it also includes extras such as nutrition guides, calorie guides, and a cooking-term glossary. Another good example of the amount of thought that went into this program is an extensible search option. ESO allows the user to perform an ingredient search. The program looks for an ingredient in its singular and plural forms.

Besides the program, the package includes a disk of more than two hundred international recipes. To these, you can add your own favorites and specialties. Entering a recipe is an easy task, which involves filling in a few screens that resemble formatted index cards. Modifying an existing recipe is just as easy. When you call for a recipe, you can specify the number of people who'll be dining; *Micro Cookbook* automatically adjusts quantities and measures of each ingredient accordingly.

Several special printing functions are also supported. It's possible to print three types of indexes: an index of all recipes, an index of all ingredients, and an index of classifications. You can print a shopping list to take to the grocery store; just tell the program what meals you have planned for the week and it generates an itemized list automatically.

The Apple IIe version uses many of the features of that machine, and it requires the eighty-column option. All the sections accept response from joystick or trackball; everything is "point and touch." The program is expanded with additional recipes and features to use the full 64K. The extra memory also enables the program to provide multiscreen recipes. Other new features such as wild-card searching and logic sorting (either/or) enhance the IIe package.

Virtual Combinatics plans additional chapters to the cookbook, add-on disks containing specialized recipes. The first two are available: *Appetizers* and *Soups & Salads*. The next planned is *Desserts*.

One final byproduct of this well-made program: Your obsolete recipe box may be just the right size for a disk holder. DAD

Micro Cookbook, Virtual Combinatics (Box 755, Rockport, MA 01966; 617-546-6553). $40. Each additional chapter, $12.

Spectre. By Bob Flanagan and Scott Miller. When you take the best elements of different games and blend them into one, you'd expect to come up with a winning combination. Well, that's what DataMost has done, but the result comes in just a few strides short of what might have been a winner.

Taking a look at *Spectre*, you'll recognize *Wayout*; you'll see what's undoubtedly from *Tron*; and the obligatory maze game is unmistakable. It's hard to pinpoint just where *Spectre* falls short because, taken by themselves, the components are pretty good.

You're given a split-screen display. On one side is a 3-D view as you see it from inside the maze; on the other side is a bird's-eye view of the maze. And hounding you through the maze are the menacing Questers, which look like clones of *Tron*'s police Recognizers.

The animation is not too shabby. Moving through the maze looks like moving through a maze, except for the turns, which feel more like West Point rights, lefts, and about-faces. *Spectre*'s sound effects are used sparingly, but when they're there, you're well aware of them. Nice and loud.

Perhaps the weakness is in the game's story line. You're marooned on a disabled space station in the outer reaches of space, waiting for help to arrive. Questers have discovered you, and now you must run through the space station's mazelike corridors, closing the space ports to keep them out.

It's not hard to figure out that the space ports line the corridors like dots in a maze, that the Questers chase you like Pac ghosts in a maze,

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and that there are "energizing beams," which allow you to destroy Questers, like power pills in a maze.

The maze is not exactly the largest ever used in a game, but there are catches. At novice level, the walls disappear after five seconds into play, making it difficult to know where and when to turn. In advanced mode, walls and space ports are invisible, making the game next to impossible.

Teleportation chambers come in handy when things get hectic. Go into one of them and you'll be placed back where you started, but you'll be out of danger—for the moment.

Spectre is a game that you'll probably sit down with repeatedly, but not because you're having the time of your life. More likely it'll be because the game looks so deceptively simple that you'll be convinced you can beat your high score the next time. MTV

Spectre, by Bob Flanagan and Scott Miller, DataMost (8943 Fullbright Avenue, Chatsworth, CA 91311; 213-709-1202). $29.95.

Bulk Mailer. By Joe Marinello. *Bulk Mailer* is both a technological and functional advance for the Apple II and as such represents a significant breakthrough. In concept and design, it runs counter to the current publishing theory that ever more versatile and complicated database programs are desirable. *Bulk Mailer* knows what it was designed for and sticks determinedly to that task alone.

So what are all the raves about?

It was not so long ago that conventional wisdom held that no Apple II could handle thousands of items efficiently. If you had lots of data in a business environment, it was automatically assumed that you would step up to a "business" computer instead of applying the Apple to the task. Or, if you were foolhardy enough to ignore that wisdom, that you would pay a severe penalty in terms of functionality and response time.

As has so often been the case when conventional wisdom assumed that the Apple II had limitations, that wisdom was wrong. In this case, it took Joe Marinello, a southern California native now residing in Seattle, Washington, to take the bull by the horns and prove the point.

What Marinello devised was a mailing program that, on a hard disk, can handle thirty-two thousand names and retrieve any one of them by account number in approximately two seconds. Pause now, dear skeptic, to reread that last sentence and let the numbers sink in this time. The time you spent rereading the sentence is the approximate duration of finding any record from among 32,000.

Everybody thought they knew that coaxing that kind of performance out of an Apple is impossible. That's the neat thing about Apples. Yesterday's impossible task is tomorrow's commonplace event—and the following day's innovation on other microcomputers.

How all this was accomplished was by stripping the program of everything that smacked of versatility or redundancy. What you can do with *Bulk Mailer* is manage a mailing list. Period. Just try to do something else with it; Satori Software dares you to succeed. It can't be done. Use it for mailing lists or forget it.

But as a mailing-list program for folks who need to manage lots of names, *Bulk Mailer* is the ticket. And it has just enough features, although nobody using it will fail to yearn for more.

What you get in terms of data space are four address lines of twenty-eight characters and one five-character code line. To call that space sparse is clearly understating the case.

Yet the built-in filtering features do provide for some versatility. The code line serves as a filter. Used wisely, it enables the user to address only that part of the total list that is desired for a particular mailing. The second address line permits entry of various codes that give it additional uses. There's a no-print code so that comments can be stored there. And there's a priority code, so that the second line will print before the first line. That's a dandy feature if you wanted to insert something like "Happy Holidays" on the second line and have it print above the mailing label.

In other areas, *Bulk Mailer* is rife with features. It has an automatic duplicate entry killer. Upon request, it will run through the database, deleting any entries that have accidentally been duplicated. The program also looks for near duplicates and reports them so that the user may determine whether an entry should be purged. That's nifty if you haven't been consistent in nomenclature. The system will report "Box 89" and "P.O. Box 89" as a near duplicate, sparing the user the burden even of consistent data-entry conventions.

Bulk Mailer also keeps a zip code inventory, so you know at any moment what the geographics of your list are like. The program will also postpone, until the end of a label run, the printing of the names in any given zip code in which there are more than fifty entries. That's a feature designed to ease preparing third-class mail for the U.S. Postal Service.

Bulk Mailer comes in two configurations, a floppy disk version and a hard disk version. The floppy version handles twelve hundred names per disk but only works with the disks you have on-line. Thus, single-drive owners get one disk; two-drive owners get two disks, or twenty-four hundred names. There's no provision for a third drive.

The reason for the limitation is that additional disks or drives cost more in performance than the author was willing to pay. Instead, for owners who outgrow the floppy system, there's the hard disk version. It's capable of taking your list out to thirty-two thousand names.

Practically everybody who buys *Bulk Mailer* will immediately wish for one little tweak to the program to add another field for filtering, or for some other purpose. But even as they wish for enhancements, they'll be stunned by the efficiency and speed at which the program executes the task it has set for itself. In this case, versatility be damned! Get me that record in two seconds. ART

Bulk Mailer, by Joe Marinello, Satori Software (5507 Woodlawn North, Seattle, WA 98103; 206-633-1469). Floppy disk version, $125. Hard disk version, $350.

Go. By Stan Erwin. Go is one of the world's ancient games. Played mostly in Japan for centuries, this game of subtle strategies is played with numerous small, smooth stones on a board marked by nineteen horizontal lines and nineteen vertical lines. Two players with stones of contrasting colors take turns placing their stones, one per turn, on any of the 361 line intersections on the board.

The object of the game is to control the playing board by surrounding and cutting off the enemy. When an enemy piece or formation of pieces is cut off, it is destroyed. Players win points for each piece captured and for every square of the board they control at the end of the game.

Warriors of old learned strategic techniques for conquering and holding land from this game—a useful pastime in old Japan with its history of feuding warlords. The game blends offense and defense in a constantly shifting pattern, so subtle that achieving proficiency often takes years of study. The modern game of Othello has its origins in Go.

In this very modern version of Go, the computer adversary plays a very competent game, making few mistakes. It plays an intermediate-level strategy. A handicap of from one to nine stones' head start is allowed in the interest of beginners. As your skill improves, the handicap can be lowered.

Hayden's version of Go is a faithful rendition of the board game that provides endless intellectual challenge. RRA

Go, by Stan Erwin, Hayden Software Company (600 Suffolk Street, Lowell, MA 01853; 617-937-0200). $34.95.

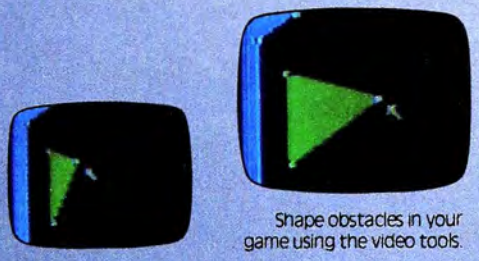
Apple Dot Matrix Printer. When you think about it, it's only natural that the printer should be the most troublesome part of a computer system. Your computer, for all its foibles, is probably the most reliable machine you own. Certainly it requires fewer repairs than your car or your washing machine. After all, the computer has no moving parts.

A printer, on the other hand, is subject to the thousand natural shocks that mechanical devices are heir to. If you've used a printer for long, you've probably seen all its tricks: form feeding in strange places, taking paper in the bottom that just came out the top, wasting a page of paper between files, not turning on underlining at the right time, not turning off underlining at the right time, and—well, you get the picture.

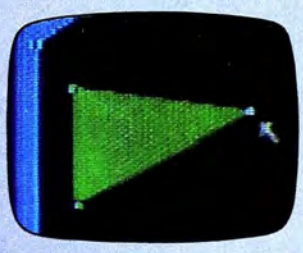
So, has Apple's Dot Matrix Printer, or DMP, as they like to call it, arrived to deliver us from all this? The answer is a resounding, "Sort of." Now don't be disappointed; most printers don't even rate a "sort of."

Okay, here's the good news. The Apple DMP has the best paper path you'll find on a tractor-feed printer. If you've ever come back to a printer to find a sixteen-page essay printed on three pages because the paper jammed, you'll realize how important that is. The DMP seems to know what paper is going in and what is coming out without confusing the two. Another very clever thing about the paper-path design on the DMP is that the tractor mechanism (those wheels with little pins that grab the

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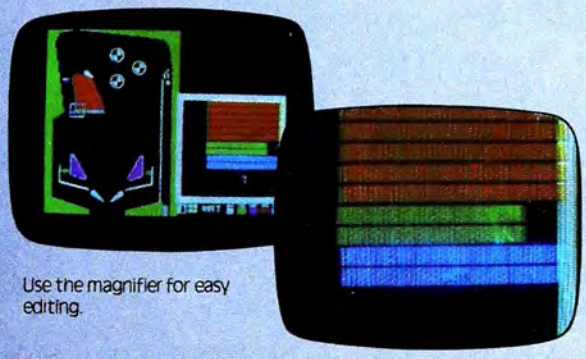
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CAN A COMPUTER MAKE YOU CRY?

Right now, no one knows. This is partly because many would consider the very idea frivolous. But it's also because whoever successfully answers this question must first have answered several others.

Why do we cry? Why do we laugh, or love, or smile? What are the touchstones of our emotions?

Until now, the people who asked such questions tended not to be the same people who ran software companies. Instead, they were writers, filmmakers, painters, musicians. They were, in the traditional sense, artists.

We're about to change that tradition. The name of our company is Electronic Arts.

SOFTWARE WORTHY OF THE MINDS THAT USE IT.

We are a new association of electronic artists united by a common goal — to fulfill the enormous potential of the personal computer.

In the short term, this means transcending its present use as a facilitator of unimaginative tasks and a medium for blasting aliens. In the long term, however, we can expect a great deal more.

These are wondrous machines we have created, and in them can be seen a bit of their makers. It is as if we had invested them with the image of our minds. And through them, we are learning more and more about ourselves.

We learn, for instance, that we are more entertained by the involvement of our imaginations than by passive viewing and listening. We learn that we are better taught by experience than by memorization. And we learn that the traditional distinctions — the ones that are made between art and entertainment and education — don't always apply.

TOWARD A LANGUAGE OF DREAMS.

In short, we are finding that the computer can be more than just a processor of data.

It is a communications medium: an interactive tool that can bring people's thoughts and feelings closer together, perhaps closer than ever before. And while fifty years from now, its creation may seem no more important than the advent of motion pictures or television, there is a chance it will mean something more.

Something along the lines of a universal language of ideas and emotions. Something like a smile.

The first publications of Electronic Arts are now available. We suspect you'll be hearing a lot about them. Some of them are games like you've never seen before, that get more out of your computer than other games ever have. Others are harder to categorize — and we like that.

WATCH US.

We're providing a special environment for talented, independent software artists. It's a supportive environment, in which big ideas are given room to grow. And some of America's most respected software artists are beginning to take notice.

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Join us.

We see farther.

ELECTRONIC ARTS™





SOFTWARE ARTISTS? "I'm not so sure there *are* any software artists yet," says Bill Budge. "We've got to earn that title." Pictured here are a few people who have come as close to earning it as anyone we know

That's Mr. Budge himself, creator of PINBALL CONSTRUCTION SET, at the upper right. To his left are Anne Westfall and Jon Freeman who, along with their colleagues at Free Fall Associates, created ARCHON and MURDER ON THE ZINDERNEUF.

Left of them is Dan Bunten of Ozark Softscape, the firm that wrote M.U.L.E. To Dan's left are Mike Abbot (top) and Matt Alexander (bottom), authors of HARD HAT MACK. In the center is John Field, creator of AXIS ASSASSIN and THE LAST GLADIATOR. David Maynard, lower right, is the man responsible for WORMS?

When you see what they've accomplished, we think you'll agree with us that they can call themselves whatever they want.

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holes on the side of the page and push the paper through) does not follow the print head on the path, but precedes it. Thus, you can tear off a page you just printed without form feeding to the top of the next page first. If you're new to all this, what that means is that many printers make you waste a page each time you print. The DMP does not.

So what about its options? What's it got? Lotsa things! Underlining, boldfacing, elongated printing, proportional spacing (two different sizes), graphics, foreign language character sets. Several options seem to exist but lack the documentation or software to work. For instance, the demo program cheerfully tells you, "function not available," when you select "download character set" from its menu. Maybe later.

The documentation is unique. The booklet that comes with the DMP tells you all the simple stuff in simple language, a feat other printer documentation writers have yet to master. Apple also provides a reference card for the more technically minded. What seems to be lacking is something in between to describe what the notes on the reference card mean. Some things can be discovered by trial and error. Some can't—like loading custom character sets.

All in all, the DMP is an excellent printer. There are some things that no printer manufacturer yet has made easy. Apple did these things no worse than anyone else. Many things, however, they have done refreshingly right. DD

Apple Dot Matrix Printer, Apple Computer (20525 Mariani Avenue, Cupertino, CA 95014; 408-996-1010). $695.

Hi-Res Computer Golf 2, Pro Courses Series. By Stuart Aronoff. Grab your mashie and niblick and head for the links. *Hi-Res Computer Golf* is back, this time as a well-done simulation of the real thing.

Avant-Garde's game features a master disk with practice sections and a beginner's course. On the back of the disk is the first in a series of Pro Courses sets, each to contain three eighteen-hole golf links. The three courses on the first Pro disk are called, "An Atlanta Course," "Hotrock," and "Glass Mountain," each corresponding to a world-class golf course in real life. Part of the fun is trying to figure out which courses these are supposed to be. Rather like a Harold Robbins novel.

The game itself is a good attempt to simulate the conditions under which golf is played and the decisions that face the player on each hole. Aside from the expected water hazards (mark them well), roughs, and woods that are par for the course in any computer golf game, *Hi-Res Golf 2* takes the wind into account. An on-screen indicator shows the frequently shifting wind direction and velocity. The holes take up as much as three full screens each, and the greens are marked with arrows showing the contours of their slopes.

But what makes Avant-Garde's golf games truly unique is the act of hitting the ball. After the player selects a club, determines how hard to hit the ball, and chooses the direction of the shot, the swing sequence begins. The picture dissolves to a tee and ball downscreen and a clubhead at the top. Swinging involves guiding the clubhead through a path of lines by tapping a key eight or nine times, changing the angle of the clubhead with each tap. If you don't tap just right, you'll end up hooking, slicing, topping, or undercutting the ball—which means the ball doesn't go as far as you wanted or goes in the wrong direction. Klutzes (that vast body of us who never could put the shot in *Microsoft Decathlon*) can easily miss the ball altogether.

For the real duffer, *Hi-Res Golf 2* has thoughtfully provided an automatic swing option that ensures a perfect swing each time the ball is addressed. There's also a maximum-strokes option that limits the number of swings allowed on each hole to double par. If you surpass the maximum, you simply go on to the next hole.

Notably improved in the new version of *Hi-Res Golf* are the graphics, the roll of the ball, and the action of the ball on the green. In the original version, water hazards, sand traps, trees, and greens were portrayed with block shapes. In the new version, they're irregularly shaped for an effect much closer to real life. The ball travels more realistically, slowing down drastically when rolling through the rough. And in putting, the strength of the swing has a more realistic influence; in the old version, no matter how hard the ball was hit, the ball would go into the cup if the aim was true.

The Pro Courses are challenging, exciting courses, each providing a unique game. Learning to play each course takes several enjoyable rounds even for the most adept player.

Overall, *Hi-Res Golf 2* stands out among computer sports games. It is challenging and has full variety. With the automatic swing option off, the combination of strategy and physical coordination required is unmatched in any computer sports simulation. Most of all, it's fun.

You don't even need to pack an umbrella when you play. DA

Hi-Res Computer Golf 2, by Stuart Aronoff, Avant-Garde Creations (Box 30160, Eugene, OR 97403; 503-345-3043). $34.95.

Police Artist. By Elizabeth Levin. *Police Artist* is an electronic version of Mr. Potato Head, souped up with the accouterments of today's urban crime. The program offers three variations on the theme of recognizing distinct facial characteristics.

Police Lineup presumes you've witnessed a crime and sneaks you a quick look at the perpetrator. Then dozens of nefarious suspects flash by as though you were looking from face to face along a police lineup. Can you recognize the villain? You can eliminate people you're sure aren't the criminal; the rest continue to parade until you eliminate them or identify the blackguard. If you succeed, your turn continues with a different criminal and new suspects. Accusing the wrong person ends the round and establishes your score.

The game claims to be able to generate one million distinct faces, so the combinations of characteristics are rarely the same. Amazingly, each of these million faces—at least, as many as you're apt to see—appears to have a unique name, a feature that adds personality and a touch of reality to the faces.

A more challenging program is the title game, *Police Artist*. In this game, you get to see the criminal a bit longer, at least on low skill levels. Then, like a real police artist re-creating a face feature by feature, you must build the criminal's face piece by piece, starting with its shape. Was it a square face, an oval face, a round face? Did the suspect have bushy eyebrows? Curly hair? Were the lips thin or full? It's amazing how fast you can forget details in the face of alternatives, even when you knew to remember.

The third program, *Off Duty* is especially for doodling. At your disposal are sixteen noses, sixteen ears, sixteen mouths, sixteen chins, sixteen pairs of eyes, sixteen sets of cheekbones, and sixteen scalps—with or without hair and millinery. You can make faces all day long—and no one will tell you your face is going to stick that way. . . . This is electronic Mr. Potato Head at its best, a delight to play with.

All the suspects have bizarre facial characteristics; every one would do well at an open-call audition for bad guys to play in the Dick Tracy comic strip. Although the characters are definitely cartoonlike, individuals seeking the harmless, positive children's world suggested by *Police Artist* author Elizabeth Levin's role in developing computer games for the Sesame Place amusement park may prefer to stick with Mr. Potato Head. RRA

Police Artist, by Elizabeth Levin, Sir-tech Software (6 Main Street, Ogdensburg, NY 13669; 315-393-6633). $34.95.

Pipeline. The observation that the computer wastes a lot of time waiting for the printer to give it the high sign sparked the development of the printer buffer for the Apple. The concept is simple: The Apple is able to send characters out at mind-boggling speed, but the printer can only handle maybe a hundred characters a second, more or less. Without a buffer, the Apple and the printer have a dialogue like this:

Apple (*quickly*): Okay, here's the file.
Printer (*lazily*): Slow down, give it to me a little at a time!
Apple: Okay, but hurry up about it.
(*pause*)
Apple: You done yet?
Printer: Just a few more characters. . . .
Apple (*after a beat*): Well?
Printer: Okay, let's have some more.
Apple: It took you long enough. Here's the rest—
Printer: Hey, wait a minute!

As you can imagine, this doesn't make for a very happy relationship between the Apple and its right-hand peripheral. With a print buffer installed, it's more like this:

Apple: Here's the file. I want to see the printout first thing in the morning.
Printer: Right, boss!

And so everybody's happy! Your Apple's got time to do more spreadsheeting or word processing, or even to play a quick game. The printer doesn't have the Apple breathing down its neck anymore, and you don't have to put up with their constant bickering.

The Pipeline is such a printer buffer, but it's smarter than most. Not being content to just sit there spoon-feeding the printer, it serves the added function of dealing with more than one chunk of output at a time. It has a mode called random-access printing (RAP), which allows the storage and retrieval of multiple files. Once a file is stored in the Pipeline's memory and given a name, you can then store another, and another, and so on until the Pipeline either runs out of names or memory. It allows as many as sixty-two different single-character names and can have from 8K to 128K of RAM (memory can be added by the user).

Pipeline calls each of these chunks of printout a bucket. A bucket can hold a word processor file (or part of one), a hi-res screen dump, spreadsheet or database information, or anything that can be printed out. Once all the buckets you want are in the Pipeline, you can send them from there to the printer in any sequence you want. So you can create two buckets, each with a half page of text, and print them out with a chart or table in the middle. Or you can print the same file a number of times without tying up your computer.

The Pipeline is not without its drawbacks. The command characters are not really memorable, so you'd have to use it fairly frequently before they became second nature. Fortunately, there are only twelve different commands, and they're summarized at the end of the manual. Another problem is that, if you forget what's in a bucket, the only way to find out is to print it.

On the plus side, because it has a separate power supply, the Pipeline can hold on to information while the Apple is off. This, as well as the random-access capability, is unique among print buffers. DD

Pipeline, Interactive Structures (146 Montgomery Avenue, Box 404, Bala Cynwyd, PA 19004; 215-667-1713). Prices range from $230 for 8K to $440 for 128K.

Caves of Olympus. By Thomas and Patrick Noone. The hub of the empire is the imperial planet of Olympus. There the empire is ruled by a Vario-500 robot named Anson Argyris. You are that robot and you seem to be in a lot of trouble! The planet is being invaded by ruthless Larens who are trying to conquer the empire. The defenses of the palace have been breached, and all your elite household troops have been killed. The only avenue of escape lies in the caves below the palace. Deep within those caves is a secret escape ship. But the caverns are heavily booby-trapped and quite treacherous.

Anson Argyris is an egg-shaped robot, a little more than fifty centimeters tall. Disguise is easy; Argyris can wear various cocoon-masks. When wearing a cocoon-mask, it can pass for human. Scattered throughout the caves are many masks, allowing Argyris to assume critical identities. One special mask is that of the emperor. When wearing that mask, the robot is allowed access to restricted areas.

Many transport chambers exist within the caves, mostly one-way. Unfortunately, the transports operate erratically; so sometimes you are transported into death traps. In fact, the pitfalls and traps are so numerous that it will take even the hardiest adventurer many attempts to get through this adventure.

The walls of the caves are nothing more than projected energy. What may seem solid and impassible will open up with the correct identification item or phrase. Almost nothing is what it appears to be. Many blind alleys are actually doorways to other sections, usable only when the mystery of their opening is solved.

A variety of unfriendly guard robots, aliens, and pursuing Larens are frequently encountered within the caves. The aliens are treasure-seeking adventurers who have gotten trapped in the mazes of the caves. Some of the aliens will even assist in Argyris's escape; so don't shoot everyone! The fiercest opponent is a deadly, nine-foot-tall Halutian battle-robot, which resembles a mobile fortress.

Caves of Olympus is intended to be deadly and difficult. The game certainly tries to live up to that reputation! It is definitely not for novice adventurers.

Although the game is in hi-res, the quality of the graphics is negligible. There are, however, several sequences of special visual effects. The game is also enhanced by frequent atmospheric sound effects. You can hear the closeness of a blaster shot.

This is one adventure people will not play through rapidly. RRA

Caves of Olympus, by Thomas and Patrick Noone, Howard W. Sams & Co. (4300 West 62nd Street, Indianapolis, IN 46268; 317-298-5566). $39.95.

The Secret Guide to Computers, tenth edition. By Russ Walter. A familiar figure at computer shows in the Boston area has been New England's unofficial computer guru, Russ Walter. Walter attends these shows dressed in an eye-catching black wizard's outfit, complete with wide-brimmed conical hat. He has long sought to demystify computer technology for the ordinary person.

The Secret Guide to Computers series is a funny, irreverent look at computers and how they work. The material is culled from special seminars that Walter has been giving since 1978. Many of the computer leaders in New England are alumnae of Walter's courses.

The books stress working understanding rather than the high-tech mumbo jumbo encountered in the usual computer store. *The Secret Guide to Computers* assumes nothing. The first instruction is "Turn the computer on." This type of thoroughness is reassuring to a new computer owner. The book proceeds, with many witty asides, to give you fundamental step-by-step instruction. You never get the feeling that Walter is on some Olympian height looking down at the poor struggling neo-

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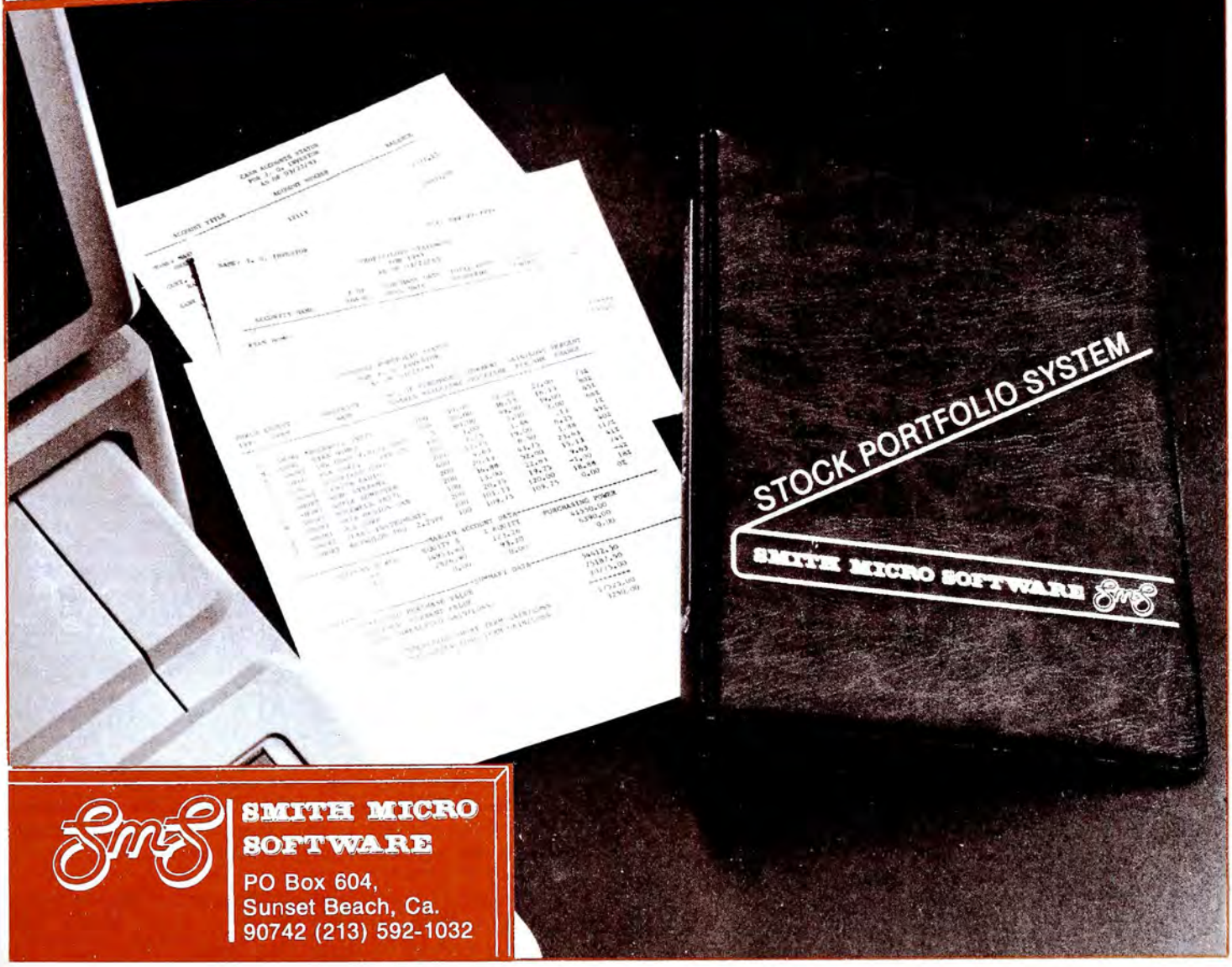
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The Secret Guide to Computers series has long been a cult hit in New England. Because Russ Walter publishes the series himself and doesn't bother much with distribution, few people elsewhere have heard of it except via the electronic grapevine.

Each volume of the series contains a letter from the author, closing with, "At your service, your computer butler, Russ Walter." This butler comes with some of the finest references in the industry, and you know how hard it is to find decent help these days. RRA

The Secret Guide to Computers, tenth edition, by Russ Walter (92 Saint Botolph Street, Boston, MA 02116; 617-266-8128) $3.70 per volume, $29.60 for the set.

Boa. By George Smith and Lee Daniels. Finally, a game you can actually win.

It's all too often that long hours at the computer come to an end with the screen arrogantly flashing "game over" in the face of the drained player. The game doesn't tell you you've lost; you assume that much. The scene is familiar: You finish all the levels or screens the game has to offer, then you go back and do it all over again, sometimes faster, sometimes harder.

Boa isn't like that. There is a definite end to the game, and if you reach it, you win. Fair and square.

The game's layout is a maze, and you control a snake. So far, it looks suspiciously like *Serpentine*; but that's where the similarities end. The object of *Boa* is to get through all levels and eventually recover a hidden jewel. Pursuing you at each level are nasty little white mice who would like nothing more than to eat you from the tail on up. That's rather strange, since you're several times bigger than they are; sort of like Herve Villechaize devouring Mr. T.

You can eat the mice, too. In fact, that's just about the only way you advance levels, by finishing the little rodents off. And characteristic of little rodents, given time, they turn into big rodents; in this case, they become big white rats. How they change from one genus to another is anybody's guess, but they're worth big points if you eat them when they're rats.

All during the game, Frizzard the enchanted frog appears and disappears. The game's instructions tell you that kissing Frizzard is another way to advance levels, but the frog hops randomly from place to place and rarely stays in one spot long enough for your boa to kiss it.

Once you've found and wrapped your boa around the hidden jewel, you're treated to what Micro Magic calls "a surprise ending." Unfortunately, if your boa isn't long enough to wrap itself around the jewel (those mice get hungry), you'll never see the surprise, and the game simply ends. No fanfare, no parade.

Boa gives you the option to use either a joystick, the keyboard, paddles, or an Atari-type joystick, and you can select one of nine levels of difficulty to play. The animation isn't as smooth as in many other games; rodents and reptiles tend to bunny hop rather than crawl and slither.

One thing *Boa* isn't is a test of endurance. Getting through a game at its easiest level usually takes no more than ten minutes. On the other hand, it's also not a game that is so hard that you lose within one or two minutes.

However long it takes to finish the game, whether you win or not, you'll never be told the game is over. MTV

Boa, by George Smith and Lee Daniels, Micro Magic (908 Memorial Parkway, N.W., Suite C, Huntsville, AL 35801; 205-536-1290). $29.95.

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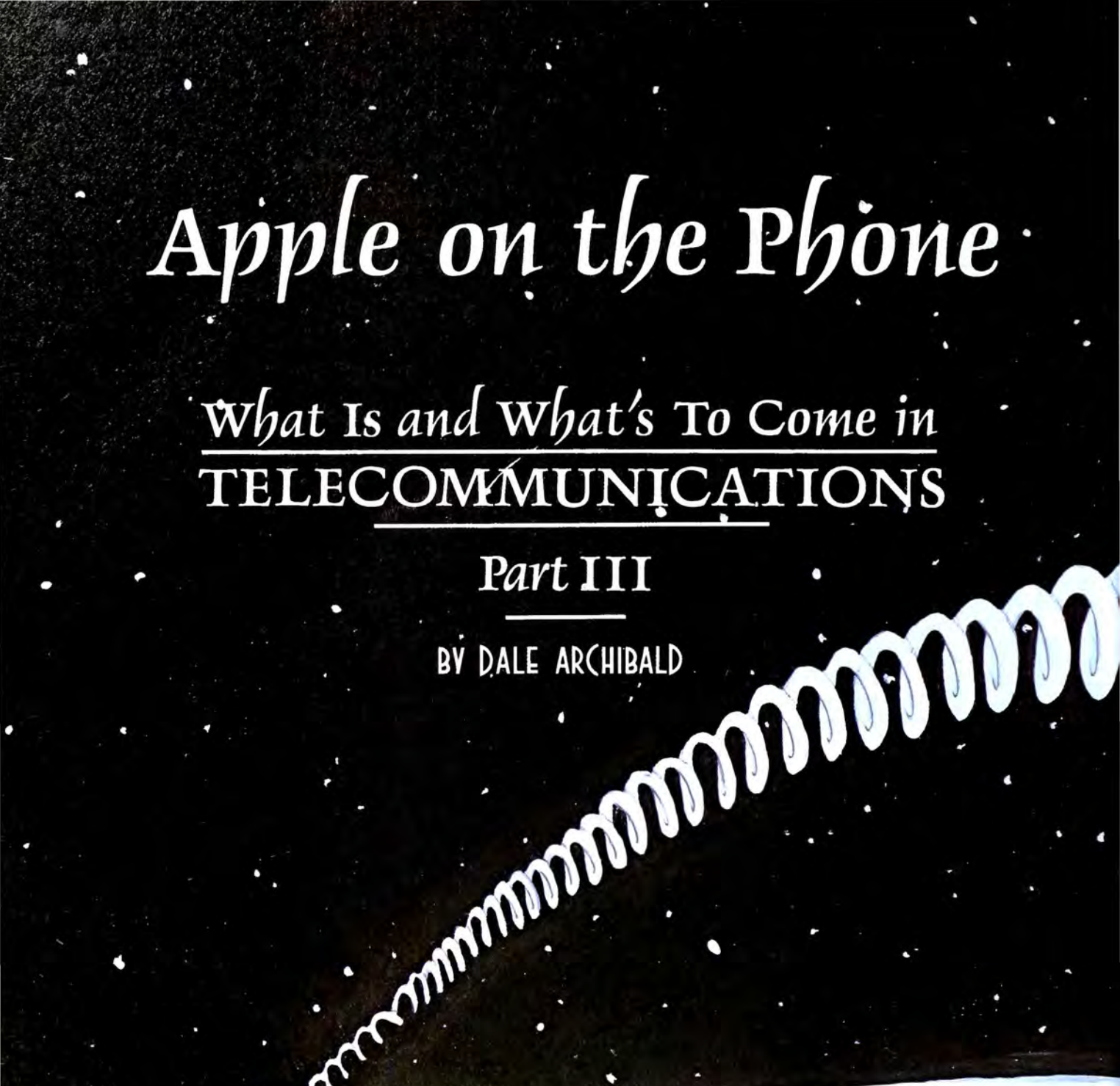
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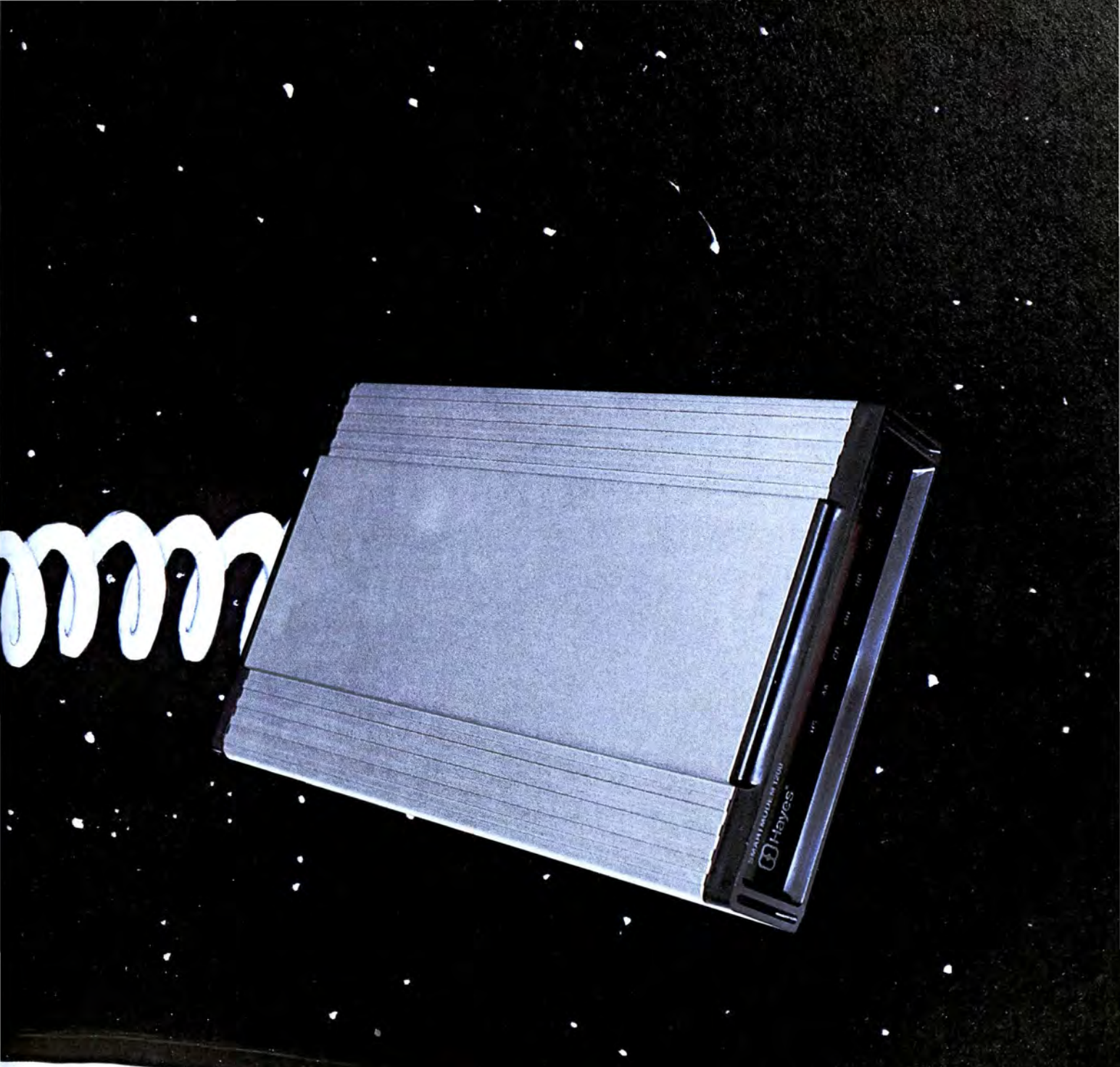
Part III

BY DALE ARCHIBALD



Travelers on the Orient Express got to see a whole lot of Europe, especially if they stopped now and then. From Calais to Belgrade, every stop they made on this grand dame of railways deposited them in a terminal. Some terminals were immense and elegant, like Grand Central Station, full of activity; some were tiny depots where travelers were lucky if the clerk knew when the next train was due—if there was a clerk.

Information is a traveler on a telecommunications railway; and data can stop only at a terminal. Some terminals are immense (or small) and elegant, called smart terminals; and some are small and plain, called dumb terminals. IBM 370s, HP 3000s, and Apples with modems are smart terminals for information; dumb terminals are keyboard-clad machines with modems that can't add two and two on their own but enable



their users to manipulate far-away smarter computers.

"Which Way Did He Go, George?" Smart terminals can pretend to be dumb ones, and they don't mind a bit. Even your Apple can pretend to be as dumb as your old Underwood if you like.

But why on earth would you like? Well, if your company happened to run its large applications on a big mainframe, your Apple, playing the role of a dumb terminal, could be your means of doing your work directly on that corporate system from your own office or home.

To run as a dumb terminal, and even to run elegantly as a smart terminal, the Apple with a modem depends on terminal software. Most terminal programs are general-purpose.

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popular is the electronic mail program. Electronic mail programs are designed to take advantage of off-times when phone rates are cheaper—they do the work so you can sleep—and offer an assortment of message arrangements. Most contain automatic clock features, so you can have your Apple send mail out at specific times to various places.

Now newer terminal packages often include the expanded electronic mail modules along with general terminal programs.

Some word processors include terminal functions or work with optional associated programs to achieve them. These functions are generally limited to the transmission of files created on the word processor.

The ultimate terminal package is the bulletin board system. Many BBSs are used for hobbyist centers; the phone numbers are publicized, encouraging any modem user to call. The atmosphere often resembles that of a user group.

But bulletin board software can be well used on a private basis, too. Any situation in which frequent exchange of electronic mail or messages within a defined group of people is desirable, or in which round-the-clock accessibility is needed, is good for a bulletin board system.

A Fishy Business. Getting into telecommunications is a bit like getting into tropical fish. You need a good grip on exactly what you want and what you want to do with it (if you want to breed, consider guppies; for beauty, perhaps angelfish. But not both: The angelfish will eat the guppies' babies), then find out what you need for what you want (a simple bowl for goldfish, a temperature-controlled aquarium of so many cubic feet per so many fish for tropical), then choose the specific items. (Aerator? Plants? Tacky statues?) In telecommunications, some decisions you make affect everything you do from then on. For example, which modem you choose determines many of the choices you'll make after that. The next thing you need is a terminal program.

Terminal Programs Strut Their Stuff. The terminal programs that come with the Hayes Micromodem and the Novation Apple-Cat II offer good results—without fancy extras—at no extra cost. But they're limited in their capacities.

Data Capture 4.0 is a low-cost terminal package with a minimum of frills and considerable features. *ASCII Express Pro* costs more but offers a multitude of features. These are fine for general use and for some uploading and downloading, although complications can set in with incompatible programs on the other end of the phone wire. *Apple Link* hasn't quite the fancy features, but you never need to worry about what's at the other end of the wire. Because *Apple Link* connects to and does business with any terminal with a modem on-line, whoever's at the other end needs no program at all.

If you need to send electronic mail to a fixed group of people or to leave an open line for others calling in to check on messages, consider a bulletin board package. Formats vary widely, from the thoughtfully subject-oriented CommuniTree to the name and chronology oriented *Net-Works II*. If all your callers have Apples, regular terminal packages *Micro/Courier* and *Transend 3* will get the job done.

Ignorance Is Bliss. Finally, if you're planning to condemn your Apple to ignorance a lot—using it as a dumb terminal through which to operate a remote computer—*VisiTerm* may fit the bill. It offers APL characters, visible control characters, and a place to design characters of your own.

Data Capture 4.0. *Data Capture* is a complete terminal program that's inexpensive and reliable. Like most terminal programs, it can be used, for the most part, only while you're tending it. There's no automatic mode. Also lacking is automatic redial.

Data Capture 4.0 does have a simple-to-use menu driving it, and it gives you five hundred lines per file, variable baud rate, special characters (with a lower-case chip), full or half-duplex transmission, and, of course, efficient uploading and downloading. A special plus is that you can make a backup and modify *Data Capture 4.0*.

Data Capture works with the Micromodem II, the Apple Communications Card, and the A.I.O. card.

There's little macro capability; the program offers two automatic log-on procedures, one for the Source and one for Dow Jones. Because *Data Capture* is unlocked, you can look at these and use them as a guide for adding other log-on routines.

The text editor that comes in the package limits messages to ten lines. When the line counter reaches five hundred, the program automatically sends a signal to the other computer to stop sending. It then dumps the file to the disk and prepares to receive the next five hundred lines.

Data Capture can convert Integer Basic and Applesoft programs to text files and send or receive them.

Micro/Courier. In the tradition of Sky Masterson, *Micro/Courier*'s day is the wee small hours of the morning. Then, when rates are cheap and lines uncrowded, and when you're peacefully sleeping, it can send and receive text files, programs, data, and graphics. Once you've told it what you want it to do and when, it no longer needs your attention.

Although its editor has a 6K limitation, the program can send files of any length. Messages or files can be sent to as many as one hundred different telephone numbers, as long as each has a *Micro/Courier* for receiving from you. By distinguishing telephone numbers by mailbox IDs, the program is able to maintain twenty-six lists of a hundred numbers each. This way, for example, a businessperson could send a report to all market analysts on the company payroll; with a clock, a publicist could send a timed press release to numerous publications by entering the message, list of publications, and time of release only once.

Micro/Courier keeps a log of messages that have been sent and messages that are ready. The log contains the message selection, current status, addressee ID, and the name of the file. It can also keep track of all incoming messages.

If you need electronic mail capability, *Micro/Courier* is one proven solution.

Micro/Terminal. *Micro/Terminal* is an expanded version of the terminal program used in *Micro/Courier*. It's completely menu-operated and easy to understand even without reference to its well-done manual.

The program uses macros extensively; fifteen lines, from A to O, can be filled with them, giving users a broad scope of rapid control. For example, you can set a macro to enter any network automatically, giving passwords and required directions to get you to precisely the subsection or area you're after.

There are no limits on the length of file *Micro/Terminal* can send or receive; when the 10K receiving buffer is full, the program sends a stop command to the host computer, saves the information on disk, and then tells the host to continue.

Micro/Terminal allows only text files; it has no provision for translating basic programs into text files.

Transend 1, 2, 3. The three *Transend* packages are rather like the house that Jack built: *1* is itself; *2* contains *1* plus a bunch more; *3* contains *2*, which contains *1*, plus a bunch more. Owners of *1* or *2* can upgrade to a higher model for the difference in price plus a handling charge.

All versions are completely menu-driven. Unique and convenient are screen-bottom references to the manual pages that deal with that screen. All versions work with more than forty combinations of serial and parallel interfaces, with most modems and modem interfaces, with Sup'R'Term, Smarterm, and Videoterm eighty-column boards, and with various clock cards.

Rather than using macros—on the theory, according to coauthor Tim Dygert, that *Transend* is intended for people who don't necessarily want to know everything about telecommunication to use it—*Transend* uses eight parameter groups. Once these are configured, choosing one automatically sets all those parameters.

Print and capture buffers in *Transend 1* can be set for incoming data, outgoing data, or both. *Transend 2* adds automatic file transfer verification where both sender and receiver are *Transends*. Both *1* and *2* have limited editors. *Transend 3* has full editing capabilities and electronic mail. In *3*, programs for transfer can be queued. And *3* can be configured to one hundred addresses and one hundred local mailboxes.

Transend 3 also offers detached mailboxes. A person with an assigned detached box can have a password and receive a disk with a word processor. Such a person can compose electronic mail on the disk and be assured that operators sending and receiving the disk's contents can't read them. If an operator should figure out the password and read the mail, the password holder gets a message that someone has been tampering with the mail.

Finally, the *Transends* compress and decompress files—taking out blank areas and repeated characters for transfer and then restoring them.

Compression can cut the size of transmissions by as much as 40 percent.

VisiTerm. The first efficient software implementation of lower case on an Apple II wasn't that in *ScreenWriter*'s predecessor's predecessor, *SuperScript*, but in *VisiTerm*, which also provides eighty-column text without hardware. There's also provision for user-designed characters, a neat feature for communicating in German or Bezardian.

Although *VisiTerm* allows nearly two hundred fifty characters in a macro, it has no automatic redial. A selection of protocols broadens the range of computers you can communicate with, and, although *VisiTerm* transfers only text files, its utilities provide for changing Applesoft, Integer Basic, and binary files into DOS text files. Watch out, though: The binary files double in size in the translation.

VisiTerm's buffer limit is 18K, and it won't stop and save automatically when it's full. You must enter a code to stop the program, save, and then continue to receive under a new file name.

Although a fitting companion for its VisiSiblings, *VisiTerm* is harder to use than most of the other terminal programs.

ASCII Express: The Professional. Bill Blue's update to *ASCII Express* is extremely flexible and surprisingly easy to use.

Macro-oriented *AEPro* can cope with baud rates up to 4800 when interfaced with an eighty-column board and at least 9600 when interfaced with a terminal capable of that. *AEPro* claims to work with all available hardware for the Apple II, including modems and eighty-column boards, and we weren't able to disprove it. It can run from a hard disk but changes some defaults.

The editor is line-oriented but has free cursor movement. Its 18K buffer can be expanded to 25.5K with memory management. In an Apple with a 16K RAM card, you get another 7.5K automatically, for a grand total of 33K.

AEPro's macro system is so extensive that you can set up specialized turnkey disks. Onto a new disk, copy the relevant parts of *AEPro* configured with appropriate macros. Booting the disk will automatically log onto the system you've set it for and go to the spot you want to be without any help from you. Such a turnkey program begins dialing by itself and, if there's a problem, redials as many times as you've configured it to.

Also via macros, you can configure your Apple to emulate other terminals, from a DEC to a Hazeltine to a Soroc.

With an automatic modem, you can leave *AEPro* unattended; no one will be allowed to log on without the password. With the Apple-Cat II in the 212 option, *AEPro* adjusts its baud rate to that of the caller.

AEPro transfers any type of file; changes the format of DOS files to Pascal or CP/M or vice versa; changes binary, Applesoft, or Integer Basic programs to text files, automatically logs onto host computers with auto-answerback; provides auto-answerback for electronic mail; and accepts mail from a forwarding mail system, saving it on disk at the conclusion of the call.

Extensive help screens, a brief mode that prints only cursory messages, file compression, freedom to jump around various elements while in terminal mode without messing anything up, the ability to do full interrupts, and a printer buffer that prevents data loss—these are a few of the extras.

Hayes Terminal Program. The *Hayes Terminal Program* that comes with the Micromodem II contains a Dow Jones converter for the *Dow Jones Portfolio Evaluator*; the program of the same name available separately consists of a terminal program only.

The *Hayes Terminal Program* is menu-driven and works with DOS, Pascal, and CP/M files. Changing operating systems is simple. It's capable of communicating at 110 or 300 baud and works with as many as six disk drives, several printer interface cards, and the Videoterm, Sup'R'Term, and Smarterm eighty-column cards.

Macro capability is limited to storing three telephone numbers. The program offers only three standard protocols.

On the other hand, a good manual provides instruction on writing special programs for the Micromodem II.

Com-Ware II. When you buy an Apple-Cat II modem, this software comes as part of the package. *Com-Ware II* does a whole lot more when one Cat's talking to another than when a Cat strays into the company of another brand modem. For example, it can transfer data at 1200 baud—between two Cats. It can perform checksum tests to verify the contents of memory at any time—between two Cats.

Com-Ware II takes control of the Apple and the Cat II for terminal operation. It sends and receives data in binary or text formats; it can convert Applesoft and Integer Basic programs into binary files and back; and it works with a wide variety of printers and host computers.

Com-Ware's autodial accepts fifty-six digits, delays, and waits for dial tones. Pressing one key redials after a busy signal. With a phone handset connected, you can talk to your contact by voice, then put down the telephone to send data.

When the Apple is being used as a terminal, you can choose to have the memory on or off. In unattended answer mode, the terminal will automatically answer.

The editor in *Com-Ware II* is very simple.

Word Processors and Electronic Mail. A few word processors don't need separate terminal programs for transmitting their files.

Executive Secretary comes with a built-in electronic mail package to send or receive text files through a Micromodem II, selectable from the main menu.

Once in that mode, the program will send or receive; the correspondent must have *Executive Secretary* or another terminal program on-line. If you have a clock in your Apple, you can tell the program when to send. You can send the entire contents of a disk by queuing up the files. Files are verified as they're sent; but only draft versions are sent, without formatting or other instructions.

Executive Secretary's terminal mode is merely for file transfer. It doesn't allow you to communicate in any other way.

Letter Perfect can be configured to send output to a Micromodem II instead of a printer. That means you can print in Peoria what you write in Mandalay. The computer in Peoria doesn't need *Letter Perfect* to receive; *Letter Perfect* documentation includes a short listing of a printer program to be used in the receiving Apple, although any terminal program set to receive text files should allow transfer.

Zip-Comm, an optional companion to *Zardax*, converts the Apple into a terminal; you are in full communication with the correspondent. The receiver need not be an Apple; anything *Zardax* can print can be sent. You can dump, draft, or print whatever file is in memory to the other machine through an acoustic coupler or a modem, including the Micromodem II. The program allows for 300 or 1200 baud.

A separate utility disk adds the *Zip-Comm* commands to *Zardax* itself, after which you can choose telecommunication mode from the main menu of the word processor. The utility disk is free with *Zip-Comm* or from *Zardax* dealers. Once you've set up your *Zardax* disk with the system, it's easy to reconfigure for various kinds of communication.

A unique option is that of having an entire terminal session saved in *Zardax* text memory for a permanent record.

A counter on-screen keeps track of how much space is left as data is coming in. When less than 256 characters' space is left, each character clicks to remind you to send a stop to the correspondent, rename and save the file, and then resume. ■

Apple Link, Computer Applications, 13300 S.W. 108 Street Circle, Miami, FL 33186; (305) 385-4277. $59.95. *ASCII Express: The Professional*, Southwestern Data Systems, 10761 Woodside Avenue, Suite E, Santee, CA 92071; (619) 562-3670. $129.95. *Com-Ware II*, Novation, 18664 Oxnard Street, Tarzana, CA 91356; (800) 423-5419, (213) 996-5060. *Data Capture 4.0*, Southeastern Software, 6414 Derbyshire Drive, New Orleans, LA 70126; (504) 246-7937. $65. *Executive Secretary*, Sof/Sys, 4306 Upton Avenue South, Minneapolis, MN 55410; (612) 929-7104. $250. *Hayes Terminal Program*, Hayes Microcomputer Products, 5835 Peachtree Corners East, Norcross, GA 30092; (404) 449-8791. $99. *Letter Perfect*, LJK Enterprises, Box 10827, Saint Louis, MO 63129; (314) 846-6124. $149.95. *Micro/Courier*, Microcom, 1400A Providence Highway, Norwood, MA 02062; (617) 762-9310. $250. *Micro/Terminal*, Microcom, 1400A Providence Highway, Norwood, MA 02062; (617) 762-9310. $84.95. *Net-Works II*, High Technology, Box 60406, Oklahoma City, OK 73146; (405) 524-4359. $99.95. *Transend 1, 2*, and *3*, SSM Microcomputer Products, 2190 Paragon Drive, San Jose, CA 95131; (408) 946-7400. $89, $149, $275. *VisiTerm*, VisiCorp, 2895 Zanker Road, San Jose, CA 95134; (408) 946-9000. $129. *Zardax*, Action-Research Northwest, 11442 Marine View Drive S.W., Seattle, WA 98146; (206) 241-1645. $295. *Zip-Comm*, Action-Research Northwest, 11442 Marine View Drive S.W., Seattle, WA 98146; (206) 241-1645. $80.

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GRAPHICALLY SPEAKING

by Mark Pelczarski

Last month we looked at a way to pack down the storage requirements of a standard 8K screen picture. While the method described can easily quadruple the number of pictures you can fit on a disk, it is not the solution for applications that require more than, say, fifty pictures per disk. The type of program that immediately comes to mind is the adventure game, in which you want to be able to display views of dozens, even hundreds, of locations easily. Any kind of program that requires a large amount of graphic information requires even better packing techniques. (On the other hand, *Sherwood Forest*, an adventure game for which Dav Holle did the graphics, does successfully use the packing routine presented last time).

When Ken and Roberta Williams wrote the first graphic adventure, *Mystery House* (with line drawings), and followed it with *Wizard and the Princess* (adding color), they used an interesting technique: They didn't store the pictures at all, just the information needed to reassemble them. Why store the pictures if you can tell the computer how to draw them, especially if telling the computer how to draw them requires much less information (in bytes)? Okay, so we tell the computer how to draw the picture.

Using a product that's a little close to home, because there's no other utility that does exactly this, we'll look at part of *Graphics Magician*. In *Graphics Magician* there is a picture-drawing utility, which in many ways is similar to others around. With it you can use paddles or a joystick to draw lines, fill areas with color, or draw with a set of "paintbrushes." The difference is, it doesn't just show what you've drawn on the screen, it saves what you do: the artist's moves. It takes these moves and, unbeknownst to the artist, puts them into a little program. The program is saved into a binary file, and to reconstruct the drawing a special interpreter called Picdraw is used. Picdraw reads through the binary program and re-creates the artist's moves at the speed of the computer, reassembling the picture right before your eyes, just as the artist originally drew it.

How's it done? We'll take a simplified example of creating a picture with just lines and a fill routine (omitting some of the options in *Magician* for clarity's sake). Start with four possible actions by the artist: (1) set the starting point of a line; (2) draw a line from the starting point to a given endpoint; (3) choose a color for filling; and (4) fill an area with color. Give each of those actions an operation code (or *opcode*, as it's called in computerese). We'll actually add one more operation, "end of picture," for our use. Figure 1 shows the different operations and the information needed for each.

Opcode	Action	Information Needed	Bytes Needed
0	Picture's finished	None	1
1	Start a line	X,Y location to start at	3
2	Draw a line	X,Y location to draw to	3
3	Choose fill color	Color number	2
4	Fill an area	X,Y location of point in area	3

Figure 1. Graphics operations.

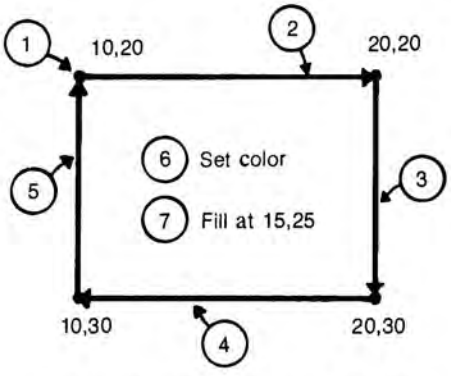
What we're doing is writing our own computer language. In a way it's much like Basic, except that, instead of writing programs by editing lines of code, you draw using a joystick or paddles and the picture editor saves the appropriate opcodes and data.

Figure 2 shows a sample program with the actual information on the left and a description on the right.

What have we done? Well, the first five instructions draw a square on the screen. Then the next two instructions fill the square with color 5 (for conversation, let's say color 5 is orange). The result is an orange square on the screen. If that's all we want in the picture, we've now compacted a hi-res screen from 8,192 bytes to 21! Of course, the more you draw, the more space it takes, but it's not unreasonable to get nice, detailed pictures in hundreds of bytes instead of thousands.

The program in figure 2 is what the computer would see. The artist would just see the results. To create the program, the artist moves the joystick so that a cursor is at the desired position on the screen, pushes a button, and command 1 is automatically generated internally. Move the cursor to another position on the screen, push another button, a line appears, and command 2 is generated inside the computer. And so it goes. . . .

The Picdraw routine in *Graphics Magician* takes several other commands, most notably *brushes*. What are brushes on the computer? They're a neat little way to use character graphics. Remember the character generator we did? Well, suppose we have a character generator that



1.	01	10	20		Start line at 10,20
2.	02	20	20		Draw line to 20,20
3.	02	20	30		Draw line to 20,30
4.	02	10	30		Draw line to 10,30
5.	02	10	20		Draw line to 10,20
6.	03	05			Set fill color to 5
7.	04	15	25		Fill at 15,25
8.	00				End of picture

Figure 2. Sample graphics program.

will plot the characters in any X,Y position on the screen, not just in the regular text columns. Suppose also that we can do this in any color we want. Now let's redefine the character patterns so that instead of As, Bs, and Cs, we've got big dots, little dots, feathered dots, and whatever looks neat. Use the character generator to plot these wherever we want on the screen in whatever color we desire, and we have paintbrushes! How useful are they? Well, instead of coloring-book pictures with outlined figures filled with certain colors, now the images can be shaded, boundary lines can be made to disappear, extra detail can be added. . . . In other words, a lot more sophistication can be added to the pictures created.

There are other tricks and benefits to using pictures created this way. One was designed; another was discovered by accident after several months of use. The picture interpreter, Picdraw, gives two options. It can clear the screen before drawing the next picture, or it can draw the next picture over what's already there. Advantage: As with adventure games, in which objects can be moved from one room to another, object pictures can be drawn after the room picture, right on top of it, giving the illusion of being part of that same picture. Thus you can save innumerable extra pictures by assembling a few components in different ways. Of course, adventure games use this technique a lot. Another example of its use is in a new Sir-tech product called *Police Artist*. In it, numerous variations of facial parts are stored and then put together in different combinations to create thousands of different faces (their package says millions, and they're probably right).

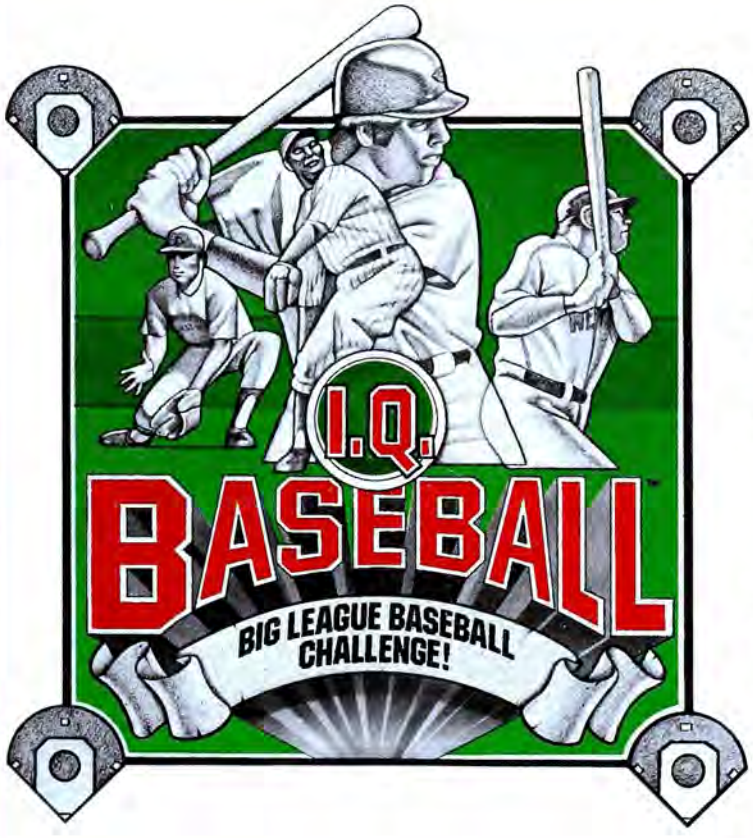
The other neat trick, unbeknownst to us when *Magician* was written, is that you can animate using pictures created this way! The story goes that the first person who discovered it was drawing a man, finished the drawing, and then decided that the eyes weren't exactly right. Instead of going back and deleting the moves that made the eyes in the first place, he just redrew over the eyes to get them the way he wanted. When the picture was redrawn with Picdraw, though, the man in the picture blinked! Recreating the artist's moves, the eyes were drawn one way, then, a split second later, redrawn another way. Since this discovery, complete choreographed animations have been done by creating a picture and drawing back over it dozens of times, with all the moves saved in the little binary picture program file. Neat stuff!

Hex Opcode (4 bits)	Bytes	Meaning
0	1	Picture end
2	1	Set line color
4	1	Set brush number
6	2	Set brush/fill color
8	3	Start line
A	3	Draw line
C	3	Plot brush
E	3	Fill

Figure 3. Graphics instructions.

For those of you who are really interested in exactly how the picture files are saved in *Graphics Magician*, figure 3 shows a breakdown of the currently used commands and their structure. Note that there's room for extra commands; these will be used for optional results and on other computers so that the picture programs can be transferred back and forth from an Apple to an Atari or Commodore or IBM, and so forth, with a minimum of fooling around required. The Picdraw routine, not listed here, consists of a line subroutine, a fill subroutine, a brush subroutine, and an interpreter that reads and interprets the instructions and calls the appropriate subroutines to redraw the picture correctly.

In the first byte of the instruction, the left four bits (four bits = one nibble) are used for the opcode. The right four bits are used for data. For example, the three-byte commands all need X and Y values, with X requiring more than one byte of storage. The high end of the X value is stored in the right nibble of the first byte. The low end of the X is stored in the second byte, and Y is stored in the third byte. In the line color and brush number commands, the right nibble is used to store that data. Since there are more than one hundred fill colors used, the set-fill-color command needs a second byte to store the appropriate number. ■



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Syncopation In 3/3 Time



A SYSTEM CLOCK INTERRUPT DRIVER

BY JOHN JEPPSON

Would you like your Apple III to turn itself back on at the appointed hour, ready to receive that important call on your modem? Or would you like your Apple III to rescue you from programmers' trance with a vital message, "Hurry up, jerk! She won't forgive you if you're late again"? Or perhaps you just want your Apple III to pause every minute, for a millisecond or so, to check a suspicious memory location in SOS . . . to see if it has changed. You need to use interrupts from the clock chip; that neat onboard real-time clock chip you recently installed in your Apple III. The one that Apple still won't admit exists.

The clock chip, National Semiconductor MM58167, plugs right into an empty chip holder at B3 on the motherboard. Of course you will need to rig a battery backup. A couple of AA cells in series gives you 3.0 volts, which is sufficient. The battery site is a round hole on the edge of the motherboard conveniently labeled "batt." The top side of the hole is negative; positive is underneath. You'll have to attach some wires. Better yet, you can get the battery and the chip in a kit, with instructions.

The MM58167 is the active element of Apple III's system clock. With this chip in place you have a functional, real-time, ticking clock that SOS will use to stamp all your files with the proper date and time. In addition, the clock is accessible from your programs. In Basic it is easy to read the system clock with the reserved variables DATE$ and TIME$. In Pascal, the *Applestuff Library Unit* contains several procedures for setting and reading the clock. And in assembly language you can use the Get time and Set time SOS calls. It's true that Apple does grudgingly admit that these facilities might be available. But they've never said a word about the interrupts; and there's a whole set of them. The interrupts are built-in features of the clock chip itself, and they are all nicely wired into Apple III's hardware, ready for you to use.

The clock chip, MM58167, is an integrated circuit device largely independent of the rest of the computer. It does require an external time reference, which consists of a 32,768 Hz crystal and a couple of capacitors. These are already present on the Apple III motherboard. One of the capacitors, capacitor C3, is a small tuning capacitor used to make fine adjustments in the clock's rate. You can get to it quite easily. Just remove the five screws holding down the plastic cover around the keyboard and lift the cover off. Then loosen the screws holding the keyboard. The keyboard is a module. It lifts up as a unit. Nothing will fall apart. Under the keyboard is a neat little hole in the middle of the metal frame; in the hole is the capacitor.

As in all crystal-controlled timepieces, the crystal's output frequency and the clock's rate vary a bit with temperature. No matter how carefully you adjust the tuning capacitor there is likely to be some small drift due to temperature fluctuations (less, perhaps, if your computer remains on all the time). Wristwatch electronic clocks enjoy the constant temperature of your wrist. But that is probably impractical with Apple III.

Table 1 shows MM58167's pin connections. The eight pins marked D0 through D7 constitute the data port through which the computer writes to or reads from the clock. The eight pins represent eight bits of one data byte. Pins A0 through A4 are address lines. They represent five bits of an address byte. The locations addressed are various registers within the chip. A computer would, for example, write the value $C4 into clock register $08 by putting the bits for binary 8 (*xxx*01000) on the chip's five address lines and the bits for binary C4 (11000100) on the eight data lines. Then the computer would send a write command to the

1. CS (chip select)	24. PWR (power maximum 5.5V)
2. RD (read)	23. Power-down
3. WR (write)	22. D7 (data bit 7)
4. RDY (ready)	21. D6
5. A0 (address bit 0)	20. D5
6. A1	19. D4
7. A2	18. D3
8. A3	17. D2
9. A4	16. D1
10. Osc in (time ref)	15. D0
11. Osc out	14. Standby interrupt
12. Ground	13. Interrupt line

Table 1. MM58167 pin connections.

control pins (RD = 1, WR = 0, CS = 0, RDY = 0), and MM58167 would do the rest. In Apple III, however, the process turns out to be a bit more complicated, as we shall see.

MM58167's power-down pin normally receives +5 volts from Apple III's power supply, as does the input power line (PWR). Whenever voltage on the power-down pin drops to zero (as when you pull the plug), MM58167 enters a low-power operating mode. It remembers and counts time, but it does not respond to the I/O lines, and it uses very little power—power that now comes from battery backup.

Table 2 shows the various registers in the clock. The addresses of these registers are each five bits in length, corresponding to the five address lines (A0 through A4). Not all possible addresses are used. The computer writes or reads each register as an eight-bit byte. As far as the clock is concerned, however, each four-bit nibble functions independently, which will be important to keep in mind. The counter and RAM registers are merely a grouping of two nibbles at a time for access by the host computer.

Registers $00 through $07 are counters. They contain the actual time information being counted by the clock. All time information is stored in binary-coded decimal (BCD). Each four-bit nibble, therefore, contains one decimal digit. If register $06 (day-of-month) contains 15, then that indicates the fifteenth day of the month. Programs must transpose BCD back to hexadecimal or ASCII or whatever the caller requires.

Two of the counter nibbles are never used: the low nibble of register $00 (.001 seconds) and the high nibble of register $05 (day-of-week). These each permanently read 0. Similarly, several individual bits in other nibbles are never used by any legal time or date value. The highest month value, for example, is 12. So bits 5, 6, and 7 of register $07 can never legally be set. Such unused bits are also permanently zero and cannot be changed.

Registers $08 to $0F are RAM. These registers are used as a comparison latch. Each nibble corresponds to a similar nibble in the counter registers. You may store any values you wish in the comparison latch. Then you may command MM58167 to produce an alarm interrupt when the counters match up with the stored RAM values. Once again, the low nibble of register $08 and the high nibble of register $0D are permanently zero. But, unlike the counters, all four bits in each of the other nibbles can be used.

When you are setting up comparison values for an alarm interrupt (for example, an alarm at 11:30 a.m. today) it is not always necessary to specify every nibble to be matched up. If you set the higher two bits of any RAM nibble, then that value becomes a "don't-care" nibble and will always produce a match. This can never be confused with any "required-match" values you might use. The highest legal BCD value of any nibble is 9, but no BCD value in the range 0 to 9 has both higher bits set at once. Remember that we are talking about four-bit nibbles, not eight-bit bytes. If register $0B (RAM minutes) contains C5, then the tens-of-minutes nibble is a "don't-care" value, but the unit minutes (value 5) must still make a required match with the unit-minutes counter.

The remaining registers, $10 through $16 and $1F, are control registers. Register $1F (for which we have no documentation) is listed as test mode. Reading this register yields FF, which we sincerely hope is a desirable result.

Register $14 is the status bit. SOS looks for this register to see if you have installed the clock. The real function of the status bit, however, is to notify you when a counter roll-over has occurred during a read operation. If so, the status bit will contain $01. If the clock ticks at the very moment you are trying to read one of the counters, the read might yield an error. So you should check the status bit each time you have read a counter and reread if necessary until the status bit reports 00.

Writing any value to register $15 executes the *go* command. This command does not start the clock; the clock always counts while power is applied. The go command merely resets the seconds and fractional-seconds counters to zero. It is useful when synchronizing the clock with the current real time.

Registers $12 and $13 are designed to reset the counters and the RAM latches respectively. You are supposed to be able to reset individual registers by writing a 1 at the bit position corresponding to that register. For example, writing 04 (00000100) to the counter reset (register $12) should reset only the seconds counter (register $02). But these reset controls simply do not work properly in Apple III, presumably due to the bizarre method by which Apple III addresses the clock. We'll get to that. It is possible to reset all the registers by writing $FF, but it's not possible to reset individual registers by writing to particular bits.

MM58167 has two interrupt modes, alarm mode and tick mode. Alarm mode interrupts are the type discussed previously. An alarm interrupt is triggered when all counter nibbles match up with stored values in the RAM comparison latch (some of which may be "don't-care" nibbles). This type of interrupt is armed by writing a 1 into bit 0 of the interrupt control register (register $11).

Tick interrupts occur at specified intervals: every second, every minute, and so on. These interrupts are armed by writing 1s into other bits of the interrupt control register. Table 3 lists the interrupts that each bit controls. It is legal for several bits to be active at the same time.

When the specified interrupt event occurs, two things happen. The interrupt line going to the 6502 becomes active, and the bit value appropriate for that interrupt appears in the interrupt status register (register $10). The interrupt handler must clear the interrupt flag by reading the interrupt status register. This both clears and resets the interrupt. The value obtained can also be analyzed to determine which clock event triggered the interrupt, in case more than one is armed. The only way to disable these interrupts completely is to write $00 to the interrupt control register (register $11).

These are ordinary, normal, everyday sorts of interrupts. MM58167's interrupt line becomes active and, by a devious route, pulls down the interrupt request line (IRQ) on the 6502 cpu chip. The 6502 then interrupts whatever it is doing and switches control (via SOS) to your interrupt handler.

There is, however, a second, entirely different interrupt system available on the MM58167 clock. This is a *standby interrupt*, used when the computer itself is turned off. The standby interrupt is a type of alarm interrupt. It occurs when all the counters match up with stored values in the comparison latch, exactly as in the alarm-mode interrupts discussed previously. In this case, however, the signal is sent on a different wire . . .

$00	U0	Counter	Thousandths of seconds in high nibble [00.90]
$01	UU	Counter	Hundredths and tenths of seconds [00.99]
$02	SS	Counter	Seconds [00..59]
$03	MM	Counter	Minutes [00..59]
$04	HH	Counter	Hours [00..23]
$05	0W	Counter	Day-of-week in low nibble [1..7]
$06	DD	Counter	Day-of-month [01..31]
$07	NN	Counter	Months [01..12]
$08	x0	RAM-latch	Thousandths of seconds in high nibble
$09	xx	RAM-latch	Hundredths and tenths of seconds
$0A	xx	RAM-latch	Seconds
$0B	xx	RAM-latch	Minutes
$0C	xx	RAM-latch	Hours
$0D	0x	RAM-latch	Day-of-week in low nibble
$0E	xx	RAM-latch	Day-of-month
$0F	xx	RAM-latch	Months
$10	read only		Interrupt status register
$11	write only		Interrupt control register
$12	write only		Reset counters
$13	write only		Reset RAM comparison latches
$14	read only		Status bit
$15	write only		"GO" command
$16	write only		Standby interrupt
$1F	read only ?		Test mode

Table 2. MM58167 registers and functions (register contents BCD).

Bit	Value to Write	Interrupt Type
0	01	Alarm mode
1	02	Every tenth of a second
2	04	Every second
3	08	Every minute
4	10	Every hour
5	20	Every day
6	40	Every week
7	80	Every month

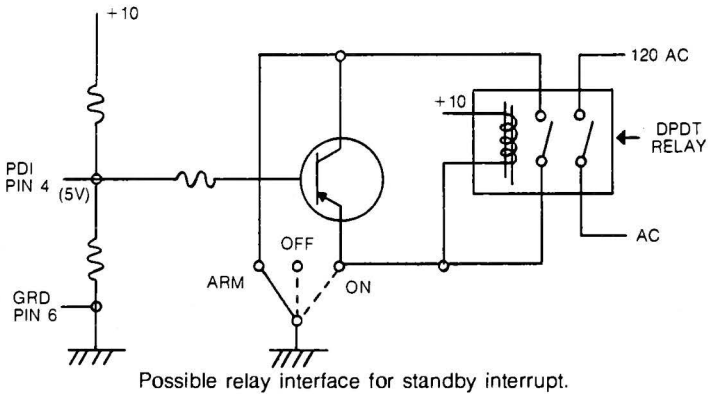
Table 3. Interrupt control register bits and functions.

to one of the pins on the back of Apple III. And when, pray tell, did Apple tell you about that?

Pages 132 and 133 of the *Apple III Owner's Guide* contain a listing of pin connections in Apple III's color video port. Pin 4 is listed as "PDI Not used," a remarkable combination of label and denial. The manual doesn't say so, but PDI stands for power-down interrupt.

Standby interrupts are armed by writing $01 to MM58167 register $16. They are both cleared and disabled by writing $00 to the same register. Standby interrupts are completely independent of the aforementioned ordinary alarm and tick interrupts. And they have no effect on Apple III's internal interrupt-handling mechanism.

The standby interrupt remains active while MM58167 is operating in its low-power mode—that is, after the computer itself is powered down. You can set this alarm for some future time and then turn off your machine. When the appointed hour arrives, the clock will pull down the interrupt wire connected to that external pin. With a few pieces of inexpensive hardware you can detect that signal and use it to turn your computer back on again. The following diagram shows a typical schematic.



Possible relay interface for standby interrupt.

Addressing the Registers. The MM58167 clock chip was designed to have its registers mapped into a computer's memory space where the cpu could then address each register directly. In Apple III, however, the 6502 cpu is surrounded and protected by a complicated bank-switching mechanism, a mechanism that permits Apple III to handle 256K bytes of memory while using a cpu that can address only 64K bytes at a time. The fundamental technique is to use the output registers of two onboard 6522 versatile interface adapters (VIAs) to provide extra address information for accessing memory. This extra information constitutes the extra address bits, or lines, required to create a unique address for each location in memory.

Thus Apple III's bank register appears to be memory location $FFEF. Its value (the lower nibble) determines which 32K user memory bank is currently on-line. More accurately, $FFEF is the E-VIA's output register for I/O port A. A value placed here is sent onto address lines, which, in turn, form part of the address information selecting various regions of memory. Similarly, the zero page register, location $FFD0, is actually the D-VIA's output register for I/O port B. Its value determines which memory page will be used as the 6502's zero page.

Access to MM58167 is much the same. The clock's eight data lines are mapped into ordinary memory space. They are connected to the eight bits of memory location $C070 (in I/O space). This is the clock's data port. But the clock's address lines, which select various clock registers, are not part of an ordinary memory address. They are connected, instead, to D-VIA's output register for I/O port B, which is location $FFD0, more familiarly known as the zero-page register. So in order to access a particular clock register you must first write the desired register number to location $FFD0 (D-VIAORB). The VIA, in turn, places those same address bits on MM58167's address lines. Then you write your data byte to location $C070, the clock's data port.

For example, to place value $24 in the day-of-month counter:

```
ClockReg    .equ    0FFD0       ; D-VIAORB (alias zero-page
                                  register)
ioClock     .equ    0C070       ; clock data port (I/O space)
            lda     #06         ; register number for
                                  day-of-month
            sta     ClockReg    ; set address lines using VIA
            lda     #24         ; BCD value
            sta     ioClock     ; the clock's data port
```

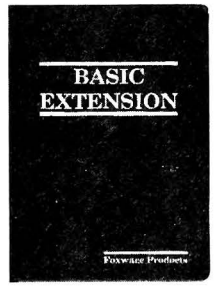
Remember that while reading counters the value obtained is unreliable if a counter roll-over has occurred during the read. This circumstance is detected by checking the status bit. The following, slightly more complicated routine will read and transfer all counter values to a buffer in memory:

```
            ldx     #00         ; start with clock register 00
            ldy     #14         ; reg. number of clock status bit
$1          stx     ClockReg    ; set address lines
            lda     ioClock     ; read data port
            sta     buffer,x    ; save in your buffer
            sty     ClockReg    ; switch to status bit register
            lda     ioClock     ; check status bit
            bne     $1          ; reread if not zero (roll-over)
            inx                 ; next counter
            cpx     #08         ; from 00 to 07
            bcc     $1
```

This routine works fine provided "buffer" refers to a sixteen-bit address in the currently switched-in banks. But what would happen if your buffer were on zero page? Well, zero page is a variable, determined by the zero page register ($FFD0), the very same register we have now redefined as ClockReg. In this routine, zero page changes with every pass through the loop. So writing to a zero-page buffer would spray data all over the place. The same is true for extended addressing, which also uses zero-page registers. Furthermore, the xbyte mechanism in extended addressing isn't even defined for zero pages outside the range $18 to $1F. The pitfalls of Apple III programming!

As noted, the counter and comparison latch reset controls don't work. These controls use registers $12 and $13 respectively. We speculate that the difficulty may be related to the 6502's method of performing a write. First it reads, then it writes. So a write instruction (for example, STA $C070) actually produces two 0.98 microsecond pulses spaced 24.43 nanoseconds apart. Perhaps this disturbs the clock, or the VIA. Or perhaps some other timing incompatibility exists among VIA, 6502, MM58167, and whatever else Apple III has mixed into the stew. In any

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event the reset controls behave as though the clock begins accepting data before the data-line information has become valid. So writing to the reset control registers causes MM58167 to reset a lot more registers than you really want it to.

Such hardware incompatibilities may have been the trouble with Apple III's system clock from the beginning. During our own experiments the other registers all appear to perform correctly. But the SOS routines that access the clock do go to great lengths for accuracy, reading and writing each register repeatedly and going over loops up to eight times. We hope all that is a relic of problems with some other clock chip. But for all we know the original chip was the same MM58167, or its prototype. Apple maintains its customary silence.

The access routines in SOS also slow the 6502 timing pulses clock to 1 MHz while talking to the MM58167 clock. Doubtless you should too. Just set bit 7 of the environment register ($FFDF). The main virtue of slowing the 6502 clock, as we understand it, is greater length and regularity of the timing pulses. (No, the reset registers don't work at 2 MHz either.)

If you are working in a driver, the only other thing you must remember to do is disable 6502 interrupts while talking to the clock. (They are already disabled when you enter an interrupt handler.) The 6502 interrupts should always be disabled by PHP and SEI, and later reenabled by PLP. This will return the interrupt status to whatever it was before. Perhaps the interrupts were already disabled. It is particularly important to restore the correct zero page before reenabling interrupts. When interrupts are acknowledged, control is transferred to SOS. And SOS gets very upset if it finds out you've been messing with zero page.

There are some other problems if you are working in the user environment, such as in an interpreter or an assembly language module. In addition to slowing the clock and disabling 6502 interrupts, you must also change $C000..CFFF from RAM to I/O space by setting bit 6 of the environment register. And, most important of all, you must avoid all use of the stack while monkeying around with zero page. This means using no subroutines until zero page has been restored. In user environment (and only in user environment) the stack is alternate stack—not the normal 6502 stack, which is true page $0100. Alternate stack is zero page EOR $01, wherever that happens to be. In practice, the user environment is always assigned zero page $1A, so the alternate stack is always on $1B . . . except when you've been messing around. If you change zero page, you change stack page. So if your access routine involves a JSR, well, who knows where the return address will be stored, or what it will obliterate. So no JSRs, no PHAs, no stack commands of any kind are recommended until zero page has been restored. Also, and for the same reason, no SOS calls. SOS even checks all SOS-call requests to be sure the caller's zero page is $1A. If there has been any hanky-panky SOS crashes the system.

We hasten to add that it is violently opposed to the spirit of Apple III even to disable interrupts in the user environment, let alone all that fancy stuff with zero page. Apple reserves a special place in hell for such wickedness. But what is a poor programmer to do?

Errors Anonymous. During each boot SOS initializes all sorts of things. Table 4 contains a disassembler listing of a subroutine that is executed during boot. It is obviously intended to disable both internal and standby interrupts from MM58167, whether you want them disabled or not. As it happens, Apple made a little booboo: Someone forgot to enable I/O space. When the subroutine is called, $C000..CFFF is RAM. So the reset attempt doesn't work and you don't need to worry about your alarm interrupt being turned off prematurely. Whatever you have set in MM58167's interrupt control registers will remain in action even when you reboot, at least until the next version of SOS.

```
29D3: AD DF FF  *  LDA  FFDF ; save environment register
29D6: 48        *  PHA       ;      on stack
29D7: 09 80     *  ORA  #80  ; slow to 1 MHz
29D9: 8D DF FF  *  STA  FFDF ;      (should be ORA #C0)
29DC: A9 00     *  LDA  #00  ; value to write
29DE: AC D0 FF  *  LDY  FFD0 ; save zero page in Y
29E1: A2 11     *  LDX  #11
29E3: 8E D0 FF  *  STX  FFD0 ; interrupt control register
29E6: 8D 70 C0  *  STA  C070 ; disable internal interrupts
29E9: A2 16     *  LDX  #16
29EB: 8E D0 FF  *  STX  FFD0 ; standby interrupt control
29EE: 8D 70 C0  *  STA  C070 ; disable standby interrupts
29F1: 8C D0 FF  *  STY  FFD0 ; restore zero page
29F4: 68        *  PLA       ; recover old environment
29F5: 8D DF FF  *  STA  FFDF ;    and restore it
29F8: 60        *  RTS
```

Note: Addresses are location in memory when run.
Routine begins at $0BD3 in file SOS.Kernel.

Table 4. SOS init: intended to disable MM58167 interrupts.

For all practical purposes this is useful only for standby interrupts. The reboot process does disable *reception* of internal interrupts. So even if your clock thinks it's sending internal interrupts, nobody is listening . . . until you reenable the VIA. In fact, your MM58167 is probably sending out interrupts right now. They obviously aren't hurting anybody.

Apple's little error does introduce a bug into the operating system. Instead of writing a zero to the clock's data port, it stores a zero in location $C070 in SOS.Kernel, obliterating that location's rightful contents and changing the code (see table 5). We don't know the function of this section of code, but we know it contains a bug.

The Year Problem. When you access DATE$ from Basic, or perform a get-time SOS call from assembly, SOS reports the year. But there is no counter in MM58167 for the year. So where is it kept? Why, in the only possible place, the RAM comparison latch, the only RAM in Apple III with battery backup. "Aha!" you say, "then how are we supposed to set up our alarm-clock comparison time if the comparison latch is all cluttered up with the year?" It's a problem.

We're going to have to share. Apple chose to place the year in the uppermost two bytes of RAM— that is, in the comparison-latch registers intended for matching with day of month and month counters (registers $0E and $0F). But the year value is first converted, by some devilishly compact code, into "don't-care" nibbles. So it is still possible to create an alarm-clock match in the other registers. You yourself can't use the day of month or month registers, but they will always match up because of the "don't-care" nibbles. You may still set your alarm for any specific time in a twenty-four hour day on any specific day-of-week.

Normally the end user, that's you, provides SOS with time information in the form of ASCII digits. SOS then translates those ASCII values, including the year, into binary coded decimal for storage in MM58167. The year, two ASCII digits, becomes one byte, or two nibbles of BCD. Finally, before storage, the year is further converted into four "don't-care" nibbles. So the year now occupies four nibbles, or two full registers.

When you are creating "don't-care" nibbles, remember that it is not enough just to set the upper two bits of a byte. Since MM58167 handles each nibble independently, each *nibble* must have its two upper bits set. The required form is (11*xx*,11*xx*). Table 6 shows how SOS encodes the year and later recovers it. Were it not for this "don't-care" conversion, only one comparison-latch register would have to be sacrificed instead of two.

Apple's method sacrifices any alarms involving a future day-of-month or month. But the alarms it does permit are capable of triggering an interrupt accurate to one-thousandth of a second. Assuming, of course, that you have apparatus hooked up that can use that kind of accuracy—certainly not your eyeball. Furthermore, in real-time applications, you may find it difficult to set the clock or adjust its rate to such tolerances.

It isn't so much that you can't use the upper two registers; obviously you can. But no matter what you store in those registers, SOS will overwrite it with the next Set time SOS call. Each time you boot a Pascal disk, such as Utilities, Pascal asks SOS for the year. If SOS cannot return a valid year, then Pascal will reset the clock using a year value stored in the

```
      C069:  A0  00      LDY     #00
      C06B:  B1  B6      LDA     @B6,Y
      C06D:  F0  2C      BEQ     - > C09B
--> C06F:  A0  00      LDY     #00
            on the disk this reads:  LDY     #10
      C071:  B1  B6      LDA     @B6,Y
      C073:  C5  35      CMP     35
      C075:  D0  10      BNE     - > C087
```

Table 5. Alteration of SOS code -- A Bug.

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```
ClockReg .equ 0FFD0     ; D-VIAORB (alias Zero Page Register)
ioClock  .equ 0C070     ; clock data port (I/O space)
Storage                         Recovery
ldx     #0E             lda     #0F
stx     ClockReg        sta     ClockReg
lda     YearBCD         lda     ioClock
ora     #0CC            sec
sta     ioClock         rol     A
inc     ClockReg        rol     A
lda     YearBCD         dec     ClockReg
lsr     A               and     ioClock
lsr     A               sta     YearBCD
ora     #0CC
sta     ioClock
Net Effect: YearBCD (7654,3210) < --- > Reg $0E (XX54,XX10)
                                        Reg $0F (XX76,XX32)
```

Table 6. SOS conversion of year to "don't-care" nibbles.

file System.Miscinfo on the boot disk. Zap goes your comparison time (and your current time as well). We stress, however, that the year problem involves only alarm-mode interrupts. Tick interrupts don't use the comparison latch and consequently are not affected.

There is another (perhaps better) way. The year could be placed in register $09, which compares tenths and hundredths of seconds. No matter what year it is, a match would always occur within a second, when the corresponding counters count "past" your stored year. In this case the year would be stored as a BCD value. Conversion to "don't-care" nibbles is unnecessary, and only one comparison register need be sacrificed. In fact, with a little more code, one of the (BCD) year nibbles could be placed in the hundredth-second comparison nibble and the other in the thousandth. That would always provide a match within a tenth of a second.

It is quite easy to modify SOS if you really want to use this alternative storage method. You will find, however, that day-of-month and month interrupts are actually useful only for standby power-down interrupts. Ordinary internal alarm interrupts, for a variety of reasons, cannot remain operational past a reboot. Furthermore, standby interrupts require external equipment that you'll probably have to build yourself. But if you are truly determined, table 7 shows which bytes of SOS.Kernel to change. The revised code is shorter, so it's only a matter of loading SOS.Kernel from disk into a suitable buffer using Pascal's Blockread procedure. Then substitute some bytes of your own code and a sufficient number of no-operation fillers. Finally, use Pascal's Blockwrite procedure to write the file back onto the disk.

We confess that it is gratifying to modify *something* in SOS—sort of a swipe at Big Brother, and a taste, however illusory, of mastery over one's fate. Apple, of course, will instantly counter by releasing the next version of SOS. And there you are, back to square one.

Getting Apple III to Listen. As we have seen, standby power-down interrupts from MM58167 function outside Apple III in external relays and other equipment attached to pin 4 (PDI) of the color video port. The pathway for standby interrupts is quite simple. MM58167's signal apparently goes directly to the external pin. (If, perchance, it is also connected to some memory location, we haven't found it.)

Not so for internal interrupts. These are intended to break into the activities of Apple III's cpu and divert the computer (temporarily) to whatever task you have set out in your interrupt handler. Internal interrupts, which really are ordinary, everyday interrupts, take a far more tortuous path in Apple III. Generating such interrupts in MM58167 is just the beginning. There are several more steps to accomplish: allocating the system internal resource (SIR); enabling the appropriate VIA control line; providing an interrupt handler (assembly code)—it must remain in memory; (optional) providing event handlers (assembly code)—they must also remain in memory.

MM58167 is but one of several sources capable of generating interrupts. Others include the keyboard, RS-232 port, video sync signal, character set downloading mechanism, and each of the slots. Each potential source of interrupts is called a system internal resource and is assigned a unique SIR number.

Allocation of SIRs is a general mechanism by which SOS coordinates all these resources and prevents conflicts between programs over ownership rights. Before using a resource, you are expected to call the SOS subroutine AllocSIR, which allocates and reserves use of that resource to your program, assuming it is not already allocated to someone else. Most important, if you intend to use interrupts from a resource, AllocSIR keeps a record associating that particular interrupt source with the appropriate interrupt handler address, which you must supply. Otherwise, SOS would not know which interrupt handler to call when an interrupt occurred. Naturally, when you are through with a resource you are expected to release it by calling DealcSIR.

Incoming interrupt signals are never passed directly to the 6502. Instead, they all arrive on special control lines belonging either to the D and E VIAs or to another specialized I/O helper chip, the ACIA (6551 asynchronous communications interface adapter). The ACIA owns the RS-232 serial port, but everything else seems to be tied to the VIAs. Physically, each SIR number is associated with a particular control line (wire) on one of these helper chips. Table 8 lists those SIR numbers known to us, as well as their associated control lines.

For the sake of completeness, we should note that Apple documentation also mentions certain logical operations that must be shared and are, therefore, assigned SIR numbers even though they don't involve interrupts—presumably for the purpose of preventing squabbles. The documentation does not, of course, reveal just what those logical operations might be. We have noticed, however, that the character set downloader routine in the console driver requests allocation of SIR #$10, which we happen to know is not a hardware interrupt line. We suspect this resource consists of exclusive use of the screen holes in video memory. But we don't really know.

MM58167, you will notice is SIR #$03. So before using interrupts from MM58167 you should call AllocSIR and request SIR #$03. In the same call you must also give SOS the address of your interrupt handler.

```
Change:  $3B9F: 09
         $3BA6: EA, EA
         $3BAB..$3BB7: EA, EA, etc. ($0D bytes)
         $3BFF: 09
         $3C06..$3C0E: EA, EA, etc. ($09 bytes)
         $3CB0: 09
         $3CB7..$3CBF: EA, EA, etc. ($09 bytes)
Note: Addresses are relative to byte $0000 of file SOS.Kernel.
```

Table 7. SOS.Kernel patch for year storage in MM58167 register 09.

SIR#	Resource	Control Line		
$00	?	none		possibly not used
$01	ACIA	ACIA – both receive and transmit lines		
$02	Keyboard	E-VIA	CA2	
$03	MM58167	E-VIA	CA1	
$04	?	E-VIA	SR	possibly not used
$05	(Sync ?)	E-VIA	CB2	
$06	(Download ?)	E-VIA	CB1	
$07	?	E-VIA	T2	possibly not used
$08	?	E-VIA	T1	possibly not used
$09	?	D-VIA	CA2	
$0A	Any slot	D-VIA	CA1	also flags listed below
$0B	?	D-VIA	SR	possibly not used
$0C	?	D-VIA	CB2	
$0D	?	D-VIA	CB1	
$0E	?	D-VIA	T2	possibly not used
$0F	?	D-VIA	T1	possibly not used
$10	(Screen Holes?)	none		
$11	Slot 1	C065	bit 7 clear	also any-slot flag above
$12	Slot 2	C064	bit 7 clear	same
$13	Slot 3	FFEF	bit 5 clear	same
$14	Slot 4	FFEF	bit 4 clear	same
$15..$17				noninterrupt—if they exist at all.

Note 1: Slot interrupts all pull down D-VIA CA1. This tells SOS it is a slot. SOS then checks the other listed flags to tell which one.

Note 2: E-VIA CB2,CB1 (SIR# $05,$06) are both pulled down (not simultaneously) during each screen refresh (60 Hz), whether video-enabled or not.

Table 8. System internal resources and their interrupt lines.

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See the accompanying driver program for an example of the method.

Now you own the resource, but your interrupt signal will still stop at the VIA. You must next enable the appropriate VIA control line. This is done by writing to the VIA interrupt enable register (E-VIAIER is location $FFEE). The value to write should have a 1 in bit 7 and a 1 in the bit that corresponds to the desired control line (bits 0 to 6 for the lines listed in table 8). Thus MM58167 interrupts are enabled (at the VIA level) by writing $82 (10000010) to location $FFEE. Before doing so, however, you should clear any stray interrupts already present by writing the same value to $FFED, the interrupt flag register (E-VIAIFR).

When you are through with the clock, interrupts must be disabled at the VIA in a similar manner by writing $02 (00000010) to location $FFEE (E-VIAIER). And, of course, you must release SIR #$03 by calling DealcSIR.

Responsibilities of the Interrupt Handler. Your interrupt handler must clear two interrupt flags, one in the VIA and the other in MM58167. The VIA flag is cleared by writing a 1 in the appropriate bit position of the interrupt flag register—in this case, by writing $02 in location $FFED. The interrupt is thereby reset and remains armed.

Next you should read MM58167's interrupt flag register using the devious methods discussed earlier (and don't forget to restore zero page to its proper value). The act of reading this register clears and resets the interrupt, and the value read will contain a 1 in the bit position corresponding to the particular clock roll-over that triggered the interrupt (table 3).

Finally you are ready to perform your task. In the accompanying driver program this is merely toggling whatever character is in the lower-left corner of the screen between normal and inverse. Hopefully you will have something more profound in mind.

One of the most important things your interrupt handler can do is queue an event. The accompanying driver includes an example showing the necessary details. Event handlers are assembly language routines much like interrupt handlers. And, like interrupt handlers, they can be embedded right in your driver where they are safe from being overwritten by Pascal or by some other blundering interpreter. Alternatively, and with appropriate care, your event handler may be kept in some more convenient place, such as a Pascal assembly language procedure or a Business Basic invokable module. Of course you must arrange to get the appropriate three-byte address so that your interrupt handler can pass it on to SOS.

Since interrupt handlers and event handlers are both assembly language routines, you might suppose there would be no point in using one to call up the other. But event handlers run in the "user" environment. You can issue SOS calls and use extended addressing and all those other good things that, in the interrupt handler environment, are strictly forbidden.

There is a price, or a danger, involved. Events, unlike interrupts, never interrupt SOS. Events are processed only when the user program, such as an interpreter, would otherwise be running. So if Pascal issues a SOS call requesting an input byte from the keyboard, SOS will wait forever for that input. And no events will be processed until SOS has obtained its input byte and is ready to return control to Pascal. Meanwhile, if you are using tick interrupts at, for example, the rate of one a second, your interrupt handler is being called each and every second. And if your interrupt handler, in turn, is madly queuing up another event every second, then the event queue is rapidly going to overflow. Its capacity is strictly limited.

You would think that SOS would politely decline a QueEvent request if the event queue were full and about to overflow. But no; it just barges right ahead, overflows the event queue, crashes the system, and writes "System Failure $05" in flaming letters all over your monitor screen. Most depressing. Pending a more forgiving version of SOS (don't hold your breath), it might be a good idea to work out some sort of semaphore system between your interrupt handler and your event handler. The interrupt handler can then refrain from queuing events until those already in queue have been processed.

Only for Those Who Already Want To Modify the Accompanying Driver. In the interest of brevity, there is no provision in the accompanying driver for merely reading or setting the current time. If you wish to include these facilities, you will need to implement DRead, DWrite, DOpen, DClose, and possibly status code 2 and control code 2. The latter two normally handle the newline mode and character. You should also bear in mind the following points:

1. In DRead and DWrite you should probably return and expect ASCII values in the same format used by the Set-time SOS call. But you should transfer only the number of bytes requested by SOS, up to a maximum of eighteen ASCII digits. The requested number is on zero page in locations $C4,C5. For DRead you should also report the number of bytes read in zero-page locations $C8,C9.
2. The eighteen ASCII digits should be (without spaces):

   19YY MM DD W HH NN SS UUU

3. Pascal (Read, Readln, and so on) will ask for one byte at a time. You should somehow arrange to return successive registers up to eighteen ASCII digits, then a carriage return, and then start over.
4. Basic (input #1, and so on) will ask for 255 bytes. Send it eighteen ASCII digits and a carriage return.
5. Just read or write the appropriate counter registers, remembering that MM58167 expects BCD values. The only other problems you're likely to encounter are manipulating the year (see table 6) and computing the day-of-week (see Zeller's Congruence, a subroutine in the program *Timeset* on the Business Basic disk).

Sysclock Interrupt Driver Instructions and Information. Once assembled and placed in SOS.driver, Sysclock Driver can be used from any language. Its form is that of a standard character device driver, but it responds only to status and control calls. Status and control calls may easily be issued from Basic using request.inv invokable module or from Pascal using Unitstatus procedure.

Available Status Requests:

Status code: 3 (returns rate parameter, comparison latch values)
  Status list: rate (one byte—see table 3 for significance of bits)
    MM58167 registers $08..$0F (eight bytes—see table 2)
  Note: Buffer must be at least nine bytes in length to avoid overwriting other data in memory.

Status code: 5 (returns event parameters)
  Status list: (five bytes)
    priority, ID, handler address L, H, Bank

Available Control Requests:

Control code: 0 (reset device—disable all MM58167 interrupts)
  Control list: (nil)

Control code: 3 (Enable/disable internal interrupts.)
  Control list: rate (one byte—see table 3 for significance of bits)
    MM58167 registers $08..$0F (eight bytes—see table 2)
  Note: Once started at a specific rate, interrupts must be disabled by using rate 00 (or by control-code 0) before a new rate can be entered.
  Note: If an alarm-mode interrupt is requested (bit 0 of rate is set), then new RAM values (eight bytes) are transferred to the MM58167 comparison latch. Otherwise these bytes of the control list are ignored. Did you preserve the year? (See text.)

Control code: 4 (Enable/disable standby power-down interrupt.)
  Control list: rate (00 = disable; 01 = enable)
    MM58167 registers $08..$0F (eight bytes—see table 2)
  Note: During enable new RAM values (eight bytes) are transferred to the MM58167 comparison latch. During disable these bytes are ignored. Did you preserve the year? (See text.)

Control code: 5 (Change event parameters.)
  Control list: (five bytes)
    priority, ID, handler address L, H, Bank
  Note: On power-up, event parameters are set to the embedded event handler in this driver, and the event is armed. This call allows you to substitute the address of another handler. If you set priority to zero, events will be disabled.
  Warning: Your event handler must still be in memory whenever it is called; otherwise the system will crash. If you cannot guarantee that your handler will remain in memory, don't use events.

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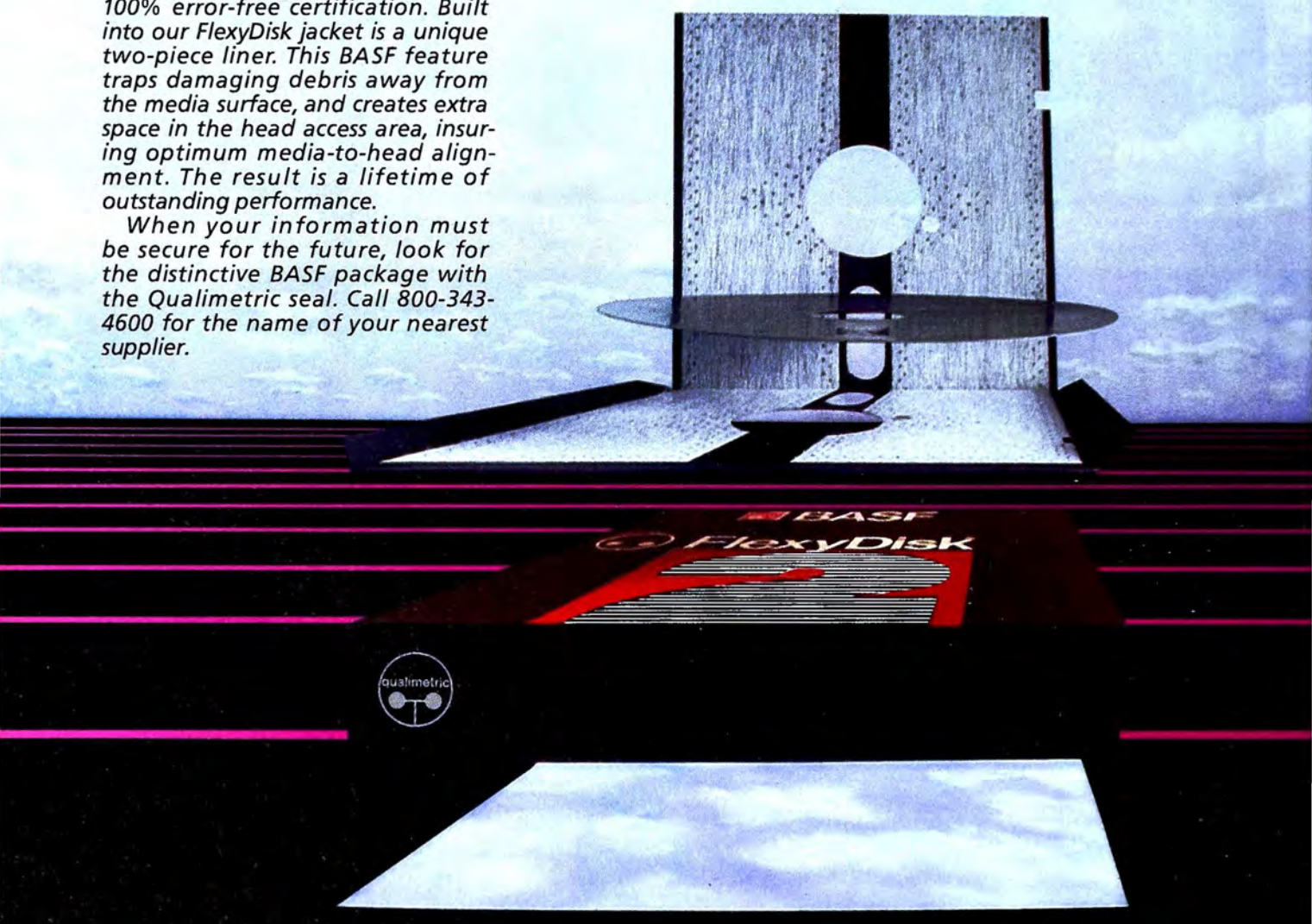
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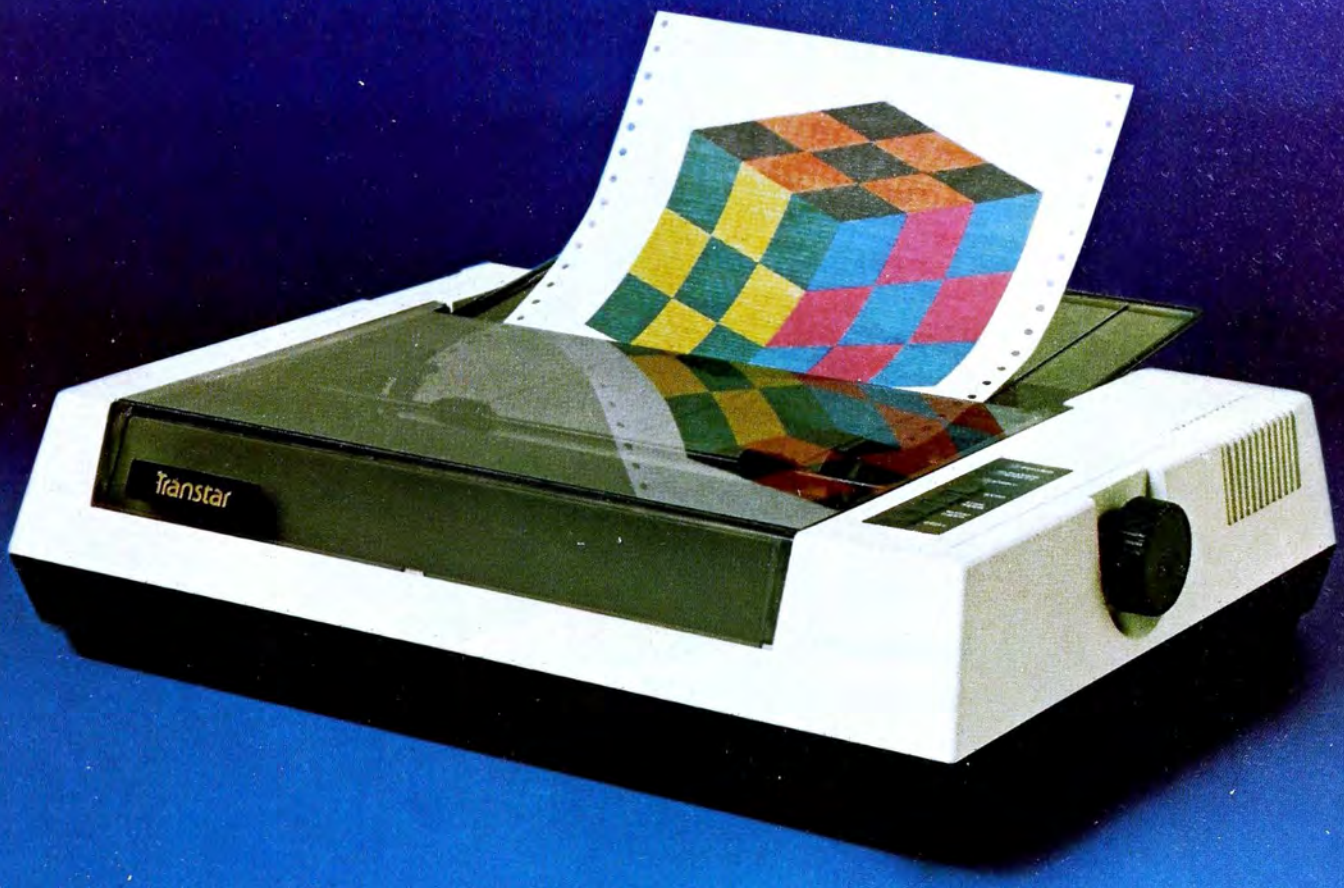
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Sysclock Interrupt Driver

```
            .proc   SYSCLOCK
;
; SOS Equates
;
AllocSIR    .equ    1913        ; allocate system internal resource
DealcSIR    .equ    1916        ; deallocate system internal resource
QueEvent    .equ    191F        ; queue an event
SysErr      .equ    1928        ; report error to calling routine
EReg        .equ    0FFDF       ; SOS environment register
BReg        .equ    0FFEF       ; SOS bank register
ZReg        .equ    0FFD0       ; d-VIA output register B
ClockReg    .equ    0FFD0       ; d-VIA output register B
ioClock     .equ    0C070       ; MM58167 I/O Data Port
eVIAIER     .equ    0FFEE       ; e-VIA interrupt enable register
eVIAIFR     .equ    0FFED       ; e-VIA interrupt flag register
;
REQCODE     .equ    0C0         ; request code
CTLSTAT     .equ    0C2         ; control/status code
CSLIST      .equ    0C3         ; control/status list pointer
;
; SOS Error Codes
;
XREQCODE    .equ    20          ; invalid request code
XCTLCODE    .equ    21          ; invalid control code
XCTLPARAM   .equ    22          ; invalid control/status param
XNORESRC    .equ    25          ; resource not available
;
            .macro  switch
            .if     "%1"<>""    ; if param 1 is present
            lda     %1          ; load A with switch index
            .endc
            .if     "%2"<>""    ; if param 2 is present
            cmp     #%2+1       ; do bounds check
            bcs     $1
            .endc
            asl     A
            tay
            lda     %3+1,Y      ; get switch index from table
            pha
            lda     %3,Y
            pha
            .if     "%4"<>"*"   ; if param 4 omitted,
            rts                 ; go to code
            .endc
$1          .endm
;
            .macro  set1mhz
            lda     EReg
            ora     #80
            sta     EReg
            .endm
;
            .macro  set2mhz
            lda     EReg
            and     #7F
            sta     EReg
            .endm
;
; Device Identification Block (DIB)
;
DIB         .WORD   0000        ; link
            .WORD   Entry       ; entry point
            .BYTE   9           ; name count
            .ASCII  ".SYSCLOCK  " ; device name
            .BYTE   80          ; active, no page alignment
            .BYTE   00          ; slot number
            .BYTE   00          ; unit number
            .BYTE   060         ; type - character, r/w
            .BYTE   000         ; subtype
            .BYTE   00          ; filler
            .WORD   0000        ; # blocks - none
            .WORD   0000        ; manufacturer
            .WORD   1000        ; release-preliminary
;
DCB         .WORD   0000        ; length of configuration table
;
; SIR table (5 bytes + 2 byte pointer)
;
Sir03       .byte   03          ; Sir #
            .byte   00          ; ID byte - assigned by SOS
ihAddr      .word   iHandler    ; address of interrupt handler
ihBank      .byte   00          ;         handler bank
;
pSir03      .word   Sir03       ; pointer to parameter table
;
; Event Parameter Table (5 bytes + 2 byte pointer)
;
Evt         .byte   0FF         ; priority of event (FF = highest)
eID         .byte   00          ; ID - passed to handler in accumulator
ehAddr      .word   eHandler    ; event handler address L,H
ehBank      .byte   00          ;               bank
;
pEvt        .word   Evt         ; pointer to event parameter table
;
; other local storage
;
rate        .byte   00          ; bits determine interrupt rate/mode
;
bufRAM      .block  08,00       ; temporary buffer for MM58167 (RAM)
;
semaphore   .byte   00          ; used by interrupt handler
;
; ******** MAIN ENTRY POINT ********
;
Entry       switch  REQCODE,8,DoTable
;
BadReq      lda     #XREQCODE           ; report Bad Request error
            jsr     SysErr
;
DoTable     .word   BadReq-1            ; 0 read
            .word   BadReq-1            ; 1 write
            .word   DStatus-1           ; 2 status
            .word   DControl-1          ; 3 control
            .word   BadReq-1            ; 4 unused
            .word   BadReq-1            ; 5 unused
            .word   BadReq-1            ; 6 open
            .word   BadReq-1            ; 7 close
            .word   DInit-1             ; 8 init (boot time only)
;
; ******** D INIT PROCESSING ********
;
; DInit's only task (in this case) is to store the driver's bank number
;    for the Interrupt and Event Handler Addresses.
;
DInit       lda     BReg                ; get driver's bank number
            sta     ihBank              ; interrupt handler address bank
            sta     ehBank              ; event handler address bank
            rts
;
; ******** D STATUS PROCESSING ********
;
DStatus     .equ    *
;
            switch  CTLSTAT,5,StatTable
;
NG          lda     #XCTLCODE           ; invalid control code
            jsr     SysErr
;
StatTable   .word   NG-1                ; 0 (no operation)
            .word   NG-1                ; 1 (return control parameters)
            .word   NG-1                ; 2 (return newline parameters)
            .word   DS03-1              ; 3 return rate, MM58167 RAM
            .word   NG-1                ; 4 not used
            .word   DS05-1              ; 5 return event parameters
;
; DStatus Code 03: returns rate, comparison latch contents
;
DS03        php
            sei                         ; disable 6502 interrupts
            lda     ZReg
            pha                         ; save zero-page value on stack
            set1mhz                     ; 6502 clock speed 1MHz
;
; first load buffer with comparison latch (RAM) values
;
            ldy     #00
            ldx     #08
$3          stx     ClockReg            ; MM58167 registers [08..0F]
            lda     ioClock             ; from MM58167 data port
            sta     bufRAM,y            ; to temporary buffer
            iny
            inx                         ; next MM58167 register
            cpx     #10
            bne     $3
;
            set2mhz                     ; restore 6502 clock speed
            pla
            sta     ZReg                ; restore zero page
            plp                         ; restore 6502 interrupts
;
; transfer rate and comparison latch (RAM) values to user
;
            ldy     #08
$1          lda     rate,y
            sta     @CSLIST,y
            dey
            bpl     $1                  ; 9 bytes
            rts
;
; DS05 return event parameters
;
DS05        ldy     #04
$1          lda     Evt,y
            sta     @CSLIST,y
            dey
            bpl     $1                  ; 5 bytes
            rts
;
; ******** D CONTROL PROCESSING ********
;
; first save and modify conditions
;
DControl    php
            sei                         ; disable 6502 interrupts
            lda     ZReg
            pha                         ; save zero-page value on stack
            set1mhz                     ; slow down 6502 clock
;
            switch  CTLSTAT,5,CtrlTable
;
BadC        ldx     #XCTLCODE           ; invalid control code
            jmp     exit                ; error exit
;
NoRes       ldx     #XNORESRC           ; resource not available
            jmp     exit                ; error exit
;
BadParam    ldx     #XCTLPARAM          ; invalid control/status param
```

```
        jmp     exit                    ; error exit
;
CtrlTable   .word   DC00-1              ; 0 reset
            .word   BadC-1              ; 1 (load control parameters)
            .word   BadC-1              ; 2 (load newline parameters)
            .word   DC03-1              ; 3 set interrupts
            .word   DC04-1              ; 4 set standby interrupt mode
            .word   DC05-1              ; 5 set event parameters
;
;
; DC00: Device reset. Disables all MM58167 interrupts, deallocates resource.
;
DC00    ldx     #16                     ; disable standby-interrupt mode
        stx     ClockReg
        lda     #00
        sta     ioClock
;
xIRQ    ldx     #11                     ; disable interrupt mode
        stx     ClockReg
        lda     #00
        sta     ioClock
;
        ldx     #10                     ; clear interrupt status register
        stx     ClockReg
        lda     ioClock
;
        lda     #02
        sta     eVIAIER                 ; disable e-VIA CA1 interrupts
        sta     eVIAIFR                 ; clear e-VIA CA1 interrupt flag
;
; deallocate system internal resource
;
        lda     #05                     ; number of bytes in SIR param table
        ldx     pSir03                  ; SIR param table addr L
        ldy     pSir03+1                ; SIR param table addr H
        jsr     DealcSIR
;
        ldx     #00                     ; value for normal exit
        jmp     exit                    ; common exit path
;
; DC03: Enable/disable IRQ interrupts, allocates resource for enable.
;
DC03    jsr     loadbuf                 ; get rate, MM58167 RAM
;
        lda     rate
        beq     xIRQ                    ; b/ rate = 00 (disable interrupts)
;
; allocate resource SIR#3 (e-VIA CA1 input control line)
;
        lda     #05                     ; number of bytes in SIR param table
        ldx     pSir03                  ; SIR param table addr L
        ldy     PSir03+1                ; SIR param table addr H
        jsr     AllocSIR
        bcs     NoRes                   ; resource not available
;
; start MM58167 interrupts
        ldx     #10
        stx     ClockReg                ; interrupt status register
        lda     ioClock                 ; clear interrupt flag
;
        ldx     #11
        stx     ClockReg                ; interrupt enable register
        lda     rate
        sta     ioClock                 ; enable specified rate/mode
;
; enable eVIA CA1 interrupts
;
        lda     #82
        sta     eVIAIFR                 ; clear e-VIA CA1 flag (bit 1)
        sta     eVIAIER                 ; enable e-VIA CA1 interrupts
;
        ldx     #00                     ; value for normal exit
        jmp     exit                    ; common exit path
;
; DC04: Enable/disable standby-interrupt mode.
;
DC04    jsr     loadbuf
        ldx     #16
        stx     ClockReg
        lda     rate                    ; enable or disable
        cmp     #02                     ; allowed range [0..1]
        bcc     $1
        jmp     BadParam
$1      sta     ioClock
        ldx     #00                     ; value for normal exit
        jmp     exit                    ; common exit path
;
; DC05: Change event parameters.
;
DC05    ldy     #04
$1      lda     @CSLIST,y
        sta     Evt,y
        dey
        bpl     $1                      ; 5 bytes
        ldx     #00                     ; for normal exit
;
exit    .equ    *                       ; common exit path
;
        set2mhz                         ; restore 2 MHz 6502 clock speed
        pla
        sta     ZReg                    ; restore old zero page
        plp                             ; restore 6502 interrupts
;
        txa                             ; error code
        beq     $1                      ; b/ no error
        jsr     SysErr                  ; report error to caller
$1      rts
;
; ******** LOADBUF SUBROUTINE ********
;
; input rate and comparison latch (RAM) values
;
loadbuf ldy     #08
$1      lda     @CSLIST,y
        sta     rate,y
        dey
        bpl     $1                      ; 9 bytes
;
; if bit-0 of rate is set, then alarm mode is requested (maybe others, too)
;  for alarm mode (when bit-0 set)—transfer new RAM values to MM58167
;  (did you arrange to preserve year value—see text)
;
        lda     #01                     ; test bit 0
        bit     rate                    ; of rate value
        beq     $2                      ; equal flag if bit NOT set
;
        ldy     #00
        ldx     #08
$3      stx     ClockReg                ; MM58167 registers [08..0F]
        lda     bufRAM,y                ; from temporary buffer
        sta     ioClock                 ; to MM58167 data port
        iny
        inx                             ; next MM58167 register
        cpx     #10
        bne     $3
$2      rts
;
; ********************************
;
;       Interrupt Handler
;
; ********************************
;
ihandler .equ   *
; clear e-VIA interrupt flag register
;
        lda     #02
        sta     eVIAIFR
;
;  MM58167 interrupt status register: Bits mark source of interrupt,
;     reading interrupt status register also clears/resets interrupt.
;
        lda     ZReg
        tay                             ; save zero-page value in Y
        lda     #10
        sta     ClockReg                ; actually same as ZReg (dVIAORB)
        lda     ioClock                 ; read interrupt status register
        sty     ZReg                    ; restore old zero page
;
; (optional) pass value of interrupt flag register
;    to event handler in accumulator as the ID byte
;
        sta     eID                     ; event parameter table ID byte
;
; do the task
;
        jsr     task1
;
; (optional) queue an event (here demonstrating semaphore protection
;       against event queue overflow)
;
        lda     semaphore               ; check if an event waiting in queue
        bmi     $1                      ; quit if there is
;
        lda     Evt                     ; check desired priority
        beq     $1                      ; quit if disabled (priority 00)
;
        ldx     pEvt                    ; pointer to event parameter table
        ldy     pEvt+1
        jsr     QueEvent                ; queue the event
;
        lda     #80                     ; set semaphore flag
        sta     semaphore
;
$1      rts                             ; exit handler with rts - not rti
;
; SUBROUTINE: the task—substitute your own code
;    (demo toggles lower-left screen byte normal/inverse)
;
task1   lda     07D0                    ; lower-left character
        eor     #80                     ; alternates normal/inverse
        sta     07D0
        rts
;
; . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
;
;       Event Handler (optionally located elsewhere—see text)
;
; . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
;
eHandler .equ   *
;
        asl     semaphore               ; clears flag (high bit)
;
; in this demo-toggles lower-right corner of screen normal/inverse
;
        lda     0BF7                    ; lower-right character
        eor     #80                     ; alternates normal/inverse
        sta     0BF7
        rts
;
        .end
```

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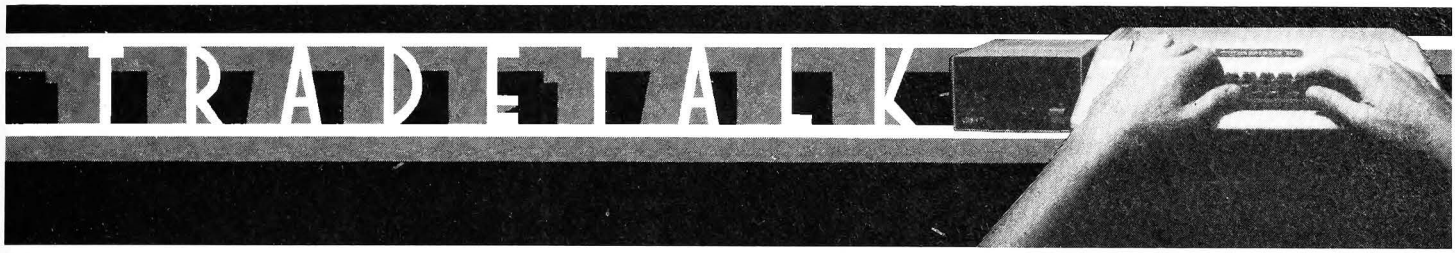
The Neptune board costs only $249 with 64K, $399 with 128K, or $499 with 192K. The 64K and 128K boards can be upgraded to a larger memory size. If you have an old, non-expandable 64K extended 80-column board, you can recycle it. Just send your old board directly to Saturn Systems for $100 credit toward the purchase of a Neptune board.

Also look for the Accelerator IIe, which will be available soon to make your Apple IIe run 3.6 times faster. In Europe, contact Pete & Pam Computers, New Hall Hey Road, Lancashire, UK; Telephone 706-227-011 Telex 635740 PETPAM G

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☐ **Denny Mosier** has been named marketing manager of **Continental Software** (Los Angeles, CA), publisher of home and business applications software. He heads a marketing unit responsible for research, advertising, public relations, planning future software programs, and supporting existing products. Continental has appointed marketing representatives **Paul Deslatte**, **Sally Hammer**, **Mike Hilton**, and **Penny Olender** to its sales staff to serve Continental's expanding number of distributors and dealers.

☐ **Don House** and **Dennis V. Vohs** have been made executive vice presidents of **Management Science America** (Atlanta, GA). Vohs is in charge of design, development, quality assurance, and central customer support of MSA's application software systems, as well as **Peachtree Software**, MSA's microcomputer software subsidiary. House is responsible for North American field operations and corporate marketing functions. His responsibilities further include advertising and public relations, corporate sales policy, and corporate operations policy.

☐ **David M. Edwards**, formerly editor-in-chief of computing and educational software at McGraw-Hill, has been appointed general manager of the **Hayden Book Company** (Rochelle Park, NJ).

☐ **A.J. Bate** has joined **Novation** (Tarzana, CA), maker of modems and portable terminals, as director of product development. He most recently served as a professor of information systems at Brigham Young University and has a background in market research and the development of advanced office automation systems. In a general company realignment, Novation's marketing and engineering departments have been consolidated and now report directly to the director of product development. The move was made to allow the company to develop products reflecting both advanced technology and user-friendliness.

☐ **ComputerLand** (Hayward, CA), the world's largest independent network of computer stores, has opened its first international "satellite" store in Toronto. The satellite stores are for "the customer who simply wants to check the latest software, buy a few blank disks, or drop off a system for repair," said ComputerLand vice president of development **Ken Waters**. Each satellite will be within a few miles of an existing full-line retail store, housing service facilities. ComputerLand expects to have 100 satellite stores in operation by the end of 1983.

☐ Business software publisher **Ashton-Tate** (Culver City, CA) has appointed **Wally Stokes** international sales manager. He formerly headed the same department at Software Distributors and predicts that "within one year international sales should generate 40 percent of Ashton-Tate's total revenues. Last fall we established a London office. We also have a German subsidiary and a representative in Japan. In the near future we plan to open French and Australian offices." Director of sales **Rod Turner** said, "Stokes will be instrumental in developing Ashton-Tate's international network as the firm explores and achieves new retailing goals."

☐ **Game Software**, the business magazine of computer entertainment (Clifton, VA), formerly *Game Merchandising*, will be out under its new name in July, featuring game-software editorial content.



Robert Fanelli, Scholastic national accounts manager.

☐ **Robert Fanelli** has joined **Scholastic** (New York, NY) as national accounts manager for its line of Wizware computer software for children. He will be responsible for software sales to major retail chains and software distributors throughout the United States. He previously worked for Canon and Casio in regional chain sales.

☐ **Software Arts** (Wellesley, MA), developer of *VisiCalc*, has named **Michael P. Silverman** to the position of New England sales representative. He reports to **Bruce H. Rampe**, director of marketing and sales, and is responsible for sales of Software Arts products in the company's home territory. By appointing its own representative for the New England territory instead of using a distributor, the company intends to experiment with new sales presentations and promotions for possible national release. "We may be manufacturers but we think like retailers," said Rampe. "Having a sales representative will help us keep our finger on the pulse of the marketplace—to best serve the retailer."

☐ As part of a major expansion, **Omega Microware** (Chicago, IL) has appointed Apple pioneer **Ken Rose** to the position of vice president of marketing and new product development. Rose, author of the *Softline* column "Adventures in Adventuring," directed the development of *Zoom Grafix*, *Adventure in Time*, and *Birth of the Phoenix*. "I'm delighted we were able to persuade Ken to come aboard," said Omega president **David Alpert**. "He's good for our customers, and he's good for business. Nobody is more of an expert in the micro market than Ken Rose."

☐ **HomeComputer Software** (Sunnyvale, CA), developer of *Family Bible Fun Games*, has split off from parent company Personal Computer Management Corporation and established new headquarters in Sunnyvale. **Jon Tedesco**, former PCMC vice president and founder, is now president and director of marketing for HomeComputer Software. **Daniel Shafer**, creator of the Bible games, is executive vice president in charge of production. **Sparrow Records**, a Canoga Park, California-based gospel record company, is marketing the Bible Fun series through Christian bookstores nationwide as part of a joint venture in which HomeComputer Software will create additional games for exclusive distribution by Sparrow, beginning with *Name That Hymn*.

☐ A marketing unit designed to provide a range of support products and services to users of VisiSeries business software has been announced by **VisiCorp** (San Jose, CA). The service marketing unit includes VisiPress, a book-publishing operation marketing a series of applications texts; The VisiCalc Professional Seminar Program, introducing business professionals to computing; VisiSeries training products, marketed under the VisiTutor label; and a software maintenance program with toll-free hot line and monthly newsletter.

☐ Citing "the tremendous increase in the sales of home computers, along with the growing sophistication of home information technology," book publisher **E.P. Dutton** (New York, NY) has entered the field of electronic publishing with a line of books packaged with floppy disks and video tapes scheduled for release in August. The product line will feature a combination of technical and entertainment subjects and will be supervised by **Jack Sibrizzi**, director of electronic publishing. "The software will be produced by groups working in the same capacity as authors," said Sibrizzi. "High-resolution

graphics will provide good, clear illustrations, and will be an integral part of the package." Prices for the Apple versions will range from $19.95 to $150.

☐ **Gene Portwood** has been named internal program manager for **Broderbund** (San Rafael, CA). He will supervise Broderbund's programming staff, contribute game ideas, and teach programmers the various tricks of animation. He will also participate in planning future products and designing cartoon characters. As an assistant animator for Walt Disney Productions in the fifties, Portwood worked on the features *Peter Pan* and *Sleeping Beauty*, as well as several animated shorts. He was also manager of customer support for Honeywell.

☐ **Greg Lynch** has organized **Memron** (Santa Clara, CA) to manufacture and market floppy disk products. Lynch, president, was formerly director of product development at Verbatim. Marketing vice president **Bill Bollinger** was most recently marketing vice president of Dakin 5. **Cal Shepard**, vice president, finance, held a similar position at Cermetek, a Sunnyvale, California, semiconductor supplier. The privately financed corporation is currently occupying temporary quarters at 400 Martin Avenue in Santa Clara while surveying manufacturing space in the area.

☐ **Computer Expositions** (Annapolis, MD) has purchased Northeast Expositions president **Gerry Milden**'s interests in four major East Coast computer and office equipment shows—the Virginia/Carolinas Computer Show, Maryland Computer Show, Mid-Atlantic Computer Show, and Southeast Computer Show. Computer Expos president **Peter Carroll** plans to increase advertising and publicity, and to have free public seminars on the basics of computers at each show.



Kathleen Forsyth, OEM sales manager, Information Unlimited Software.

☐ **Information Unlimited Software** (Sausalito, CA), makers of *EasyWriter II*, has announced the appointment of **Kathleen Forsyth** to the new position of OEM sales manager. She has responsibility for all OEM sales efforts throughout the United States and overseas. Prior to joining IUS, she founded Forsyth Consulting, an executive recruitment firm.



☐ **Richard G. Bratt** has been appointed director of software engineering for **Spinnaker Software** (Cambridge, MA). He is responsible for quality assurance of the company's line of educational software. He was previously director of engineering and development at Bolt Beranek and Newman Computer. **Jonathan C. Mixter**, formerly with the marketing divisions of Richardson Vicks and Frito Lay, has been named director of marketing; **Kenneth S. Madell** has been signed to author educational and entertainment software. Madell's word game, *Catchword*, will be released by Spinnaker later this year.

☐ **Gibson Laboratories** (Laguna Hills, CA) has named **Micro D** (Fountain Valley, CA) sole distributor of the Gibson light pen. Micro D will be highlighting the pen at its product fairs for dealers and major markets. "We have already sold more than twenty-five hundred pens with almost no marketing effort on our part. The word-of-mouth advertising has been that strong," said company president **Steve Gibson**. "We believe the Gibson light pen system is the most important peripheral product to be developed for the Apple II since disk drives."

☐ **Linda Marcus** has been appointed manager of corporate communications at **State of the Art** (Costa Mesa, CA), a business-software publisher. She joined the company in 1982 as marketing administrative assistant and previously served as sales promotion manager for the book division at Petersen Publishing Company.

☐ **Microtek** (San Diego, CA), manufacturer of disk emulators, drivers, software, and printer interfaces, has moved to larger facilities, consolidating all operations under one roof. The new plant, located at 4750 Viewridge Avenue, San Diego, CA 92123, is designed to accommodate a three-shift operation with a staff of more than three hundred and allow the networking of all phases of production on a central computer system.

☐ **Quentin Research**, maker of mass storage systems, has moved to a larger headquarters and manufacturing facility at 9207 Eton Avenue, Chatsworth, CA 91311. "A booming demand for our floppy disk and rigid disk drives caused the company to outgrow its former location in a five-thousand-square-foot building in Northridge," said president **Dan Duke**. The new building contains twenty-five thousand square feet.

☐ **Human Systems Dynamics**, publisher of *The Statistics Series*, has relocated to a larger facility at 9010 Reseda Boulevard, Northridge, CA 91324.

☐ **Small Business Systems Group** (Westford, MA) has expanded its headquarters, locating its consulting and development, sales, production, and administrative departments in one building. All building outlets were prewired for Corvus Systems's Omninet, facilitating research and development on multiuser network communications and accounting software.

☐ Regardless of what you have read here previously, **Ultrasoft** is now located at 12503 Bell-Red Road, Suite 200, Bellevue, WA 98005. Telephone (206) 451-8104. ◨

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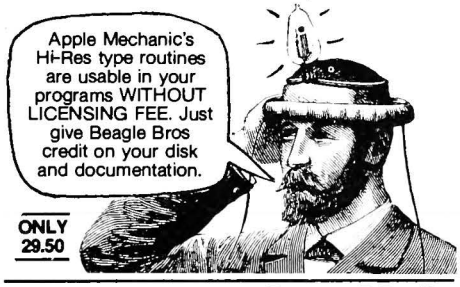
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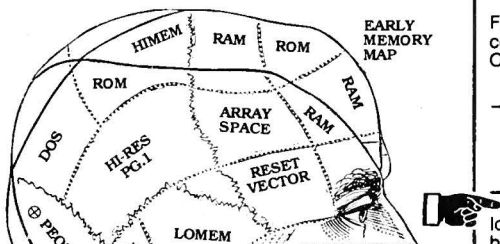
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```
10  A$="RUQWLU RBOC YNTOOB C@OBDC":
    SPEED=180: VTAB 10: PRINT A$
20  FOR X=0 TO LEN(A$)-1: S=SCRN(X,19):
    COLOR=S+(S=12)-(S=13)-(SCRN(X,18)>10):
    PLOT X,19: NEXT X: GOTO 10
```

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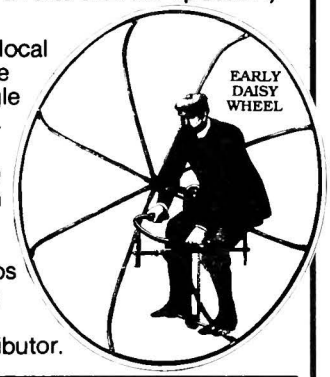
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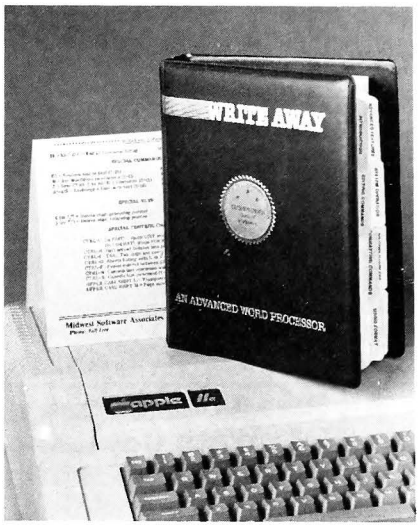
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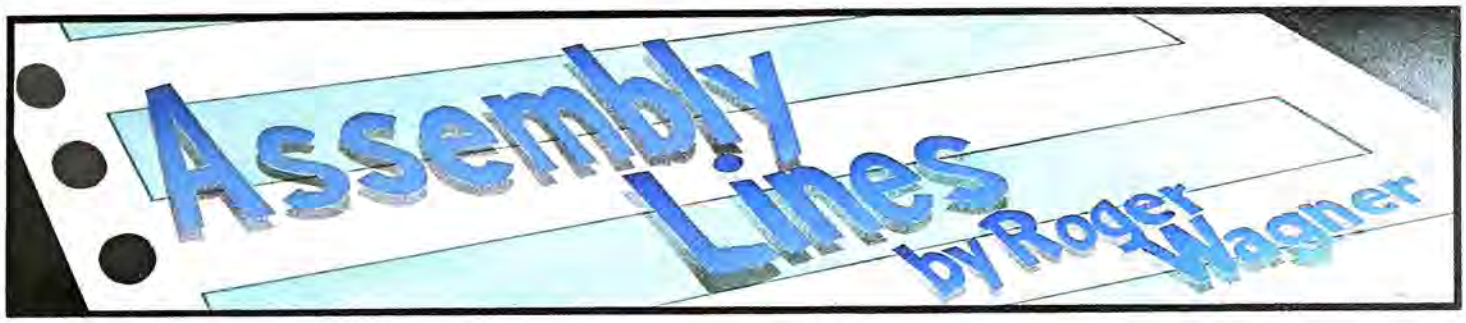
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Everyone's Guide to Assembly Language, Part 33

This month's discussion deals with a new version of our beloved 6502 microprocessor known as the 65C02. Although the chip has just been released within the last few months and has yet to find its way into the mainstream of computers, it seems likely that we'll be hearing more about this item in the upcoming year.

Before jumping right into its new functions, though, let's first get a little background information out of the way.

The 6502 was apparently first designed by Commodore Business Machines, and, as of the present, 70 percent of its use is by Apple, Atari, and Commodore. The current manufacturers of the 6502 are Rockwell International, MOS Technology, and Synertek. As sometimes happens with these things, though, some of the key persons involved with the 6502 went to work at a new company, Western Design Center. This company, then, is the original source of the new 65C02 chip. But the story doesn't end there. Western Design Center has sold the design to at least three independent manufacturers, Rockwell International, GTE, and NCR. These companies took the initial 65C02 design, corrected initial design errors, and added their own enhancements.

The picture at this point is that each of these three companies will be marketing its own version of the 65C02. The chips are more or less the same, but the Rockwell chip has the largest instruction set.

"Largest instruction set," you ask? Yes! The new 65C02 has had the old 6502 instruction set appended with a variety of new instructions. Because the Rockwell chip appears to be a superset of all the other chips, the bulk of this article will assume that it's the chip that's being used. At the end of the article we'll describe differences among the three chips.

The Rockwell chip has a total of twelve new instructions and two new addressing modes. In addition a number of addressing modes not previously available to an instruction (such as the immediate mode for the BIT instruction) are now available. There are a total of fifty-nine actual new op-codes. The meaning of all these numbers will become clear shortly.

New Addressing Modes. Since this is one of the smaller numbers, let's start here. You'll recall from many earlier discussions that each 6502 instruction has up to six addressing modes. That number is arrived at by counting some modes as mere variations of others and not including the value (relative addressing) associated with branch instructions (BEQ, BNE, BCC, BCS, and so on) as an addressing mode here. To refresh your memory, a list of modes and variations is provided in table 1 for the LDA (load accumulator) instruction.

Indirect Addressing. The first of the two new addressing modes is quite easy to explain because it is essentially another variation of an existing mode. The new mode is *indirect* addressing. This may sound very familiar because this is similar to the instructions used to access memory locations via a zero-page pointer. Usually, though, the Y register is set to zero or some other value, which is then added to the address indicated by the zero-page pointer to determine the address of interest.

This is fine for addressing a large table of data, but many times we are interested in only one byte of memory, and must then go through the obligatory LDY #$00 to properly condition the Y register. (See entries 5 and 6 in table 1.)

The new instruction allows us to ignore the contents of the Y register and gain access to the memory location directly. This conserves two bytes of code for each reference, since the Y register does not have to be loaded. If you want to scan a block of memory, such as for a table, this instruction can still be used if you are willing to INC or DEC the zero-page pointer accordingly.

This new addressing mode is available for the instructions listed in table 2.

Addressing Mode	Common Syntax
1. Absolute	LDA $1234
Zero Page	LDA $12
2. Immediate	LDA #$12
3. Absolute,X	LDA $1234,X
Zero Page,X	LDA $12,X
4. Absolute,Y	LDA $1234,Y
5. (Indirect,X)	LDA ($12,X)
6. (Indirect),Y	LDA ($12),Y

Table 1. Addressing modes.

Instruction and Common Syntax
ADC ($12)
AND ($12)
CMP ($12)
EOR ($12)
LDA ($12)
ORA ($12)
SBC ($12)
STA ($12)

Table 2. Instructions with indirect addressing.

Indexed Absolute Indirect. The second new addressing mode has a name that was obviously not designed with easy recall in mind. Fortunately, this too is a variation on an existing theme and as such should be easy to remember. In the past, we had indexed indirect addressing. We called this mode preindexed for clarity's sake. Item 5 in table 1 is an example. Preindexing means that the contents of the X register are added to the address of the zero-page reference *before* using the sum of those numbers to determine which zero-page pair to use. For example, the instruction LDA ($22,X), where the X register held the value 4, would actually use bytes $26,27 to get the final destination address.

This differs from indirect indexed, which we refer to as postindexing. In postindexing, the value of the Y register is added *after* the base address is determined. For example, in the instruction LDA ($22),Y, where the Y register holds the value 4 and $22,23 point to location $1000, the memory location accessed would be $1004.

You'll recall also that pre- and postindexing were limited in their use of the X and Y registers. Preindexing could use only the X register and postindexing only the Y. Before you get too excited in anticipating the possibilities of the new instruction, restrain yourself: This much has not changed.

What has changed is that preindexing is no longer limited to zero-page pointers. The new mode allows any two-byte value to be used. This

means that the X register can be added to the base address of a table of memory pointers that previously could only have been located on the zero page of memory.

Addressing Mode	Common Syntax
8. Indexed Absolute Indirect	LDA ($1234,X)

For example, suppose you had a command interpreter that accepted a command value between 0 and 2. With the 6502, such an interpreter could be used in conjunction with a JMP table located on page zero, constructed as in the following example:

```
JMP DATA TABLE:
20: 80 10
22: A0 10
24: C0 11

                        1  * * * * * * * * * * * * * * * * * *
                        2  *SAMPLE COMMAND PROCESSOR*
                        3  * * * * * * * * * * * * * * * * * *
                        4  *
                        5          OBJ  $1000
                        6  TABLE   EQU  $22
                        7  *
1000: 20 00 40          8  ENTRY   JSR  GETCMD     ; GET VAL FROM 0 - 2
1003: AA                9          TAX             ; PUT IN X REG
1004: 7C 22 00         10  GO      JMP  (TABLE,X)  ; EXECUTE PROPER ROUTINE
                       11  *
                       12  ...MORE CODE HERE...
1080: EA               50  CMD1    NOP             ; FIRST ROUTINE
                       51  ..MORE CODE HERE...
10A0: EA              100  CMD2    NOP             ; SECOND ROUTINE
                      101  ...MORE CODE HERE...
11C0: EA              150  CMD3    NOP             ; THIRD ROUTINE
                      151  ...MORE CODE HERE...
```

This is a very fast and effective technique, but for a large set of command routines it can chew up valuable zero-page memory very fast. Wouldn't it be nice if we could put the table somewhere else? With the new addressing mode you can. The table could now be put, for example, at $1200, with line 6 modified accordingly. This would free up six bytes of valuable zero-page real estate.

Table 3 shows the instructions that can use this new mode.



Instruction and Common Syntax
ADC ($1234,X)
AND ($1234,X)
CMP ($1234,X)
EOR ($1234,X)
LDA ($1234,X)
ORA ($1234,X)
SBC ($1234,X)
STA ($1234,X)

Table 3. Instructions with indexed absolute indirect addressing.

New "Standard" Addressing Modes. There are a few instructions that have addressing modes that are new just to them. For example, two of the most exciting ones are INC and DEC.

Previously, any uses of INC and DEC were limited to memory locations. In addition (so to speak), using the X and Y registers was the only way to maintain a simple loop counter without using a dedicated memory location. The surprise here is that INC and DEC will now work on the accumulator. This is nice because you can now maintain a counter in the accumulator, or even do fudging of flag values as they are being handled in the accumulator.

Some future assemblers may require the "somewhat usual" (if not inconvenient) use of DEC A or INC A as they seem to prefer for LSR, ASL, and other operations on the accumulator.

The BIT instruction also allows some additional addressing modes that may prove useful. Previously, the BIT instruction supported only absolute addressing. That is to say that a directly referenced memory location was used as the value against which the accumulator was operated on.

Addressing Mode	Common Syntax
Absolute	BIT $1234
Zero Page	BIT $12

This is useful for testing a memory location for a given bit pattern, but not directly suitable for testing the bit pattern of the accumulator. For many operations, this means you have to rather artificially load some memory location with the value you wanted to compare to the accumulator.

The new 65C02 supports three new addressing modes for the BIT instruction:

1. Immediate	BIT #$12
2. Absolute,X	BIT $1234,X
3. Zero Page,X	BIT $12,X

At Last, the Real Scoop! Of course, the real question lurking in everyone's mind is: "But what are the new instructions?"

The great thing about the 65C02 is that not only are many of the old instructions enhanced, there are a number of absolutely terrific new instructions—twelve, to be exact.

The new instructions are shown in table 4.

BBR	Branch on bit reset (clear)
BBS	Branch on bit set
BRA	Branch always
PHX	Push X onto stack
PHY	Push Y onto stack
PLX	Pull X from stack
PLY	Pull Y from stack
RMB	Reset (clear) memory bit
SMB	Set memory bit
STZ	Store zero
TRB	Test and reset (clear) bit
TSB	Test and set bit

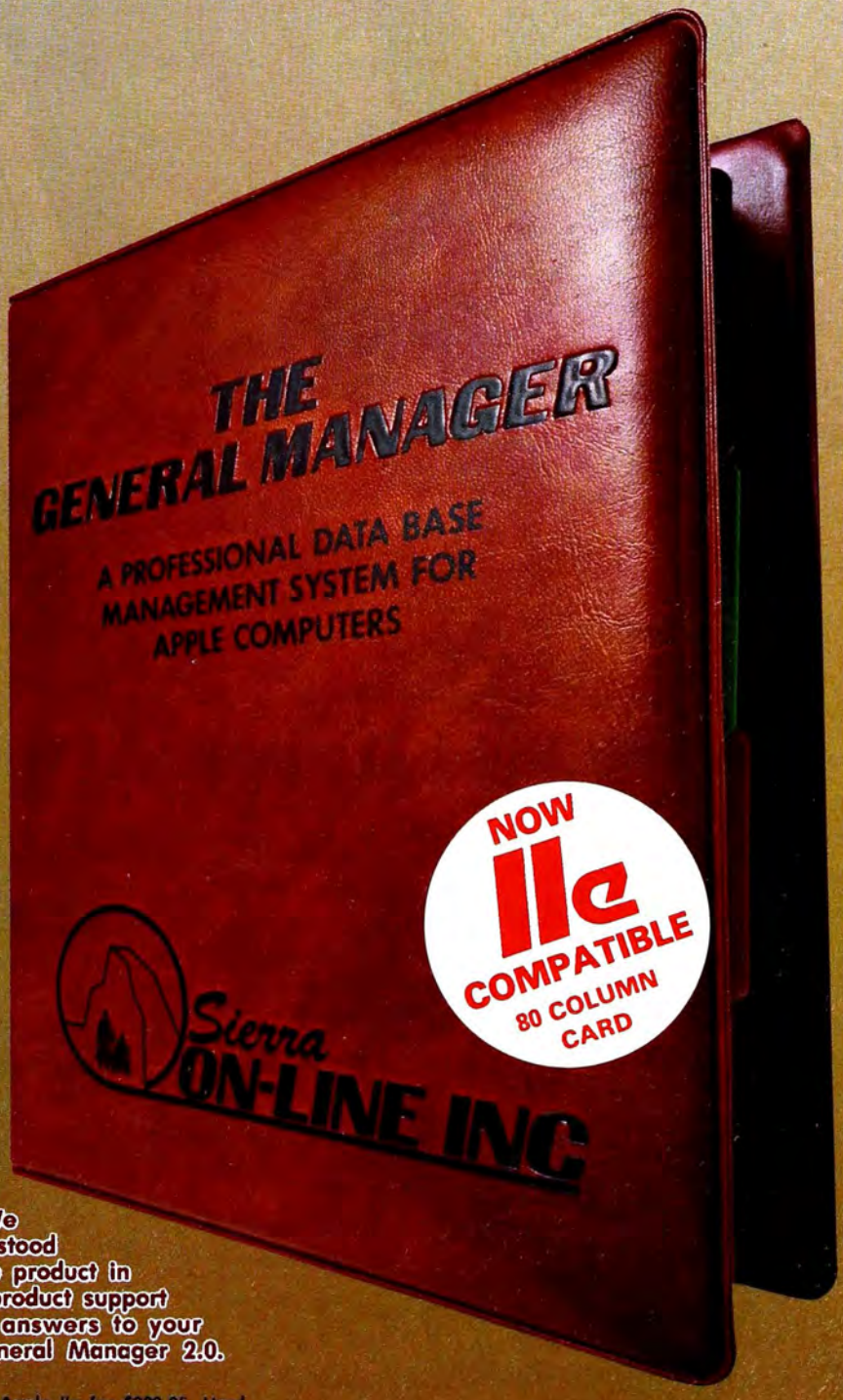
Table 4. New instructions in the 65C02.

So what exactly do these instructions do? Well, let's examine some of the easy ones first: PHX, PHY, PLX, and PLY.

Commands for pushing a byte onto the stack and pulling a byte off the stack exist for the accumulator but not for the X and Y registers in the 6502. One of the more common uses for the stack is to save all the registers prior to going into a routine so that everything can be restored just prior to exiting. Ordinarily, to save the A, X, and Y registers, we'd have to do something like this:

```
ENTRY   PHA     ; SAVE A
        TXA     ; PUT X IN A
```

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```
        PHA     ; SAVE IT
        TYA     ; PUT Y IN A
        PHA     ; SAVE IT
WORK    NOP     ; YOUR PROGRAM HERE
DONE    PLA     ; GET Y
        TAY     ; PUT IT BACK
        PLA     ; GET X
        TAX     ; PUT IT BACK
        PLA     ; GET A
EXIT    RTS
```

The problem is complicated even further in programs like the character generator listed in the April issue. There we had to refer to the original value of the accumulator several times and this interfered with any simple way to push all the register data onto the stack.

With the new 65C02, this could all be resolved with the following:

```
ENTRY   PHX     ; SAVE X
        PHY     ; SAVE Y
        PHA     ; SAVE A, BUT LEAVE IT ON TOP
WORK    NOP     ; THE PROGRAM HERE
DONE    PLA     ; GET A
        PLY     ; GET Y
        PLX     ; GET X
EXIT    RTS
```

All four are one-byte commands, addressing only the indicated register.

BRA (branch always) is one of those instructions that will thrill writers of relocatable code. One of the techniques for writing code that is location-independent involves the use of a forced branch instruction, such as:

```
CLC             ; CLEAR CARRY
BCC LABEL       ; ALWAYS
```

Unfortunately, this means we must force some flag of the status register, which may not be convenient at the time. In addition, the process takes up an extra byte on most occasions.

Branch always alleviates both these problems by always branching to the desired address, subject of course to the usual limitations of plus or minus 128 bytes as the maximum branching distance.

It is worth mentioning, in the interest of programming style, that many people indiscriminately use a JMP to go back to the top of a loop when a branch instruction would do the trick; this only adds one more limitation to the final code in the process. Hopefully, this new branch instruction will encourage people to make their code more location-independent. BRA, like the rest of the branch instructions on the 6502, uses only relative addressing.

STZ (store zero) is used for zeroing out memory bytes without changing the contents of any of the registers.

Many times it is necessary to set a number of internal program registers to 0 before proceeding with the routine. This is especially needed in mathematical routines such as multiplication and division.

Ordinarily, this is done by loading the accumulator with 0 and then storing that value in the appropriate memory locations. This is easy to do when you have to load the A, X, or Y registers with 0 anyway. The problem is that on occasion the *only* reason one of the registers is loaded with 0 is because of the need to zero a memory location.

Store zero allows us to zero out any memory byte without altering current register contents. Not all of the addressing modes usually available to STA, STX, or STY instructions are available with STZ, though. Table 5 shows what modes are available.

Addressing Mode	Common Syntax
Absolute	STZ $1234
Zero Page	STZ $12
Absolute,X	STZ $1234,X
Zero Page,X	STZ $12,X

Table 5. STZ addressing modes.

SMB and RMB (set/reset memory bit) will allow you to set or clear a given bit of a byte in memory. Previously, this would have required three separate instructions to achieve the same result. For example:

```
LDA MEMORY      ; LOAD VALUE FROM MEMORY
AND #$7F        ; %0111 1111 IS PATTERN
                ; NEEDED TO CLR BIT 7
STA MEMORY      ; PUT IT BACK
```

With the new instruction, we can accomplish the same thing with:

```
RMB7 MEMORY     ; RESET (CLR) BIT 7 OF MEMORY
```

or set the bit again with:

```
SMB7 MEMORY     ; SET BIT 7 OF MEMORY
```

Two interesting things to note here. The first is that for some reason they use the term *reset* instead of clear to indicate the zeroing of a given bit.

The second item is that we now have four-character instruction codes (mnemonics), the last character being the number of the bit being acted on. What problems this may cause in some assemblers remains to be seen, but this new species of instruction seems to have arrived.

These instructions are limited to zero-page addressing only.

BBS and BBR (branch on bit set/reset) are two new branch instructions that make it possible to test any bit of a zero-page location and then branch, depending on its condition. This instruction will be very useful for testing flags in programs that need to pack flag-type data into as few bytes as possible. By transferring I/O device registers to zero page, it is also possible to test bits in these registers directly for status-bit conditions.

These instructions are very similar in appearance and use to the bit set and reset instructions just discussed. They, too, use four-character mnemonics. The difference is, of course, that we are testing bit status, rather than changing it. These are three-byte instructions, the first byte being the op-code, the second being the byte to test, and the third a relative branch value. In assembly, these commands will actually require two labels!

One of the first applications is the testing of whether a number is odd or even. Previously, this had to be done with an LSR or ROR instruction, followed by a test of the carry flag, such as:

```
LDA MEMORY      ; LOAD A WITH VALUE
LSR             ; SHIFT BIT 0 INTO CARRY
BCS ODD         ; SET IF ODD
BCC EVEN        ; CLR IF EVEN
```

The equivalent can now be done without affecting the carry flag or

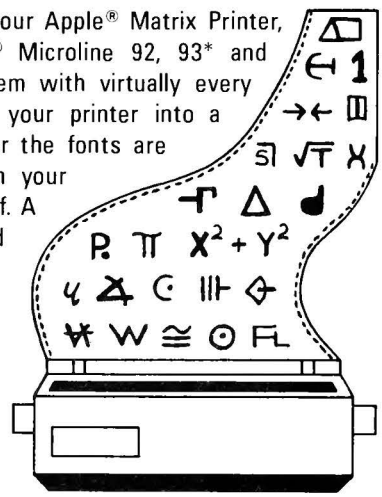
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the accumulator:

```
BBR0 MEMORY, EVEN     ; BRANCH IF BIT 7 = 0 = EVEN
BBS0 MEMORY, ODD      ; BRANCH IF BIT 7 = 1 = ODD
```

This could be useful also in creating drivers for the new Apple IIe eighty-column extended memory board since this card uses one bank of memory or the other for the text screen, depending on whether the screen column position is odd or even.

TSB and TRB (test and set/reset bit) are the most complex of the new instructions. These instructions are rather like a combination of the BIT and AND/ORA instructions of the 6502.

The instructions seem primarily designed for controlling I/O devices but may have other interesting applications as things develop.

The action of these two instructions is to use a mask stored in the accumulator to condition a memory location. The mask in the accumulator is unaltered, but the Z flag of the status register is conditioned based on the memory contents prior to the operation.

For example, to set both bits 0 and 7 of a memory location, we could use the following set of instructions:

```
LDA #$81        ;%1000 0001 = MASK PATTERN
TSB MEM1        ; SET BITS 0,7 OF MEMORY
BNE PRSET       ; ONE OF THESE WAS 'ON' ALREADY
BEQ PRCLR       ; NEITHER OF THESE WAS 'ON' ALREADY
```

This would clear the bits:

```
LDA #$81        ; %1000 0001 = MASK PATTERN
TRB MEM2        ; CLR BIT 0,7 OF MEMORY
BNE PRSET       ; ONE OF THESE WAS 'ON' ALREADY
BEQ PRCLR       ; NEITHER OF THESE WAS 'ON' ALREADY
```

These instructions use only absolute and zero-page addressing.

Other Differences. There are a number of other differences in the chips, most notably the power consumption. The power use of the 65C02 is one-tenth that of the 6502, so the chip runs considerably cooler. The lower-power requirement opens new possibilities for portable computers and terminals.

One point of interest is that the old 6502 indirect jump problem has been fixed. If you're not aware of it, the 6502 has a well-documented problem with indirect jumps that use a pair of bytes that straddle a page boundary.

For example, consider these three instructions:

Instruction	Pointers Wanted	Pointers Used
JMP ($36)	$36,37	$36,37
JMP ($380)	$380,381	$380,381
JMP ($3FF)	$3FF,400	$3FF,300

Notice that, in the third instance, the pointers used are *not* those anticipated. This is because the high byte of the pointer address is not properly incremented by the standard 6502.

This problem has been fixed on the 65C02. The only possible problem here is "clever" protection schemes that use this bug to throw off people trying to decode the protection method. Otherwise, this should not present any problems to existing software.

Are there any problems to be anticipated? In theory, no. The new 65C02 is compatible pin for pin with the old one, and also upwardly compatible in terms of software. Software for the Apple, PET, Atari, or other 6502-based microcomputers *should* work without problems with the new chip. Are there any exceptions? Unfortunately, yes.

The first big problem concerns internal microprocessor timing on the Apple II and II Plus computers. The Apple II and II Plus do not handle the microprocessor clock cycles in the same way the IIe does. On the surface, the 65C02 should directly replace the 6502; however, because the 65C02 is a faster chip, data is not available for as long, and bits can get lost. What this means for now is that the 65C02 can be used only on the Apple IIe and Apple III machines. None of the manufacturers at this time produce a chip that works on the Apple II or II Plus. It can be expected, though, that revisions will be made in the near future that will allow the 65C02 to be implemented in the older machines.

There is also a possibility of problems with some existing software. A small percentage of software may be using undocumented bugs or "features" of the old 6502 chip, and these might not function as anticipated.

For example, a reasonable question might be, "Where did all the new op-codes come from? After all, wasn't the chip full?" To answer this, consider how the instructions we use now are structured. The 6502 operates by scanning memory and performing specific operations based on the values that it finds in each memory location. You would then expect a total of 256 possible op-codes. As it happens, all 256 possible values are not used. It is this group of unused op-codes that allows for the new instructions and also creates the possibility of a small percentage of difficulties with existing programs.

Although rarely documented, the previously "unused" values will cause certain things to happen, much the same way that a legal value would. For instance, the code $FF on a 6502 is labeled as an alternate NOP. This is one of the codes that have been converted to a new function in the 65C02, namely BBS7 (branch on bit 7 set).

There are other unused codes, though, that have combination effects, usually of little use, such as loading the accumulator and decrementing a register at the same time. Their main application is similar to the indirect jump problem: creating code that cannot be casually interpreted. If these instructions have been used in existing software, problems could arise with the 65C02.

With such difficulties, then, why bother to substitute the new 65C02 into an existing Apple? The answers are varied.

First of all, the 65C02 is likely to appear in upcoming releases of existing computers (in a new release of the IIe, perhaps?), and as such you can experiment now with the newest version of this versatile device.

Second, there will likely be specific applications where the advantages of the chip will make it worth supplying with the software, since the disadvantages are practically nonexistent for the Apple IIe and Apple III. Code rewritten to take advantage of the new instructions can be expected to be 10 to 15 percent smaller and run proportionally faster. In certain applications, even greater improvements could be expected.

At this writing, the Rockwell chip seems to have the largest set of instructions of the three varieties available. The GTE and NCR chips lack the bit manipulation instructions but are otherwise identical.

As to assemblers supporting the instructions, the current version of *Merlin* supports all the new op-codes in both the assembly and *Sourceror* portions of the product. S-C Software is offering a 65C02 cross assembler to registered owners of the *S-C Assembler* at a reduced rate. Hayden will be offering an update to *ORCA* to support the GTE version of the chip. Any assembler that supports macro capabilities should be able to be used immediately by defining the proper hex codes.

If readers have any unique problems or questions about the 65C02, send them to *Softalk*; if possible, the answers will be published in a subsequent issue.

This installment marks the last in this series. I want to thank the many readers of this column over the last several years for their enthusiastic support and valuable suggestions. I have always believed that the human element to this industry, and in fact any endeavor, is the truly rewarding part. I would also like to thank *Softalk* for giving me the opportunity to share the excitement of programming with its readers, and also thank Brian Britt for his help in researching this month's article.

For better or worse, though, you're not likely to be completely rid of me. There are rumors of other columns and projects, and I look forward to being a small part of the *Softalk* family for some years to come.

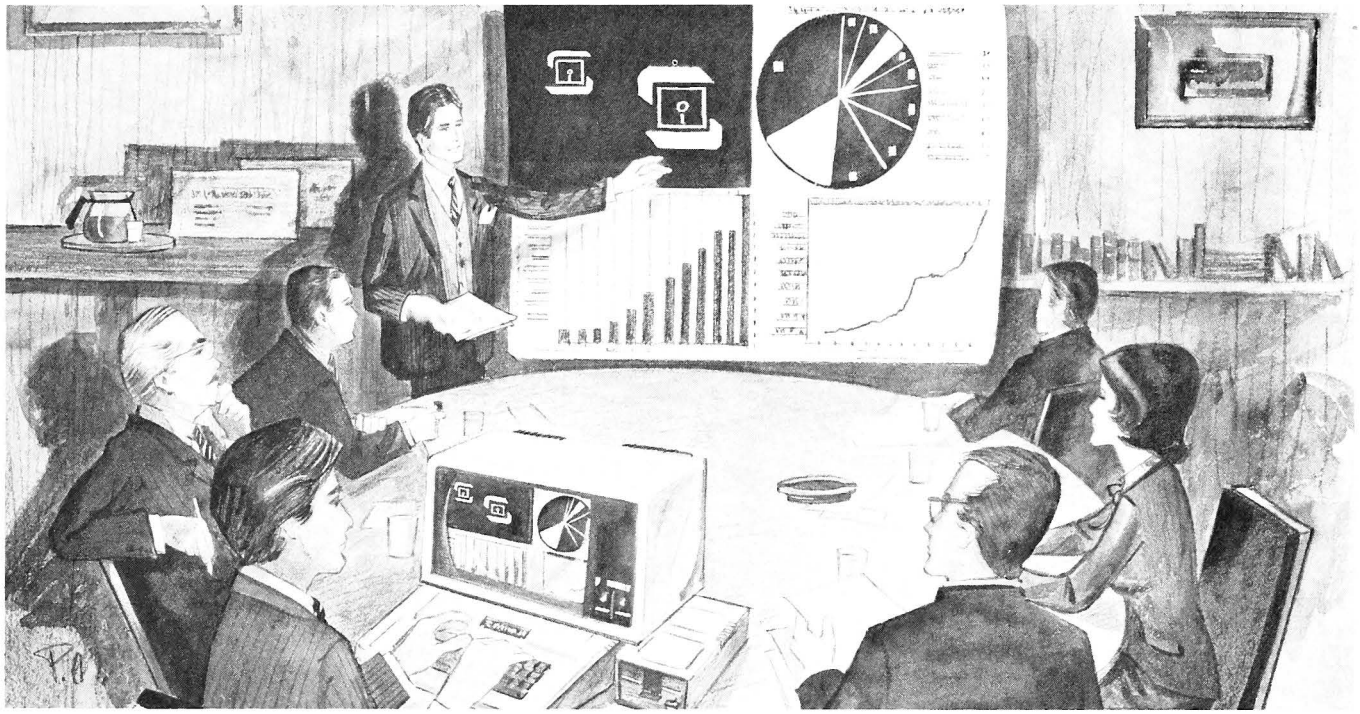
It was nearly three years ago that Roger Wagner's Assembly Lines began appearing in Softalk*; the magazine was only one month old. In that first year, Wagner's column elicited more mail from* Softalk*'s readers than any other feature, and properly so: It was the first time assembly language had been explained from step one. In fact, in his first column, Wagner didn't even introduce a command.*

With this issue, Roger Wagner's Assembly Lines ends. The first year's columns plus appendixes and revisions have been available for some time in Assembly Lines: The Book. *Volume 2, covering the rest of the columns, will be released shortly by Softalk Books.*

Roger Wagner will not fade away. He's planning occasional feature articles for Softalk *and he's promised to remain available to answer questions from* Softalk *readers.*

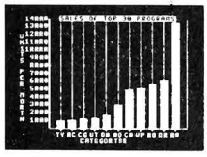
Next month, a new assembly language tutorial will begin, back at step one. The new column will be written by Jock Root, a frequent guest reviewer in Softalk *and the author of "IInd Grade Chats: A Custom Menu Generator" in May.* ■

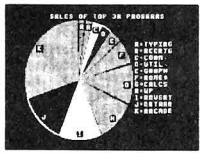
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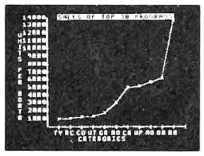


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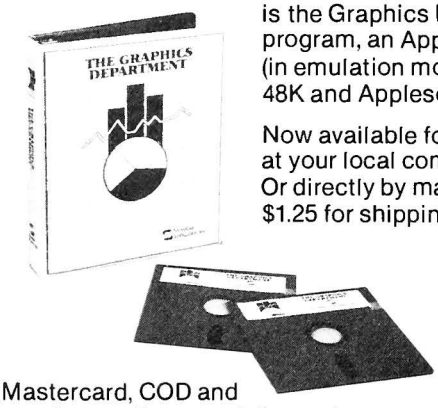
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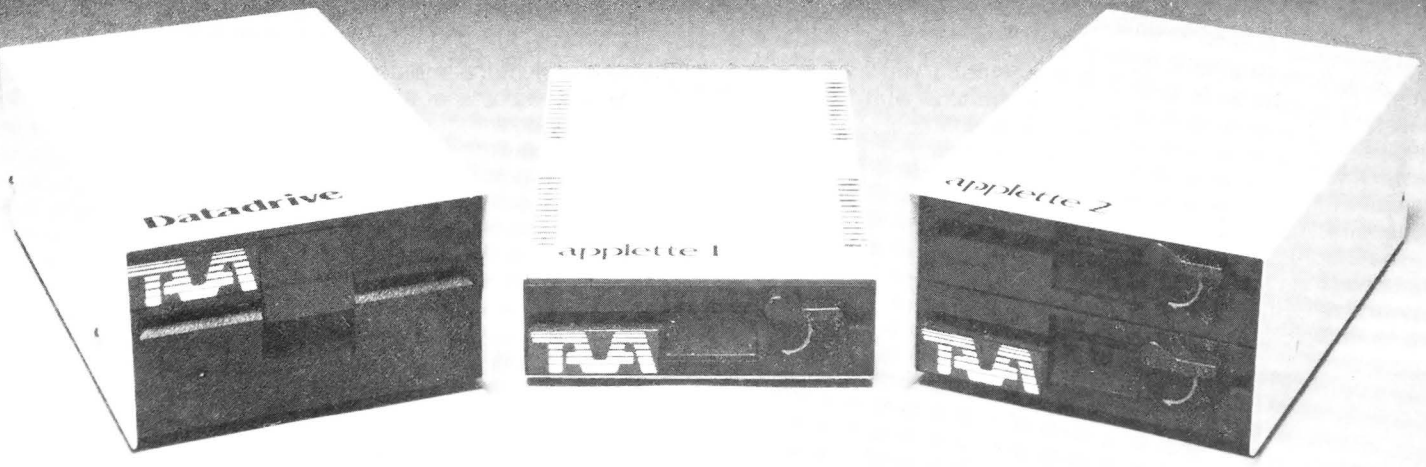
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Mind Your Business

BY PETER OLIVIERI



Summer is upon us! What is so rare as a day in June? Right now, some of us would contend that inexpensive computer equipment is about as rare. Nevertheless, we enjoy our computers almost as much as we do good weather.

This month's column begins with a request. When you have a moment, please send along the names of any utility programs you've found useful (comments are also welcome). These might include disk catalogers, menu preparers, hi-res screen dumps, archival backup utilities, and so forth. If enough information comes in, we may spend a column looking at "useful utilities." Thanks in advance.

IIe or Not IIe? Lately, many readers have called or written to ask questions about the Apple IIe. What new features does the new machine offer, they want to know, and should owners of other Apple IIs consider "upgrading"? Furthermore, they wonder, will the software they now own run on the IIe, and will software being developed for the IIe run on the II Plus?

Of course, no one but you knows whether or not you should upgrade to the new machine, and your answer will likely depend on a variety of factors. Do you feel you've "outgrown" your present system? Is software out (or coming out) for the IIe that meets a particular application need you've identified? Is there a market for your present machine?

A brief description of what is "different" about the new machine should help you make a more informed decision. From a user's standpoint, the most striking difference between the II and the IIe is the keyboard, which has been substantially redesigned. In fact, some of the nice features of the Apple III were transported to this new design. Delete, tab, up arrow, down arrow, and two special-function keys were added to the keyboard, and every key has an automatic-repeat feature that's activated when you hold the key down. In addition, no lower-case chip is required; upper and lower-case characters can be entered from the keyboard, and a caps-lock key enables you to type everything in upper case.

The IIe also has more main memory. The machine comes with 64K, including a 16K language card. There is also 16K of ROM, in which Applesoft Basic, the assemblers, and the system software are kept. You can display eighty columns on-screen using one of the many eighty-column boards on the market or by means of a special IIe eighty-column display device available from Apple that comes with optional additional memory. Also, the machine has fewer chips inside, one less slot, easier maintenance, and built-in self-testing procedures.

More important than the physical differences between the IIe and its predecessors is the matter of software. Will the software you now use on your Apple II work on the IIe? The answer is, generally yes. But while it may be true that most of the software that works on the II will also work on the new machine, it's also true that vendors are developing versions of their packages that take advantage of the newer machine's enhancements. Picture, if you will, a fictitious word processing program called *Author* that works just fine on your Apple II Plus. Of course, in order to delete a word, you have to press four or five keys, but you're used to this and all is going well. Say, however, that the vendor releases a version of the program especially for the IIe. In the new version, deletion of a word is accomplished by pressing one of the two new "special-function" keys. Which version of the program—and therefore, which machine—will tend to become more popular?

You can expect the IIe to be the more popular machine eventually, for two reasons. The first, of course, is that anyone who buys a new Apple II these days automatically gets a IIe, and the second is the software that will become available—software that you won't be able to run on the II Plus. Thus, it may not really be a question of whether the programs you have now will run on the Apple IIe but of whether you might need or want some of the new software.

Some folks will argue that now is the time to upgrade. Others will cite the fact that there are an estimated seven hundred fifty thousand Apple II owners out there who will continue to be the focus of software vendors' sales efforts. How to decide whether you need or want a IIe? Well, if you own an Apple II Plus and you're satisfied with the ways it's assisting you in your work, it makes sense to stay put. You may want to upgrade someday, but prices will get lower and machines will get better. If you've been planning an upgrade anyway, and you feel that now is as good a time as any, you may want to get yourself a IIe (or a Lisa). And if you don't yet own an Apple, the IIe is the one for you.

One thing is certain—the Apple IIe will not be "the last machine"; next year there'll be another one available. The computer world is constantly changing. There will always be a "new and better" version; that's the American way. But few of us can afford to "keep up with the Jetsons" with respect to the new technology. So, as usual, the best thing you can do for yourself is to know your needs! If you do your homework and become knowledgeable about the applications that are important to you, you won't be disappointed with your machine. You'll still want to upgrade one day. But let that upgrade be because your application needs have changed or expanded and not simply because there's a new kid on the block.

Beam Me Up, Spock. We are right at the beginning of the Information Age. The automated office, electronic mail, and working out of one's home are becoming more common. It's now possible to access newspapers, encyclopedias, classified ads, and banking services over the telephone. All of these activities involve using a computer and a telephone; and all are examples of a process known as telecommunication.

Let's talk a bit about this exciting area. What exactly is telecommunication, and why might you want to get involved in it? What do you need to get started in telecommunications? And what services are available?

The term *telecommunications* refers to combining the computer with high-speed electronic communications. This process is sometimes also referred to as *data communications* or *teleprocessing*. All three terms mean essentially the same thing; that is, you can link one or more computer systems or a number of terminals or microcomputers together. Such "linked systems" are sometimes called *networks*. The actual communications may take place via simple telephone lines or through more complex networks involving earth satellites.

The concept of telecommunications is certainly not new. Many large organizations have been using such systems for some time now, with hundreds of terminals throughout an area connected via telephone lines

to a central computer. Universities usually have similar arrangements, as do airline companies and research libraries. It's only recently, however, that the general public has begun to acquire personal computers, which have the capability of communicating with a remote computer. Thus, the Information Age can now begin to become a reality.

One way to set things up for telecommunications is to connect your personal computer to a device that will facilitate the transmission of data over the telephone lines. There are two requirements for this device: It must be one that can be connected to the telephone in some way, and it must be capable of converting the signals that the computer generates into signals that can be sent over the telephone lines. One device that fits this description is called a *modem*. There must be a device of this sort at both ends of the communication link. A modem converts a stream of digital signals (generated by your personal computer) into a stream of wave patterns. These patterns, similar to those produced by the human voice, can be "understood" by the "telephone."

One special type of modem is known as an *acoustic coupler*; it is usually attached to, or built into, the "terminal." The telephone handset is then placed into two rubber holders located on the coupler. The newer modems have a modular plug-in jack that allows you to unplug your telephone and plug in your personal computer to the phone lines.

It's also possible to install special lines in a communications network. These lines, which eliminate the need for modems, are for data transmission only, not for voice transmission. But because of the expense of data-only lines, it's likely that the normal telephone lines will be the communications channel in general use.

Data transmission channels are the "roads" over which data travels. When the volume of use is sufficient, it's often more economical to have a dedicated, or leased, line that will be used only for transmission of data. Many a personal computer owner who has done some teleprocessing (and has incurred the wrath of other family members for tying up the telephone) can attest to the advantages such a line offers.

The most commonly used channels are most often described in terms of how information can be transmitted through them. When working with the software programs that accompany a modem, you are often asked to identify this characteristic. A channel is *half duplex* if the line can alternately send or receive data. It is *full duplex* if it's possible to use it to transmit and receive data simultaneously.

The speed at which data is transmitted is called the *baud rate*. In most communications systems, a *baud* is one bit per second. For illustrative purposes, think of eight bits as forming a character (a letter or a number). Thus, if a system has a data communications speed capacity of 300 baud, it can transmit about thirty-eight characters per second.

Baud rates vary from 110 baud all the way up to 9600 baud. With the introduction of fiber optic channels (which send data at the speed of light), it will be possible to send data great distances at enormous speeds.

Why Get Involved? There is little doubt that in the years ahead computers will become as common in the home as a telephone. The computer will still be used in the ways it's being used now, but it will be used more often as a device for communicating with remote services. We'll use our microcomputers to read the newspaper, read books, send and receive mail, look up answers to our children's questions, pay our bills, sell used items, manage our stock portfolios, prepare and pay our taxes, look for jobs, get medical advice, and for a host of other things.

Even now, it is possible to use an Apple and a modem to dial up the main computer at your job and finish looking up some of the data you worked with earlier that day. Perhaps you'll also decide to send a *VisiCalc* file to the IBM DisplayWriter (a standalone word processing system) at work. People are doing these things now.

It's really not a matter of why get involved; rather, it's a question of when to. The major drawback to getting involved in telecommunications now is that it's fun. Why is that a drawback, you ask? Well, besides being charged by the phone company, users of these remote services must pay for the time they use the service; many people become so involved that they lose track of time and money. At the "prime-time" rates (in the middle of the day), losing track of time can be very expensive.

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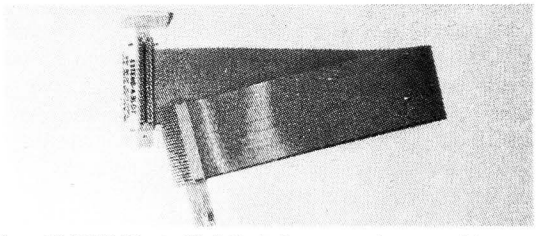


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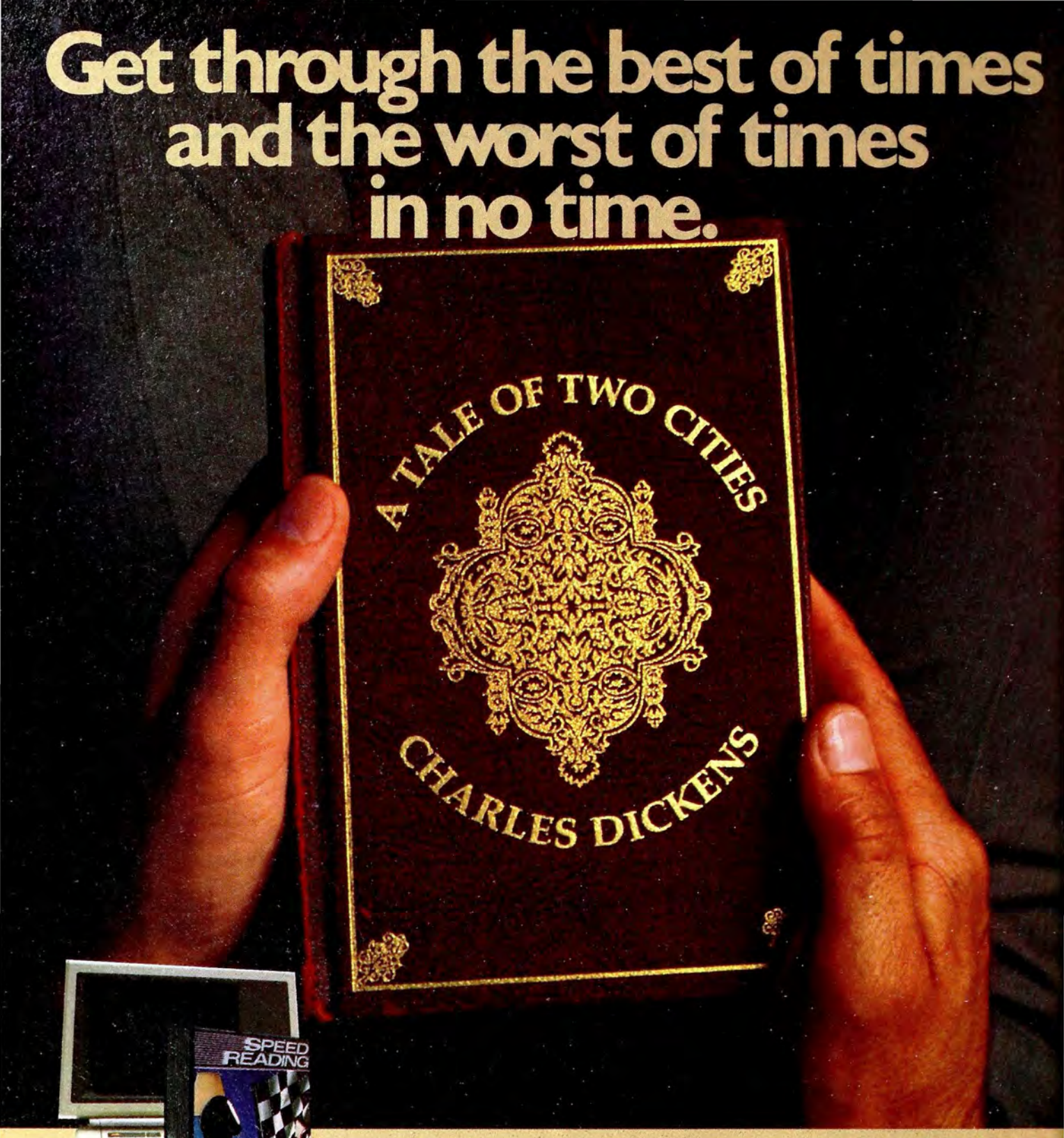
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Cost-conscious users often set up their machines to dial up the remote computer automatically at 3:00 a.m. in order to obtain copies of information at the lower rates. Certainly, the costs will come down as more subscribers join these systems. As an example of these costs, some services charge eighteen dollars per hour for prime time and three dollars per hour for "wee-hours-of-the-morning" time. This is not the standard; rates vary, depending on the types of services offered.

What Do You Need? First, of course, you need a computer or a terminal and a device for connecting your computer to the telephone network. You'll also need some software (known as terminal software) that will allow you to maintain some control over the communications process.

Remember, of course, that you need some place to call; that is, you must have the telephone number and password for the system you wish to connect with. If it's a system at work or at school, you need to find out whether they have a "dial-in" capability and then get permission to use the system. If it's an information utility you're interested in using, you will no doubt have to pay a subscriber fee in order to become a user of the service.

One of the most popular systems for the Apple II is the Hayes Micromodem II. It comes with a peripheral card that plugs into one of the Apple's slots, a coupler that stays outside of the Apple (and accepts the modular plug from your phone), the telephone plugs you'll need to make the connection (a trivial procedure, by the way), a user guide, and a disk containing software appropriate for its use. Within thirty minutes of starting to set up the system, you'll be ready to place your first call.

The Micromodem offers the ability to select a baud rate of either 10 baud (ten characters per second) or 30 baud (thirty characters per second) for the software. These rates translate to about 75 and 250 words per minute respectively.

The Hayes terminal program allows you to originate, answer, or terminate a call; create, receive, send, or list a file; turn on a printer; or change any of the system's parameters (such as sending speed).

The system is extraordinarily easy to use. To call up a remote computer, you press a letter key and a control key and then type in the telephone number of the computer you want to make connections with. A red light comes on in the coupler device (to tell you that the phone is off the hook) and the computer dials the phone.

(It's important to determine whether the product you're interested in will work with your telephone system. For example, the Micromodem cannot dial out on a Touch-Tone system; you must dial the number first and then connect the modem.)

When the computer at the other end "answers the phone," it sends a signal that the Micromodem recognizes. You're then informed that a successful connection has been made. At this point, you can communicate with the main computer.

In a similar vein, the Micromodem can answer the phone if another computer (or another Apple) is calling you. When the Micromodem answers the phone, the other user has access to your machine (it's as though the person calling you were actually typing at your keyboard). In this way, your caller can retrieve data from disk, store data, run programs, and so forth.

A variety of software programs can be used with the Micromodem. In fact, Hayes publishes a software directory that lists compatible products. Among these are software for creating an electronic bulletin board among Apples, software for monitoring a game of chess between two opponents, and software for interfacing with Western Union Services.

What Services Are Available? There are almost two thousand online databases in existence today. Not all are appropriate (or available) for use by the typical consumer; some are maintained by the government, while others are of such a specialized nature as to make everyday use impractical. Let's look now at some databases that are currently popular among members of the microcomputer community.

The Source, owned by *Reader's Digest*, currently has forty-five databases available to subscribers. These include the UPI news service and information about stocks, bonds, commodities, precious metals, futures, and money markets. In addition, subscribers have access to abstracts from nearly thirty business journals and can obtain historical data on more than three thousand stocks. Members can get airline schedules, lists of job openings, and even a job resume service. Home users can enjoy catalog shopping and game playing, among other things.

A $100 fee is charged when you join the Source. You are then charged at the rate of $18 per prime-time hour and $5.75 per nonprime hour for the amount of time you use on the system. If you wish to store data on the system or to transmit data at faster speeds, there's an additional charge.

The Dow Jones News/Retrieval Service is operated by the company that publishes the *Wall Street Journal*. Through the system, members can get a daily summary of the *Journal* and stories from *Barron's*. Other services provided include current and historical stock quotations and information on publicly held companies. You can also obtain money market forecasts and weekly economic updates. Another service you can subscribe to provides performance analyses for a variety of companies.

The Dow Jones service charges sixty dollars per hour for prime-time use and twelve dollars per hour for nonprime-time use.

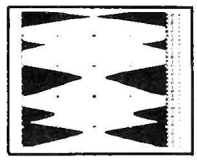
CompuServe is owned by H & R Block. This service provides information about nearly forty thousand stocks and bonds, as well as access to Standard and Poor's General Information Service and to the Commodity News Service. CompuServe also covers the *Washington Post* and the Associated Press wire. Users can make extensive use of the electronic mail capabilities of the system and often have access to a resident expert who will answer questions on a particular topic. The World Book Encyclopedia has recently been added to CompuServe's collection.

Prime-time charges for CompuServe are $22.50 per hour. The nonprime-time rate is $5 per hour.

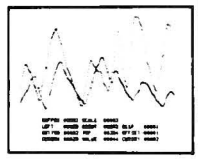
Dialog Information Services, owned by Lockheed, is one of the more extensive (and expensive) database services around. Through Dialog, more than one hundred fifty databases, containing more than fifty million references, are available. These include magazines, books, newspapers, journals, economic reports, statistical information, and so forth. Because of the wide variety of services provided, charges can range from $25 to $100 per hour.

VERSATILE DATA REDUCTION, DISPLAY AND PLOTTING SOFTWARE FOR YOUR APPLE* II

STRIPCHARTER — Turns your APPLE and Epson MX series printer into an economical *4-pen chart recorder*. Prints and displays continuous 1 to 4-channel stripcharts of any length. Ideal for large data sets. Numerous user-selectable graphics options enhance output quality. Includes 5 demos on disk with 37-page manual **$100**

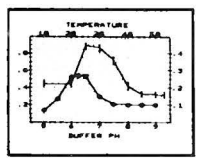


VIDICHART — Proven tool for lab data management. *Fast* plots of 4 data sets with *scrolling* in 4 directions, *zoom* scaling on X and Y axes, 2 types of graphic cursors and on-screen STATUS REPORT, even plots A/D input while sampling. ADD, SUBTRACT, MULTIPLY, DIVIDE, INTEGRATE, DIFFERENTIATE, AVERAGE or NORMALIZE data sets with SIMPLE COMMANDS. Ideal for spectra, chromatograms, rate curves, etc. Includes SAMPLE DATA on disk with 28-page manual **$75**

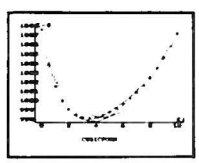


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Other On-line Options. Several other services are available to you, including the New York Times Information Service, LEXIS (and NEXIS), and BRS (Bibliographic Retrieval Service). Before you decide to subscribe to a database, call or write to its operators for additional information about services and charges. In addition, you might want to find out whether a minimum monthly charge is assessed.

A note to Business User Group members: If you'd like to share your experiences using information services or would like to communicate electronically with fellow BUGs, drop a note to the magazine; perhaps we can get a network going.

Communicating. Apple III owners can now use their machines to communicate with other machines, including other Apple IIIs. *Access III*, a new package from Apple Computer, allows your Apple III to emulate Digital Equipment Corporation's most popular terminals, the VT-100 and the VT-52. Since the program transforms your Apple III into a terminal, you can also hook up to any of the information services currently available to microcomputer owners. By connecting a modem to your Apple's III's built-in RS-232 interface you can communicate directly with other machines over the telephone (at 110, 300, 1200, 2400, 4800, or 9600 baud).

This package allows users to upload and download files to and from larger computers or other Apple systems. A setup menu in the program permits you to define the communication speed you'll be using and the other parameters associated with data transmission.

Once the setup procedure is completed, a main menu presents five additional options. For dialing up and communicating with a remote computer, there's the *terminal mode*. Assuming there's a modem connected to your machine, establishing communication is simply a matter of dialing up the number of the other computer. When you're getting information from another machine and want to save the transmitted information selectively, use the *recording mode*. To help you organize incoming data into separate files on disk, there's the *change the name of the recording file* option. The *transmit a file* option allows you to send a file to a remote computer. Finally, a *help* option offers explanations of all the *Access III* commands.

If you want to try your hand at telecommunications via your Apple III, consider acquiring this package. You'll get the Apple *Access III* program disk (both Pascal and Business Basic versions) and a user guide. Don't forget—if you wish to communicate with other machines, you'll need additional hardware.

Of course, Apple Computer is not the only vendor supplying communications packages for the Apple III. Microcom offers a similar product called *Micro/Terminal*, a software program that enables your Apple III to emulate an intelligent terminal. With it (and a modem) you can communicate over telephone lines to other computers.

This package requires a minimum of 128K, a disk drive (or ProFile hard disk), and, of course, a monitor. In addition, it's recommended that you have a Hayes Smartmodem. Another modem or acoustic coupler can be used, but the auto dial-up and auto answer features of the *Micro/Terminal* work only with the Smartmodem.

Micro/Terminal uses an easy-to-follow, menu-driven method of selecting from among options. From the main menu, you can enter "interactive mode," load terminal options from a file, create or edit disk files, use various utility programs, or leave the program. Hitting the escape key allows you to stop whatever you're doing and return to the previous menu.

The interactive mode allows on-line control of the communications process. Incoming and outgoing commands are displayed on the monitor. In this mode, you can instruct the Apple III to answer incoming calls, dial a particular number, hang up the phone, erase the screen, communicate with the printer, or send files.

Terminal options are those communications parameters that might be specific to a particular machine. It's possible (and appropriate) to save each special set of parameters for use each time you communicate with the particular machines that require them. It is from this option also that you select transmission speed (baud rate), state whether you're communicating in full or half duplex, indicate whether a line feed is needed, and set up a variety of special functions.

In addition, the terminal option allows you to create and save macro instructions—a series of commands entered as a continuous string. You might, for example, create a macro that dials up an outside computer, enters a user identification number, enters a password, and selects a particular item from the first main menu shown. At the appropriate time, you'd send this string of commands by means of only one or two keystrokes. In addition, any of your previously created command options can be changed by selecting the change-terminal-options menu item.

At any time, you can create and edit your own disk files with a powerful, easy-to-use editor. The three basic editing capabilities—which allow you to insert text, delete text, and move the cursor—are sufficient to prepare and edit files. As you'd expect, the cursor is moved with the arrow keys. In addition, the leftmost bank of sixteen keys act as a special keypad. Holding down the control key and pressing one of these designated keys allows you to perform specific tasks; namely, to move forward and backward by character, word, line, or paragraph; and to delete by character, word, line, or paragraph.

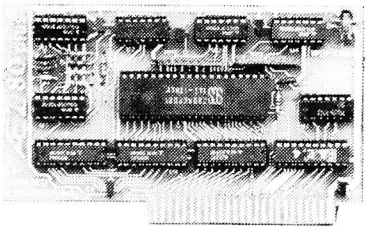
The utilities option lets you review file names, rename files, delete disk files, redefine your system configuration, and so forth.

The user guide supplied with the system is well written and easy to read. It contains an overview of telecommunications; sections on trouble-shooting, using different system configurations and the ASCII character codes; an index; and information about a customer support system.

Almost Midsummer. If you've taken the time to read the whole of this month's column, it must be almost July. So long till then. ◨

Apple Computer, 20525 Mariani Avenue, Cupertino, CA 95014; (408) 996-1010. BRS (Bibliographic Retrieval Service), 1200 Route 7, Latham, NY 12110; (800) 833-4707. CompuServe, 5000 Arlington Centre, Box 20212, Columbus, OH 43220; (800) 848-8990. Dialog Information Services, 3460 Hillview Avenue, Palo Alto, CA 94304; (800) 227-1927. Dow Jones News/Retrieval Service, Box 300, Princeton, NJ 08540; (609) 452-2000. Hayes Microcomputer Products, 5835 Peachtree Corners East, Norcross, GA 30092; (404) 449-8791. New York Times Information Service, 1719-A Route 10, Parsippany, NJ 07054; (201) 539-5850. The Source, 1616 Anderson Road, McLean, VA 22102; (703)734-7500.

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If you don't mind leaving your name with our answering machine, you can call anytime, day or night. Phone (702) 832-1001. Offer expires August 30, 1983.

The story behind the program. I'm Bob Payne, co-creator of Money Street. When I bought my Apple last year, I wanted it to do two rather simple-minded tasks: balance my checking account, and collect financial data in the process.

From my personal checking account, I wanted to keep an informal budget of spending, watch some small investments, and collect tax deduction data. If nothing else, tax time should be a breeze since I could transfer data to my 1040 and Schedule A.

Better yet, with a good tax preparation program, I could calculate my own taxes near the end of the tax year. This would allow me to see next year's returns this year. Hence, tax planning would be based upon actual amounts, not guesstamates.

In addition to all this, I wanted my computer to help make my commercial real estate more profitable. You see, I own a small commercial building, so I wanted a checkbook program to total income by rental unit, track property taxes, and watch expenses. All the while, it could collect "cost basis" data should I ever sell the building. Since all transactions pass through my checkbook, why not collect financial data then and there?

I was wrong. This seemed like a straightfoward application, so I thought it would be a cinch to locate such a program.

But I was wrong. In frustration I tried a slew of checkbook programs, even Apple's own balancer.

What did I get for all this effort and money? A maze of complex graphics, a tangle of computer jargon, and pages of fouled-up documentation. All checkbook programs seemed totally obsessed with budgets and home accounting. Worse: they were limited to only one checking account, so I would need one program for each account and each year!

I got mad! Then I got mad. "What the hell," I said, "I can do better than this." So optimistic as Candide, I set to work programming, but quickly fell flat on my face. I guess at fifty-two years of age, I'm simply too old for the torqued-out world of computer programming.

Finally I met Don Hill, an up-and-coming game programmer and the creator of Blackjack Vegas Style. At twenty-four, Don seemed to have the youth and fire for complex programming. Better yet, Don comes from a small business family and understands what accounting is all about.

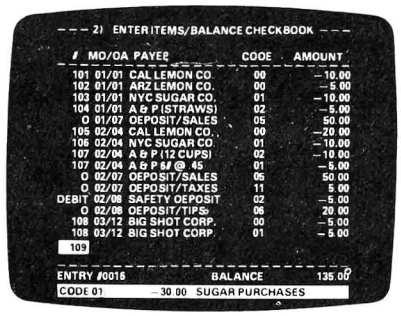
So, we joined forces determined to create a checkbook accounting program for small business, professional offices, and personal use.

In the winter of 1982, we set to work to create a totally new checkbook accounting system. Our objective: make it the silk stocking of them all.

Snowbound programming. We live in a small ski town in Western Nevada. 1982 produced a winter like few others. At nearby Donner Pass, for example, 60 feet of snow fell. Don and I were snowbound much of the time, which gave us plenty of programming time. Near the end of January, so much snow accumulated on Don's roof his front door refused to open without a half dozen hard kicks. Rather than venture out, he just kept fine-tuning the new program.

When the snow plows finally got through, I saw the new program. It simply knocked my socks off. No doubt about it, here's the ultimate checkbook program. Don calls it Money Street, and it does amazing things with checkbook data. For example, it can:

- Scan an electronic file 2400 checks in 300 seconds.
- Sort checks (and deposits) into 100 business, personal, or tax categories.
- List a "history" of 2400 checkbook entries, showing the running balance each step of the way.
- Print monthly (and year-to-date) totals for business, office, or home accounting.
- Display year-to-date totals for 100 categories with the press of two keys.
- Locate a cancelled check in a file of 2400 in one minute!



How it works. On your computer screen, you create a facsimile of your checkbook. You see 17 items per screen, and can scroll for more. As the computer balances your checking account, you give each check or deposit its own category code. You get 100 name'em codes. Press Ctrl-O and see a code dictionary. To set-up codes, just type them in. You can add, delete, or change codes anytime without affecting data.

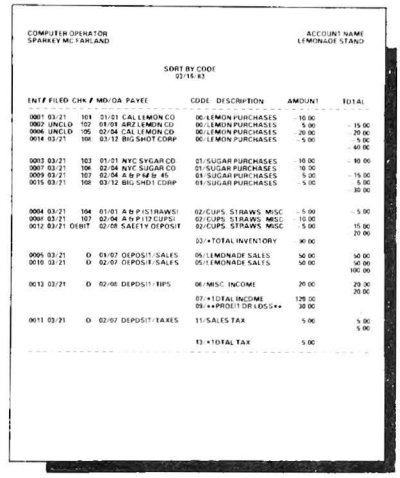
Happy customers. For us, the best thing about Money Street is our happy customers. Every day we get letters like the one from Jerry Losse of New York who wrote: "I'm very pleased. Money Street does everything but go to the bank".

Keller Watson, of California wrote saying, "The speed of operation is fantastic, the double cursor is a help to tired old eyes, and the data bank totals are worth the price of the whole program".

A.W. Matthews of Colorado wrote to say, "...it is truly a relief to purchase software that does as advertised".

Mike O'Bryan, a farmer from Kansas, wrote this: "I like Money Street. I like the split check feature. I like the command to stop printing".

All kinds of people use Money Street. A lawyer in Orlando, Florida uses it to control his trust account. A doctor in New York City uses it to separate expenses in his medical partnership. A computer store owner in Reno, Nevada uses it to control store expenses.


COMPUTER OPERATOR
SPARKEY MCFARLAND

ACCOUNT NAME
LEMONADE STAND

SORT BY CODE
07:16:42

ENT#	FILED	CHK #	MO/DA	PAYEE	CODE	DESCRIPTION	AMOUNT	TOTAL
0001	03/21	101	01/01	CAL LEMON CO	00	/LEMON PURCHASES	-10.00	
0002	UNCLD	102	01/01	ARZ LEMON CO	00	/LEMON PURCHASES	-5.00	-15.00
0006	UNCLD	105	02/04	CAL LEMON CO	00	/LEMON PURCHASES	-20.00	-20.00
0014	03/21	108	03/12	BIG SHOT CORP	00	/LEMON PURCHASES	-5.00	-5.00
								-40.00
0003	03/21	103	01/01	NYC SUGAR CO	01	/SUGAR PURCHASES	-10.00	-10.00
0007	03/21	106	02/04	NYC SUGAR CO	01	/SUGAR PURCHASES	-10.00	
0009	03/21	107	02/04	A & P M & @ .45	01	/SUGAR PURCHASES	-5.00	-15.00
0015	03/21	108	03/12	BIG SHOT CORP	01	/SUGAR PURCHASES	-5.00	-5.00
								-30.00
0004	03/21	104	01/01	A & P (STRAWS)	02	/CUPS, STRAWS, MISC	-5.00	-5.00
0008	03/21	107	02/04	A & P (12 CUPS)	02	/CUPS, STRAWS, MISC	-10.00	
0012	03/21	DEBIT	02/08	SAFETY DEPOSIT	02	/CUPS, STRAWS, MISC	-5.00	-15.00
								-20.00
					03	/*TOTAL INVENTORY	.00	
0005	03/21	0	02/07	DEPOSIT/SALES	05	/LEMONADE SALES	50.00	50.00
0010	03/21	0	02/07	DEPOSIT/SALES	05	/LEMONADE SALES	50.00	50.00
								100.00
0013	03/21	0	02/08	DEPOSIT/TIPS	06	/MISC. INCOME	20.00	20.00
					07	/*TOTAL INCOME	120.00	20.00
					09	/**PROFIT OR LOSS**	30.00	
0011	03/21	0	02/07	DEPOSIT/TAXES	11	/SALES TAX	5.00	5.00
								5.00
					13	/*TOTAL TAX	5.00	

15 ready-to-print reports.

1. Month
2. Amount
3. Payee
4. Category
5. Check number
6. Deposits
7. Code dictionary
8. Single month
9. Single category
10. Entry order
11. Statement date
12. Uncleared check
13. Uncleared deposit
14. Code dictionary
15. Category totals

Money Street may be the only accounting program you need, because one master program handles unlimited checking accounts. More than that, the program is tax deductible when used to collect tax data (See IRS Publication 17). In addition, Money Street will save you the cost of organizing and totaling tax data. One customer put it this way: "Why pay my $100-an-hour CPA to count beans?"

Includes tutorial, map, and reports. Money Street includes Program Map, complete documentation, and samples of all reports. For Apple® II, II+, IIe, and III in emulation. Requires 3.3 DOS, 48K. Money Street works with one drive, but two are preferred. It's also okay without a printer, but you'll miss a few reports. Master Charge, Visa, COD okay. Add $2.50 on all orders for postage and packing.

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Read what the experts are saying...

BusinessWeek
December 13, 1982

And Business Solutions Inc., of Kings Park, N.Y., is selling its JACK program, one of the few programs written for an 8-bit machine, at $79 – far below cost. "Price will go to the heart of the matter," predicts Marian L. Murphy, vice-president for operations at ComputerLand Inc. The Hayward (Calif.)-based chain of 370 computer retail stores carries 2,500 separate software programs, and Murphy says that ComputerLand's experience has shown that "If a program is cheap enough, a lot of people will try it."

Electronic Engineering
TIMES October 25, 1982

JACK-OF-ALL-TRADES

Called Jack, this software package for the Apple II includes a word processor, mailing list, a personal-file system and calculator routines. All of the routines are integrated into one package, not as a collection of separate programs.

The word-processing capability includes the creation of formatted records with items that require calculation being automatically computed and included as the document is prepared. The record-keeping routines handle records that range in size from the data for a mailing label to one that stores text from up to 69 sheets of legal-size paper.

Up to 1000 records, depending on individual record size, can be handled on one diskette.

PERSONAL COMPUTING December, 1982

NEW SOFTWARE IS JACK-OF-ALL-TRADES

The Incredible Jack, a four-applications-in-one software package for the Apple II computer, has just been introduced by Business Solutions. Jack offers a personal filer, calc package, and word processing and mailing label capabilities in one package.

"Jack combines the convenience of a personal filer with the power of a calc package, and handles most word-processing tasks, providing all of the functions that people usually want from a personal computer," says Alan Dziejma, president of Business Solutions. "Jack turns your computer into a jack-of-all-trades by performing all functions with a simple integrated set of commands. Besides being easier to learn, these functions can be combined in a single task."

Jack's unique features let users create letters and reports with embedded calculations, the company says. The word processing capability enables the creation of neatly formatted records and can include items that are automatically calculated as the document is being prepared.

Needing only a few simple commands, the word-processing functions create letters, memos and reports. Jack also inserts, deletes and copies text with automatic word wrap and flush-right margins.

Users can arrange information in files they design themselves using Jack's personal filer. The records can be as small as a mailing label or as large as 60 sheets of legal-size paper.

The calc features let users build decision-making logic into their files. With English language calculation rules and powerful IF/THEN/ELSE function, it is possible to perform complex calculations instantly.

PERSONAL COMPUTING February, 1983

NEW SOFTWARE FOR THE APPLE // e DOES THE WORK OF THREE PROGRAMS FOR THE PRICE OF ONE

Are you on a budget? Do the functions of file management, word processing, and calculation pretty much cover what you want out of your computer? Do you find that specialized programs in these areas often cost too much, take too long to learn or to keep current, and do more than you really need? Does having to load one program after another into memory as you go through the day get you down? Well, there may be one program in all computerdom that will make you happy: The Incredible Jack, from Business Solutions, Inc., for an Apple //e or Apple II Plus with 64K RAM and two disk drives.

Our test of Jack showed you could just load it into your computer and leave it there all day. Say you start a business letter, and halfway through, a client calls with a question. Saving your letter on disk, you switch to the file management function, get the data you need, switch to the logic function, get the calculations you need – give your client one-call turnaround on his question – and return to your letter without ever leaving your program!

A relative newcomer to computing became comfortable with Jack (working through the manual's tutorial) in an hour, with only occasional help. An experienced computer user took even less. In five hours you should be flying with Jack, regardless of your background, thanks to the 57 diskette-size pages of tutorial. The comprehensive 67-page reference section will help you thereafter. The reference section includes a troubleshooting guide, calculation templates, index, and more.

For $129 you get a remarkable program specializing in the generalist's needs. Jack lets you adapt the computer to your work flow, freely using the various functions as needed...if Jack's functions fit your needs, no combination of single-function programs will fill those needs at anywhere near Jack's price.

FOR MORE INFORMATION: BUSINESS SOLUTIONS INC., 60 East Main St., Kings Park, NY 11754

SOFTALK Vol. 3, February, 1983

The Jack of Apples. The appearance of *The Incredible Jack* from Business Solutions among the IIe specific software is almost a travesty. If there were any justice, Business Solutions would be the only company making a software announcement. This is the single current program that from the conception stages was intended for the IIe only. When Apple's development time on the new machine became extended, Business Solutions retrofitted it to the II Plus.

The Incredible Jack draws its name from your ordinary garden-variety jack-of-all-trades. That's what this program is: a spreadsheet, a database, and a word processor in one integrated package. It's the Apple and eight-bit answer to *MBA* and *1-2-3*, widely heralded and praised software packages for the IBM pc.

Microcomputer Software Letter Vol. I, No. 2 January, 1983

Low-Cost Apple "Jack" of All Trades

An easy-to-use, very low-cost package for the Apple II Plus combines simple spreadsheet analysis, fairly advanced word processing for reports and memos, a versatile mail list manager, and a very good personal filing system. Called JACK, this program is the only fully integrated package available for the Apple II; other new integrated products work on the IBM PC or larger machines. JACK costs $129, very inexpensive for a program with its capabilities.

JACK can also serve double duty as a good computer literacy package for novices or new users who can graduate to more powerful packages later.

Recommendation: Managers with Apples and especially start-up users should see if JACK's capabilities meet current needs. JACK has a two-week money-back guarantee, and requires a 64K Apple with two disk drives.

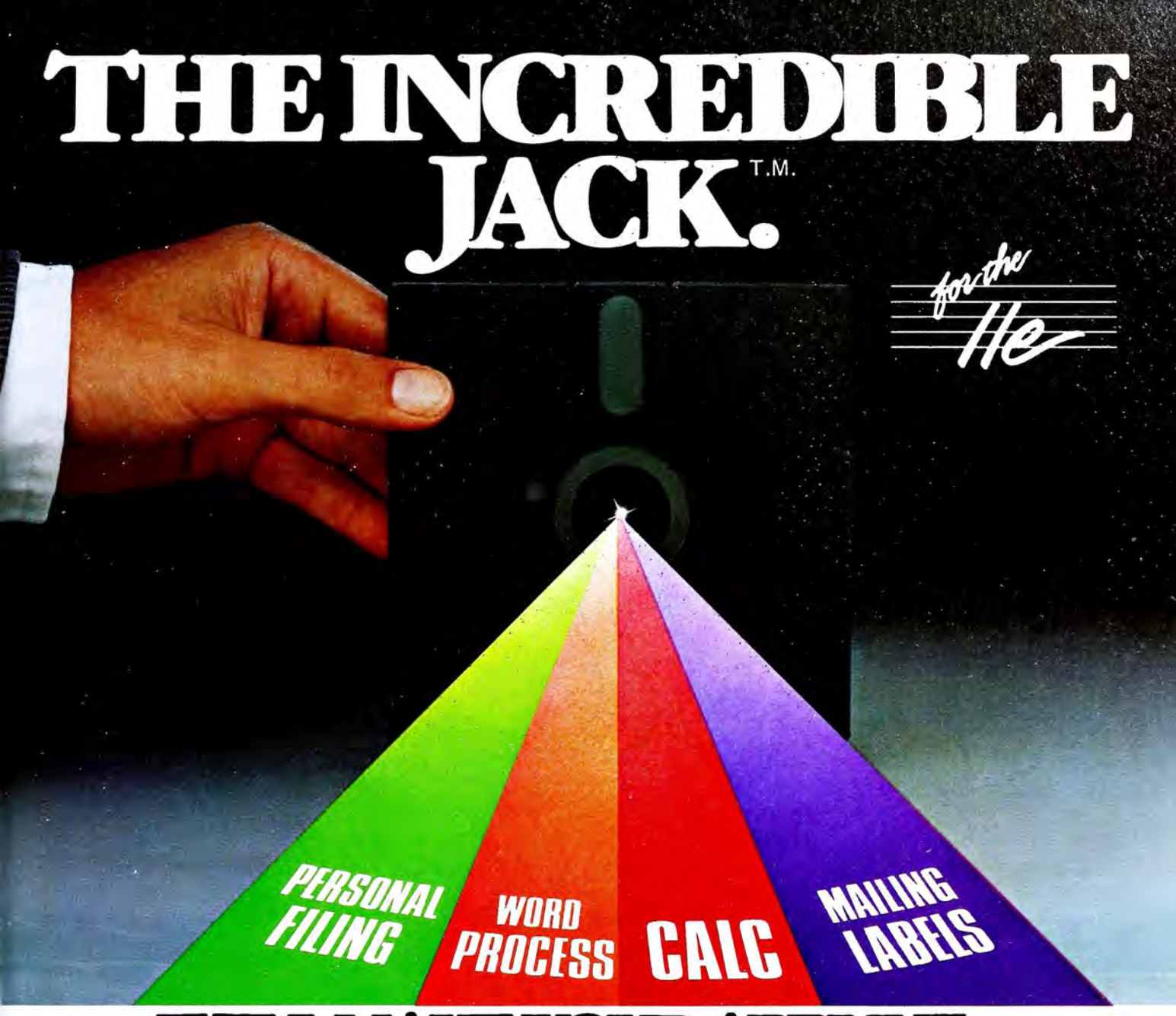
Source: Business Solutions, Inc., 60 E. Main St., Kings Park, NY 11754. **Call:** (516) 269-1120. **Available:** Independent dealers.

FOR MORE INFORMATION, CALL (800) 645-4513

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THE SIXTH SENSE

Searching For Substance

BY MELISSA MILICH

The room sits empty, waiting, its silence locked in. In the corridor beyond the door, the sound of distant footsteps gets nearer.

The scientist guides the next experimental subject into the room. Human Subject #325—female, twenty-seven years old, somewhat spacy, no prior ESP experience. Then the scientist leaves.

"Close Outside Door to Hall during All Experiments To Prevent Sensory Leakage."

Dr. Charles T. Tart, the scientist, obeys the sign and then takes his place in front of a computer in a laboratory across the hall, separated from the subject by three closed doors.

Human Subject #321 sits waiting, wondering why she is in this "rat cage" when she'd rather be outside, even though outside is threatening to be the wettest winter in northern California in one hundred years.



The rat cage is actually a Faraday cage, a room within a room, totally covered with copper sheeting and resting on rubber tires to absorb shock from building vibration. In the sound-attenuating chamber, #321 is shielded from the rest of the psychology department.

She sits down on a hard green ottoman in front of the console—the Ten Choice Trainer, Generation Three. An Apple computer in a wooden case is hooked up to the console—it's not at all like the Apples #321 has seen before. A television camera mounted in the Faraday cage points at her and a video monitor stares blankly.

"Experiments Involving Human Subjects at UCD Are Conducted under the Aegis of the Campus Human Subjects Committee, Which Can Be Reached through the Office of the Dean."

That's just wonderful, #321 thinks; the dean is never in his office.

"You May Stop Participating in This Research at Any Time with No Adverse Consequences."

Ten green bulbs flash on the console.

"Are you ready, #321?"

She presses the button at the top of the console to indicate that she is. The extrasensory-perception experiment has begun. Seated at his Apple in the other room, Tart prompts the computer program to spin out a randomly generated number from one to ten.

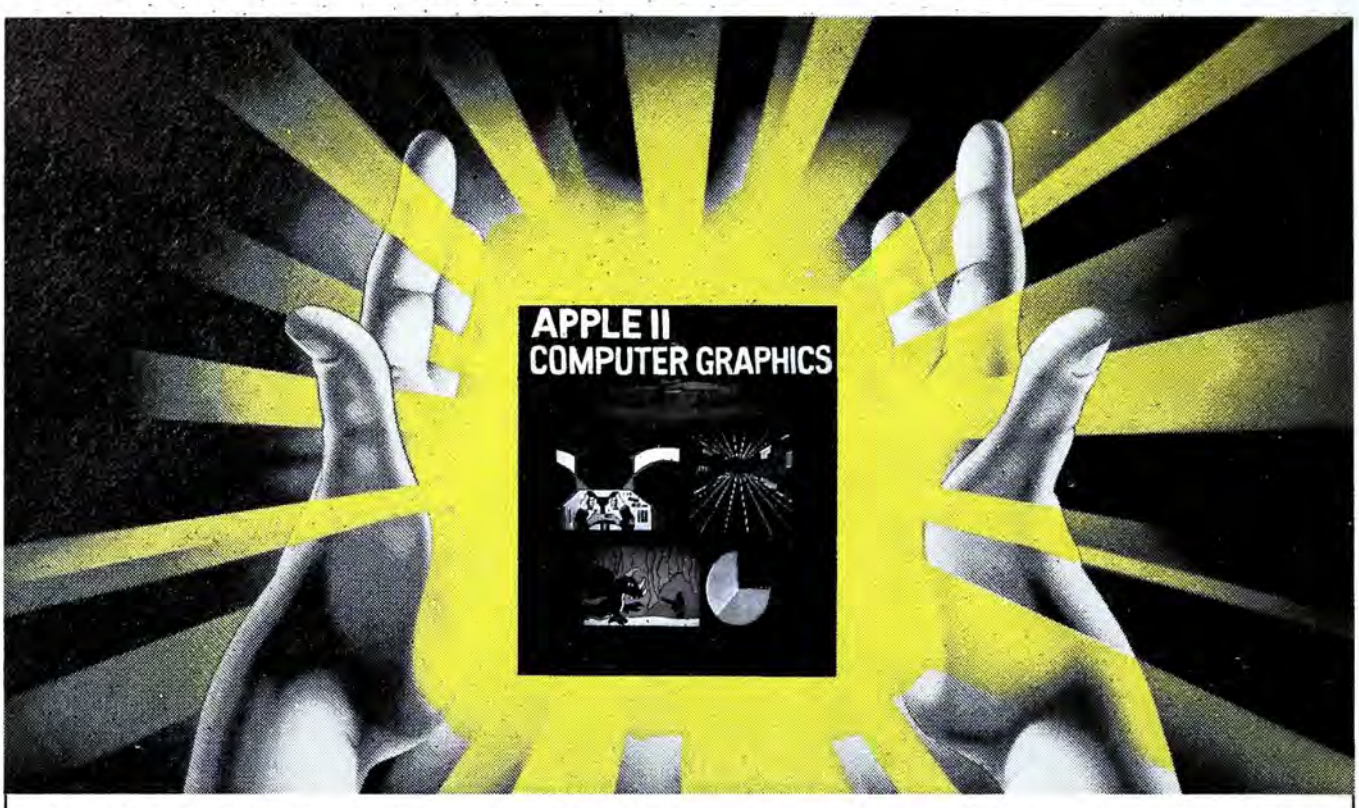
In the Faraday cage, #321 is supposed to pass her hand over the console and use her ESP powers to determine the number Tart has generated. Instead, she gets nervous and jabs at a button almost immediately.

It's not a big deal when the subject gets a wrong answer, but Tart asks his subjects not to leave until they get a "hit." He wants them to leave the cage on a positive note. Some subjects are truly adept—his ESP superstars.

"You mean, somebody else—somebody who isn't so good—might have to stay here all day till they get it right?"

"Nobody," says Charles Tart, "has ever been here all day."

ESP and Worlds beyond the Unknown. Dr. Charles T. Tart, professor of psychology at the University of California at Davis campus,



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dares to investigate areas that many scientists make it a point to avoid: altered states of consciousness, parapsychology, out-of-body experiences, sleep and dreams, the effects of marijuana, and hypnotism. Currently Tart is training people to use their ESP more reliably.

"There's really only a handful of us doing scientific research; it's been a great struggle to get solid recognition in this area."

The microcomputer aids Tart in his efforts to achieve validity for his work—helping him separate "the sense from the nonsense." Tart is in his office, swiveling in his chair. Nothing paranormal here, just a chair that needs oil, but it's like a screaming banshee, especially when Tart spins around to emphasize a point.

Tart believes that providing immediate feedback is the key to a revolutionary breakthrough in ESP. The greatest problem with investigating paranormal experiences is that they only manifest themselves sporadically. Premonitions, mind reading, and ESP happen like a bolt of lightning, bright and loud but over in a second, making them very difficult to study in a laboratory.

"You can make a good case that there is such a thing as ESP," Tart says, "but if you want to discover its nature, what it teaches about people and the universe, it's very hard to do when it comes only in sporadic, intermittent signals."

The Elusive Breakthrough. Tart compares our current understanding of parapsychology to the nebulous grasp most of pre-Industrial Age mankind had of the phenomenon of electricity. When the battery was invented and electricity could be contained and used for experimentation, scientists realized a major breakthrough.

Today, Tart seeks the elusive "parapsychological battery," an abstract concept meant to convey a mechanism or ability by which people can call on their ESP reliably for experimentation and application.

"If you can get immediate feedback on whether you're right or wrong," Tart says, "you can try a variety of strategies and note how they work. Eventually, you'll also build up a catalog of strategies that never work, and so can be dropped. Other strategies will have some promise and need to be developed."

He points at a bicycle blocking a path in the middle of his office. "Now if I told you to move that bicycle, you'd know what to do. We could use all our learned skills to move that bicycle. But if I told you, 'I'm thinking of a number in my mind,' and I asked you to tell me what it is by using telepathy, your first reaction would be, 'Huh?'

"You don't know!" says Tart. "We don't teach people to do that. It's not like performing a variation on something we already know well." He looks at the bicycle as if for affirmation. "You don't know what to do."

A Mad Scientist Is Born. Tart earned a degree in electrical engineering at MIT and worked as a radio engineer for commercial broadcasting stations during the late fifties. He subsequently enrolled at the University of North Carolina and by 1963 had earned a doctorate in psychology. As a graduate student he spent a summer doing research at a fourteen-room house on the rugged seashore of Maine. Overrun with slightly mad scientists conducting every strange test imaginable, the strange house was like a scene straight out of a Ray Bradbury story.

Today Tart is one of the top parapsychologists in the United States, and among a small group at the top of the field in the western world. He publishes scientific papers and articles frequently and has written several books, including *Altered States of Consciousness: A Book of Readings*; *On Being Stoned: A Psychological Study of Marijuana Intoxication*; *Transpersonal Psychologies*; *Psi: Scientific Studies of the Psychic Realm*; and *Learning To Use Extrasensory Perception*.

The psychic world is full of characters, some nasty, who use people's belief in psychic phenomena to spirit all their money away or exploit the innocent in other ways. Thousands of people claim they are psychic, says Tart. A few are definitely talented and a few are definitely charlatans. Most are just nice people who probably have no real psychic powers at all.

"Some of the nicer people honestly believe they're doing parapsychology, but what they're doing is not science. So while I like some of these people, I wish they wouldn't call what they're doing science."

Parapsychological Apple. Dana Redington was a graduate student in the psychology department at UCD during the mid-seventies. He had gone to Holmstead High School in nearby San Jose with a guy named Steve, who later put together a computer in his friend's garage. When Tart mentioned to Redington that he was looking for something that would make his ESP setup more flexible, Redington told him about Woz (another mad scientist) and his wonderful invention.

All computer purchases made with University of California funds had to be approved by the data-processing department; personnel there thought a computer was supposed to take up an entire basement. Redington did all the legwork necessary to get the purchase approved. When every form had been filled out in quadruplicate, the data-processing department somewhat hesitantly signed the permission slip.

Research funds were low; fortunately, Redington managed to get the price of the Apple knocked down a little by buying the computer without the case. A wooden case, varnished in rich brown tones, was built to house the motherboard. Tart fondly christened it the Wooden Apple. The result is a little crude and a little elegant at the same time, definitely a collector's item. Tart still uses it daily.

With two Apples and a Pascal program that took psychology graduate student Ron Goldthwaite four months to complete, Tart performs tests designed to discover three different kinds of extrasensory perception: telepathy (communication by scientifically unknown or inexplicable means), clairvoyance (power to perceive beyond the range of human senses), and precognition (knowledge of events before they occur).

In a telepathy experiment, for example, the "sender" sits in front of an Apple computer in the first lab and waits for the very clinical-looking sign "Acoustical Path Suppression Baffler" to flash green. (Translated, it means simply that all the doors that should be shut are shut.)

There is an intercom linking the sender and the receiver that is automatically shut off by the Apple when a trial begins. The monitor inside the receiver's Faraday cage is used to inform the test subject that the trial is about to begin. The tester sends a brief message through the Apple, such as "The trial has begun; use your ESP now!"

When experimental conditions are just right, the sender starts the program. The master Apple randomly generates a number from one to ten, which appears on the sender's computer screen.

The receiver sits inside the Faraday cage, with the Wooden Apple hooked to a graphics tablet. The graphics tablet has an overlay that consists of ten switches arranged in a circle, each with a tiny green light bulb adjacent to it. The switches correspond to the numbers one through ten.

Graphically ESPing. The receiver holds the stylus of the graphics tablet and passes the hand holding the stylus slowly around the circular path of bulbs and switches until a decision—conscious or unconscious—is made. The test subject then flicks the chosen switch.

A television camera in the Faraday cage sends the receiver's every move to a monitor watched by the sender. When the stylus comes in range of the correct switch, the sender may concentrate hard, attempting to broadcast hints telepathically.

Some receivers report definite physical sensations they can't explain. Apparent temperature changes are common. "My hand passed through fire; my hand passed through ice," one woman claimed. This may have occurred because the sender was thinking, "You're getting warm, warmer; now you're getting cold." What is telepathy? The elusive sixth sense?

The graphics tablet and the Apple keep a statistical record of the hand activity, measuring where the hand goes and how long it lingers in a certain spot. For instance, sometimes the test subject's hand may hover next to the correct switch for a long while and then abruptly move to the opposite side of the board and hit a wrong switch. Maybe this means that some part of the subject knew the correct answer. Careful statistical analysis of the behavior might reveal a significant pattern.

Tart's setup gives his subjects immediate feedback. A correct hit rings a nice electronic chime and prompts a graphic cartoonlike display. Tart, whose talents include programming in Applesoft, created the display.

Testing subjects for clairvoyance and precognition is accomplished with the same equipment used in testing for telepathy. In the case of the former, there is no sender. The test subject is trying to discover something that exists but is unknown to both the subject and the person administering the test. The Apple randomly generates a number but keeps it a secret until the trial is over. It is up to individual test subjects to ascertain the correct choice entirely on their own.

In a similar fashion, testing for precognition requires the subject to predict an event before it takes place. Tart will tell the test subject, "The Apple is going to randomly generate a number in one minute. Tell me

what that number is now."

Immediate feedback, Tart emphasizes over and over, is the key to learning to use a steady, reliable method of ESP. "The vast majority of past ESP tests, done without immediate feedback, may have actually been extinguishing the very ability they were trying to test," explains Tart. "One of the most pervasive findings in ESP research was the so-called 'decline effect,' a regular drop-off in scores as initially talented people were tested and tested and tested."

To Have and Have Not. Of course, not everybody wants to have ESP. Tart, past president of the Parapsychological Association, put the possibility in an extreme form not long ago when he spoke to a group of parapsychologists attending a workshop: "Let's imagine there's been a new drug invented, a pill that will give you complete ESP right now. You'll be able to read the minds and know the feelings of everyone within a hundred yards of you. Who wants to take this pill?"

Not one of the parapsychologists in the group raised a hand to volunteer, and Tart didn't blame them.

"Have you ever had a day when you could hardly stand your own mind? I've certainly had days like that," Tart admits. "And I've walked past people on the street and with my ordinary sensory perception realized I didn't want to know anything about what they were really like and what was going on inside.

"We really do have strong reservations about what it would be like to have complete ESP. Unlimited access to other minds would probably be a real curse."

An incident that took place a few years ago in his lab still bothers Tart. It concerned a young student who used to come in periodically to be tested on the Ten Choice Trainer. Consistently she'd get 50 percent right. Ten percent correct is chance; a few people get 12 percent. By any statistical consideration, 50 percent is a tremendous score.

And she got frightened. One time she came in, wowed everybody with another high score, and cried for an hour. She didn't come back after that.

Too Hot To Handle. According to Tart, the young woman developed her ESP at a faster rate than her conscious mind was ready to handle. She was not ready, he says, to face the "full implications" of having really strong ESP. It is an extreme case, but Tart can recall many other cases where people contacted him because they'd had an ESP experience. They'd call or write him pleading, "How can I stop this?"—not, "How can I develop this?"

Then there are people who simply want to know what happened. Their minds seemed to leave their bodies, they floated through space, they saw the future, or their dreams came true. They had an unusual experience and want to know why.

Tart's lab setup is aimed at promoting a gradual development of ESP, not a sudden breakthrough that could be more risky than useful.

"One of the points in this feedback is that people can go at their own speed, improving at their own pace and learning in a specific kind of laboratory situation. I think their own unconscious minds work with them as to how much permission they'll need to be able to call on ESP more often, eventually taking it outside the lab."

Imagine, suggests Tart, if the parapsychological battery were here now. The practical applications he proposes run the gamut from medical diagnosis to intelligence gathering and a life-saving disaster warning system. In fact, any kind of decision making that must be done when all the facts are not available or when their interpretation leans toward the hazy could be greatly aided by adding Psi information.

One of Tart's colleagues, parapsychologist Douglas Dean, has shown that top-level executives who have doubled their corporations' net worths show more ESP ability than executives who haven't done as well. These more successful executives occasionally and unknowingly use ESP, calling it "hunches" or "business sense," notes Dean.

Tart is giving a major lecture this summer at a meeting of the American Psychological Association. His paper discusses the values that have crept into the orthodox scientific views of man—assumptions that we don't survive death, that the mind is nothing but electrical impulses.

We Are Not Alone? "If that is the case," says Tart, "what do I care if you're suffering when my mind is really locked in my skull and yours is locked in your skull? There's no direct contact between us—it's all mediated by sensory means. And I can get rid of your suffering very easily, can't I? I can turn around and not look.

"The very existence of something like telepathy—direct mind-to-mind contact, even though it's only sporadic now—demonstrates that the idea that we are one may be illustrating a fact, not a moral injunction or a philosophy.

"The implications are that we may have direct connections with each other. Of course, if that's true, then there's a very real and fundamental way in which I care about other people. If you're suffering, there's a real sense in which I'm diminished—not just some abstract sense of it."

If our minds can occasionally operate in some way that seems to transcend the ordinary limits of physics, then the very idea of surviving death is not so preposterous, Tart says. He believes that these are unknowns worth looking into even though the laws of physics say they're impossible.

"My main job in this world is to try to bridge the gap, the cultural conflict between the scientific world and traditional religious ideas and values," says Tart. "Religions use miracles to prove their validation. Miracles are occurrences that have formed the basis for religious experience, and miracles, visions, and so on sound like parapsychology to me."

There have been times, though, when Tart has lost faith and entertained thoughts of doing something more conventional to get some funding. "If I went to Washington, D.C., to try to get a research grant to screen a hundred thousand people for ESP ability, I'd be laughed out of town."

Tart calls the amount of money spent on scientific research into ESP in this country "absolutely trivial." All the money spent in parapsychology research labs in America added together amounts to less than six hundred thousand dollars a year, he says. If the amount of money spent in parapsychology research labs in Western Europe were added to that figure, it would be maybe another hundred to hundred fifty thousand.

With more research funds, Tart would be able to expand his lab and purchase more Apples so students could come in and test themselves on their own.

"If my theory—that you can train people by immediate feedback experiments to develop their own ESP ability—is correct," says Tart, "then this is going to be easy to implement on microcomputers. I have a vision of computer freaks picking up on a 'Train Your ESP' type of program and trying it."

Psychic Society. To some people, guessing numbers or patterns generated by computers may sound boring. But an Apple backing you up with graphics and sounds, says Tart, will help keep things interesting and put you a big step ahead. "Just as we found young computer geniuses, we're going to find some ESP geniuses working on their microcomputers.

"I think everybody has ESP to some extent; it's probably just like any other talent. And if we can suddenly get ourselves a handful of real geniuses, we can make real progress.

"Everything can be used for good or evil; it's up to us how we use it. If people in this country started implementing this program on their own computers, they'd screen themselves. And, if they really began to practice ESP, a cultural revolution would take place."

Human Subject #321 presses the ready button to begin Trial Two. She can see herself shriveling up into an old lady as the years go on, never making a hit. As she thinks, her hand passes absent-mindedly around the console, next to each of the light bulbs.

The random generator has chosen seven. Dr. Charles Tart, three doors away, thinks seven.

#321's hand passes slowly around the console. She feels a slight pull, then a violent tug. I don't want to be here, she thinks. I don't want to do this. What if I get it right?

Her hand, her entire arm, is pulled by some unseen force to number seven. Pick any number but seven, her reason shouts. But the force is too strong. She has already picked seven.

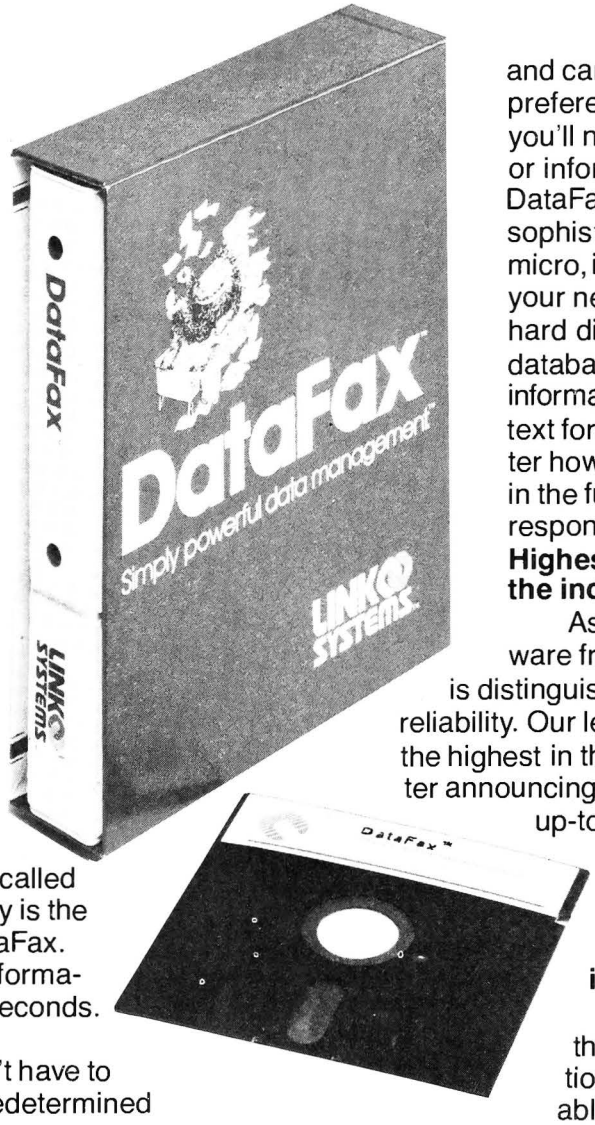
"Hooray!" Tart rushes through the three doors and into the Faraday cage. The eerie atmosphere dissipates a little when #321 sees his boyish enthusiasm.

"You May Stop Participating in This Research at Any Time with No Adverse Consequences."

But, if you should decide to continue . . . . ■

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Can You Read Your Apple's Mind?

Dr. Charles Tart hopes programmers who take a look at his flow chart to convert the Apple into an ESP machine will say, "That's not very sophisticated. I can do something better."

"Good!" says Tart. "If somebody writes a wonderful program, I'd like to see it, and I might be able to incorporate it into my research."

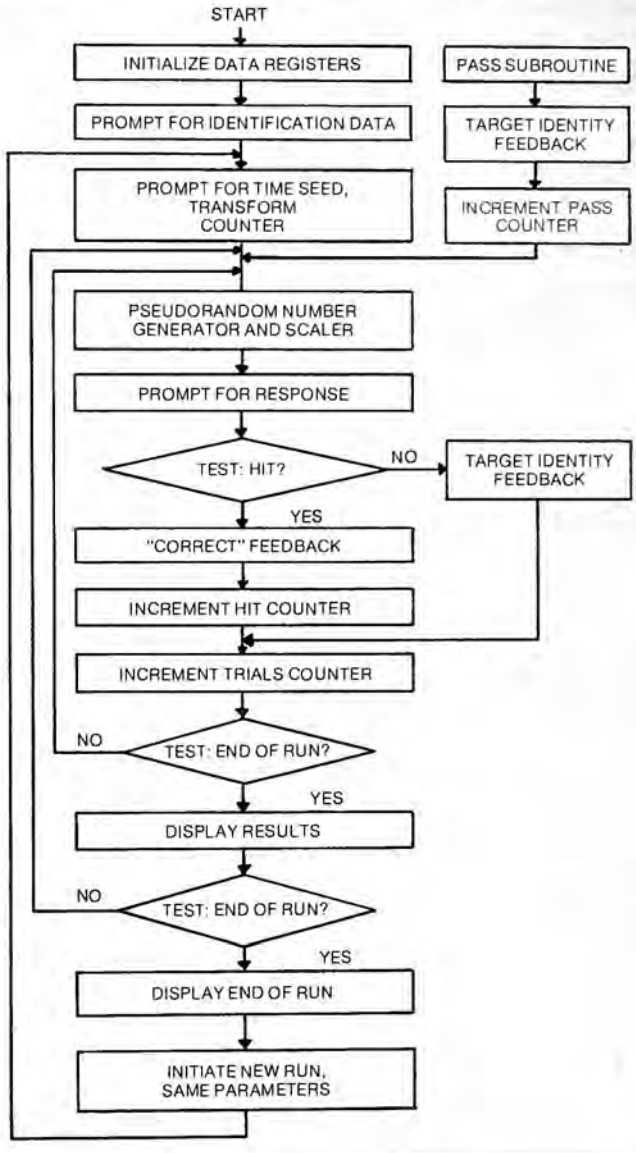
Not everyone, Tart warns, will get significant results using a program of this kind. But if you have a little ESP to begin with, he believes, a program like this one may serve as a training device to increase it, and you may begin to get your ESP under conscious control.

Although at this stage of our knowledge getting ESP to manifest itself is more an art than a science, Tart offers some advice and suggests a few factors that can aid or inhibit ESP:

1. Test yourself when you're relaxed and in a good mood. Bad moods have been known to lead to scores significantly below chance expectation. If it doesn't seem to be your day, give it up and try again when you feel better.
2. Don't test yourself too much at once unless you feel particularly "hot." Don't do too many runs in a single session. A run length of twenty-five trials, with about a minute's break between runs, is usually plenty. And it's better not to program it for more than a maximum of ten choices. When you're dealing with more than ten possibilities, you'll rarely make the correct choice, even by chance.
3. Try sticking with the first impression that comes to mind. Second-guessing and logical analysis often get poor results. Be intuitive. Try a variety of strategies. Be serious—but even more, be playful. Keep it as much of a game as possible.
4. Be prepared to see a lot of variation in your scores. There will be days when you do exceptionally well, and other days when your results will be poor. Such variation is normal. Don't get discouraged if you don't get spectacular scores. Relatively small deviations above what would happen by chance that continue for large numbers of trials are significant. Some of the best subjects in the history of the field are people who scored only 1 or 2 percent more than chance expectation but were able to do it over and over again.
5. Get your friends involved and get some gamelike competition going. Keep records of how you do. Before you begin, make a note of your mood and other factors; then you'll be able to consider how these might affect your ESP performance.
6. Finally, don't hesitate to ignore all these suggestions if you find some other way that works for you!

You might want to keep records of all your results. If you find yourself steadily improving, Professor Tart would like to hear from you. You can reach him at the Psychology Department of the University of California at Davis.

The Program. You don't really need psychic ability to read Dr. Tart's flow chart, but it helps. You definitely need programming ability.



	Run Length				
	20	40	60	80	100
2—Choice	15	26	37	48	59
4—Choice	9	16	21	28	33
5—Choice	8	13	18	23	28
10—Choice	5	8	11	13	16

Table of Significance. The values in the body of the table are the number of hits you must reach or exceed for your ESP results to be statistically significant at a probability of .05 or less. For example, if you had completed sixty trials with a five-choice test procedure, getting eighteen or more hits would occur by chance less than 5 in 100 times and would suggest that ESP was operating.

In the interest of readers who don't know a rem from a gosub, and never hope to meet one, David Durkee produced an Applesoft version of the flow chart, with the good doctor's help.

Parapsychology is an individual-centered science, and different people find they get different kinds of results under different conditions. For that reason, we left a few options in this program up to the user.

First of all, you can set the number of trials to be run to a number between five and thirty. Both ends of the scale are determined by the requirements that the science of statistics places on determining what results are significant and what are not. Fewer than five trials just isn't meaningful. More than thirty-three will cause an overflow error.

The second option is the number of choices offered on each trial. The

limits on this are two and ten, as suggested by Dr. Tart.

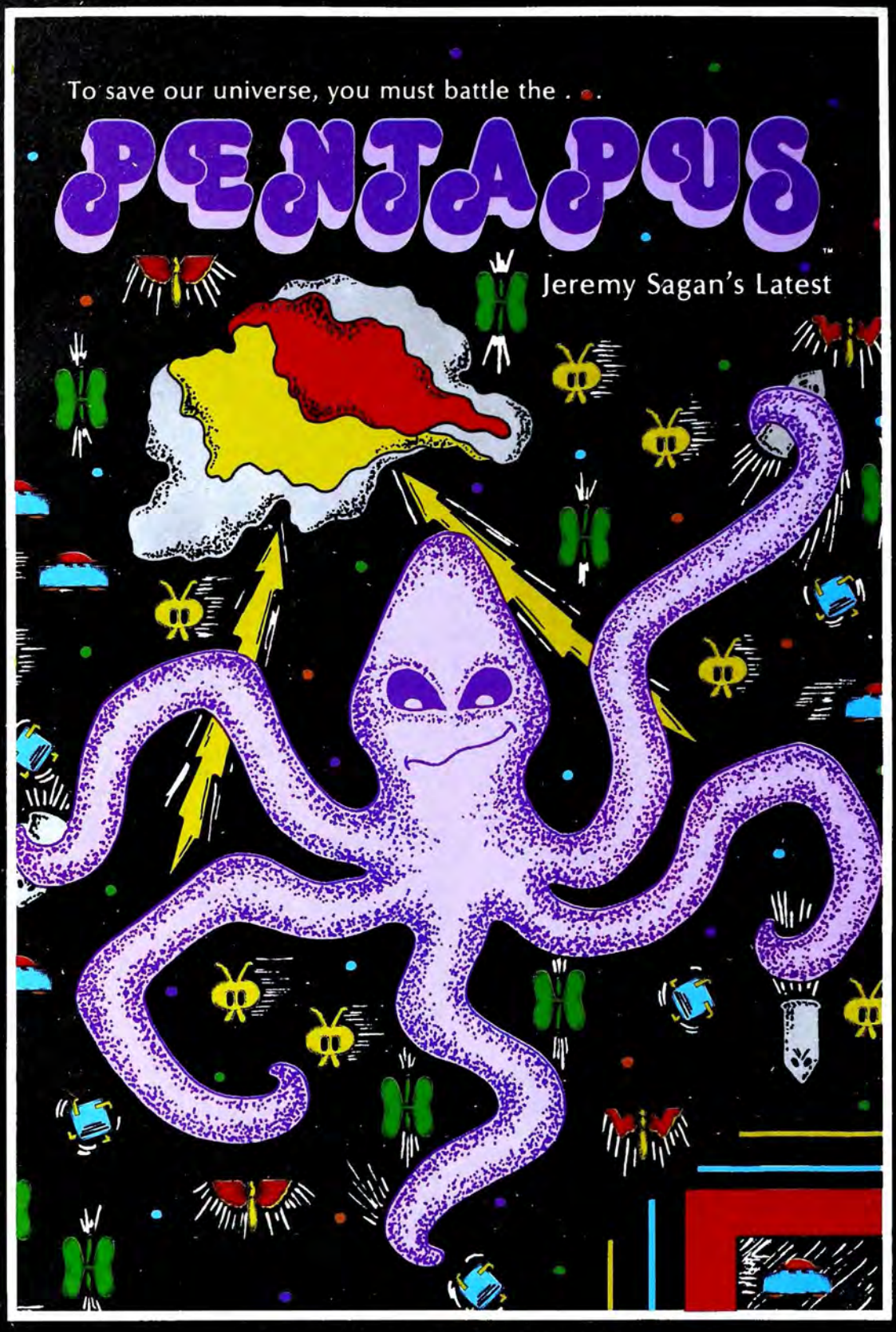
The other options have to do with the types of feedback available to the user. You can choose any combination of the three or none. Aural feedback is noise: a buzz accompanies a wrong answer and a bell sounds for a right one. Top-line feedback is a running total of the results kept at the top of the screen. Flashing feedback means two things: After you guess, the correct square flashes, and if you got the right answer, it flashes the message "Right!!!" on your screen.

The program allows you to use either a paddle or a joystick for guess input. If you don't have a game controller, you'll have to replace the input routine in lines 590 through 660 with this one:

```
590  REM INPUT ROUTINE
600  VTAB 15:N = INT (NC / 2)
605  HTAB 1: CALL - 868: HTAB 1 + FN H(N): PRINT "^";
610  HTAB 1 + FN H(N): GET A$
615  IF A$ = CHR$ (13) THEN RETURN
620  IF A$ = CHR$ (8) THEN N = N - 1: GOTO 635
625  IF A$ = CHR$ (21) THEN N = N + 1: GOTO 635
630  GOTO 610
635  IF N < 1 THEN N = NC
640  IF N > NC THEN N = 1
645  GOTO 605
```

This routine lets you move a blinking pointer with the arrow keys and accept the number pointed to by pressing the return key.

```
10   REM PARAPSYCHOLOGY TESTER
20   REM BY DAVID W. DURKEE
30   TEXT : HOME : INVERSE : PRINT SPC( 40): POKE 34,1
40   DEF FN H(X) = 1 + D + 4 * (X - 1)
50   POKE - 16368,0
60   REM SEED RANDOM NUMBER
70   VTAB 15: HTAB 10: INVERSE : PRINT "HIT A KEY TO START"
80   R = RND (1):K = PEEK ( - 16384): IF K < 128 THEN 80
90   POKE - 16368,0: HOME
100  NORMAL : PRINT : PRINT
110  VTAB 4: HTAB 1: INPUT "HOW MANY TRIALS (5-33)? ";TR
120  IF TR < 5 OR TR > 33 THEN 110
130  VTAB 5: HTAB 1: INPUT "HOW MANY CHOICES (2-10)? ";NC
140  IF NC < 2 OR NC > 10 THEN 130
150  D = 20 - 2 * NC
160  PRINT : PRINT "FEEDBACK:": PRINT
170  M$ = " AURAL: ": GOSUB 280:F1 = (A$ = "Y")
180  M$ = " TOP LINE: ": GOSUB 280:F2 = (A$ = "Y")
190  M$ = " FLASHING: ": GOSUB 280:F3 = (A$ = "Y")
200  VTAB 24: HOME : GOSUB 450
210  RN = INT ( RND (6) * NC) + 1
220  GOSUB 590
230  IF RN <> N THEN 250
240  NH = NH + 1
250  NT = NT + 1: GOSUB 670
260  IF NT = TR THEN 870
270  GOTO 200
280  REM PARAMETER INPUT
290  PRINT M$;
300  GET A$: IF A$ <> "Y" AND A$ <> "N" THEN 300
310  PRINT A$: RETURN
320  REM TOPLINE
330  IF NT = 0 THEN PC = 0: GOTO 350
340  PC = NH / NT * 150
350  INVERSE : VTAB 1
360  HTAB 1: PRINT "TRIALS: ";NT;" ";
370  HTAB 14: PRINT "HITS: ";NH;" ";
380  HTAB 24: PRINT "PERCENT: "; INT (PC * 150) / 100; SPC( 40 -
     PEEK (36));
390  NORMAL
400  RETURN
410  REM NOISE FEEDBACK
420  IF RN = N THEN PRINT CHR$ (7); CHR$ (7);: RETURN
430  FOR X = 1 TO 20:Z = PEEK ( - 16336): NEXT X
440  RETURN
450  REM PRINT "HAND"
460  INVERSE
470  FOR X = 1 TO NC
480  FOR DL = 1 TO 30 * (11 - NC): NEXT DL
490  FOR Y = 1 TO 3: VTAB 10 + Y
500  HTAB FN H(X)
510  PRINT SPC( 3)
520  NEXT Y
530  VTAB 12: HTAB 1 + FN H(X)
540  IF X = 10 THEN PRINT 0;: GOTO 560
550  PRINT X;
560  NEXT X
570  NORMAL
580  RETURN
590  REM INPUT ROUTINE
600  VTAB 15:N1 = 0
610  N = INT ( PDL (0) * NC / 256) + 1
620  IF PEEK ( - 16287) > 127 AND N1 = N THEN RETURN
630  IF N = N1 THEN 610
640  N1 = N
650  HTAB 1: CALL - 868: HTAB 1 + FN H(N): PRINT "^";
660  GOTO 610
670  REM FEEDBACK ROUTINE
680  IF F1 THEN GOSUB 410
690  IF F2 THEN GOSUB 320
700  IF NOT F3 THEN RETURN
710  FOR X = 1 TO 6
720  IF RN = N THEN NORMAL : VTAB 5: HTAB 16: PRINT
     "RIGHT!!!"
730  FOR DL = 1 TO 75: NEXT DL
740  VTAB 11
750  NORMAL : IF X / 2 = INT (X / 2) THEN INVERSE
760  FOR Y = 1 TO 3
770  VTAB 10 + Y: HTAB FN H(RN)
780  PRINT SPC( 3);
790  NEXT Y
800  VTAB 12: HTAB 1 + FN H(RN)
810  IF RN = 10 THEN PRINT 0;: GOTO 830
820  PRINT RN;
830  VTAB 5: HTAB 1: CALL - 868: FOR DL = 1 TO 75: NEXT DL
840  NEXT X
850  NORMAL
860  RETURN
870  REM DO END OF RUN STATISTICS
880  GOSUB 320
890  PB = 0
900  FOR X = 0 TO NH - 1
910  GOSUB 1060
920  PB = PB + PR
930  NEXT X
940  PB = 1 - PB
950  HOME
960  VTAB 5: HTAB 8: PRINT "TRIALS: ";NT
970  VTAB 7: HTAB 7: PRINT "CHOICES: ";NC
980  VTAB 9: HTAB 10: PRINT "HITS: ";NH
990  PRINT "--------------------"
1000  PRINT "PROBABILITY = ";PB
1010  PRINT
1020  IF PB < .05 THEN PRINT "THIS IS STATISTICALLY
     SIGNIFICANT.": GOTO 1050
1030  PRINT "THIS IS NOT STATISTICALLY SIGNIFICANT."
1040  TEXT : VTAB 16
1050  END
1060  REM CALCULATE PROBABILITY
1070  P = 1 / NC:Q = 1 - P
1080  N = NT: GOSUB 1130:N1 = NF
1090  N = X: GOSUB 1130:N2 = NF
1100  N = NT - X: GOSUB 1130:N3 = NF
1110  PR = (N1 * P ^ X * Q ^ (NT - X)) / (N2 * N3)
1120  RETURN
1130  REM FACTORIAL
1140  NF = 1
1150  FOR CT = 1 TO N
1160  NF = NF * CT
1170  NEXT
1180  RETURN
```



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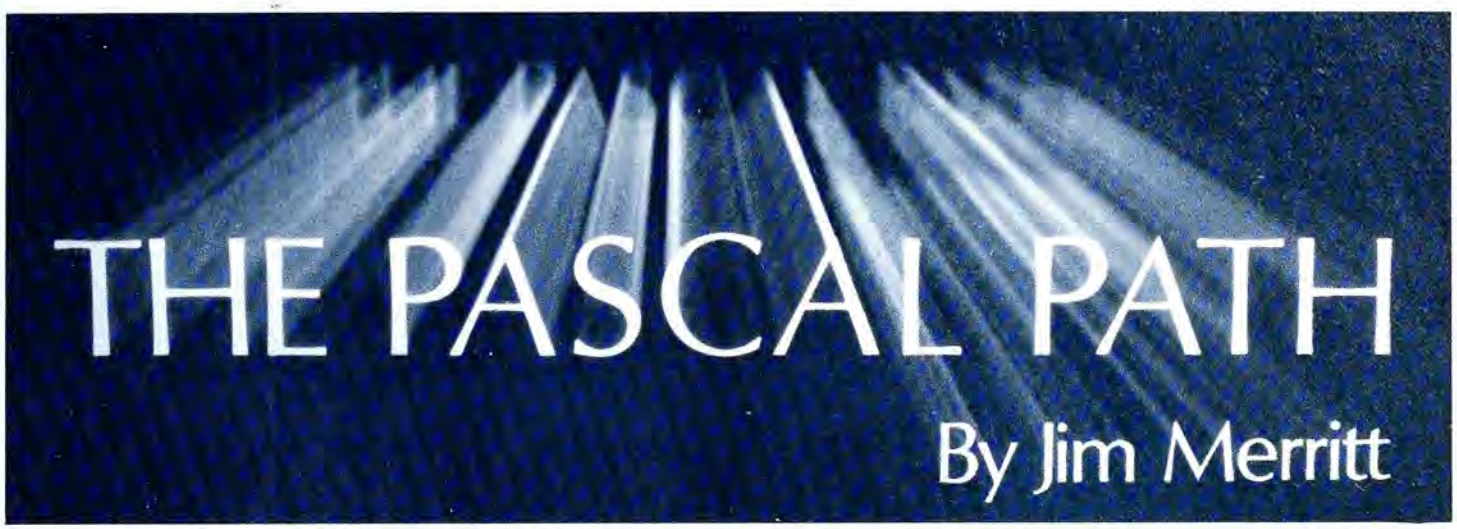
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Tools of the Craft, Part 24

A man of letters once said, "Be careful what you wish for; you might get it." This cautionary remark is an especially appropriate warning to those who would program a computer, as nothing rivals the computer's capacity for blind, uncritical obedience. Tell your Apple to overwrite all of its memory with meaningless garbage, and it will, in the blink of an eye. Tell it to erase a valuable disk, and in scant seconds the job will be done. If you're like most people, of course, you'd never knowingly command your machine to commit electronic suicide. Unfortunately, it's easy to do by mistake. Certain common bugs can transform a mild-mannered, unassuming program into a wantonly destructive renegade.

One of the jobs of the Apple Pascal operating system is to protect your computer from attack by renegade programs. Toward this end, several defense mechanisms are scattered among the major components of Apple Pascal. This month, as we conclude our initial investigation of *compiler directives*, we'll look at the compiler's contribution to the continued health of your Apple.

String Parameter Checking: The V Instruction. Many months ago, we discussed the wisdom of the Pascal rule that requires you to assign a specific data type to each variable you use. By stating up-front how you expect to use a variable, you can enlist the compiler's aid in preventing its misuse. For instance, the compiler will not allow your program to assign a *Real* value to an *Integer* variable. This is quite fortunate, as the space in RAM that corresponds to an Integer variable is only half as large as that necessary to hold a Real value! In short, *data typing* helps the compiler prevent a program from putting data where it doesn't belong.

In the earliest version of Apple Pascal (1.0), String variables were not always subject to Pascal's "strong typing," especially when passed to procedures and functions as VAR parameters. This situation often led to subtle problems, as illustrated by the following program:

```
PROGRAM
    VarString;
    CONST
      Empty=      '';
    VAR
      OneCharString
        :String[1];
      PoorDevil
        :String;
    PROCEDURE
      GetName(VAR S: String);
    BEGIN
      Write(Output, 'Please type your name: ');
      ReadLn(Input, S);
    END;
BEGIN (* VarString *)
    OneCharString := Empty;
    PoorDevil := Empty;
    WriteLn('OneCharString= ',OneCharString);
    WriteLn('PoorDevil= ',PoorDevil);
    GetName(OneCharString);
    WriteLn('OneCharString= ',OneCharString);
    WriteLn('PoorDevil= ',PoorDevil);
END  (* VarString *)
```

OneCharString is physically very small—it contains room for only one character, while a regular String (such as PoorDevil) can accommodate as many as eighty. Stated another way, a regular String can contain any value that will fit into OneCharString, but OneCharString can contain only a small fraction of the values suitable for regular String variables.

Because GetName's VAR parameter S is declared as being a regular String, GetName's code is compiled under the assumption that the object represented by S can hold up to eighty characters. However, the 1.0 Pascal compiler did not guarantee the validity of this assumption. Instead, it permitted any String variable to serve as a VAR String parameter, regardless of its maximum physical length. Thus, under Pascal 1.0, the call to GetName in the program VarString is quite legal. It is also dangerous, as you can see by examining the following transcription of a session with the program:

```
OneCharString=
PoorDevil=
Please type your name: j merritt
OneCharString= j merritt
PoorDevil= merritt(ile, C(omp, L(ink, X(ecu
```

This is a classic example of the right hand (the main program) not knowing what the left hand (GetName) is doing. By declaring S as a (regular) String in GetName, we imply that S will always refer to an area of memory that can hold up to eighty characters. Due to a lax attitude on the part of the 1.0 compiler, however, we could associate S with a much smaller region of memory. To understand how harmful this practice can be, let's consider an analogous situation from everyday experience.

A new trend has emerged in the design of soft-drink vending machines that dispense by the cupful. Have you noticed? The customer must grab a cup from a stack that is mounted on or near the machine, then place it under the soft-drink spigot. The presence of a cup under the spigot interrupts a beam of light, which causes the machine to squirt a precisely measured amount of liquid into the cup. Customers who wish to do so may reuse the same cup or may even employ their own personal cups. Those cups provided by the customer, however, should hold at least as much as the paper cup that is available from the vending machine, since the machine expects to dispense a certain amount of liquid. If you place too small a cup under the spigot, much of the drink will spill over the rim of the cup and down the drain.

When you specify a String variable in a call to GetName, you are, in effect, putting your own personal "cup" under GetName's "spigot." The routine will proceed to fill your "cup" with any String value it receives from the terminal. However, the fixed size of the "cup" expected by GetName is determined by the declaration of S. OneCharString is much smaller than S is supposed to be. Consequently, some of the input String "spills over" into the memory *adjacent* to OneCharString. The figure illustrates this "overflow" process by depicting the regions in RAM mem-

ory assigned to OneCharString and PoorDevil before and after the sample call to GetName.

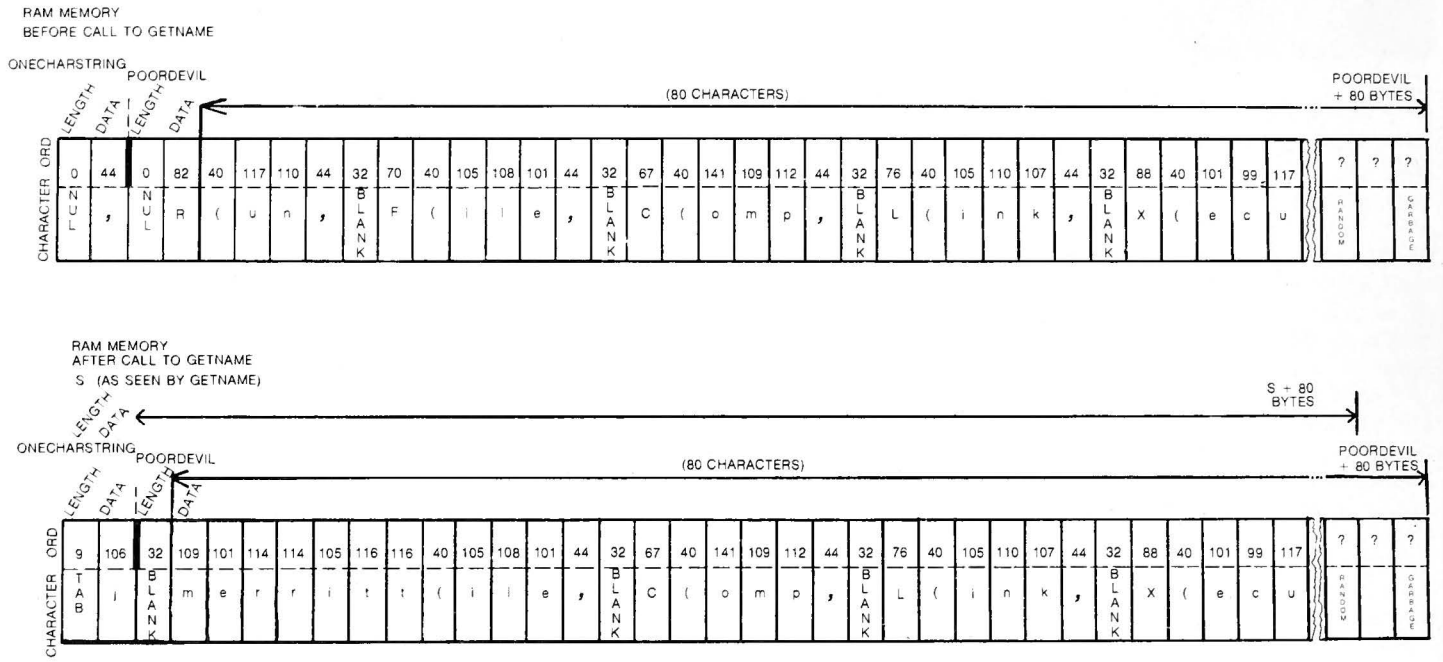
Note that after the procedure call OneCharString masquerades as a nine-character String, j merritt, despite its declared maximum length of one. This is possible because GetName has permitted OneCharString's *Length-byte* to acquire the value of nine.

Most system routines that access or otherwise manipulate Strings, including Write and WriteLn, are ignorant of any String's maximum length. Instead, they perform according to the dynamic length stored in the String's length-byte. This is why WriteLn sends nine characters to the screen when called upon to display OneCharString, even though eight of the characters lie in the region of memory reserved for PoorDevil.

And what of PoorDevil? Because a blank character—Chr(32)—has overwritten that String's previous length-byte, the Pascal system is fooled into believing that PoorDevil's dynamic length is 32! WriteLn therefore displays the first 32 characters that follow PoorDevil's length-byte. These happen to include the last portion of the String acquired by GetName, as well as some "garbage" characters that, in this example, were left in memory by the operating system's command-line processor.

The program VarString clearly exhibits renegade behavior under Apple Pascal 1.0 but will not compile at all under Apple Pascal 1.1, because laxity in String type checking was eliminated with the 1.1 release of the system. Under normal circumstances, the compiler would now ensure that the maximum lengths of all actual String parameters are greater than or equal to those implied by corresponding VAR parameter declarations.

You can force the latest compiler to ignore the maximum lengths of formal and actual String VAR parameters, and thus to relax strong type-



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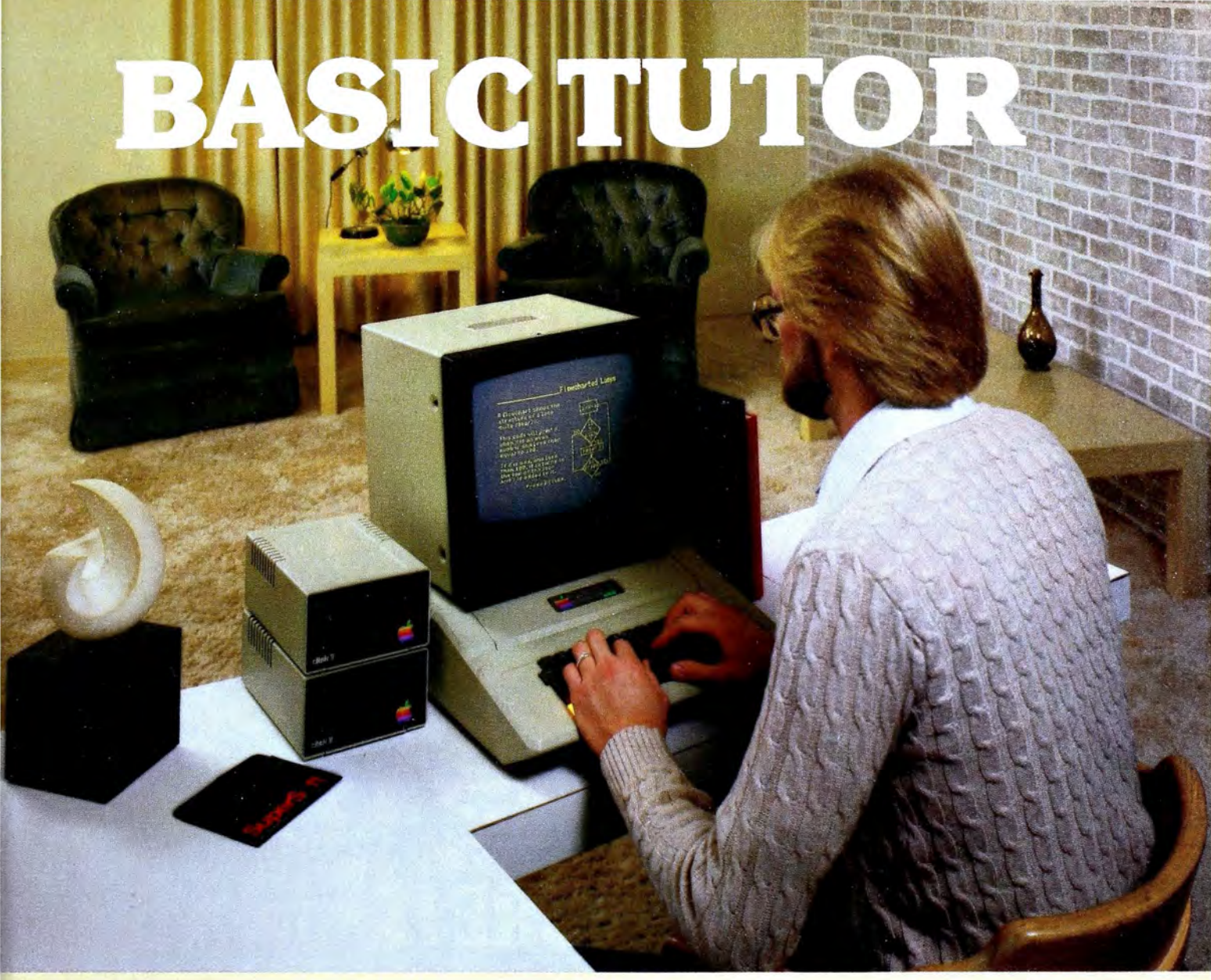
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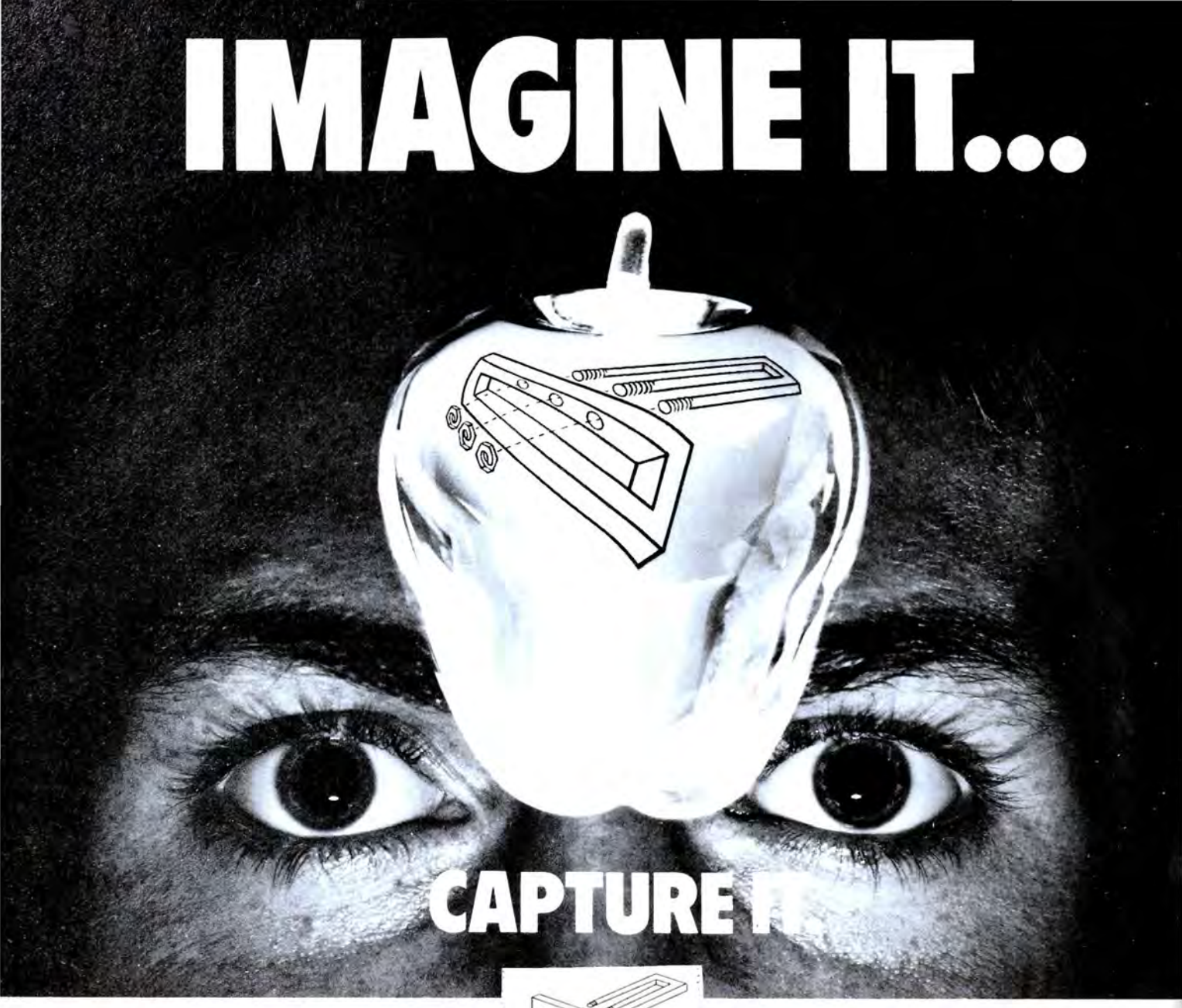
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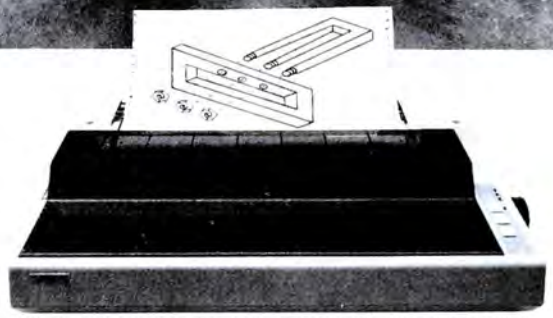


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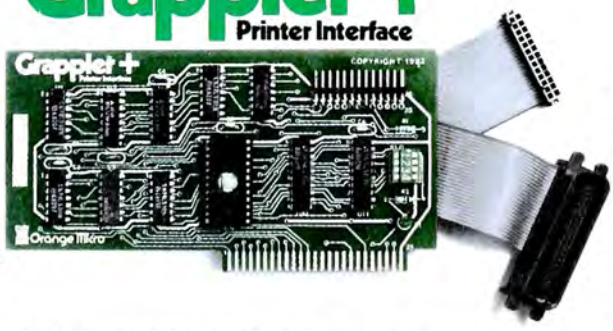
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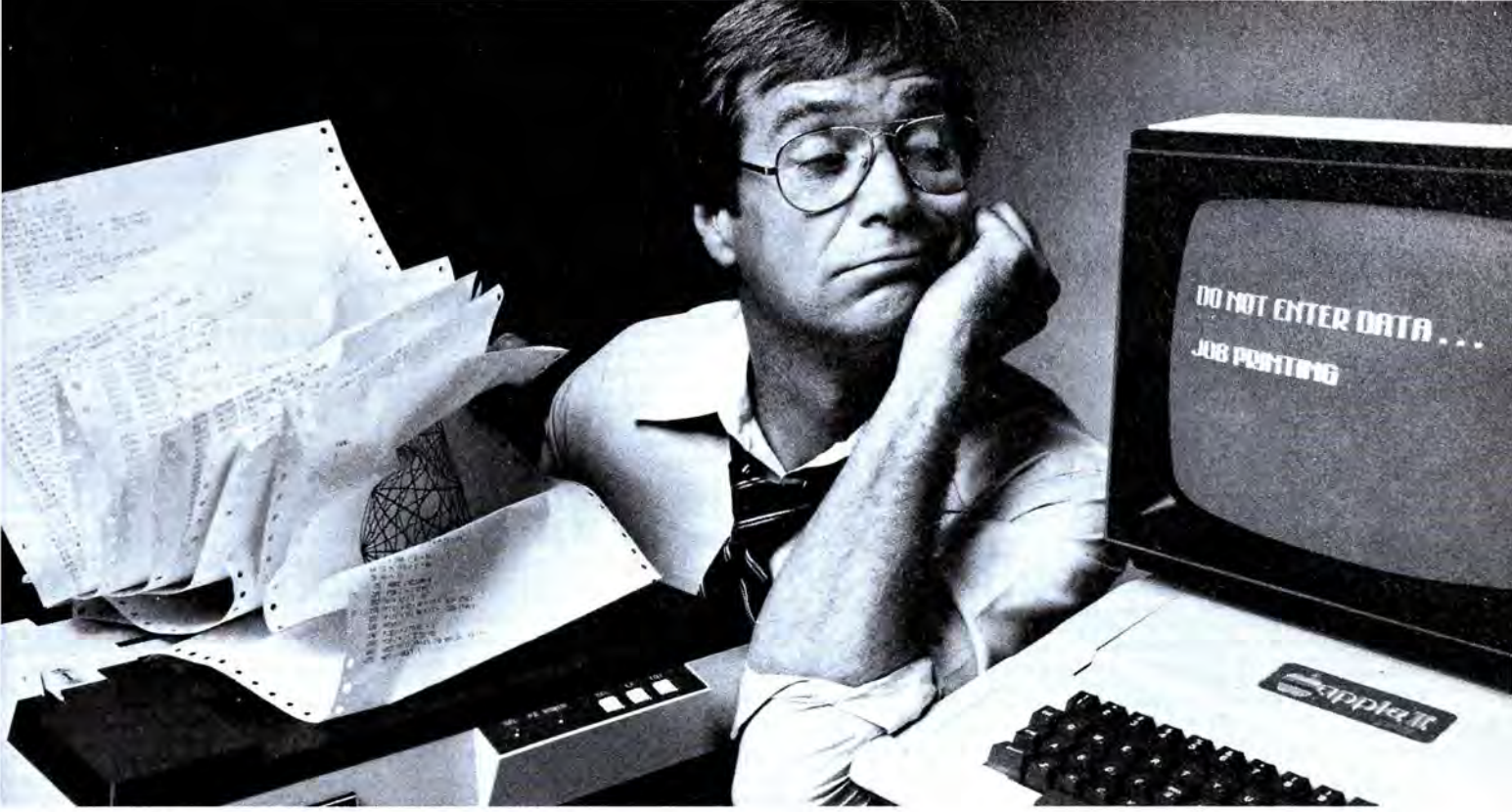
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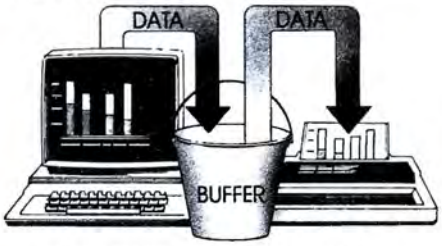
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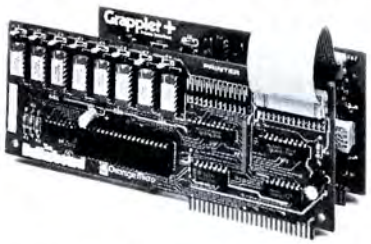
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checking for Strings, by issuing a compiler directive that contains the instruction V−, as in (*$V−*). Try putting this directive before the keyword PROGRAM in VarString. The 1.1 compiler should now accept this program, and the object code produced should exhibit renegade behavior, as discussed previously. To reinstate strong type-checking for Strings, you may use V+, as in (*$V+*).

Protective Code, Pascal's "Guard Dog." Some errors in programming cannot be detected by the compiler and only become apparent during program execution. These *logical errors* involve the unfortunate *combination* of otherwise legal Pascal statements. For instance, suppose that you declare the following subrange variable:

```
Byte: 0 .. 255;
```

Now, consider the two pairs of assignment statements below:

```
Byte := 1;
Byte := Byte + 1;
Byte := 255;
Byte := Byte + 1;
```

All four statements are fine examples of Pascal syntax; the compiler cannot fault them for reasons of grammar. The second pair of statements, however, engenders a crisis situation. *By the time the fourth statement is executed,* the expression "Byte + 1" represents the value 256. Nevertheless, Byte's declaration prohibits that variable from containing any values greater than 255 (or less than 0). Clearly, the programmer is at fault for this unfortunate state of affairs; a programming error has definitely been made. Yet, the compiler cannot detect this kind of mistake without first anticipating how the program will behave during execution. Since it is not generally possible for a compiler to do this, logical errors such as the one just described must remain undetected during compilation. Fortunately, although the compiler cannot itself detect logical errors, it *can* force the object program to recognize and respond to them at execution time. It accomplishes this by routinely "spiking" compiled programs with special p-code sequences. This extra, *protective code* is designed to terminate program execution and to invoke the operating system's error-reporting mechanism whenever it detects certain problem situations.

Protective code is "invisible" in the sense that under normal circumstances the behavior of any particular program remains exactly the same, whether or not the protective code is included. The extra p-codes do require space and execution time of their own, however. Thus, an object program that includes protective code is slightly larger and executes somewhat more slowly than an object program that functions identically but doesn't contain the extra code. On the other hand, the program without protective code is more dangerous; even seemingly trivial errors in program design can compromise the Pascal system, unless protective code intervenes.

Two types of protective code are described below. You may order the compiler to dispense with either or both by using the appropriate compiler directive instructions.

Range-Checking: The R Instruction. "Range-checking" code ensures that variables of subrange types are assigned only the range values they can hold, and that arrays and matrixes are referenced using only proper indexes. For instance, range-checking code would prevent illegal assignment of the value 256 to the subrange variable Byte in the example given above.

To disable the generation of range-checking code, simply insert the directive

```
(*$R−*)
```

into your program at appropriate points. The directive

```
(*$R+*)
```

causes the compiler to resume production of range-checking code.

The elimination of range-checking code will be of most benefit to programs that make extensive use of strings, arrays or matrixes, and subrange data types. For example, applying the R− instruction to the following source program results in object code that executes around 15 percent faster than the normal, protected version:

```
(*$R−*)
PROGRAM
 TestSpeed;
 CONST
  BEL=          7;          (* ASCII value for bell (beep) *)
  MinReps=      1;
  MaxReps=      100;
  LowInx=       1;
  HighInx=      999;
 VAR
  I,J:  Integer;
 A: ARRAY [LowInx . . HighInx] OF Integer;
BEGIN (* TestSpeed *)
 Write(Output, 'PRESS RETURN TO BEGIN TEST');
 ReadLn(Input);
 FOR I := MinReps TO MaxReps DO
  FOR J := LowInx TO HighInx DO
   A[J] := J;
 WriteLn(Output, Chr(BEL), 'END OF TEST');
END (* TestSpeed *).
```

Nearly all the range-checking code in TestSpeed is associated with the single assignment statement *A[J] := J*. Simply removing protective code from this one statement produces a significant increase in the program's overall execution speed, but it doesn't decrease the size of the total object program by any appreciable amount. In fact, you should never expect use of R− to shrink the object code for any particular program by more than 5 percent. (Savings of around 2 percent are typical.) R− is more useful in optimizing object code speed rather than size.

I/O Checking: A New Form of I Instruction. After every I/O operation, a special Pascal system variable acquires a *completion code* that signifies whether or not the operation succeeded. This Integer value is usually zero, indicating that the preceding I/O operation took place without mishap. Occasionally, however, a disk drive fails, the user provides confusing data through the keyboard, or some other calamity occurs. At these times, the special system variable is set to a positive Integer value that indicates the nature of the problem.

Your programs can examine the I/O completion code by means of the built-in Integer function IOResult. The value returned by IOResult is precisely that contained in the system's I/O status variable, and it is always one of the Integers listed in Appendix B, table 2, of the *Apple Pascal Language Reference Manual.*

Under normal circumstances, however, protective, "I/O-checking" code examines IOResult immediately after every I/O operation. Whenever IOResult becomes nonzero, this protective code calls the operating system's error-handling routine, just as range-checking code does when it detects an illegal assignment or an out-of-range array index. In other words, protective code (if present) always manages to observe and respond to IOResult before your program can.

With the directive (*$I−*), you can force the compiler to quit producing the protective code that checks IOResult, thus leaving your program free to detect and handle error situations for itself. When you'd rather have the operating system deal with I/O errors, the directive (*$I+*) orders the compiler to resume the generation of the corresponding protective code.

To see how the I instruction works, study this sequence of code:

```
VAR
 F
  :Text;
 FN
 :String;
BEGIN
 REPEAT
  Write(Output, 'File name: ');
  ReadLn(Input, FN);
  (*$I−*)
  Reset(F, FN);
  (*$I+*)
 UNTIL (IOResult = 0);
END;
```

This program slice requests the name of a file from the user, then attempts to associate the variable F with the specified file. IOResult will be nonzero if the Reset operation fails; should this occur, another file name will be requested, and the cycle will continue until the call to Reset is successful, as indicated by an IOResult of zero. Without I−, an unsuccessful Reset would lead to the abrupt (and probably inappropriate) termination of the program.

Note that the "I/O-checking" instruction is not the same as the "in-

clude file" instruction we studied last month, even though the same key-letter is involved. The compiler distinguishes one type of instruction from the other by the different types of parameters each requires. A "name parameter" following the I signifies source file inclusion, while a "switch parameter" indicates the enabling or disabling of protective code.

On page 32, the *Apple Pascal Language Reference Manual* claims that "IORESULT only [returns] a valid [function value] the first time it is referenced after [any particular] I/O operation . . . [subsequent references] return 0." This simply isn't so, although it is easy to understand how the rumor got started. Consider the following program fragment:

```
VAR
  F
    :Text;
BEGIN
  (*$I-*)
  Reset(F, 'thisnameismuchtoolong.text');
  (*$I+*)
  IF (IOResult < > 0)
    THEN
      WriteLn(Output, 'Error number ', IOResult);
END;
```

The call to Reset will always fail, because the file name given is invalid, according to the rules of Apple Pascal. Thus, the IF-clause (IOResult < > 0) will be true immediately afterward. However, here is what WriteLn puts on the console:

```
Error number 0
```

The erroneous explanation in the Apple manual *is* consistent with this mystifying behavior. IOResult is nonzero the first time it is accessed following the failed call to Reset, and so the IF-clause succeeds. According to the manual, IOResult then automatically becomes zero, which is the value of the function as reported by WriteLn.

In reality, the value of IOResult is updated after (and *only* after) each I/O operation. Your program may refer to IOResult thousands and thousands of times *between* two I/O operations; the values returned will be identical, and they will be zero only if the preceding I/O operation was successful. IOResult will be zero by the time WriteLn is executed in the above example; this is because output of the String value 'Error number' is itself a successful I/O operation that changes the value of IOResult before it can be displayed.

Remember, Write and WriteLn are "anomalous" procedures. They aren't really procedures at all—at least not in the way your own routines are. The "procedure call"

```
WriteLn(Output, 'Error number ', IOResult);
```

is shorthand for—and *exactly* equivalent to—the three calls:

```
Write(Output, 'Error number ');
Write(Output, IOResult);
WriteLn(Output);
```

IOResult is updated after each item is displayed, leading to the strange behavior we've already witnessed. If WriteLn were a *true* Pascal procedure, its arguments would be evaluated *before* any output took place, and the proper, nonzero value of IOResult would be displayed in our example. Unfortunately, WriteLn *is* anomalous, and you must take this fact into consideration when using WriteLn to display the value of IOResult. Careful, clever design can enable your programs to avoid this trap but can also render them obscure. An easier way to get around the problem is always to assign IOResult's value to some local Integer variable and then to use the stable variable, rather than the unstable function value, in subsequent computation:

```
VAR
  F
    :Text;
  IOR
    :Integer; (* will contain IOResult for local use *)
BEGIN (* correct technique *)
  (*$I-*)
  Reset(F, 'thisnameismuchtoolong.text');
  (*$I+*)
  IOR := IOResult;
  IF (IOR <> 0)
  THEN
    WriteLn(Output, 'Error number ', IOR);
END;
```

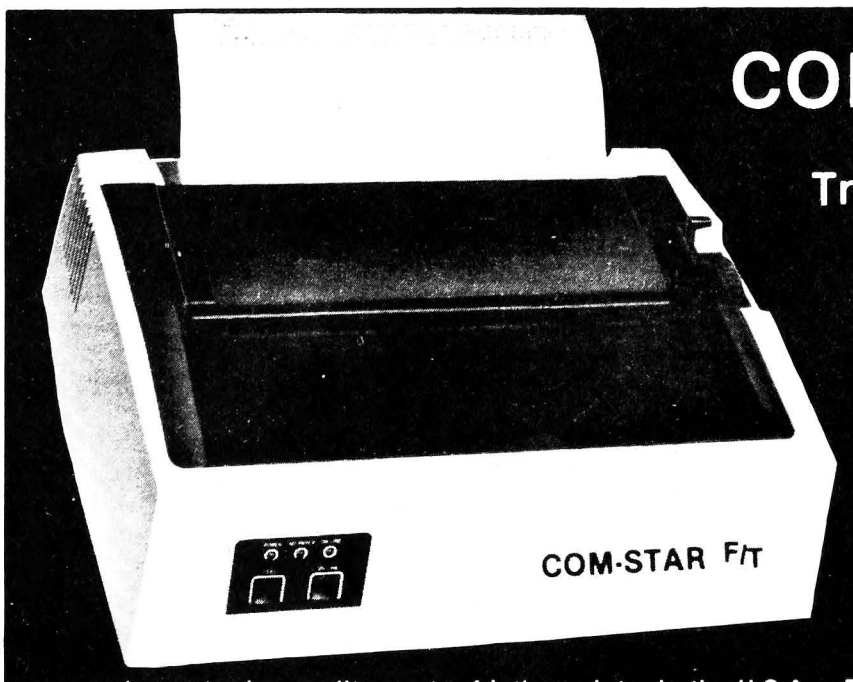
When To Quit Paying for Protection. Experienced programmers eschew protective code in two situations:

1. Once a programmer has rigorously tested a program and is confident about its reliability, she may elect to dispense with protective code, so as to increase the program's execution speed and reduce its memory requirements. If you are ever tempted to do this, keep in mind that, the larger and more complicated a program is, the less it deserves to operate unchecked, even after extensive testing.
2. In many cases, the program itself needs to recognize and deal with its own problems, so as to appear "friendly" to an inexperienced user. For instance, suppose your program asks the user to mount disk A, but disk B is mounted by mistake. If the program then attempts to access a file on A, the operation will fail. At this point, protective code will step in, abort the program, and reinitialize the system. This is like swatting a fly with a sledgehammer. From the user's point of view, it would be better for the program simply to repeat its request for disk A. Such friendly behavior is impossible, however, unless protective code is eliminated at strategic spots in the program.

The following program, TestCopy, replicates the contents of one text file in another. The names of both the source and destination files are specified by the user. TestCopy is remarkable more for its error-handling capabilities than for its speed; the copying process proceeds on a character-by-character basis, and is therefore as slow as molasses. However, judicious application of the I− compiler directive instruction permits TestCopy's "active ingredient," the function CopyTestFile, to recognize and recover from problem situations without having to rely on the operating system's clumsy and cryptic error-handling mechanism. As you study CopyTextFile, note that the compiler is never restrained from producing I/O-checking code for more than a statement or two. Good programmers never interfere with the system's protective mechanisms any more than is necessary to get the job done. To do otherwise would be foolhardy.

```
PROGRAM
  TestCopy;
  (* Text file-copying program, designed to drive the FUNCTION
     CopyTextFile. *)
  CONST
    VersionMark=
      'TEXT FILE COPIER (Ver 1.0: 20-Mar-83)';
    Empty=      '';
    OK=         0;
    Blank=      ' ';
    TwoBlanks=  '  ';
  VAR
    SN,
    DN
      :String;
    StatCode
      :Integer;
    StatMsg
      :String;
PROCEDURE
  TrimBlanks(VAR Victim: String);
BEGIN (* TrimBlanks *)
  WHILE (Copy(Victim, 1, 1) = Blank) DO
    Delete(Victim,1,1);
  WHILE (Copy(Victim, Length(Victim), 1) = Blank) DO
    Delete(Victim, Length(Victim), 1);
END   (* TrimBlanks *);
PROCEDURE
  Capitalize(VAR Victim: String);
  VAR
    I
      :Integer;
BEGIN (* Capitalize *)
  FOR I := 1 TO Length(Victim) DO
    IF ((Victim[I] > = 'a') AND (Victim [I] < = 'z'))
      THEN
        Victim[I] := Chr(Ord(Victim[I]) − Ord('a') + Ord('A'));
        (* The guts of our old friend Capital—stated explicitly
```

```
          here in order to optimize the speed of this routine. *)
END   (* Capitalize *);
PROCEDURE
   AdjSuffix(Src: String; VAR Dest: String;
             Suffix: String);
(*Append Suffix to Src filename if not already appended;
 return value in Dest. Suffix value must begin with
 period. Do not append Suffix to UCSD-style device
 names (which end with a colon), or to Apple III SOS
 device names (which begin with a period and do not
 contain any forward slashes). Finally, do not append
 Suffix to any name that ends with a period; instead,
 strip off the period and return the resulting name, in
 keeping with UCSD/Apple Pascal file-naming conventions.*)
BEGIN (*AdjSuffix*)
   TrimBlanks(Src);
   IF (Src = Empty)
      THEN
         Dest := Src
   ELSE
      BEGIN
         Capitalize(Src);
         TrimBlanks(Suffix);
         Capitalize(Suffix);
         IF ((Copy(Src,Length(Src),1) = ':') (* UCSD Dev name *)
               OR ((Copy(Src,1,1) = '.') AND (Pos('/',Src) = 0))
                  (* SOS Dev Name *)
            THEN
               Dest := Copy(Src,1,Length(Src))
         ELSE IF (Copy(Src,Length(Src),1) = '.')
            THEN
               Dest := Copy(Src,1,Length(Src)-1)
         ELSE IF ((Pos(Suffix,Src) <> (Length(Src)-
               (Length(Suffix)-1))) OR (Pos(Suffix,Src)=0))
            THEN
               Dest := Concat(Src,Suffix);
      END;
END; (*AdjSuffix*)
FUNCTION
   CopyTextFile(SrcName, DestName: String)
      :Integer (* I/O completion code *);
(* Create (or overwrite) the text file specified by DestName,
   turning it into a duplicate of the text file specified by
   SrcName. Return Integer completion code (the magnitude of
   which corresponds to a valid IOResult). Function value
   will be negative if problem occurs during processing of
   source file, positive if it occurs during processing of
   dest file. *)
   VAR
      (* Src, Dest file types and file I/O logic are
         chosen to work for all files and devices. *)
      Src, Dest
         :Interactive;
      Ch
         :Char;
BEGIN (* CopyTextFile *)
   AdjSuffix(SrcName, SrcName, '.TEXT');
   AdjSuffix(DestName, DestName, '.TEXT');
   (*$I-*)
   Reset(Src, SrcName);
   (*$I+*)
   IF (IOResult <> OK)
      THEN
         CopyTextFile := -IOResult
      ELSE
         BEGIN
            (*$I-*)
            ReWrite(Dest, DestName);
            (*$I+*)
            IF (IOResult <> OK)
               THEN
                  CopyTextFile := IOResult
               ELSE
                  REPEAT
                     (*$I-*)
                     Read(Src, Ch);
                     (*$I+*)
                     IF (IOResult <> OK)
                        THEN
                           CopyTextFile := -IOResult
                        ELSE
                           BEGIN
                              IF (EOLn(Src) AND (NOT EOF(Src)))
                                 THEN
                                    BEGIN
                                       ReadLn(Src);
                                       (*$I-*)
                                       WriteLn(Dest)
                                       (*$I+*)
                                    END
                                 ELSE
                                    IF (NOT EOF(Src))
                                       THEN
                                          (*$I-*)
                                          Write(Dest, Ch);
                                          (*$I+*)
                              IF (IOResult <> OK)
                                 THEN
                                    CopyTextFile := IOResult;
                           END;
                  UNTIL (EOF(Src) OR (IOResult <> OK));
                  IF (IOResult = OK)
                     THEN
                        BEGIN
                           (*$I-*)
                           Close(Dest, LOCK);
                           (*$I+*)
                           IF (IOResult <> OK)
                              THEN
                                 CopyTextFile := IOResult;
                        END;
         END;
END   (* CopyTextFile *);
PROCEDURE
   IntToString(Source: Integer;
               VAR Dest: String;
               MinFW: Integer;
               LPad: String);
(* Build the character-string representation of decimal Source,
   such that it contains at least MinFW characters. Pad on the
   left using Pad string, if necessary to achieve the Minimum
   Field Width, MinFW. Concatenate the final, padded representation
   of Source onto the right of Dest. *)
   CONST
      Radix= 10;
   VAR
      Sign
         :String[1];
      TDest
         :String;
BEGIN (* IntToString *)
   TDest := Empty;
   IF (Source < 0)
      THEN
         BEGIN
            Sign := '-';
            Source := -Source; (* make positive *)
         END
      ELSE
         Sign := Empty;
REPEAT
   (* These next two lines made necessary by the
      fact that String and Char are two separate and
      distinct data types. In particular, you cannot
      use a value of type Char as an argument to Concat,
      which deals exclusively with Strings. This common
      method of "Concatenating" a Char to a String involves
      concatenating a "dummy" one-character string (such
      as a Blank) to the victim string, then accessing
      that character position directly, using Char ARRAY syntax. *)
      TDest := Concat(Blank,TDest); (* blank char at front *)
      (* Now, replace the blank with appropriate digit char *)
      TDest[1] := Chr(Ord('0') + (Source MOD Radix));
   (* Conceptually, "Lop off" least significant digit,
      and slide each survivor over one to the right. *)
   Source := Source DIV Radix;
UNTIL (Source = 0);
TDest := Concat(Sign, TDest);
IF ((Length(TDest) < MinFW) AND (LPad <> Empty))
   THEN
      BEGIN (* Apply leftward padding *)
         WHILE (Length(TDest) < MinFW) DO
```



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ABCDEFGHIJKLMNOPQRSTUVWXYZ 1234567890

```
            TDest := Concat(LPad,TDest);
          (* In case Length(LPad) > 1, make sure padding
            process doesn't overshoot the mark. *)
          TDest := Copy(TDest,Length(TDest) - MinFW + 1,MinFW);
        END;
    (* Now, we have final string representation; shove it on
      the end of Dest, as specified. *)
    Dest := Concat(Dest, TDest);
  END   (* IntToString *);
  PROCEDURE
    IOErrToString(ErrNum: Integer; VAR Dest: String);
  (* Fill Dest with a String representation of the completion
    code ErrNum. Show numeric value and common meaning (if any). *)
  VAR
      MsgStr
        :String;
  BEGIN (* IOErrToString *)
    Dest := '#';
    IntToString(ErrNum, Dest, 0 (* min field width *), Empty);
    MsgStr := Empty;
    (* Common error descriptions adapted from Appendix B,
      table 2 of the Apple Pascal Language Reference Manual. *)
    CASE ErrNum OF
      00:
        MsgStr := 'Operation successful';
      02:
        MsgStr := 'Bad device number';
      03:
        MsgStr := 'Illegal operation';
      05:
        MsgStr := 'Device no longer on line';
      06:
        MsgStr := 'Lost file';
      07:
        MsgStr := 'Illegal file name';
      08:
        MsgStr := 'No room for file';
      09:
        MsgStr := 'No such device';
      10:
        MsgStr := 'No such file';
      11:
        MsgStr := 'Duplicate file';
      12:
        MsgStr := 'File not closed';
      13:
        MsgStr := 'File not open';
      14:
        MsgStr := 'Bad data format';
      15:
        MsgStr := 'Ring buffer overflow';
      16:
        MsgStr := 'Device is write-protected';
      64:
        MsgStr := 'Diskette read/write failure';
    END;
    IF (MsgStr <> Empty)
      THEN
        Dest := Concat(Dest, '—', MsgStr);
  END   (* IOErrToString *);
BEGIN (* TestCopy *)
  WriteLn(Output, VersionMark);
  WriteLn(Output);
  REPEAT
    Write(Output, 'Copy from source file [.TEXT]: ');
    ReadLn(Input, SN);
    IF (SN <> Empty)
      THEN
        BEGIN
          Write(Output,'    to dest file [.TEXT]:     ');
          ReadLn(Input, DN);
          IF (DN <> Empty)
            THEN
              BEGIN
                StatCode := CopyTextFile(SN, DN);
                (* Build up the status message *)
                IF (StatCode = OK)
                  THEN
                    StatMsg := 'Copy successful'
                  ELSE
                    BEGIN
                      IOErrToString(Abs(StatCode), StatMsg);
                      StatMsg := Concat('*** ERROR: ', StatMsg);
                      StatMsg := Concat(StatMsg, ' (');
                      IF (StatCode < OK)
                        THEN
                          StatMsg := Concat(StatMsg, 'source')
                        ELSE
                          StatMsg := Concat(StatMsg, 'dest');
                      StatMsg := Concat(StatMsg, ')');
                    END;
                WriteLn(Output, TwoBlanks, StatMsg);
                WriteLn(Output);
              END;
        END;
    UNTIL ((SN = Empty) OR (DN = Empty));
  END   (* TestCopy *).
```

Stepping over the Line: U− Compilation. The U instruction may be used to tell the compiler whether to produce "user-level" or "system-level" object code.

In past discussions, we've seen that Apple Pascal allows programs to be organized into two or more *segments*. Each segment is a group of procedures and functions that remains on disk until called by the currently active program. While a segment is being used, it is *active* and resides in RAM until it is no longer needed. Then, it is erased from RAM, becoming *inactive* until such time as it is needed again. While a segment is active, two copies of it exist: the one on disk and the one in RAM. (Of course, only the copy in RAM matters to the p-machine.) The code for an inactive segment exists only on disk.

In truth, the p-machine knows how to execute only one program: the operating system, which is associated with segment 0. This "superprogram" is always active—it always resides in RAM. Under normal circumstances, your program's code and data are assigned to segment 1. When you order Apple Pascal to ex(ecute one of your own programs, the operating system obliges by fetching the code from disk, loading it into RAM memory as segment 1, and calling it as if it were a procedure. While your program executes, it and the operating system are active simultaneously, and each occupies its own region in your Apple's RAM memory.

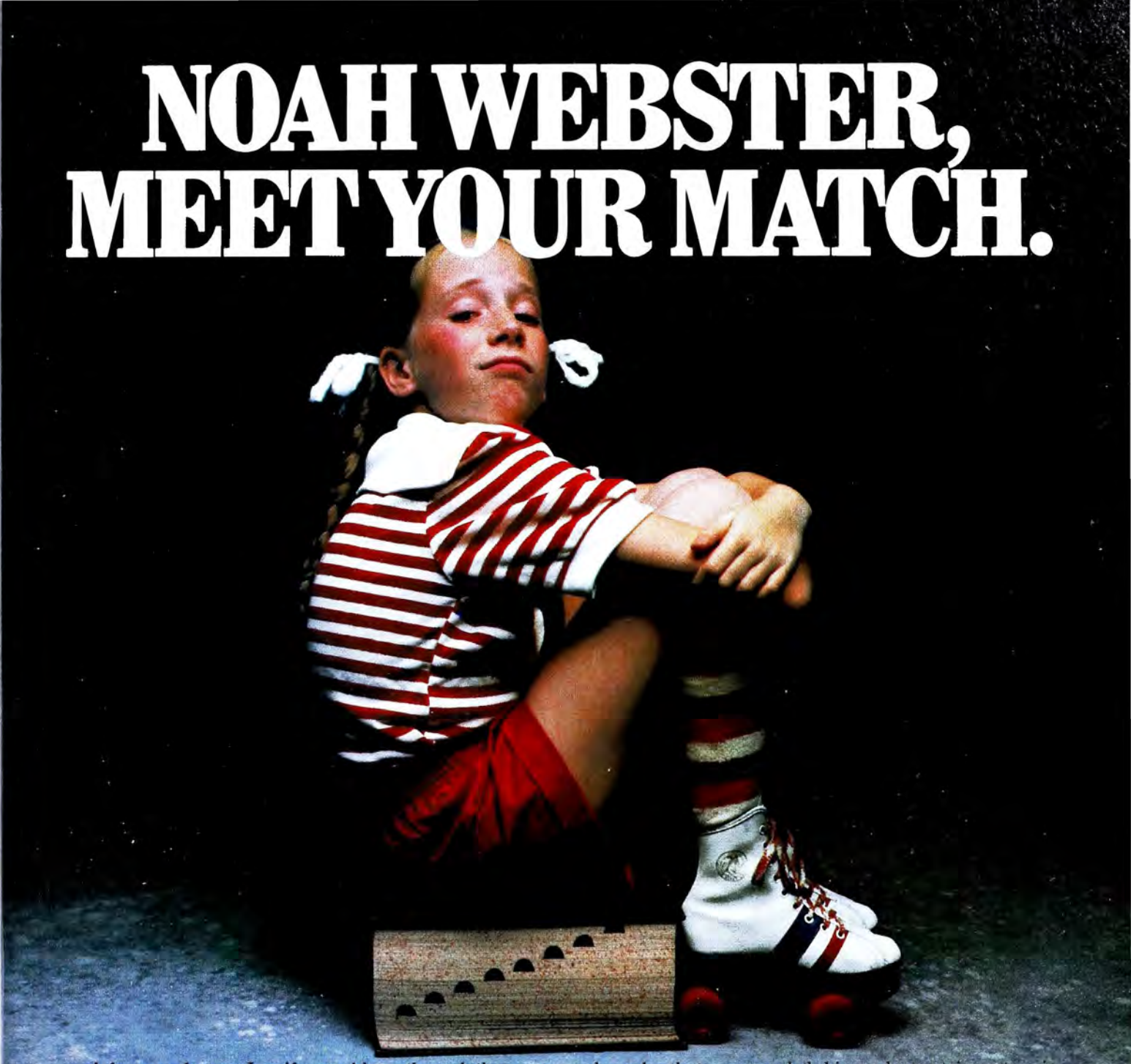
When first invoked, the compiler assumes that it will be processing a user program, intended for segment 1. In other words, it operates as if the directive (*$U+*) were placed at the beginning of your program's text. Upon encountering a U− instruction, however, the compiler switches over to generating code for segment 0. Understandably, the U− instruction should only appear at the very beginning of program text, even before the PROGRAM heading. It may be preceded, however, by comments and certain compiler directive instructions—especially those that control the generation of listings.

The U− directive tells the compiler that it is in the employ of a systems programmer. Because there is no trifling with such an individual, the compiler will neither emit protective code nor worry about String VAR parameters. In other words, U− incorporates R−, I−, and V−.

The main body of a "U−" program is loaded into the space that is normally occupied by the operating system; its global variables are stored in the space allocated to the operating system's global variables. Thus, a "U−" program had better *be* the operating system, or at least be a program that performs all the same functions in a very similar fashion, since once it is loaded into RAM, it *becomes* the operating system, whether it deserves that title or not. This is one reason why you find almost no documentation for U− compilation in Apple's manuals. Apple quite understandably wants to keep you from writing programs that must, by their very nature, clobber the operating system!

Among the global data kept by the operating system are such items as the current date, the name of the bootstrap disk, and other interesting and useful tidbits. The U− instruction is crucial to the writing of programs that access this information without disturbing the operating system code itself. However, it would be fruitless to study U− compilation and systems programming techniques until we have mastered the use of *segment procedures*, *units*, and *variant records*. Fortunately, these subjects are just around the corner and, as soon as we have examined them in sufficient detail, we will again take up the challenge of U− compilation. ■

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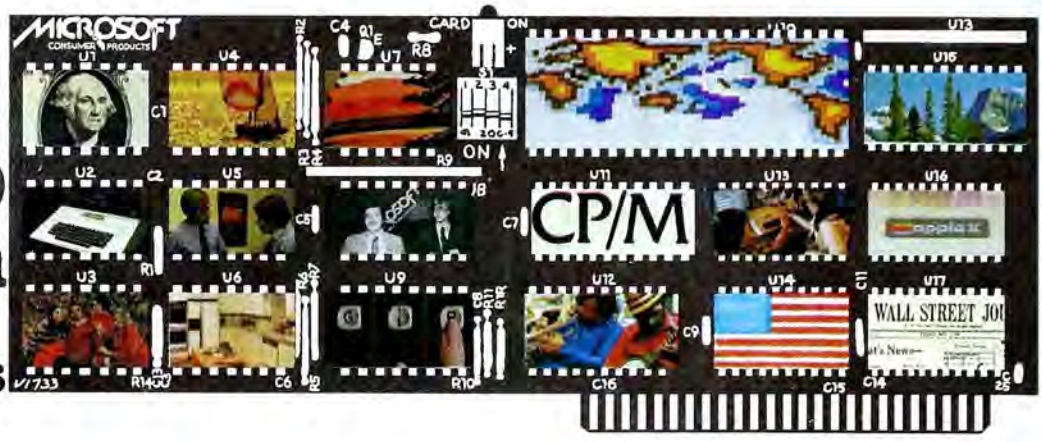
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SOFTCARD Symposium

by Greg Tibbetts



Welcome to the June installment of Softcard Symposium. This month we'll begin a multipart series on the BIOS disk I/O routines. The pace at which this series progresses will be slow enough to allow for adequate explanation of this complex area.

Although CP/M, like other operating systems, controls all elements of the hardware in a given computer, there's no doubt that its main purpose is to control the disk hardware in a disk-based system. CP/M cannot be installed and used without a disk drive, and its primary module, BDOS, is named Basic Disk Operating System. This is not to make light of the character I/O portions of CP/M; they too are necessary. But it is the disk routines that make CP/M what it is, so to speak.

Before beginning to discuss the actual routines, we should examine some terms that will be used frequently in this and upcoming columns. Most of you will recognize most of these terms, but it's important to review so that we all associate the same concept with a specific term.

The terms *disk*, *hard disk*, *floppy disk*, *disk drive*, and *diskette* all refer in some manner to a type of mass-storage device. The correct term for the device itself is *disk drive*. The disk drive is one of the few highly mechanical devices in today's computer systems. It consists of a motor driving a spindle which in turn causes the disk to spin. The disk surface is coated with a magnetic material similar to that found on ordinary recording tape, and, in fact, its purpose is identical to that of tape. The magnetic properties in the coating can be altered to form two distinct levels of magnetism, which we'll call magnetism and nonmagnetism, although these terms are not precisely correct. Creating isolated pockets of magnetism and nonmagnetism in an area of the coating allows storage, retrieval, and erasure of bits of information with relative ease.

The disk's surface and its coating are most often referred to together as the drive's *media*.

Disk drives come in two varieties, *rigid* and *flexible*. A rigid disk drive (also called a *fixed* or *hard disk drive*) is a sealed unit whose coated surface is made of aluminum or other hard material that will remain rigid under normal operation. The flexible disk drive (also called a *floppy disk drive*) is an unsealed unit whose media is a type of thin plastic or Mylar. Like most plastics, Mylar is very easily flexed and bent. Regardless of the type of media, the principle of information storage in each case is identical. Each type of drive contains a read/write head, again similar to the head in a tape recorder. The head sits close to or directly in contact with the spinning disk and, when current is applied to it, creates the pockets of magnetism.

The drive's read/write head is mounted in such a way that it moves in and out, like the tone arm of a record player, from the center of the surface to the rim. By stopping the head's in and out travel at a particular place and letting the disk spin underneath, a circular pattern of magnetized and nonmagnetized points on the coated surface may be created. This circular path is called a *track*. Unlike on a record, however, the tracks on a drive's media are not grooves. Rather, they are simply concentric circles of magnetism.

Without grooves for the read/write head to follow, some method had to be devised so that the head would be able to find a specific track on the media. This is done by building drives to very strict specifications with a mechanism called a *stepper*. This mechanism enables a drive to position the read/write head over any track on command. The closer together a disk's tracks are, the greater the amount of information that can be stored on the disk. Of course, if tracks are too close together, the recording of information on one track will interfere with the information stored on tracks close by. Different drive designs allow closer tracks, depending on their accuracy and tolerance. Drives are rated for this attribute in number of tracks per inch of radius, called the drive's TPI value. In general, the higher the TPI value, the more accurately the drive must be constructed and the higher will be the potential for error.

Within each track, the bits of information are grouped into easily manageable units called *sectors*. Each sector can then be treated as a block of information, organized into an address field and a data field. The address field contains the side, track, and sector numbers: information needed in order to find the data block. Additional information, such as checksum values to aid in error determination, may also be included in the address. The data field contains the actual data stored in that sector and may be empty. Empty sectors are not truly empty; during the formatting process when the tracks are identified and formed, some set value will be written into the sector as fill. This is usually a value that—because of its bit pattern—is prone to error, so that the program formatting the disk can check the surface during the worst possible case. Once again, the tolerance of the drive determines how many bits of information can be stored on a single track. Although there is a value called bits-per-inch, or BPI, it is seldom used by the microcomputer community. Instead, this kind of information is usually expressed as a value of how many sectors per track the drive will support for a given bytes-per-sector value.

The first disk drives made were of the rigid media variety. As sealed and rigid units, not susceptible to dust and dirt contamination, they could be built to very high tolerance. The disk tracks, therefore, could be very close together (usually hundreds of TPI), allowing tremendous amounts of data to be stored on relatively small surfaces. Unfortunately, these early disk drives were also very expensive, costing many thousands of dollars. As computers came into more widespread use, and as the slower magnetic tape storage devices became inadequate to handle the storage needs of computer users who couldn't afford the rigid media drives, a cheap method of disk storage was called for.

The floppy disk drive has become this inexpensive method. Using plastic media in an unsealed environment meant that not as many TPI or sectors per track could be tolerated. The first commercial drives (pioneered by IBM) were capable of creating seventy-seven tracks on an 8-inch diameter surface and twenty-six 128-byte sectors per track. This became referred to as IBM 3740 format and is generally the industry standard even today. These flexible disks held far less data than their rigid counterparts, but the media itself was cheap; and since it didn't need excessive protection it could be made removable. This meant that switching diskettes

(as these flexible surfaces were called) was relatively simple.

Those first floppy disk drives were slow in storage and retrieval and generally low in capacity by today's standards. It wasn't long, however, before they spread into almost universal usage among microcomputer users. After that, nearly overnight it seems, new types of floppy disk drives began appearing. The first breakthrough came with a new way of storing the bits themselves, an innovative method called double-density encoding, which essentially doubled (or increased even further) the storage capacity of a single disk. This method of encoding also required that the drives be built to higher tolerances.

While single density (the IBM 3740 format) has remained a true standard with its single-side, seventy-seven tracks, twenty-six sectors, and 128 bytes per sector, double density has literally been all over the map. There are now many different double-density formats for 8-inch disk drives, with 256, 512, 1,024, or more bytes per sector, single and double-sided disks, and many different sectors-per-track values. The number of tracks, though, still remains at seventy-seven. This is because the mechanics of drive-stepper mechanisms must remain fairly constant so as to be able to read single-density media and therefore maintain some compatibility between systems.

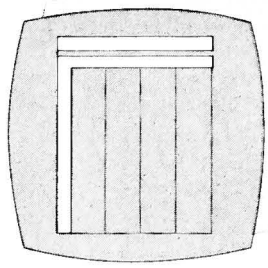
The introduction of 5-inch-diameter disk drives with the numbers of tracks per side ranging from thirty-five to eighty, along with all the various double-density sectors-per-track and bytes-per-sector values, confused the issue even further, since no standard format at all exists for the 5-inch disk. The result, of course, is that no real standard beyond the 3740 format exists in the microcomputer industry. The Apple's disk format is of the 5-inch variety, and although Apple disks don't use the same format as other 5-inch disks do, they are of approximate double density, with 256 bytes per sector and sixteen sectors per track.

Any operating system must make provision to deal with the various types of disk drives and formats in use in the industry. Digital Research's method of doing so was to design CP/M to deal with 3740 format and to require the designers of the BIOS for a particular system to make adjustments as necessary to deal with their particular drives.

The BIOS disk portion consists of two elements: disk *data structures* and disk *driver routines*. The data structures describe and define the characteristics of the disk drives to the BIOS and to BDOS, while the driver routines control and operate the drives. In this way, such information as BDOS might need in order to determine total number of tracks, sectors per track, and so on is always provided to it by the system integrator via the data structures; and the actual control of the drives is provided by routines that BDOS can call to perform specific functions. Both the data structures and the driver routines are further broken down into subcategories.

There are two basic types of data struc-

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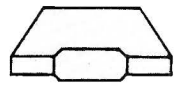
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02	BIOS+03	JP WBOOT	INIT	Warm-start initialization
03	BIOS+06	JP CONST	CHAR	Console device status check
04	BIOS+09	JP CONIN	CHAR	Console device input
05	BIOS+12	JP CONOUT	CHAR	Console device output
06	BIOS+15	JP LIST	CHAR	List device output
07	BIOS+18	JP PUNCH	CHAR	Punch device output
08	BIOS+21	JP READER	CHAR	Reader device input
09	BIOS+24	JP HOME	DISK	Seek track 00 on selected disk
10	BIOS+27	JP SELDSK	DISK	Select a specific disk drive
11	BIOS+30	JP SETTRK	DISK	Seek a specific track
12	BIOS+33	JP SETSEC	DISK	Seek a specific sector
13	BIOS+36	JP SETDMA	DISK	Set DMA for next read/write
14	BIOS+39	JP READ	DISK	Read a specific sector
15	BIOS+42	JP WRITE	DISK	Write a specific sector
16	BIOS+45	JP LISTST	CHAR	List device status check
17	BIOS+48	JP SECTRAN	DISK	Map logical-to-physical sector

BIOS Jump Vector Table

tures, *tabular data* and *individual data temporaries*. We have spoken of temporary data before, during our discussion of character I/O—as, for example in speaking of variable data locations such as ESCFLG. We said that the ESCFLG variable was an eight-bit value in memory that BIOS used to keep track of whether a screen function was currently in progress. As such, it was constantly being altered to reflect the current status of character I/O to the screen. Disk data temporaries likewise represent the status of the current disk operation, including such things as the current drive, track, and sector numbers being used.

Tabular data, on the other hand, although it is altered occasionally, is more fixed than temporary data. Instead of being individual memory locations designed to keep temporary track of current status items, tabular data consists of tables that describe the nature of each disk drive connected to the system. There are three types of this tabular data in use: the disk parameter headers (or DPHs), the disk parameter blocks (or DPBs), and the sector translation tables. These three structures contain all the information that BDOS and BIOS (together called FDOS for Full Disk Operating System) need in order to access and control the drives properly.

The disk driver routines may also be broken down into a number of individual subroutines. Just like the character I/O subroutines we recently examined, each of these subroutines has its own entry in the BIOS jump table. For each BIOS disk function, there is one subroutine that BDOS may request of one of the disk drives connected to the computer.

There are eight of these disk subroutines in total; they are HOME, SELDSK, SETTRK, SETSEC, SETDMA, READ, WRITE, and SECTRAN. The complete BIOS jump table is reproduced here so that you can see how the disk subroutines relate to the initialization and character I/O routines we've already covered. The relative address column identifies the position of each entry point as a number of bytes from the beginning of the table (which is also the beginning of BIOS itself).

Since BIOS immediately follows BDOS in memory, and since the BIOS jump vector table is the first thing in the BIOS, BDOS can easily find whatever subroutine it needs by simply vectoring control to BIOS+*xx*, where *xx* is the number in column two. In this way, BDOS need know nothing more about BIOS than the contents and arrangement of this table. Each of the eight disk subroutines is designed to perform a single function; when done in sequence, these functions allow BDOS to read or write a sector from or to one of the disk drives. Before the first read or write on a disk, BDOS calls each of the routines to set up the necessary parameters. Subsequently, the routines are called only when it's necessary to alter a particular set of parameters.

Taking the subroutines in the approximate order in which they are used, the first one to consider is SELDSK. It is this routine's responsibility to initialize several data temporaries and to return to BDOS with the address of the DPH data structure for the drive number that BDOS wants to be selected. Selecting a drive in this case, therefore means simply that temporaries to be used by routines coming later are set to indicate the appropriate drive, and BDOS is informed of the characteristics of that drive by being given the address of the drive's DPH. The DPH itself, as we'll see later, contains the addresses of that drive's DPB and sector translation table.

Some systems that may be using both single and double-density media need to be able to determine automatically which kind is in use; SELDSK is also the routine that handles that determination. Making this determination is usually a trial and error process, with dummy reads being attempted on the disk at double-sided/double-density, single-sided/double-density and, finally, single-sided/single-density. Whichever read completes a sector-read operation without error determines the density and sides selected. SELDSK also modifies the data structures in these cases to reflect the drive's new status.

The next routine used by BDOS is HOME. Its purpose is to force the newly selected disk drive to position the read/write head to track 00. This process of moving the read/write head is called *seeking*. HOME is done primarily to

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initialize the disk drive, by placing the read/write head at a known location. Typically, a BIOS HOME routine works by simply calling the BIOS SETTRK routine itself with a track number of 00.

These first two routines, SELDSK and HOME, may be thought of as initialization routines, since they are called only when a drive is selected for a future read and write. So long as this drive continues to be the one in use, these routines will not be called again. As soon as another drive is selected, however, both BDOS and BIOS forget the attributes of this drive, and reselecting it requires that both of these routines be called once again.

The next several calls are made just prior to the actual read or write. They establish the particular location on the disk and the particular location in memory between which the data will be transferred. Generally these calls can be made in any order, with the exception of the call to SECTRAN which must always precede the call to SETSEC. Usually, however, these routines are called in one of two orders: SETDMA, SETTRK, SECTRAN, and SETSEC; or SETTRK, SECTRAN, SETSEC, and SETDMA.

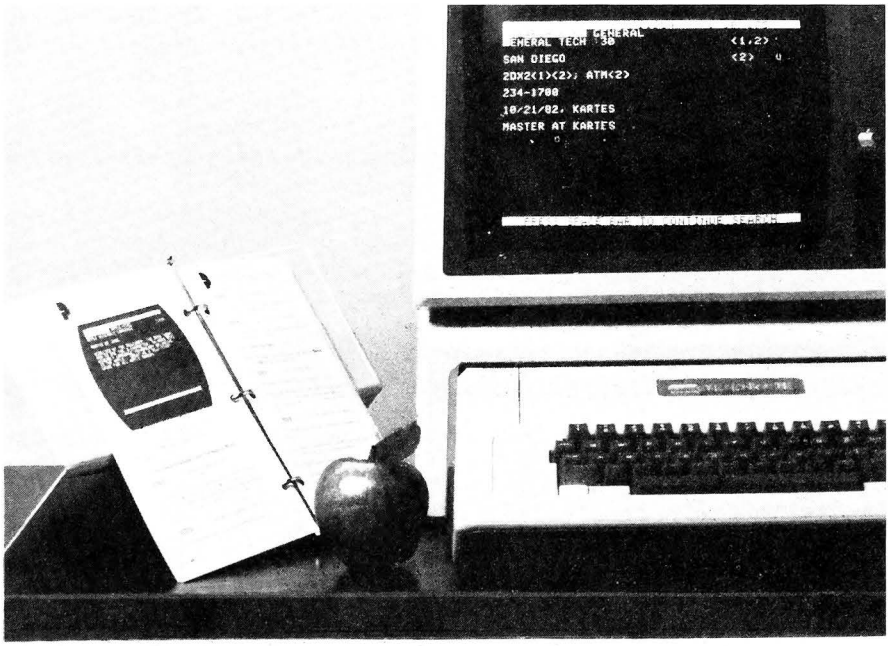
Calling the first routine, SETDMA, installs a particular address value (given to it by BDOS) into a temporary variable that READ or WRITE will use later on to determine where in memory to put or get data that will be transferred to or from the disk. SETDMA, then, simply makes sure that other BIOS routines know where in memory the next sector is to be obtained from or placed. The term DMA stands for direct memory access. Its origin comes from the fact that certain computers contain a type of hardware (known, obviously, as DMA circuitry) that transfers data directly between memory and an external device (a disk drive, external banks of memory, or some other device).

This differs from the way things are set up in other computers, where each byte of data coming in or going out must be handled individually by the computer's processor. In other systems, the processor must get the byte from the device and store it in memory, or get the byte from memory and pass it to the device. Using DMA hardware greatly speeds up external device operations, since, after giving the DMA controller the necessary information on where to transfer data from, how much to transfer, and what direction to transfer in, the processor need not be involved at all. Although not all computers have such hardware, the term DMA has come to be used somewhat loosely; consequently, the address of data to be transferred has generally come to be called the DMA address whether DMA circuitry is used or not.

The next subroutine to be called is SETTRK. SETTRK takes the track number passed to it by BDOS and forces the disk drive to seek to that track on the media. In practice, BIOS SETTRK routines seldom do the actual seek at the time they are called. Instead, they set a temporary variable to the BDOS-requested track number, leaving it for READ or WRITE to force the drive to perform the actual seek. In the case of double-sided drives, SETTRK may also take care of translating the BDOS track number (since BDOS is ignorant of the existence of double-sided drives) into an actual track number and a head number. This activity may also be handled by the READ and WRITE routines, however.

Once the track and the DMA address have been set, BDOS must tell the BIOS what sector of the track is to be read or written to. There's an added bit of confusion here, resulting from the way BDOS looks at logical sectors (that is, as though the sectors were written sequentially on the disk), while the BIOS must select the physical sector. As we've alluded to in the past during more general discussions, there is in many cases a difference between these two numbers. The reason for this difference is that, as fast as computers are, they are not always fast enough to read and process data from the disk as quickly as it comes by the read/write head.

Obviously, the software doing the disk read or write can keep up during the reading or writing of the bytes in a given sector. When these operations stop, however (to return control to BDOS to process the data or call the routines to set the next track, sector, and DMA address), the



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READ or WRITE routine generally can't be called fast enough the second time to catch the beginning of the next sector as it passes by the head. This forces READ or WRITE to wait almost a full disk revolution before getting the next sector. This is especially common with double-density format, where the distance between sectors is shorter still. At three hundred revolutions a minute, this may not seem like much of a drawback, but you'd be surprised how much the reading and writing of data can be slowed down by "blowing revs," as this effect is called.

To prevent blowing revs between fast reads or writes of disk sectors, the sectors are spaced farther apart; this is done by placing other sectors in between them. You can demonstrate this arrangement to yourself by drawing a pie with sixteen sections, one for each sector of the disk. Around the outside of the pie, number the sections sequentially zero through fifteen. Now, starting at zero, number inside the sections zero through fifteen again, but this time skip two between each number so that zero is inside the section with zero on the outside but one is inside the section with three on the outside, two is inside section six, and so on. When you reach the section you started at, you'll see that by skipping two each time you still land on an empty section, even though you go around the pie three full times. When you finish you'll find that you've drawn a representation of logical-to-physical sector numbers for a given track. In our diagram, the numbers outside the sections represent the physical sector numbers while the numbers inside represent the logical sector numbers. This technique is called *sector interleaving*, and since two physical sectors were skipped between one logical sector and the next, this particular instance is an example of a *two-sector interleave*. Simple, no?

With today's better disk drive controller electronics, interleaving can actually be done two ways. The method just illustrated is called *software interleaving*; the disk controller actually numbers the sectors sequentially and numbers each sector's address field to match the numbers shown outside the sections in our diagram. It is therefore up to the software to figure out for a given logical sector (the number inside the section) what physical sector number it must pass to the disk controller to get the actual sector it wants. In the case of our diagram, for example, if the BIOS wants the second sector it wrote earlier, it has to ask the disk controller for physical sector number six.

The other method of interleaving is called *physical* or *hardware interleaving*, and it requires a disk controller with more smarts. In this method, when the disk is formatted, the controller numbers the sector's address field using the order shown inside the sections. That way, even though there are still two sectors between the first sector and the second, the BIOS simply passes the logical sector number directly to the controller; the logical and physical sector numbers are the same.

Since early controllers could not perform hardware interleaving, CP/M is based on the idea of software interleaving. As such, CP/M demands that every BIOS provide a SECTRAN routine, the purpose of which is to translate the logical sector given to it by BDOS into the physical sector needed by the controller. This is done by means of the sector translation table, which we'll get into in depth when we go on to data structures.

Systems with 8-inch disks that don't use software interleaving for double density must still provide it for single-density 3740 format so that they can still read or write to these standard disks. When dealing with their double-density drives, they can simply have SECTRAN return the same number to BDOS that BDOS gave it. Systems using only 5-inch drives and hardware interleaving needn't provide software interleaving at all; they just use the shortened form of SECTRAN mentioned a moment ago. In any case, BDOS always calls SECTRAN and gives it the logical sector number, then calls SETSEC immediately with whatever number it received from the SECTRAN routine.

This brings us to SETSEC. It is the job of this routine to take the sector number given it by BDOS and place that number in a temporary variable for later use by READ and WRITE. It is assumed (by BDOS, anyway) that this is the physical disk sector to be accessed. In this way, SETSEC is like SETTRK and SETDMA, since it doesn't actually do anything with the drive itself but works instead only with the data temporaries. These last four routines are called before every disk access and simply set the stage for later.

The next two routines, READ and WRITE, are very similar to one another in their operation. Using the data temporaries just established, they perform the bulk of the work involved in controlling the drive. Their first job is to examine the track number BDOS requested, compare it to the last track number used (which will generally be the track the head is now positioned over), and, if necessary, to move the head in or out to the requested track. Their next job is to find the sector requested and either read it into memory starting at the DMA address or write it to disk from the DMA address. If the read or write was completed without error, they return to BDOS with a 00 in the [A] register. An error, however, is reported by returning with a 1 in the [A] register. If an error occurs, the READ and WRITE routines must attempt at least ten retries before returning to BDOS. This is so that, if a sector is only moderately unstable, it may still be read successfully, since BDOS itself makes no provision for allowing a reread of the same sector.

BDOS responds to an error by printing BDOS ERR ON *x*: BAD SECTOR, where *x*: is the drive letter. It then waits for the operator to type a control-C, which aborts the entire operation; or any other character, which ignores the bad sector and reads or writes the remainder of the information.

There is one other error that can be generated by BDOS under command of the BIOS during write operations. This is the write-protect error. BDOS has always had the capability to report BDOS ERR ON *x*: R/O (read only), but it was originally reserved for those times when a file or a disk had been purposely set to read-only status by the operator, or when a disk had been changed without BDOS having been informed of the change via a warm boot.

Floppy disks can, of course, also be write-protected by installing a tab over the notch on a 5-inch disk or by removing the tab on an 8-inch disk. In the very early versions of CP/M, having the BIOS report write-protected disks was not allowed for, since some disk controllers were not capable of indicating that this was the problem. Better disk controllers made this possible though, and, in an attempt to provide this capability, an entry point in BDOS was identified that would generate this error and allow correct recovery from it. Therefore, if a write-protect error occurs, most of today's BIOS modules remove the BDOS return address off the stack to clear it and jump to this entry post at BDOSSTART+7, where BDOSSTART is the normal BDOS entry point.

One final job of READ and WRITE is sector blocking and deblocking. We'll get into the actual details when we cover these routines, but basically this is a means by which BDOS can treat all disks as having 128-byte sectors, as they do in 3740 format, when in reality they may have sectors as long as 4,096 bytes. Block/deblock is implemented by having a physical disk buffer that is separate from the DMA address BDOS is using. When BDOS requests that a sector be placed at the DMA address, it is al-

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ways requesting a 128-byte sector only. If a drive uses 256-byte sectors, then READ (or WRITE) cannot move all 256 sectors between the disk and the DMA address. To do so would write over valuable information in memory or place bad data on the disk. Using a physical disk buffer, READ, for instance, can read all 256 bytes into the physical buffer when the sector number that corresponds to the first half of the physical sector is requested. Additional code in READ then moves the first 128 bytes of this data to the DMA address. When (and if) BDOS requests the second half of the physical sector by requesting the next sector number, READ can get the same physical disk sector and move the second 128 bytes to the new DMA address.

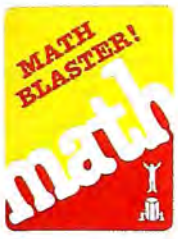
In cases where block/deblock is in use, DBOS is informed via the DPB data structure of the number of sectors per track that the media would have if its sectors were 128 bytes long (rather than being told the actual number of sectors it has). The Apple media, for example, with sixteen 256-byte sectors per track, is shown to BDOS as actually having thirty-two sectors per track. Since there are two "CP/M" sectors for every physical sector, BIOS simply divides the sector number that BDOS requests by two to get the actual physical sector. It then uses the fact of whether the number was odd or even to decide which half of the physical sector BDOS wants. The same principle is used whatever the sector size, although determining which chunk of the physical sector is being requested gets slightly more complex as the sector size gets larger.

In the WRITE routine, special care must be taken during block/deblock. This is because BDOS may only wish to write one 128-byte sector to the disk. If WRITE were to move that sector immediately into the disk buffer and write it to disk, it might obliterate the other half of the physical sector with whatever garbage was in the buffer. WRITE must therefore be capable of seeing whether that physical sector has been used before and therefore contains valid data. If so, WRITE must read it from the disk into the buffer, move the new half requested by BDOS from the DMA address into the buffer, and then write the entire physical sector back to the disk. BDOS helps in this regard by passing an extra parameter to BIOS that tells it whether that disk sector was previously allocated (in use) or unallocated. WRITE uses this information to decide whether to preread the buffer or not. If things were handled as described here, the system would be slowed down by all the prereads and other activities that are required. During the time CP/M has been in use, several changes have been instituted to make block/deblock more efficient; these will be described when we discuss the actual READ and WRITE routines themselves.

Next month we'll begin discussing the actual SoftCard BIOS by examining the data structures and how they're organized. In coming installments we'll go on to talk about each of the disk I/O routines and see how each one functions. When we're finished, you should have a much better picture of how this portion of the BIOS operates. Until next month. . . .■



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Word Processing:



Banking on Simplicity

If you had asked nine-year-old Matt Shapiro five months ago what he hated most about school, writing would have topped the list. Like a lot of youngsters, he found writing by hand a rite of agony—and it showed in his work.

"He was a fourth-grader but writing and spelling at a second-grade level," recalls teacher Robert Warde of the West Orchard Elementary School in Chappaqua, New Jersey.

"Writing was the only negative in his otherwise positive outlook on life, and I was hoping to find something to turn him around."

That "something" turned out to be *Bank Street Writer*, the child-tested word processor that's so easy to learn, even adults can master it. Warde vividly remembers the breakthrough day. He and Matt were working after school editing Matt's story about the class trip to Sturbridge Village, a faithfully restored New England settlement (circa 1820) in western Massachusetts. There were so many things to write about that Matt could do little more than list them in his first, handwritten draft—the one he keyed into an Apple with *Bank Street* following fifteen minutes' instruction from Warde.

Banking on Bellows. Lists don't bring a story to life, details do; so Warde pressed Matt to tell him more about what he'd seen in the Berkshire Mountains. The blacksmith shop had three bellows, as Matt had written, but what were they for, asked Warde. And what about the drop stone on the pulley that automatically closed the door of the blacksmith's shop? How did it work?

Warde figures that Matt spent a good two hours—two uncomplaining hours—editing the story, but the real payoff came when the two of them visited principal Robert Jackson, the man responsible for bringing computers to the elementary school in Chappaqua, an upscale bedroom community in Westchester County. Matt, the boy who'd hated editing, looked up at the principal and, in what was music to his teacher's ears, said matter-of-factly, "But of course, we still have to do a lot more on it."

To someone unfamiliar with the habits of young pencil pushers, such a remark might hardly seem extraordinary, but Warde regards it as a conceptual breakthrough. Before he introduced word processing to his computer-demonstration class in February, a story was a product, not a process. It was etched in granite by youngsters pushing pencils that often felt to them like giant redwoods. When a child finished a writing chore like this, it was done—and good riddance.

BY JONATHAN MILLER

"Kids had this quality of finality about their writing," says Warde. "I could have talked till I was blue in the face about the value of revising as the soul of good writing, but as long as the tedium of recopying existed, they didn't want to change what they'd written. With word processing, they can *see* things don't have to be all good or all bad. If they take a few minutes to correct the bad points, they have a whole different story."

Which brings us, with relentless logic, to the heart of a different story, the one about the word processor with the funny name and that most powerful of features—simplicity. Incredible as it may seem, someone has actually designed a simple-to-use word processor. It's not everything a word processor could be, but *Bank Street Writer* appears to be everything little kids (and most big kids) will probably ever need—a forgiving typewriter.

Star and Newsmaker. Since its release in December of last year, *Bank Street Writer* has held its own among top-selling word processors, its ascent spurred by a low-end price tag ($69.95 for Broderbund's home version, $95 for the school tutorial package from Scholastic) and a couple of glowing write-ups in *Time* magazine and the *New York Times*. Thus far, user reports are proving as friendly as the program. And, what's more, *Bank Street* even appears to be turning some dyed-in-the-wool technophobes on to computing—from English teachers and busy execs with no time for manuals to those who up till now were afraid of or uninterested in computers.

"The kind of response we're getting from English teachers is that here at last is something for us," says the program's spiritual father, Richard Ruopp, president of the Bank Street College of Education in New York City. "Up till now all the software for schools has either been management or math science software, with some drill and practice programs in the language arts. There were no writing tools for kids or, as far as that's concerned, for adults.

"Most word processors are business tools, not writers' tools. They're terrific for somebody who uses one all the time and cares about formatting, but not for someone who simply wants to write. The notion of an easy-to-use word processor is not profound. What is surprising is that nobody had ever done it before."

Ruopp and his staff at Bank Street's Center for Children and Technology came to that conclusion in 1981. The new center had just received a $74,000 grant from the Lounsbery Foundation to study the impact of word processing on children's writing and editing, only to discover that there was nothing commercially available for kids to use. Since the only way to conduct the study fairly was with a program youngsters could easily grasp, Ruopp and company realized they'd have to reinvent the word processing wheel one more time. Very logical, perhaps, but would it sell in an industry already awash in "user-friendlies"?

A private teachers' college with links to the progressive education movement and a former Greenwich Village address, Bank Street College had experience in developing income-producing commercial properties. It pioneered a popular series of multiracial, urban grade-school readers in the sixties, but software publishing was something new.

Simply Complex. So new and so problematic, in fact, that Ruopp recognized the need for something borrowed—the organizing and marketing experience of consultant Franklin E. Smith of Cambridge, Massachusetts. Smith, a former colleague of Ruopp's, understood the complexity of simplicity. It was Smith who put together the unique development team consisting of the college and Intentional Educations of Watertown, Massachusetts, on the design and programming end, and Broderbund Software and Scholastic respectively on the home and school marketing fronts.

"Frank was a very good manager of the design process," says an admiring Ruopp. "He would tell the educators, 'That's a wonderful idea, but we can't do it because we don't have enough memory.' And then he'd say to Gene Kusmiak, the principal programmer, 'This is for kids. If you want to create a word processor that will do the bells and whistles, let's do it another time.' "

What they were doing this time was producing a low-end minimal word processor. It had to run on an Apple (which had the largest installed base in schools and a familiar assembly language), off a home television set on one disk drive, and require no expensive add-ons.



Which was another way of saying the program had to be completely resident in memory and feature a hi-res page to permit upper and lower case without hardware modifications.

"We could have supported eighty columns, but we decided it was impossible to read if done in software on a hi-res-graphics page," Smith explains. "So we decided to stick with forty columns and solve in other ways the problems that that would create."

What emerged after a year of development and testing is the friendliest little word processor around. It is not unique in terms of its features; Smith freely admits he borrowed highlighting from friend Mitch Kapor's *VisiPlot* and other touches from Wang. What is unique is the development team's ruthless dedication to Smith's concept of "powered simplicity."

Straight to the Point. Consider. It has a boot time of nine seconds that puts you instantly into the writing mode. There are no made-in-Hollywood graphics to explode, no menus to pore over, just a blinking cursor awaiting your entry in the text window. The cursor sits in the upper-left corner of a rectangle that represents a page. Prompts above the rectangle, at the top of the screen, give all the instruction you need.

Want caps? Hold down the shift key and hit the N/inverted caret key. Want all caps? Hit N a second time while holding down the shift key. Want to erase? Strike the left arrow key. Want help or want to change something you've written? Just hit escape and—voila—you're in edit mode guided by a new set of prompts above the window. Change your mind again and want to write? Just hit escape and toggle back into writing. It's that easy, and, what's more, you've done it without reference to a manual.

Bank Street sports a handy, pocket-size manual of twenty-eight pages, but the truth is, you really don't need it. And why should you if all you want to do is get down to writing that occasional letter, memo, or school paper.

"We wanted to make *Bank Street* powerful," says Smith, "but with only those features the average person needed. We made a list of all the features a word processor could have and then threw out those that would be of use to only 10 percent of the market."

So be forewarned, formatters. *Bank Street* doesn't support the exotica of word processing—underlining, subscripting and superscripting, and split screen—nor is it a guarantee of "instant success." *Bank Street* makes the editing easier; the writing's still hard work.

What the fledgling author needs in basic editing power, however, *Bank Street* delivers. The edit mode offers five choices: erase/unerase; move/moveback; find/replace; transfer menu (which transfers you to the save, retrieve, and print functions); and a cursor control emblem, a diamond-shaped display of the I-J-K-M cursor control keys. Each key is depicted onscreen as an arrow and points in the direction it moves the cursor. Specific functions are selected by manipulating a highlighter using the left-right keyboard direction arrows for lateral movement and the space bar for vertical.

Cracking the Manual. These visual prompts are all a user needs with a short file, but the program also supports a second level of useful control keys. To learn these, you're obliged to crack the manual, but the commands are easily committed to memory. They're simple and logical—control-B to move to the beginning of a text file, E for end, U for moving up twelve lines, D for moving down twelve lines, S to count the word space left in the file, I to indent eight, sixteen, twenty-four, or thirty-two spaces, and C for text centering.

When you're processing text, there's nothing to remember. Everything you need to know is up there on the screen, one logical step after another. If you want to erase text, select that function with the highlighter and hit return. The program instructs you to place the cursor at the beginning of the passage you're deleting, followed by return; it then tells you to place the cursor at the end of the passage, followed by another return, with the cursor highlighting the entire block as it moves from the beginning to the end of the passage. To delete, simply answer yes to the program's yes/no prompt.

End of passage, end of story, right? Wrong. In most programs, text deleted is text kissed off. Not with the forgiving *Bank Street Writer*. It lets fickle, agonized scribes recover their precious words from pixilated limbo by selecting a function that makes perfect sense to kids of all ages—unerase.

Smith marvels that he was ever able to get the educators at Bank Street to go along with that bastardized English, but it's just that sort of inspired flexibility that makes the program so refreshing. Eight-year-olds don't delete, they erase. And they unerase. Their preprocessing mind set was formed by pencils, erasers, and smudges.

"Erasing is a very scary thing for kids," says Ruopp. "That sounds silly, but when you erase something, it's gone. Both the erase and move-back functions of *Bank Street* give kids a design feature that allows them to take something out and see what it reads like with or without it, and still put it back without having to retype it."

When it comes to printing, *Bank Street Writer* provides two options—print draft and print final, the latter asking the customary default questions about spaces between lines and page numbering. The print-draft option prints a file exactly as it appears on-screen, with thirty-eight lines of text per page. That doesn't tell an adult how the text will format in a standard sixty-five-character-line business letter, but it's great for kids who've yet to graduate to conventions of adult correspondence. What they see is what prints out, with generous right-hand margins to be used by teachers or the kids themselves to write notes in.

Little Big Writer. *Bank Street Writer* is a powerful little package, but it's not all-powerful. It supports indents at eight, sixteen, twenty-four, and thirty-two columns, but not tabs. The

Having a Durkee Dilemma?

If you've been following the SoftGraph series of articles in *Softalk*, then you may have noticed that it's all one big program.

The author, David Durkee, has created an easy-to-use graphing system for generating pie, bar, and line charts on the Apple II Plus or Apple IIe. The dilemma arises when you get around to entering the SoftGraph program yourself. One false entry could mean hours of frustration or circular bar graphs.

Now, courtesy of Softalk Publishing, you can get Durkee's SoftGraph already on disk for the low price of $8. SoftGraph is unprotected, expandable, and comes with an instruction file on disk, in the form of a tutorial, which can be printed out.

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first-time user is apt to confuse the highlighted indent with a tab, however, because only the initial indent appears on-screen. The others are omitted to save display space. In addition, *Bank Street* has no keyboard buffer allowing immediate recovery of words deleted with the left-arrow key in the write mode.

Another limitation concerns moves and erasures of copy within text files—they're limited to fifteen lines. To delete more than fifteen, it must be done in segments; if you forget and try it anyway, friendly *Bank Street* will throw you another prompt. If, after erasing a passage, you return to the write mode and enter any new text or make alterations, you won't be able to unerase your most recently deleted copy. Longer files, those in excess of five pages single-spaced, tend to slow performance, so users are urged to break them into shorter ones to be recombined during printing.

Bank Street does have its shortcomings, but many of them can probably be minimized, if not overcome. The nice thing about software as opposed to hardcover book publishing, notes Ruopp, is that it is more forgiving. It is as much a process as it is a product; you're encouraged to learn from your mistakes, because corrections are easier. So there are enhancements already in the works—like tabbing, extended indents beyond column thirty-two, a Spanish language version—to meet or anticipate user needs or complaints.

The biggest annoyance to date concerns the inherent limitations of the forty-character screen. It doesn't correspond to the standard sixty-five-character printout. As a result, some users complain that it's awkward typing date blocks so that they're flush with the right-hand margin, though this difficulty can be minimized by hitting the control-C centering command and estimating from there.

"There also seems to be some confusion on the retrieve function," Smith reports. "When you retrieve something, it doesn't clear the buffer. It appends whatever you're retrieving into what's already there, but with kids and adults that can be easily solved. We'll revise that so the program asks if you want to erase it or leave what's in there."

Fancier word processors, such as *WordStar*, permit users to suppress prompts and take short cuts as they grow familiar with a program. *Bank Street* is less flexible in this regard, at least in its present incarnation. "With *Bank Street*, you have to go through a series of steps that are laid out," says Smith. "That's the other side of user-friendliness. If you were using *Bank Street Writer* day in and day out, you might get tired of doing that."

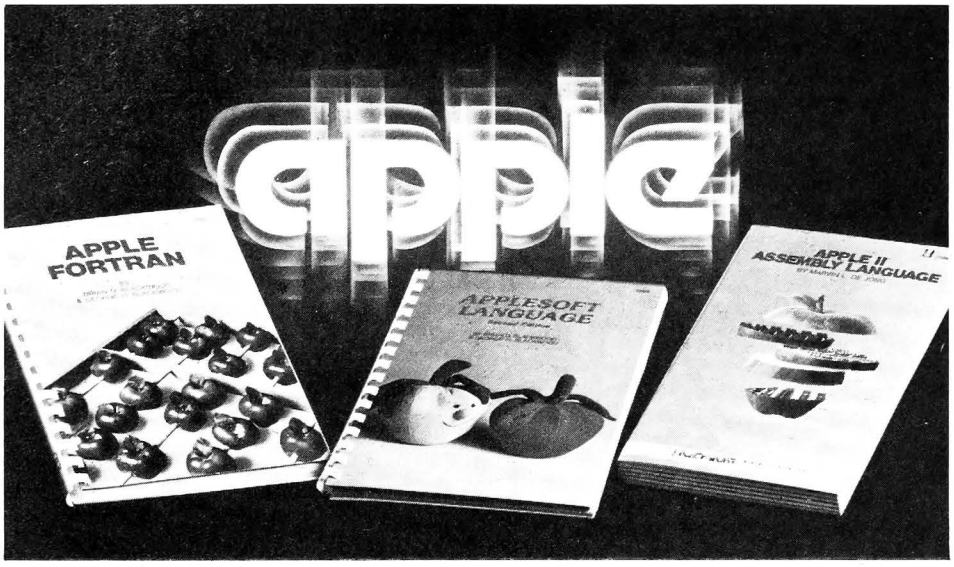
Handheld Targets. The target market for *Bank Street* probably wants all the handholding it can get. Ruopp suggests that some control short cuts—for example, extended cursor movement in the text mode—could be built into *Bank Street* to satisfy advanced users, but he feels strongly about keeping them as utility program default options.

"Adults get frustrated when they have to go back and forth between write and edit modes correcting text," Ruopp explains. "But we did that as a design feature, because we think kids really have to separate out conceptually writing from editing. When you write you should write, and when you edit you should make a decision to do it."

The larger question, as far as Ruopp is concerned, is whether children, and ultimately home users, will do more writing and editing because of *Bank Street Writer*. He thinks the chances are good that they will, because the program makes the process so much easier, though ease isn't motivation and could be a novelty that wears off.

"Machines may alter the way people perceive the environment," he cautions, "but they don't change things. People change things. I think the belief that the microcomputer is going to revolutionize education is about as mythological as the belief that if every low-income person in the country became a computer operator we'd solve poverty."

The creators of *Bank Street Writer* had more modest objectives—to turn kids, teachers, and nontechies on to writing with an easy-to-use word processor. So far, at least, it appears to be succeeding, because it is creating the excitement that is the wellspring of education. Turned-on teachers turn on kids, says Ruopp, and teachers who were feeling unmotivated and lifeless now report to him that they're thinking differently about their roles. *Bank Street Writer* is al-



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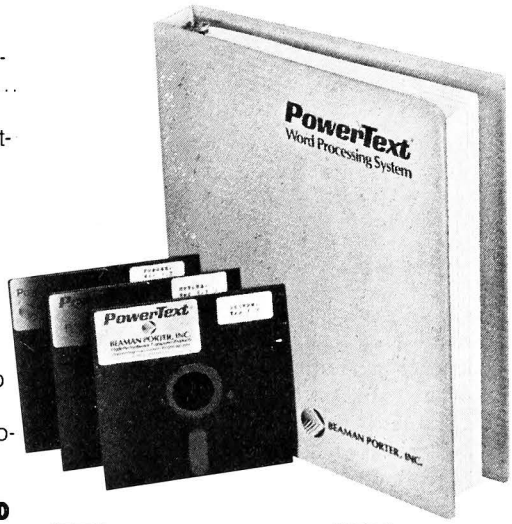
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lowing them to introduce team writing concepts so youngsters can work together on stories, each doing a paragraph, each helping the other.

"I'd like to see just how far word processing can go—down to the second and first grades," says Warde. "I find nothing that the kids have trouble with. It makes sense to me and it makes sense to them. Out of twenty-one kids, I have half a dozen now that are typing without looking at the keyboard at all. I'm talking about eight-year-olds, third-graders. If they can do it, anybody can." ❑■

Olivieri's Outline of Word Processors

by Peter Olivieri

Word Juggler, Quark Engineering, 2525 West Evans, Suite 220, Denver, CO 80219; (303) 934-2211. $295.

Equipment required: 128K Apple III, monitor, printer.

Time and time again in this series we have stressed how important user-friendliness (thorough program design) and good documentation are to the effectiveness of a word processing program. The designers of *Word Juggler* (version 2.4) seem to have had these elements firmly in mind.

Various features help make *Word Juggler* extraordinarily simple to operate. The package comes with two rubberlike templates that fit onto the Apple III keyboard. One rectangular template fits around the Apple III keypad and identifies the functions that certain keys on the keypad will perform. These functions include printing a document, displaying a document, finding strings, replacing characters, setting tabs, inserting and deleting text, and returning to the menu. The second strip that fits above the top row of keys on the keyboard identifies special functions, such as centering, justification, spacing, page length and width, and so on. A quick reference card is also included in the package; it is meant to be placed in the "gutter" behind the keyboard so that it can be readily seen and used.

The user guide for *Word Juggler* is well written, thorough, and readable. It contains both a table of contents and an index, as well as an eight-part reference section. Some screen illustrations would have been a nice addition here, since they tend to clarify points being made in the text, but these omissions are not at all serious in this case.

In addition to providing information on how to configure your system, the guide provides a helpful three-lesson tutorial. This is one of the more thorough tutorials around; by the time users finish working through it, they're likely to feel quite comfortable with the major features of the program.

To begin, you enter, with guidance, a simple letter. In the process, you become familiar with some of the special keys the package uses and the functions they perform. You discover, for example, that the deletion of previously typed characters is done by pressing the minus key on the keypad (remember, there's a template around this keypad that identifies the minus key as a delete key).

As you proceed through the tutorial, you do a good deal of editing. You learn how the arrow keys move the cursor around the screen (and the text), how to store a letter on disk and retrieve it, and how to search for the occurrence of a particular string and replace it with another. In the final part of the tutorial, you get experience at inserting page headers, numbering pages, and performing many of the tasks that ultimately enhance the appearance and orderliness of your document.

The program has various features you're likely to appreciate. One especially helpful one is the ability to move blocks of text around. With many word processors, this task is arduous at best, but not with this one. *Word Juggler* allows the user to copy, move, load, store, and delete portions (blocks) of text, all accomplished by means of single keystrokes to mark the beginning and end of the block in question.

Word Juggler also offers a wide variety of options for printing text. Subscripts, superscripts, underlining, and boldface printing are all included. You can predefine certain variables for use later on in your text, including $date, $year, $month, $time, and so on. These variables can be quite useful in many applications.

Many of the print options are activated by pressing one of the special command keys (the top row of keys, with the template above them to identify what functions they'll perform). Among these functions are the control of page length, page width, centering, margins, line spacing, pitch indentation, and widow lines, to name a few. There's also a *let* command that allows you to define or redefine the values of variables. For example, you might use the let command to restart the page number count at a certain point in your document.

Word Juggler does have a drawback—namely, that what you see on-screen is not the same as what you'll get in your printed copy. When text is entered, it is always displayed starting from the far left edge of the screen and going to the far right edge. Special commands to control printing are embedded in the text itself; these, of course, will not appear in the final copy. You *can* display a copy of what the document will look like when printed out, but while viewing this display, you can't do any editing. To edit, you must return to the edit mode.

Word Juggler permits you to insert text files created by other Apple III programs (most notably *VisiCalc* and *PFS*) into any *Word Juggler* document. This is relatively easy to do and is an especially useful ability to have. On a 128K machine, a single document can contain about 799 lines of text (on a 256K machine, this jumps to 1,536 lines). A newly formatted disk can hold approximately 1,700 lines of text.

Another interesting option allows you to type at the Apple III keyboard and have the results print directly on the printer. This feature is easy to use and offers some options not normally found in the typical word processor.

Quark also offers a variety of "accessories" (available for an additional charge) to enhance *Word Juggler*'s capacities. A mail list manager allows you to interface with Apple's *Mail List Manager*. (A limited listing capacity is included with the main program, but it is not nearly as powerful as the Apple version). *Lexicheck* is a spelling checker with a thirty-thousand word dictionary. It scans documents at a rate of ten thousand words per minute. *Legal Dictionary* adds eight thousand legal terms to *Lexicheck*. The program *Typeface* allows you to interface *Word Juggler* with computerized typesetting equipment. And *Discourse* is a software spooler that permits you to use your Apple III while the printing process is taking place.

All in all, *Word Juggler* is easy to use and can be learned quickly. The extra efforts to make this package emulate the best standalone word processors certainly stand out; it performs all the functions of more sophisticated systems. The documentation is well done, thorough, and easy to refer to. It's obvious that much care was taken with the design of this package. Users should appreciate that. ❑■

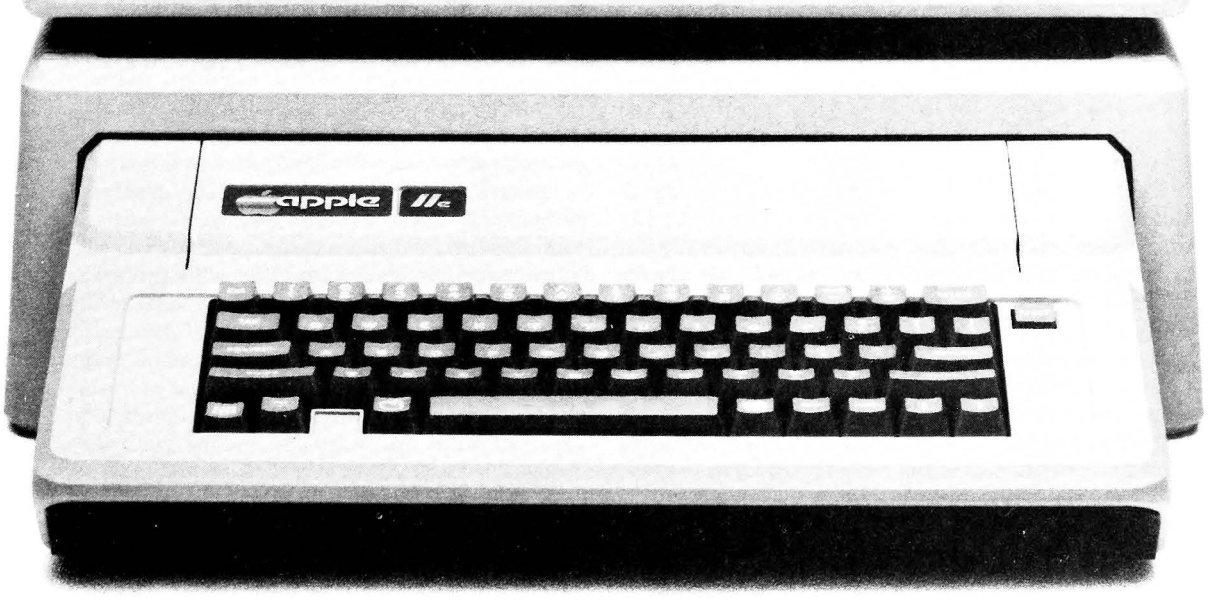
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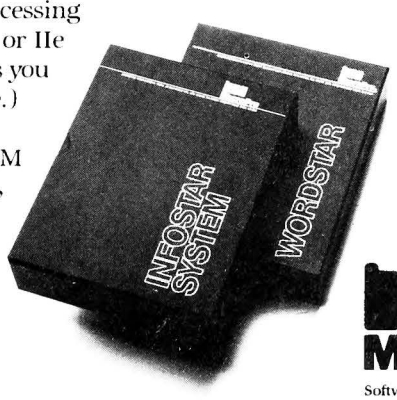
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THE THIRD BASIC



by Taylor Pohlman

Exploring Business Basic, Part 21

Two quick announcements before we begin are appropriate. First, the long-awaited *SOS Reference Manual* and *Device Drivers Writer's Guide* came off the presses in April and should have reached the far corners of the earth by now. They are an incredible wealth of information about how your favorite machine really works. If anybody you know thinks SOS isn't the best single user operating system around, show him a copy.

The second announcement is a great one for those of you who read this article wistfully, because you have an Apple II and keep wondering what all the fuss is about concerning the Apple III, or because you need another Apple III for your business. Apple dropped the price of a 256K Apple III in April to $2,695. That's a full $1,600 less than this time last year.

And Now, Back to Our Regularly Scheduled Program. As was mentioned last time, this article is the last in a series exploring the text and bit-map modes of graphics on the Apple III. We've covered a great deal in the last three months, from simple character set and shape definitions to character-set-animation effects (even including a game) and finally to color bit-mapped graphics with Business Basic's own brand of animation. This installment will be the last in the graphics series (at least for now) and will cover a combination of the two worlds, text and the bit-mapped graphics display.

Farewell, Faithful Bgraf.inv. Those of you who have been following these articles for some time may be a bit confused by the last sentence in the paragraph above. "I know how to do text on the graphics screen," you say; "just open the grafix driver and print characters to it like any other driver." Right as rain, but what does that have to do with the graphics invokable in Business Basic?

If you carefully read the sections in your Basic manual on the Bgraf invokable module, and the section in the *Standard Device Drivers Manual* on the .grafix driver, you'll notice that the printing of text characters on the graphics screen is handled by the DrawBlock function of the driver, writing out the bit patterns of each character from the currently defined character set (normally the set used by the .console driver). By using the Bgraf module, it is possible to assign a new character set to be used by DrawBlock. It is also possible to use the DrawImage function of the module to draw any shape (including text characters) onto the graphics screen. In the last two articles in this series we've been dealing with DrawImage's shape-drawing ability in order to fill our screen with creatures of various shapes that have crawled their way into our hearts. The marriage of the DrawImage flexibility with a text character set presents some interesting possibilities, among which is the ability to dress up the appearance of text on-screen. It is on this intriguing capability that our final discussion of the Bgraf invokable module will rest.

Beauty in "Proportion" to Its Cost. By now many of you have probably looked at a photograph, if not an actual demo, of Apple's new Lisa system. One thing that immediately strikes people is how pleasing the display looks. When you analyze it, it's not only the hi-res display but the fact that the characters are pleasingly arranged on the screen, more like text found in a magazine or book than that found on a computer terminal. The fundamental difference in the display modes is that all text on the Lisa screen is *proportionally* spaced—that is, each character is placed so that there's a minimal space between each pair of characters. In normal computer printouts and screen displays, each character occupies the same amount of space as every other character.

It's easy to see that the characters i and l don't take up nearly as much room as M and X, yet in standard computer output they do, in order that all columns will automatically line up properly and that editing can be simplified. Such constant spacing techniques are called *monospacing*, and for certain things, like columns of numbers, they are really important. For ordinary text, however, monospacing is not only less natural and attractive, it wastes space as well. Several word processors for the Apple II use the hi-res-graphics mode to create character sets. These programs allow up to seventy characters across a screen that ordinarily can accommodate only forty standard text characters. We will learn in this article that the higher resolution of the Apple III allows us to get over one hundred characters across the screen, with no sacrifice in readability!

Beauty on a Budget. This month's program allows you to play with the concepts of proportional spacing and text font appearance from within a program that works like a hi-res screen editor for text. The editor program permits you to place either proportional or monospaced text anywhere on-screen, use multiple fonts on the same screen, and use the graphics driver "transfer-mode" feature to do such things as overstrikes and erasures. The best feature of the program, however, is that it contains many routines you can use to create your own hi-res displays, both with the currently available fonts and any of your own design. Remember that with Bgraf and the .grafix driver you can have individual characters that are much larger than the normal seven-by-eight character-cell definition. The program deals with normal-size character fonts, but we'll discuss easy modifications that are possible if you want to use your own nonstandard sizes. There's plenty to cover, so let's go. . . .

```
10  DIM char%(63,7),cset%(511),lookup(15),flip(255),cstart%(127),
    clen%(127)
15  HOME:PRINT"High Resolution Screen Character Editor":PRINT
20  PRINT"Initializing variables, please wait."
25  GOSUB 4000
```

The first section sets up our arrays and goes to the subroutine at 4000 to load up tables and do other initialization. For those of you who have been following this series, the arrays char, cset, lookup, and flip should be familiar. Char contains the character set of our choice and is defined as being 128 bytes wide by eight rows high—enough to contain the 128 ASCII character definitions in a standard font (which is eight by eight pixels per character), with the rightmost pixel column used for defining flash in inverse text mode (seven by eight displayable). Those of you who read the documentation will notice that a .bgraf character set can actually contain 256 character definitions, but the standard system fonts are limited to 128, so that's what we'll go with for now. Cset contains the actual image of a system font file, as read in by the download.inv invokable module. We'll look at a conversion routine that transforms fonts in the system format into character-set definitions that Bgraf can operate

on. Lookup and flip are used to accomplish this transformation quickly.

Which brings us to the cstart and clen arrays. Their size of 128 elements each should be a clue that each element contains information about the respective character associated with the element number, and the names should be a clue as to what that information is. The characters in a normal character set are stored in blocks one byte wide in the char array, but since we want to do proportional spacing, it is necessary to define for each character cell just how much of the character in it we want to display. In this program, that is accomplished by defining the starting pixel row within the character cell to start the display, as well as the number of pixel rows to display from that point. Let's look at the initialization section, where this will become more clear:

```
4000  REM initialize
4025  DATA 0,8,4,12,2,10,6,14,1,9,5,13,3,11,7,15
4045  FOR i=0 TO 15:READ lookup(i):NEXT
4055  v256=256:v512=512:v128=128:v16=16
4060  FOR i=0 TO 255:a$=HEX$(i):flip(i)=v16*lookup(TEN(MID$
      (a$,4,1)))+lookup(TEN(MID$(a$,3,1))):NEXT
```

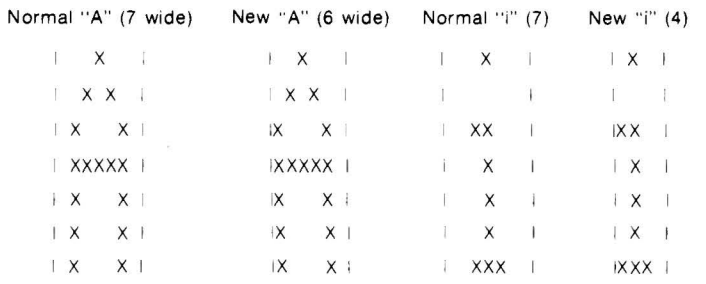
The section from line 4000 through line 4060 is identical to routines in previous programs. It creates the flip array, which is simply a lookup table of all the possible combinations of the value of a byte of data (256 in all), with their values as if the bits in the byte were exactly reversed—that is, flipped over. This table is required by the routine that transforms a character set from system font format to .grafix format. Apple cleverly made these two formats the exact reverse of each other. Next comes more initialization of variables:

```
4070  name$="Font":array$="cset%":size%=1024
4085  ctrl$=CHR$(8)+CHR$(21)+CHR$(11)+CHR$(10)+
      CHR$(13)+CHR$(27)
4090  left=0:right=559:top=191:bot=18:cvert=191:chorz=
      0:delay=1:noset=1
4100  hspace=7:vspace=8:reverse=0
4110  bell$=CHR$(7):eras$(0)="Replace":eras$(1)=
      "Overlay":eras$(2)="Invert"
4120  eras$(3)="Erase ":prop$(0)="Monospace  "
      :prop$(1)="Proportional"
```

Several variables are worthy of note. First, in line 4085 a string is built of command characters that will be used later for fast lookup by the editor command routine. In order, the characters are back arrow, forward arrow, up arrow, down arrow, return, and escape. Line 4090 sets some initial constraints for the area that may be edited and sets the initial position of the cursor to 0,191 (chorz and cvert). Line 4100 sets the default for horizontal and vertical character spacing. These are values you would want to change if you used other, nonstandard character sets. Next comes a big table that will be a challenge to type in:

```
4200  DATA 3,4,3,2,2,4,1,6,1,6,1,6,1,6,3,2
4205  DATA 1,4,3,4,1,6,1,6,2,3,2,5,3,2,1,6
4210  DATA 1,6,1,6,1,6,1,6,1,6,1,6,1,6,1,6
4215  DATA 1,6,1,6,3,2,2,3,1,5,2,5,2,5,1,6
4220  DATA 1,6,1,6,1,6,1,6,1,6,1,6,1,6,1,6
4225  DATA 1,6,2,4,1,6,1,6,1,6,1,6,1,6,1,6
4230  DATA 1,6,1,6,1,6,1,6,1,6,1,6,1,6,1,6
4235  DATA 1,6,1,6,1,6,2,5,1,6,2,5,1,6,1,6
4240  DATA 2,4,1,6,1,6,1,6,1,6,1,6,1,6,1,6
4245  DATA 1,6,2,4,1,5,1,6,2,4,1,6,1,6,1,6
4250  DATA 1,6,1,6,1,6,1,6,1,6,1,6,1,6,1,6
4255  DATA 1,6,1,6,1,6,1,6,2,3,1,6,1,6,0,7
4300  FOR i=32 TO 127:READ cstart%(i),clen%(i):NEXT
4500  RETURN
```

Notice that there are eight sets of two values on each line and that there are twelve lines, for a total of ninety-six sets of values—one for each of the displayable characters in a font definition. To save trouble and improve performance, we have not bothered to make the control character definitions displayable, so the characters from 32 (space) through 127 (delete) are the only ones defined. Note that most characters seem to follow the pattern 1,6; this indicates that the program should start one pixel over in the character definition and use the next six pixels. This is because a large number of characters in the standard set are five pixels wide, and we need one pixel for spacing. For consistency, we always steal the extra pixel from the leading edge of the character, leaving the spacing pixel at the end. This does mean, however, that we save at least one pixel per character, which for eighty characters across on a normal screen



Monospaced versus Proportional Characters

is eighty pixels, or the equivalent of an extra thirteen characters from that technique alone. Six-wide monospacing thus buys the ability to write ninety-three characters across the screen, which, depending on the number of i's and 1's and other skinny characters that are used, may increase the total considerably. An example would help; see the accompanying figure.

Notice that the new A is obtained by simply shaving off the first column, which makes our starting-pixel, character-width pair 1,6. As to the lower-case i, the formula is 2,4, since we are to skip the first two pixel columns and then use only four to draw the character.

In any case, the table presented in lines 4200 through 4255 will define the slim new format for all the characters in the font we'll be using. Note that this definition is for the Standard font. Several other fonts come with the Business Basic disk, such as Roman and Apple. These fonts contain characters designed a little differently than those of the Standard font, so you should construct a different table for those characters.

Having beaten initialization to death, let's get on with the show:

```
30  INVOKE"/basic/bgraf.inv","/basic/request.inv","/basic/
    download.inv"
35  OPEN#1,".grafix"
50  INPUT"Use Normal or Inverse screen (N or I)? ";a$
55  IF a$="" THEN GOTO 1050
60  a$=MID$(a$,1,1):op=INSTR("Nnli",a$)
65  IF NOT op THEN 50:ELSE op=INT((op+1)/2)-1
70  fill=op*15:pen=(NOT op)*15
75  erasenum=2+4*op
```

Because we'll be dealing with fonts as well as the .grafix driver, we'll invoke the three modules listed in line 30, all of which are found on the Business Basic master disk. Then the graphics driver is opened, allowing us a path to print text commands on the graphics screen and perform other functions.

Lines 50 through 75 then ask whether the screen is to be displayed in normal mode (white characters on a black background) or inverse mode (just the opposite). Notice the use of the instr statement and the calculations in lines 60 and 65 to check for mismatches and then set op to 0 or 1 for normal or inverse. This causes line 70 to set fill and pen to either 0 and 15 or 15 and 0, depending on the value of op. An if statement would work just as easily, but practice in logical value calculations can't hurt.

The variable erasenum in line 75 is used to define what transfer option is appropriate to use to draw the cursor so that it doesn't interfere with the text on-screen. If the pencolor is 0 (black), then transfer option 2, invert, is used. If the pencolor is 15 (white), then option 6 is used, inverse invert. More detail on how these transfer options work will be found later. Next comes more initialization:

```
100  PERFORM initgrafix
105  PERFORM grafixmode(%2,%1)
110  PERFORM fillcolor(%fill):PERFORM pencolor(%pen)
115  HOME:PRINT:PRINT"Initializing the graphics screen, please
     wait."
120  erase=0:prop=1
130  GOSUB 3600
```

In line 105 the program sets mode 2, the 560-by-192 mode, and line 110 uses the previously defined fill and pencolor variables. Line 120 sets the initial values for erase, which defines the transfer option used to write characters on-screen, and prop, which defines whether proportional or monospaced character writing will be performed. Then the subroutine at line 3600 is called to set up the screen:

```
3600  PERFORM viewport(%0,%559,%0,%191):PERFORM fillport
3620  PERFORM moveto(%0,%9):PERFORM linerel(%559,%0)
3630  PERFORM moveto(%412,%9):PERFORM linerel(%0,%-9)
3640  IF reverse THEN RETURN
3650  warn=1:message$=eras$(erase)+" "+prop$(prop):GOSUB
      3100
3660  RETURN
```

Lines 3600 through 3630 clear the screen to the current fill color and then create a message area in the bottom ten lines of the screen. If reverse is on (more on that later), then the operation is finished. Otherwise, the subroutine at line 3100 is called to write the current state of the transfer option and the spacing mode:

```
3100  PERFORM xfroption(%0)
3105  GOSUB 3500
3110  PERFORM moveto(%7+412*warn,%7):PRINT#1;message$;
3120  IF NOT warn THEN FOR i=1 TO 750*delay:NEXT
3125  PERFORM xfroption(%( NOT( NOT erase))*(erasenum-2+
      erase))
3130  IF NOT warn THEN GOSUB 3500:ELSE:warn=0
3135  RETURN
3500  PERFORM viewport(%5+408*warn,%411+148*warn,%0,
      %8):PERFORM fillport
3510  PERFORM viewport(%,%559,%0,%191)
3520  RETURN
```

These subroutines give the program a general-purpose ability to write messages to the user on the bottom of the screen. Line 3100 first sets transfer option 0, called replace, which will overwrite any message currently in the message area. Then subroutine 3500 is called to clear the appropriate part of the message area. If warn mode is on, then the message is written from horizontal positions 413 through 559, between rows 0 and 8 on the screen (the lower right-hand corner). If warn is zero, then the message is written between positions 5 and 411. These techniques can be used to establish several message windows if necessary, each using the same routines.

Line 3110 then moves to the appropriate place on-screen and writes the message in message$. Messages in the warning window remain until changed by another message, but if the regular message window is used the program will pause briefly (line 3120) and then set the transfer mode back to its original state, calling line 3500 to clear the window.

Back Home from the Subroutines. Now that the program has set up the screen and the default modes are established, we turn on the screen and start using the program:

```
150  PERFORM grafixon
155  message$="High Resolution Screen Editor":GOSUB 3100
160  GOSUB 1400
165  IF fin=2 THEN 1000:ELSE IF fin AND noset THEN 1000
170  GOSUB 3500
```

After putting an identifying message on the bottom of the screen, the previous section uses the subroutine at line 1400 to load the character font that will be used to write on the screen. That routine starts like this:

```
1400  prompt$=name$+" pathname: "
1425  GOSUB 3000:IF fin THEN RETURN
```

This font subroutine first prompts for the pathname of the font file by using the variable prompt$ and the hi-res input routine at line 3000 (more on that routine later). The variable fin in line 1425 is used to indicate a nonstandard exit from input, such as pressing escape or a carriage return at the beginning of the input. In any case, the font name, if any, is returned in the variable line$. A quick look at the input routine is appropriate now (are you beginning to feel like the Apple III itself, plunging deep into subroutines again?):

```
3000  PERFORM xfroption(%0)
3005  GOSUB 3500:PERFORM moveto(%7,%7):PRINT#1;prompt$;
3010  line$="":fin=0
3015  GET a$:a=ASC(a$):IF a<32 THEN 3030
3020  IF LEN(line$)<40 THEN PRINT#1;a$;:line$=line$+
      a$:ELSE: PRINT bell$;
3025  GOTO 3015
3030  IF a=13 THEN fin=(LEN(line$)=0):GOSUB 3500:GOTO 3070
3035  IF a=27 THEN fin=2:GOSUB 3500:GOTO 3070
3040  IF a=24 THEN PRINT bell$;:GOTO 3005
3045  IF a<>8 THEN 3015
3050  IF LEN(line$)=0 THEN 3015
3055  PERFORM moverel(%-7,%0):PRINT#1;" ";:PERFORM
      moverel(%-7,%0)
3060  line$=MID$(line$,1,LEN(line$)-1)
3065  GOTO 3015
3070  PERFORM xfroption(%( NOT( NOT erase))*
      (erasenum-2+erase))
3075  RETURN
```

The previous routine is very similar to others in this column that accept input while on the hi-res screen. It supports typing in characters and erasing input with the back arrow. In addition, a check is made in line 3020 to be sure that the input doesn't overflow past forty characters and thus into the next message window. If everything's okay, the character is added to line$, and the routine loops back up to get the next character.

Control character processing, including back-arrow erasing, is handled in lines 3030 through 3065. Backing up is a matter of moving the cursor location back one space, printing a blank, and then moving back to accept the new character. In addition, line 3060 removes the previous character from the end of line$ and then loops back to get the next character. Lines 3030 through 3040 handle special character exits from the routine. A carriage return exits with fin set to 0 if there are characters in line$ or set to 1 if the string is null. A value of 2 for fin indicates that escape has been pressed, and a control-X erases the input line, just as it does in Basic, except that the prompt is redisplayed. In all, this is a useful routine that could easily be adapted for use anywhere on the screen.

Now that we have a general way to get input and to check for certain characters like escape, we can continue our look at the font request routine:

```
1435  ON ERR GOTO 1460
1440  font$=CHR$(34)+line$+CHR$(34):PERFORM
      getfont(@font$,@array$)
1445  OFF ERR:GOSUB 2000
1450  message$=name$+" loaded.":GOSUB 3100:GOSUB 2100
1455  RETURN
```

This routine first sets up an on error jump to line 1460 and then tries to use the getfont procedure from the download.inv module to load a font from the file specified in line$. If anything goes wrong—for example, the file specified is not a font file—then a jump is made to the error routine:

```
1460  ON ERR GOTO 1490
1465  OPEN#3,line$
1470  PERFORM filread(%3,@array$,%size%,@ret%)
1475  OFF ERR:CLOSE#3
1480  IF ret%=size% THEN GOSUB 2000:GOTO 1450
1485  message$=name$+" in "+line$+" is invalid.":GOSUB 3100:
      GOTO 1400
1490  message$="Not a "+name$+" file.":GOSUB 3100
1495  OFF ERR:IF TYP(3)=0 THEN CLOSE#3:DELETE
      line$:ELSE:CLOSE#3
1500  GOTO 1400
```

The routine at 1460 attempts to open the file as a Basic file, and use the filread procedure from request.inv to read a font definition array. This might be the case if you used the *Character and Shape Editor* from a previous article, or some other means to get a font definition into a file without being able to change the file type to FONT. If something goes wrong this time, then the appropriate error message is displayed, either in line 1485 (if the file could be opened and read from but contained wrong information) or line 1490 (if there was trouble opening or reading the file). The typ function in line 1495 serves to check if the file is blank because the original open caused it to be created. If so, it is deleted and control goes back to the beginning to ask for the file name again.

In the event that the file name is correct and the program can read a font from it, a subroutine at line 2000 is called to prepare the font for use by the program (ever deeper into the routine abyss):

```
2000  message$="Preparing the character font.":GOSUB 3100
2010  FOR k=0 TO 511:b$=HEX$(cset%(k)):cset%(k)=
      TEN(HEX$(v256*flip(TEN(MID$(b$,1,2)))+
      flip(TEN(MID$(b$,3,2))))):NEXT
2020  RETURN
```

This routine has also been seen in previous episodes, since the standard system-font definitions used by text mode are exactly the reverse

(on a character basis) from those of the hi-res Drawblock fonts. Line 2010 uses the flip array to define all possible byte values and their corresponding reversed values. The routine is compacted on one line for maximum performance. Now that the font is flipped, it is necessary to expand it from the single-dimensioned array cset% to a form more readily usable by Drawimage:

```
2100  message$="Transferring Font format to Character set
      format":GOSUB 3100
2105  FOR k=16 TO 63:j=8*k-1
2110  FOR i=0 TO 7 STEP 2:j=j+1:a$=HEX$(cset%(j)):b$=
      HEX$(cset%(j+4))
2115  char%(k,i)=TEN(MID$(a$,1,2)+MID$(b$,1,2))
2120  char%(k,i+1)=TEN(MID$(a$,3,2)+MID$(b$,3,2))
2125  NEXT:NEXT
2140  message$="Font format transferred":GOSUB 3100:GOSUB
      3500
2150  noset=0
2160  RETURN
```

Note in the prior routine that we are unpacking cset% into a simple row-and-column format in the array char%, where rows represent rows of bits and columns represent character definitions, two per integer value. More information on this format can be found in previous articles in this series, as well as in the Business Basic manual, volume 2, under the discussion of the Bgraf invokable. Note also that you could speed up this process considerably by prestoring a font definition in a file as a character set array in the char% format. That would require modification of the subroutine at 1400, which reads in the array, but would allow quick switching of fonts without the complicated preparation routines.

Now for Something Completely Useful. Those of you who've been following along with our nested subroutine calls will now realize that we're back to the main routine, with a font definition loaded in the char% array. That brings us to the interesting stuff: actually putting some of these characters on-screen using the proportional spacing tables. Our first step is to put a cursor on-screen to indicate where the character will be written:

```
200  PERFORM xfroption(%erasenum)
205  PERFORM moveto(%chorz,%cvert)
210  PERFORM drawimage(@char%(0,0),%v128,%995,%0,%1,
     %vspace)
215  GET a$
220  PERFORM drawimage(@char%(0,0),%v128,%995,%0,%1,
     %vspace)
```

First we set the transfer option for invert, allowing the cursor to overwrite information on-screen by turning black to white and white to black. Line 205 positions the cursor to the current horizontal and vertical value, and line 210 writes the cursor on-screen using the Drawimage routine. This statement draws a vertical bar of bits from the char% array, which is one pixel wide and eight pixels (vspace) high starting at bit location 995 in the character set. It happens that 995 is the location in the standard character font of the vertical-bar character (ASCII 124). By multiplying 124 by 8 (the width of a character definition) and adding 3 for the offset within the cell for the bar, we obtain 995. Thus our cursor consists of a vertical bar at the extreme left-hand edge of the current character cell. This is a convenient definition of a proportional cursor, since we will be writing characters with many different widths, and we would like to know exactly where the character will be placed. If you use different fonts, you may well want to define another character position to contain this cursor character and change the values in lines 210 and 220.

In line 215 we get a character from the keyboard and immediately print the cursor again—exactly on top of the previous one. Since we are in invert mode on the transfer option, this second printing of the cursor simply changes everything back to its original state.

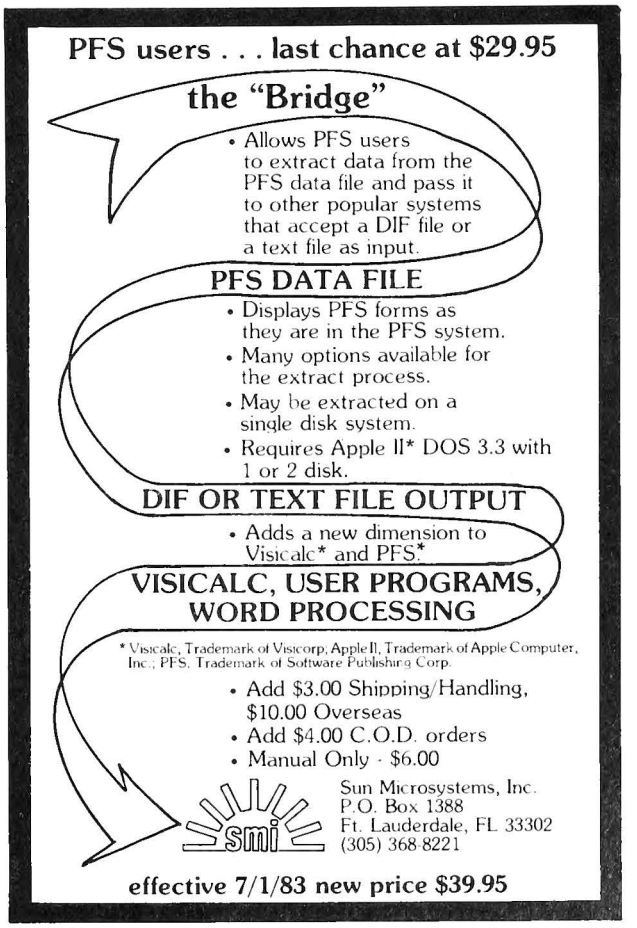
Now it's time to put this typed character on-screen:

```
225  PERFORM xfroption(%( NOT( NOT erase))*
     (erasenum-2+erase))
230  key=ASC(a$):skp=1:IF key<32 OR key>127 THEN 270
240  IF prop THEN hspace=clen%(key):xskip=key*8+
     cstart%(key): ELSE:hspace=7:xskip=key*8
245  IF right<chorz+hspace THEN PRINT bell$;:GOTO 200
250  PERFORM drawimage(@char%(0,0),%v128,%xskip,%0,
     %hspace,%vspace)
255  chorz=chorz+hspace
260  GOTO 200
```

Notice that first we put the screen back into whatever transfer mode was selected and then set key equal to the ASCII value of the typed character. A check is made to see if the character is a control character or if open-apple was pressed along with the character (key>127). If not, then it's a printing character, which is to be put on-screen. Line 240 sets hspace and xskip based on whether proportional or monospace mode is being used. Hspace indicates how wide the character is to be written—seven pixels wide if monospace or the value in clen% if proportional. Xskip is the offset in the char% array and the point at which to start the transfer of the character. It's always the character code times 8 for monospace, with the additional value cstart% if proportional. Once the correct values are computed, a check is made to see if the result will go past the right edge of the window defined by right. If everything is okay, the character is written by line 250 and the current horizontal position is updated. Then a loop back to the beginning is done to redisplay the cursor and start the process over.

As was mentioned earlier, control and other special characters are handled by the routine at line 270:

```
270  IF key=27 THEN 400
275  IF key>127 THEN skp=0:key=key-128
280  kvl=INSTR(ctrl$,CHR$(key))
285  ON kvl GOTO 340,350,360,370,380,160
290  GOTO 200
340  hmove=chorz-skp*(hspace-1)-1:IF left<=hmove THEN
     chorz=hmove
345  GOTO 200
350  hmove=chorz+skp*(hspace-1)+1:IF right>=hmove THEN
     chorz=hmove
355  GOTO 200
360  vmove=cvert+skp*(vspace-1)+1:IF top>=vmove THEN
     cvert=vmove
365  GOTO 200
370  vmove=cvert-skp*(vspace-1)-1:IF bot<=vmove THEN
     cvert=vmove
375  GOTO 200
380  chorz=0
385  IF bot<=cvert-vspace THEN PRINT#1;CHR$(10);:cvert=
```

```
      cvert-vspace
390   GOTO 200
```

First a check is made in line 270 to see if the character typed was an escape. If so, an immediate jump is made to line 400 to do processing of commands. If not, a check is made for open-apple in line 275; if so, the skip flag is set to 0, indicating that cursor positioning is to be done in one-pixel increments. The character typed is then checked against values in ctrl$, which was defined a while back on line 4085. Let's reproduce it for quick study:

```
4085  ctrl$=CHR$(8)+CHR$(21)+CHR$(11)+CHR$(10)+
      CHR$(13)+CHR$(27)
```

The first four characters represent the cursor arrows back, forward, up, and down. The fifth is the carriage return and the sixth is escape. Since we have already checked once for escape in line 270, escape can be detected only at line 280 if it was open-apple escape. Similarly, the open-apple key can be used with the cursor keys to signal single-pixel or normal movement in a given direction. This also allows us to define additional commands, either control characters or printing characters with open-apple on, to implement other features in the program. The routines themselves from 340 to 390 are pretty straightforward. Cursor movements are first checked against the left, right, top, and bot limits, and then the cursor position is updated. Remember that when the program redraws the cursor it first positions it to the current values of chorz and cvert in line 200, which means there is no need to redraw the cursor in these routines.

Next let's look at the routines at line 400, which processes requests for command and mode settings:

```
400   prompt$="Proportional or Monospace characters: ":GOSUB
      3000
405   GOSUB 3500:IF fin=2 THEN 200:ELSE IF fin THEN 425
410   a$=MID$(line$,1,1):a=INSTR("PpMm",a$):IF a THEN
      a=INT((a+1)/2)
415   ON a GOSUB 520,530
420   message$=eras$(erase)+" "+prop$(prop):warn=1:GOSUB
      3100
520   prop=1:hspace=6:RETURN
530   prop=0:hspace=7:RETURN
```

The request is made in line 400, and a is given the value 0 (mismatch), 1 (if proportional), or 2 (if monospace). The subroutine sets the appropriate flag and the default spacing to be used. Then line 420 takes care of writing the latest status in the warning window.

Next, the transfer option value is requested:

```
425   prompt$="Replace, Overlay, Invert, or Erase mode: ":GOSUB
      3000
430   GOSUB 3500:IF fin=2 THEN 200:ELSE IF fin THEN 450
435   a$=MID$(line$,1,1):a=INSTR("RrOoIiEe",a$):IF a THEN
      a=INT((a+1)/2)
440   ON a GOSUB 500,505,510,515
445   message$=eras$(erase)+" "+prop$(prop):warn=1:GOSUB
      3100
500   erase=0:RETURN
505   erase=1:RETURN
510   erase=2:RETURN
515   erase=3:RETURN
```

The settings of replace, overlay, invert, or erase correspond to the descriptions in the Business Basic manual on the xfroption routine of Bgraf. Remember that the actual transfer-option value used will depend on whether the screen is in inverse or normal mode. The routines at lines 500 through 515 may look too simple to make into subroutines, but using this structure allows you to easily add enhancements to the options. Now, on with more commands:

```
450   prompt$="Normal, Inverse, Clear, or Reverse: ":GOSUB 3000
455   GOSUB 3500:IF fin THEN 200:ELSE:a$=MID$(line$,1,1)
460   a=INSTR("NnIiCcRr",a$):IF a THEN a=INT((a+1)/2)
465   ON a GOSUB 540,560,580,590
470   GOTO 200
540   fill=0:pen=15:erasenum=2
550   GOTO 565
560   fill=15:pen=0:erasenum=6
565   PERFORM fillcolor(%fill):PERFORM pencolor(%pen)
570   RETURN
580   GOSUB 3600
585   RETURN
590   reverse=1
595   SWAP pen,fill:PERFORM pencolor(%pen):PERFORM
      fillcolor(%fill)
600   PERFORM xfroption(%erasenum):GOSUB 3600
610   IF erasenum=2 THEN erasenum=6:ELSE erasenum=2
615   reverse=0
620   RETURN
```

The same structure is used to get command values, but this time the command implementation is a bit more complicated. The inverse and normal commands are handled in lines 540 through 570 by setting the appropriate values of fill and pen colors and then using the Bgraf routines to pass those values to the driver. Clear simply calls the screen set-up routine at line 3600 to redisplay everything and, in the process, erase everything on the current screen.

The reverse command in lines 590 through 620 works by changing the pen and fill colors, then setting invert mode (which changes white to black and black to white), and clearing the screen with the same subroutine at 3600 that was used to erase the screen in the previous command. The result is really nice to watch, as a curtain rolls down the screen, inverting everything it encounters. Think how tough that would be to do if you had to examine every pixel yourself and decide what to do.

Farewell to the Fun Stuff. Well, that about wraps up the commands to implement and the main routine that displays the characters in the various modes. Now it's time to wrap up the program with the routine at line 1000:

```
1000  REM clean up and go home
1005  prompt$="Quit the Screen Editor? (Y to confirm): "
1010  GOSUB 3000
1015  IF NOT INSTR("Yy",line$) THEN GOTO 170
1020  HOME:TEXT
1025  PERFORM release:PERFORM release:PERFORM release
1030  INVOKE
1035  CLOSE
1040  END
```

That's it! Have fun experimenting with the various modes. Especially try to type a line of proportional text and then a line of the same text in monospace below it. You'll find that an average of 20 to 30 percent more characters per line can be written while still being extremely easy (and some would say, more pleasant) to read. Be sure also to try the effect of the various transfer options on your ability to write to the screen. Since you can position the cursor to exact pixel locations, you can also have fun with superscripts, subscripts, underlining, boldfacing, and other effects. In addition, be sure to try other character fonts, like Roman and Apple. The proportional-mode table will not work exactly right, but will do well enough to show the effect.

What's Next. This program is one of those that you could almost infinitely enhance. One immediate thought is that you will want to use gsave and gload to store and retrieve your screen images, especially if you have a program to print screen images to a printer. This will allow you to make copies of your edited screens. You'll probably want to clear the message line before saving the screen, however.

Other suggestions would include the ability to store several fonts in memory at once, switching quickly between them for various effects. You would also have to store proportion tables for each one. If you have a font editor, you may want to create a special proportional-font definition, with narrower characters than those found in the standard font. This would enable you to put many more than the 100 characters across the screen possible with the regular fonts. Another use would be to modify the character definitions to allow larger-than-normal fonts for such things as gothic, shadow, and other uses.

With enough work the program could be a general screen-design package, with the line and circle editor from article 8, combined with the general character capabilities of this article.

As you can see, programming, like papers on a desktop or appointments in a day, has the ability to expand infinitely to fill up any available space and time. Use yours wisely, and come back next time for some new challenges.

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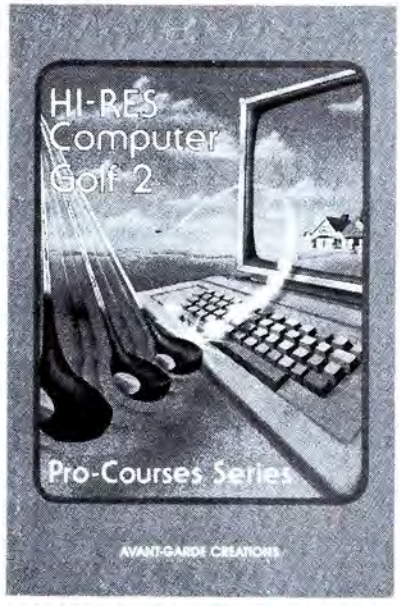
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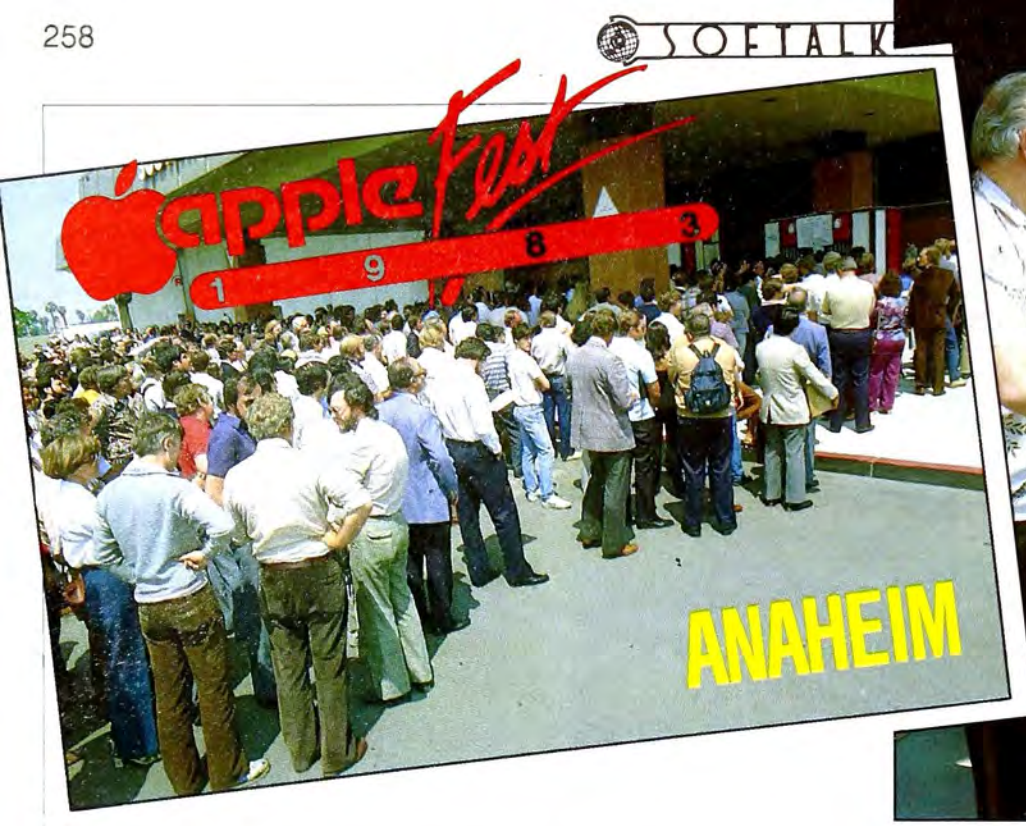
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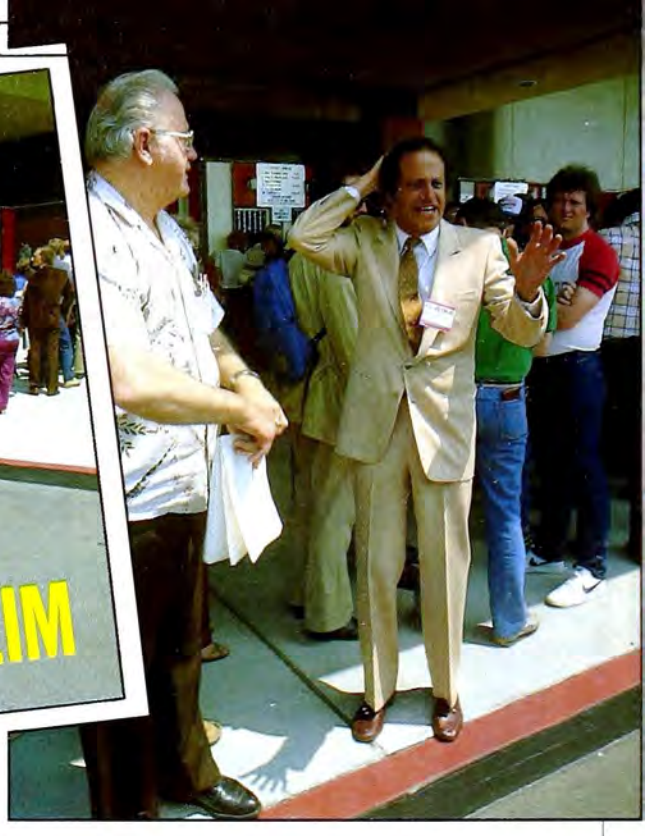
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Southern California has always been a leader in high-technology industries as both a producer and a consumer, so it was only fitting that Applefest finally made its way there in its third year, pausing for three days in Anaheim.

So many thousands of attendees prowled the premises that Anaheim '83 immediately became the third biggest Applefest in history—following only last year's Boston and San Francisco shows. The opening day, first-hour crowd was so large that it became unruly while waiting to be processed into the Anaheim Convention Center. Not only were lots of folks in attendance, but they came with their buying pants on. Exhibitors with products to sell found little resistance to their importunities.

Apple had Lisa there for demonstration, and she drew mighty throngs. Apple's hands-on booths for the Apple IIe and the Apple III were also popular.

The seminar sessions seemed well attended and most folks seemed to get their money's worth. The headliner on Sunday was Steve Wozniak, answering almost every question thrown at him. Overall, seminar subjects ran the gamut from advice to the noncomputer owner through very sophisticated tips for the most knowledgeable Apple veterans.

Most of the niftiest new products were hardware-based. It seems that the creative block plaguing software writers has not yet extended to the hardware makers.

New software was mainly specialized in nature: programs to help the sports bettor, to solve specialized accounting functions, to address investor requirements, or to create graphics.

Applefest moved on to Boston last month, with another West Coast appearance planned for San Francisco in October. From all indications, it should be a big one. ◻■











Opposite page, top row: Left, on opening morning, a couple of folks showed up. Right, promoter Gerry Milden tried to direct traffic. Bottom row: Robots captured the most attention in the aisles. Left, the question was whether Robot C3PO was following that gentleman because of the legend on his shirt, or was there another connection? Middle, Robot Topo was a lovable fellow from Androbot. Right, this was reputed to be Robot Wunderkin, a rare mechanical device attracted to 35mm cameras. It turned out to be human Gene Wunderlin, a Fresno, California, citizen who's managed to get captured on celluloid at every recent West Coast computer event. This page, left column: Top, Nina Cohen and Alan Wootton debuted Top-Notch Productions and Pollywog. *Middle, Software Spot was selling a kit to make your Apple portable. Bottom, Personal Computer Products wants to turn your Apple into anything else—like an IBM or Cromemco. Their reps were Ken Kilgore, Jacky Dyer, and Glenn Karp. Right column: The tube was a popular architectural design element. Top, Apple's ceiling permitted this top view of the Lisa wing of Apple's booth. Below, Ellen Cederstrom shows off Capco's computer furniture.*

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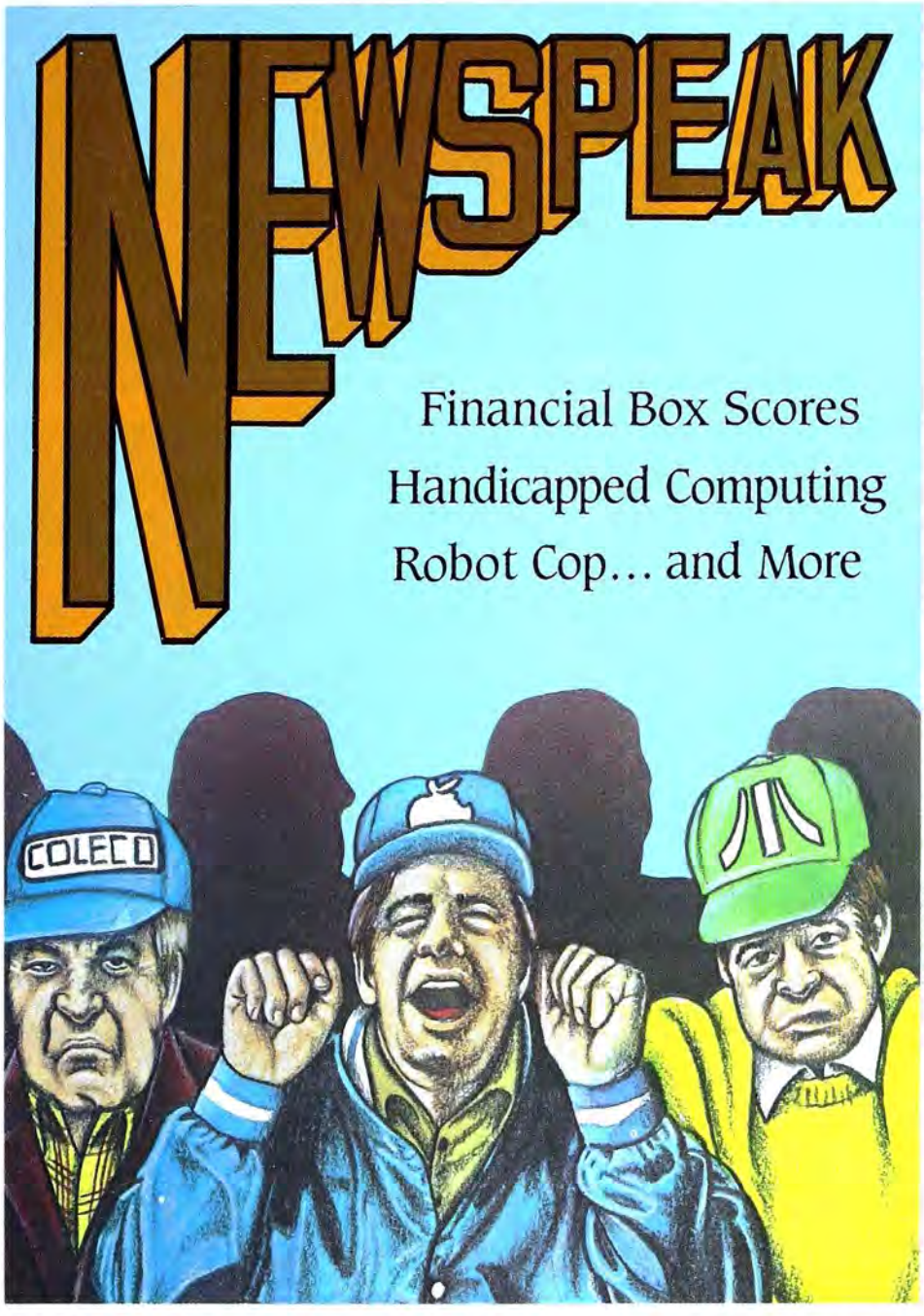
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SOCIETY CHANGES AS COMPUTERS MOVE AND GAMES GATHER DUST

The recent publication of *Fortune* magazine's list of the 500 largest industrial companies underscores the changing nature of America's economy.

It's become fashionable to call the economic metamorphosis either a move to a post-industrial society or a move to an information-based economy. But whatever name is put to the shift in industrial emphasis, one thing stands out: The technology companies are growing at a relatively faster rate today than companies in more traditional industry groups. That trend implies an accelerated rate of change toward a new economic base.

No matter how you sort out the industrial groups, computers and allied technological companies were the only group among the Fortune 500 that uniformly advanced in the rankings. Nary a single company that could reasonably fall into that category failed to rise at least two positions on the list. Understand that such an assertion omits companies whose major technological market is aerospace.

What we've culled are those computer-technology companies with primarily commercial civilian customers. And those companies are uniformly climbing up the ranks of *Fortune*'s 500.

Leader of the high-tech bunch, of course,

GOTO page 266, column 1

FEDERAL AGENCY TO OPEN D.C. COMPUTER STORE

The federal government's office supply sergeant, the General Service Administration (GSA), hopes to open a computer store this September.

To be called the Information Product and Training Center—or something friendlier if they can think of it—the privately operated emporium will occupy three thousand square feet of the agency's headquarters building in Washington, D.C.

GSA, which is currently evaluating vendor bids to run the business, made the unprecedented move in response to any unprecedented fact of contemporary life—the computer.

"Microcomputers are forcing the private sector and government to rethink how they do business," notes GSA project manager Bill Frazer. "We have to try new techniques to get a handle on it, because the old techniques aren't working effectively."

In the past twenty years, the federal government has purchased eighteen thousand general-purpose computers—mainframe, mini, and micro, according to Frazer. But in the next seven years, it's estimated that Uncle Sam will procure five hundred thousand to one million units. Many of those will probably be microcomputers, earmarked for short-handed managers who are under budget pressure to operate more efficiently.

It is the agency's hope that the store will create excitement among these midlevel nontechies who need a convenient and friendly place to shop for business tools. "There's a great deal of inertia that prevents the end-user manager in government from getting the product he wants," says Frazer. Part of that is bound up with the mystique of the computer and computer stores, but it's also tied to the lingering suspicion among bureaucrats that government red tape will frustrate purchasers.

Vendors bidding for the computer-store contract, therefore, are being evaluated not just on their ability to deliver a varied product line in machines and programs, says Frazer, but also on their willingness to hold a bureaucrat's hand.

"With the procurement schedule we use now, when you buy something, you buy a piece of hardware," Frazer explains. "You don't necessarily get it all tied together—hardware, software, recommendations on what to buy, training, and ongoing maintenance. They all come from different places."

News of GSA's decision to get bids on the

GOTO page 267, column 1

High-Tech Exhibit Explains Economics



Four microcomputer games are installed in the lobby of the Federal Reserve Bank of San Francisco. Hundreds of people play them every day and learn something about money.

The arcade-style games are part of an eight-thousand-square-foot permanent exhibit called the World of Economics. Together with large murals, glass-cased displays, and twelve electronic exhibits, they give viewers an entertaining and educational understanding of economics. A total of twenty-seven displays are arranged in family groupings such as "money and markets" and "fluctuations and policy."

The entire exhibit contains forty thousand words and is so packed with information that anyone assimilating all of it could pass the first two semesters of a college course in principles of economics, says Kent Sims, executive vice president of the bank.

Sponsored by the Federal Reserve Bank, the $2-million educational exhibit was assembled by Howard Lathrop & Associates, a Santa Monica, California-based design firm. It took three and a half years to complete. John Scadding, director of public information, was the bank's liaison on the project.

Not surprisingly, the games are very popular. "But I'm continually surprised," says Scadding, "to see people standing around and reading parts of the display. We were warned not to use a lot of words and to keep it interactive. I'm heartened to see people studying it quite intently."

The four games run on Radio Shack microcomputers. One is *The Election Game*, in which the player becomes President, juggling taxes and government spending in a valiant attempt to control inflation and deflation.

Another one is *The Monetary Policy Game*. Here the player becomes chairman of the Federal Reserve Board, a job that demands juggling the country's money supply by buying and selling government securities. The object is to avoid inflation while at the same time staving off unemployment.

Winning at the *Policy* game is as difficult as it is in real life. When executive vice president Sims played the game, it fired him as head of the Federal Reserve Board when unemployment ran amok.

The Constraints Game is a shoot-'em-up that depicts the uncertainty faced by economic policy makers. A rocket-firing spaceship disappears—policy makers don't always have the information they need; ships fire with unpredictable force—policy makers can't rely totally on past experience; there are time lags between pressing the button and firing—policy makers don't know how long it will take for their decisions to affect the economy; and ships jerk uncontrollably—there is no absolute control of the economy.

The game *Muffin Mogul* turns players into bakery shop owners. Controlling muffin prices based on cost of ingredients and the weather (more muffins are sold on sunny days) is a lesson in the principles of supply and demand.

Two LED displays prompt viewers to push a button and see how the economy flows. Another display shows how dollar bills circulate in the economy.

The exhibit came about as a result of San Francisco zoning laws, which require that buildings of a certain height offer something that contributes to pedestrian life of the street they're built on. "The fact that we're a Federal Reserve bank," says Scadding, "made us aware that we could show people what the Federal Reserve does."

The Federal Reserve Bank decided to build an educational economy-oriented exhibit instead of the usual restaurant or flower shop. "Of course, we also decided we should make it fun, large, colorful, and exciting," he adds.

School tours of the exhibit are being arranged. And to help students and the general public through the maze of information, the Economic Literacy Council of California is developing printed directories. MF



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Hollywood's Past Goes Color

Computers Help Bring New Life To Old Films





The year is 1935. The scene on-screen is from a classic comedy short, *The Fixer-Uppers*, starring Stan Laurel and Oliver Hardy. Typical of Laurel and Hardy films (even in the era of talking pictures), *The Fixer-Uppers* depends a lot on sight gags, Laurel's sneaky expressions, and Hardy's pompous mannerisms. Now look again.

It's 1983 and something strange is going on. In a new version of *The Fixer-Uppers*, Laurel is wearing a brown suit and blue hat while Hardy sports green gloves and a dark blue suit. What makes this strange is that *The Fixer-Uppers* was originally filmed in black and white.

Laurel and Hardy films are the first from the Hal Roach Studios film library to be converted from black-and-white film to color video tape. Ever since the early days of one-color tinting and three-strip technicolor, the film industry has labored mightily to bring color to the screen. By far, the majority of films made in Hollywood in the last seventy years have been in black and white. Only in the last thirty years has the economics of film processing made color film cheaper than black and white.

Now, with the help of computer and video technology, there's a movement afoot to add color to many early black-and-white films as well as to certain old television programs. At present, Hal Roach Studios, through its subsidiary Vidcolor, has cornered the market on converting films. Vidcolor's Wilson Markle says he knows of no other comparable systems for adding color.

Earl Glick, chairman of the board at Hal Roach Studios, feels that network television, pay-TV, and home video-cassette players are all potential markets for the color-enhanced films. "Most of the major studios and networks have shown an interest," says Glick.

The process, which is fairly simple, involves a minicomputer for number-crunching, a specialized image processor, and a computer operator who must stay alert. First, a film is transferred to video tape and broken down by scenes. Then the elements of each scene are entered into the computer. An art director then coordinates the color information, which is also entered into the computer.

Once it has the color information and the original black-and-white information, the computer matches them and sends the combined result to the specialized image processor. This device creates a new video tape with the desired colors added in.

Some of the process is automated. In simply constructed scenes where the elements do not change much, it's possible to define colors in only the first frame and the computer will add color to all the other frames in the scene automatically. When a scene includes pans, zooms, or tilts, the task is a little more difficult, sometimes requiring the computer operator to make adjustments during the process. "The speed of the process depends entirely on the complexity of the scene," says Markle.

"Once we get a dedicated facility for this project it'll take seventy-two to ninety-six hours to convert one hour of film, or around two and a half seconds per frame."

According to Glick, advertising agencies have seen the advantages of this computerized coloring. He recalls one incident where a commercial was filmed using a white bottle. Later the producers wanted the bottle changed to brown. Rather than spend the time and money involved in reshooting, the client had the bottle recolored electronically by Vidcolor.

Glick intends eventually to color all the films in the Hal Roach film library. At the moment, the Laurel and Hardy classics, *1 Million B.C.*, and *Topper* are taking top priority. Glick believes that all black-and-white films would benefit from this process.

"Black and white is not natural," Glick says. "We do not see in black and white; we see in color." Most old films were shot in black and white because color technology was not available, was not refined, or was too expensive.

"It's all a matter of volume," says Mar-

GOTO page 264, column 1

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A Bomb-Hauling Police Robot Is Back on the Beat

The long arm of the law has been strengthened in the City by the Bay.

San Francisco police have reequipped Snoopy, a police robot, with a heavy-duty metal arm to replace the one damaged on the firing line last October.

A one-armed contraption that maneuvers on a tanklike tread, Snoopy has spent the last few years carefully hauling suspicious-looking packages to a reinforced bomb trailer. Snoopy was one of two robots donated by the International Association of Bomb Technicians and Investigators to the cities of San Francisco and San Jose some four years ago.

Snoopy's arm was damaged in duty when the robot was loaned to Oakland police to rout a berserk gunman from a liquor store. Snoopy toddled to the store entrance, flexed his hinged arm, then promptly damaged it trying to yank off the store's aluminum-frame door. Undeterred, Snoopy blasted away the door lock with a shot from his built-in twelve-gauge shotgun and wheeled five feet into the store for a quick look-see with his built-in television camera. When officers monitoring the camera transmissions determined the suspect was holed up in the rear of the store, Snoopy was withdrawn from the scene.

The robot, which cost $17,000 and was produced by a now-defunct company, is manipulated via a control panel and joystick located in a nearby van. A three-hundred-foot cable tethers it to the van.

Sgt. Greg Cash, head of the San Francisco Explosive Ordinance Disposal unit, says the machine could be used for other things besides the usual bomb work—a department workload that totaled three real bombs and sixty-five hoaxes in 1982. Possible applications, according to Cash: enlisting robots in hostage negotiations (Snoopy has a built-in intercom) or in physically retrieving downed officers and citizens when police or citizens are under fire. JM



TOP OF THE NEWS

Bay Area

Major crime in the Bay Area dropped 7.1 percent the first six months of this year, a sharper drop than the U.S. average. Page 10.

Breast feeding is better for babies and mothers, and doctors are trying to make it popular again, two physicians said. Page 4.

A UC probe cleared university officials of charges that they censored a radio script. Page 5.

The U.S. Court of Appeals in S.F. reversed a ruling that restricted immigration raids on private businesses. Page 5.

An agreement that could "open up the European market" to California wines was announced. Page 25.

State

Attorney General George Deukmejian played international statesman on a quick trip to Tijuana. Page 7.

Tom Bradley flew to Lake Tahoe and endorsed Proposition 4, the measure to help buy environmentally fragile lands. Page 7.

Pete Wilson accused his Senate campaign rival, Governor Brown, of "getting fat" on involuntary UFW campaign contributions. Page 10.

The Army Corps of Engineers wants to overhaul the levees around 18 islands in the Sacramento-San Joaquin River Delta. Page 2.

Nation

A new motive has been attributed to the prime suspect in the Tylenol-cyanide deaths. Page 5.

The Food and Drug Administration is investigating a company that's selling a product promoted as "sober-up" capsules. Page 4.

When buying a house you should examine its psyche as thoroughly as you do its plumbing. Page 37.

World

The Israeli commission investigating the Beirut massacre officially began its work yesterday. Page 14.

Guerrillas firebombed the headquarters of Northern Ireland's main political party, a day before an election for a provincial assembly. Page 15.

Nicaragua won a seat on the U.N. Security Council, in a defeat for the U.S. Page 13.

Weather

Bay Area: Mostly sunny Wednesday with light westerly winds. Highs, mid-60s to 70s; lows, 50s. Page 36.

Cards Even Rain-Soaked Series

See Sports

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A Robot Cop Breaks Down

Car Tycoon Arrested — '$24 Million in Cocaine'

By Larry Ruhe

Oakland police guided 'Snoopy,' a TV-equipped, gun-toting robot, toward a liquor store to try to get at an armed, frightened shopkeeper holed up inside. The robot broke down, however, and lear gas and a family friend persuaded the man to leave, ending a 15-hour standoff. Three policemen were slightly injured in the incident. Story on Page 3.

FBI Calls Deal a Bid To Save Firm

Los Angeles

John De Lorean, the flamboyant automobile executive whose recent effort to challenge Detroit with a sleek sports car ended in financial failure, was arrested in Los Angeles yesterday on charges of taking part in a conspiracy to distribute cocaine.

Richard T. Bretting, special agent in charge of the FBI's Los Angeles office, told a news conference that a five-month undercover investigation had established that the 57-year-old De Lorean was the "financier" of a ring that brought nearly 60 pounds of cocaine into the Los Angeles area and had plans to import another 100 pounds, altogether worth $24 million.

Bretting said De Lorean was apparently motivated by the opportunity to make a windfall profit at a time when he was struggling to save his sports car venture from bankruptcy.

Bretting said two other suspects were arrested Monday and, like De Lorean, were charged with conspiracy to distribute cocaine and possession with intent to distribute. They were identified as William M. Hetrick, 50, the owner of an aviation company in Mojave, and Stephen L. Arrington, 34, of San Diego.

Arrington, who was described as the deliveryman in the ring, was arrested Monday night near the Van Nuys airport in a car carrying about 60 pounds of the drug, which Bretting said had an estimated street value of $6.5 million. Hetrick, who allegedly provided the cocaine, was picked up in Hollywood.

De Lorean, who quit his job as a $650,000-a-year vice president with the General Motors Corp. in 1973, was arrested yesterday afternoon by undercover agents in a hotel near Los Angeles International Airport shortly after his arrival from New York, where he lives.

Ted Hunter, the head of the Drug Enforcement Administration office in Los Angeles, said De Lorean had several pounds of cocaine in his possession.

De Lorean established his own company in Northern Ireland four years ago to produce the gull-winged, stainless steel bodied sports

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JOHN Z. DE LOREAN
British closed his Irish factory

Raids Reap 'Tons of Pot' In Humboldt

By H. G. Reza

Machete-wielding narcotics agents marched through marijuana plots in Humboldt County yesterday, harvesting the illegal crop and carting it off to be burned.

The search-and-destroy mission began secretly earlier this week, but erupted into bowls of protest yesterday from the cultivators of Humboldt's biggest cash crop.

Garberville radio station KERG was besieged with phone calls yesterday from residents of Harris and Alderpoint in easter Humboldt County and of Zenia in Trinity County, who complained of numerous helicopters buzzing the area and officers jumping out armed with carbines and automatic rifles.

"The cops are dropping in on growers, pointing their guns at them and making them lie spread-eagle while they cut down the crops," an angry pot farmer told The Chronicle. "Man, they're cocking rifles at people's heads and hitting places without search warrants. They've blackened the skies with helicopters."

A state narcotics bureau spokesman confirmed yesterday that the raids had been going on for a week and that state and federal officers are involved. No Humboldt County law enforcement personnel are participating.

"We've confiscated tons of pot

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THE SERIES

Lebanon Asks Far a Bigger Peace Force

Washington

President Amin Gemayel of Lebanon asked President Reagan yesterday to consider expanding the size and scope of the international peacekeeping force in Lebanon to help bring about an early withdrawal of Israeli, Syrian and Palestinian forces, a senior State Department official said.

Reagan, according to the official, agreed to give "serious consideration" to the request, which could lead to an increase in the number of American Marines assigned to the 5400-man force of American, French and Italian troops.

Although the one-hour session at the White House and a later meeting involving senior aides were described as going well, there was no optimism expressed at the end of the day by American officials that there would be a rapid withdrawal of Israeli troops.

Reporters were told by a Reagan [illegible]

Back Page Col 1



Cardinals Win In the Rain, 13-1

Between pitches Don Sutton stood in the rain during the fifth inning of last night's game, which had lengthy delays. Whenever the team were able to play, St. Louis had no trouble beating Milwaukee to open the series. All three games each. The final game will be tonight, Detroit at the Sporting Green.

FBI Reports Decrease In Major U.S. Crimes

Washington

The number of crimes reported in the United States in the first half of the year has declined 5 percent, compared with the same period in 1981 — the first drop in four years, the FBI said yesterday.

Attorney General William French Smith said the report was encouraging, but he cautioned against predicting any trend.

Instead, Smith noted that the FBI crime index had reached an all-time high in 1980 and remained at that level through last year.

"While this apparent reversal is encouraging, the fact that the all-time high was reached and maintained for a two-year period should be of major concern to the nation," he said.

Crime experts offered numerous possible explanations for the decrease.

Professor Gerald Kaplan of George Washington University said his own pet theory is that a shift in national attitudes — away from permissiveness — may account for the change.

"The mood of this administration and this country as a whole is

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Perrier Swallows Calistoga Water

By Larry Ruffer

Great Waters of France, distributor of Perrier water, one of the classic French bubblers, has bought the Calistoga Mineral Water Co. of Calistoga.

Rod Dorn, president of Great Waters, confirmed yesterday from his New York, Conn. office that the deal had in fact gone through 18 months ago.

"We didn't try to keep it a secret," Dorn claimed.

Great Waters announced the transaction at the time of purchase, according to Dorn, and it has been reported in Beverage Industry News, a trade [illegible]

lation within the beverage industry.

Asked why Calistoga didn't reveal the move, Dorn said that Edmond Springer of Santa Rosa who owned Calistoga before the sale is "a very private guy who doesn't like to see his name in print."

Yesterday, the Calistoga plant

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Chronicle Publishing Co. [illegible]

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Old Films

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kle, adding that Vidcolor is currently looking for a faster computer. Soon the company will be able to increase its workload, thereby lowering the cost to the client. "We're going to be upgrading and maintaining our software. The final product is eventually going to look as if it were photographed in color originally."

Currently, Hal Roach Studios seems to be the only major film company committing itself to an effort of this kind. When asked about the possibilities of adding color to old films, Daniel Slusser, vice president and general manager of Universal, noted, "It's an interesting concept and it may have value. There are other processes out there, other variations, that we might consider."

Vidcolor's process is geared only to making color video tapes for television and it may be a while before a process is worked out to color 35mm or 16mm film. "I don't pretend to be able to do it for the large screen," says Markle. "But I don't really see a market for that either."

The decision to accept or reject the films lies with the networks and local stations. "We'll be ready to go full force in late September or October," says Glick confidently. He also emphasizes that if, for some reason, a person does not like watching an old film in color, he can still watch it in black and white using the color television's black-and-white option. MS

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Terminal System Can Aid Visually Impaired Workers

Over the years business employers have attested to the productivity and dependability of handicapped workers. Even so, unemployment runs high in the ranks of the handicapped.

Apollo Electronic Visual Aids of Chatsworth, California, is working to change that—at least for the visually handicapped—by providing handicapped workers with more efficient tools designed to meet their special needs.

Since its inception twelve years ago, Apollo has worked closely with both private industry and partially sighted workers. The company has developed several electronic aids that enable the visually impaired to compete in the job market on almost equal footing with their nonimpaired counterparts.

The Apollo Computer Terminal System (ACTS) is the latest system produced by the company and is a logical step up from the Apollo Professional Typing System, says general manager Douglas Brent.



The ACTS features a nineteen-inch monitor that can display enlarged characters black on white or white on black. The screen can be split to include both the material being entered into the computer and the actual computer output. The former is accomplished by means of a closed-circuit television hookup; a video camera sends an enlarged image of the printed material to the monitor.

In addition to enlarging text, the ACTS allows variations of brightness and contrast, vertical line spacing, and horizontal letter spacing. Characters can be displayed in any of sixteen different sizes, ranging from a half inch high to six inches.

Apollo's system is meant to be used primarily in conjunction with minicomputer systems and dedicated word processors, but it is also compatible with microcomputers through a standard RS-232 interface.

Until now, touch typists with limited vision have had to rely upon voice inputs and audio tapes. But, as Brent points out, "about 80 percent of the people who are legally blind have some residual sight." The ACTS was designed with those partially sighted people in mind.

Although the initial response has been good, Brent says, "We're trying to introduce this system to companies who are already employing the visually handicapped. We haven't gotten much response from the rest of private industry."

Another potential market Brent sees is the forty or so training centers across the country for the partially sighted: "We envision this system as having a definite usefulness in education."

The ACTS sells for around six thousand dollars and the closed-circuit video hookup costs another two thousand. Brent is aware that this may seem expensive, but he believes the employer who buys the system and hires the visually impaired operator is making a good investment. MS

Fortunes

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was IBM, which moved from eighth to sixth, passing Standard Oil of California and Standard Oil (Indiana) in the process. IBM reported sales in 1982 of $34 billion, including an estimated $500 million from the sale of the IBM Personal Computer.

One of the more interesting movers was Control Data, which moved from 144th to eightieth, leapfrogging such companies as Hewlett-Packard, Burroughs, Warner Communications, and Digital Equipment Corporation in the process.

Most industry interest, however, was focused on the arrival of Apple Computer in position 411. Arriving a mere seven years after the company's inception, Apple became the youngest corporation ever to earn a spot on the Fortune 500 list.

That milestone event was a watershed, in that it completed the tasks former Apple president Mike Markkula had set for himself. Just a few days prior to the release of the *Fortune* report, Markkula stepped down as chief operating officer in favor of John Sculley, formerly the head of Pepsi-Cola Co.

Another newcomer to the Fortune 500, Coleco, was enjoying the rarefied heights of 444th and a big jump in first-quarter earnings. Many investors weren't convinced, however, as short sales of the stock remained at a high level.

It seems that sales of game cartridges have plummeted from more than eight million units in the last half of 1982 to two million units in the first quarter of this year. While some of that slump was expected because the peak sales were reached during the Christmas holiday buying spree, investors appear wary of Coleco. Not to worry, claims company chief Arnold Greenberg; Coleco's new home computer will come to the rescue.

How the firm's entry in the low end of the computer market will strengthen the company is a matter of some puzzlement, considering that the established contenders in that market are already having trouble making ends meet. Texas Instruments merely pushed money around during the first quarter. TI reported sales of slightly more than $1 billion, but only about $7 million stuck to the company coffers. Returns of less than 1 percent won't lessen the short-sale pressure on any stock.

On the other hand, TI looks like a well-managed company next to its competitor from Warner Communications, Atari. Atari's situation gets worse with every sunrise. Late last year, it was the sad tale of a weaker-than-expected holiday surge that lowered earnings. Now Atari's a flat-out losing proposition. Warner Communications as a whole reported a drop of some $19 million in the course of the last three months, while the Atari division alone took something resembling a $45-million bath. Like Coleco, Atari has lots of cartridges in warehouses instead of in users' hands. Unlike Coleco, Atari can't promise to get into the computer business to salvage the situation—it's got three models out there already.

If these tales seem to run counter to the earlier proposition that the U.S. is now heading toward a postindustrial society, be not misled. They merely illustrated that, even in Wonderland, some folks can get themselves in trouble.

Higher end competitors don't seem to be having difficulties of this sort. Markkula, for instance, is not giving up a turnaround situation to Sculley at Apple. The Cupertino firm reported significantly stronger sales and earnings for its first half, fueled mostly by sales of the Apple IIe.

How strong was Apple? Well, sales for the first six months were approximately half of IBM's profit for the first quarter of 1983.

Big Blue came home with equally sharp increases in sales and profits, just missing the scoring of a $1-billion net in the quarter. And IBM's sales of $8.28 billion for the quarter were just a tad less than the sales of Xerox for all of last year. In fact, the quarter was so strong that IBM chairman John Opel hazarded a guess that the period kicked IBM's "business off to a healthy start in 1983." Let no one accuse Opel of overstatement.

The mammoth-system folks got in their own licks. Cray, maker of maxi mainframes, reported higher sales and earnings as well. The Minneapolis firm announced first-quarter profits of around $2 million and speculated that it might sell as many as sixteen computers this year. That's hardly like selling thousands of TI 99/4As, but it seems to be nearly as profitable. AT

Federal Agency

continued from page 261

store—which could do anywhere from $1 million to $5 million in business its first year—was not warmly received in the nation's capital. Area vendors, particularly those who do not carry an extensive product line, decried the project as socialistic and unfair, but Frazer considers that view shortsighted, because there's more than enough business to go around. The store represents competition to local dealers, he concedes, but government agencies are not under any obligation to make their computer purchases through the store. They can still procure equipment directly through dealers whose salespersons make the agency rounds or through a GSA-approved discount catalog in which many of these same area dealers are listed.

Although initial news accounts reported that the store was to be one of several, Frazer says that only the headquarters project is scheduled at this time. That leaves open the question of whether more such outlets could follow, but Frazer, emphasizing the pilot nature of the project, acknowledges another plausible scenario. "It's also possible we'll find this was not the best idea we could have come up with." JM



☐ **Big Screen Graphics.** A new graphics projector, the Series 700, will soon be offered by Hughes Aircraft Company's industrial products division. Long an in-house project at Hughes, the Series 700 will utilize a liquid crystal light valve to intensify the image from a cathode-ray tube and project it onto a display up to twelve feet wide. The sophisticated but relatively cheap piece of hardware (under $30,000) will display computer-generated alphanumerics, symbols, and graphics in raster scan format, with the high-light-output display giving a bright image even in high ambient light areas, thus eliminating the need for a darkened viewing room. Available later this year, the Series 700 will be targeted for use in board rooms and other business areas where telconferencing takes place.



☐ **Enhance Your Lurability.** If you're a devotee of the sport of fishing, you might want to check out the Pro-Guide computerized lure selector offered by Basstronics of Midwest City, Oklahoma. Retailing for around five hundred dollars, the Pro-Guide is an easy-to-use self-contained battery-operated unit designed for easy mounting on a boat. The Pro-Guide program relies on the knowledge of Bill Dance and Roland Martin, veteran bass fishermen well-known to the sport's enthusiasts. The user inputs information about the conditions at the site—such as temperature, water clarity, and time of day and season—and the program suggests the best color and size bait to use and how fast to reel in the line. Basstronics's Pro-Guide is available in sporting-goods stores, tackle shops, and through mail-order catalogs.

☐ **Software To Make Big Bucks.** The Yankee Group is predicting a boom in software sales during 1983. The Boston, Massachusetts-based marketing research and consulting firm is projecting home computer software sales of $810 million this year, up from

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$270 million in 1982. According to the Yankee Group, home computers generated revenues of $1.2 billion on sales of 2.4 million units in 1982. Projected figures for 1983: revenues of $2.5 billion on sales of over five million units. While the software market on the whole will see dramatic growth, game software for game computers will experience a shakeout, which the Yankee Group says is due to saturation of the market and increasing competition from home computers. The firm predicts that educational software will be the next major home market. The group also identifies major trends in software development occurring over the next eighteen months. These include the emergence of "microwafers"—an alternative software medium—and the introduction of the first interactive video-disc-based programming for game and computer consoles. The Yankee group is also predicting an increasing focus on "targeted" software for particular vertical and horizontal markets, tiered pricing of software in the games market, and a general price decline for all applications and formats.

☐ **Reach Out and Zap Someone.** American Telephone & Telegraph Co. is considering a move into the video games business. No firm announcements have been made, but it's widely anticipated that AT&T will test-market a "telegames" service before the end of the year. By retrofitting existing game systems with inexpensive modems, AT&T would pave the way for competitive game cartridges. A research group at Bell Laboratories has adapted Atari's *Star Raiders* so that two players can battle each other over the phone lines and watch both ships maneuvering against each other on their screens. AT&T believes that intercity chess, bridge, or poker competitions would also be possible. Researchers at Bell Labs are developing a modem that would allow people to talk with each other while they play. AT&T is definitely interested in the potential revenues of the "telegames" project, but officials stress that the project won't be limited to video games. A Bell Labs official said in a recent *Washington Post* article: "This is a vehicle for socialization, not just entertainment."

☐ **Micros Make the Library Scene.** Tava Corporation (Newport Beach, CA) has implemented an innovative idea—the coin-operated computer. Designed for public and private libraries and schools, the package includes a 192K Apple-compatible computer, two disk drives, a monitor, a printer, and a



fully enclosed desk with chair. For a minimal fee, such as fifty cents for fifteen minutes, users buy time to use the computer. The only hitch is that they must provide their own software. Library officials around the country have shown interest in the scheme. The system should start appearing in various locations this summer.

☐ **Robots Caught in a Calm Windy City.** According to an article in the *Wall Street Journal* (April 23, 1983), both the Thirteenth International Symposium on Industrial Robots and Robots 7 were kind of a bust. Last year in Detroit the simultaneous events—the robot industry's NCC—drew an exhibit-hall-bursting 27,871 attendees. This year in Chicago, April 18–22, attendance dropped off by more than seven thousand. The disappointing turnout capped a dismal two years that have seen the projected growth of the robot industry slip 25 percent below previous forecasts. According to the *Wall Street Journal*, as other industries gradually emerge from a recession, robotics is speeding toward a long-predicted shakeout that may see smaller, less established companies go under. The bad times in the robot industry, in part, kept companies from unveiling much new technology in Chicago, though there were still many innovative products. Robotics technology is advancing on schedule, but the marketplace is sluggish at best. Dennis E. Wisnosky, vice president of GCA Corporation's industrial systems group, was quoted by the *Journal* as saying that the robot business "is a mile run, not a hundred-yard dash, and we're only at the ten-yard line."

☐ **Salespersons Meet Video Discs.** Datatron Inc., of Tustin, California, has started up a new division that will offer an interactive point-of-sale system designed for selling personal computer software. Integrating a laser video disc with microprocessor control, Datatron's initial system is configured to operate in retail computer stores as an electronic salesperson. The system can store one hundred forty software programs and features instant random access to any of the programs via joystick control. The idea is to let customers evaluate software at the point of purchase without overburdening salespersons. Datatron also claims that the system can be customized with additional software to aid in inventory management as well as in the tabulation of market research and user preference data. Three of Datatron's systems are installed at a personal computer store (Software and More) in Orange, California, with more to follow in other outlets soon.

☐ **Valley Cops.** California patrol officers in the San Fernando Valley's five police divisions were selected as the first to try out a new $42-million computerized communication system being implemented by the Los Angeles Police Department. Compact computer screens and keyboards are being mounted on the dashboards of all patrol cars. Through the terminals, officers will access the Emergency Command Control Communications System—a large central computer—which will route incoming and outgoing calls from the field. In other words, the system is taking over almost all the functions that up till now have been performed by short-wave radio. By eliminating the middle man—the radio operator who would take an incoming call and then have to access a computer for information—officials hope to relieve congested radio frequencies and speed police response. So far the new system has worked without a hitch. In fact, there has already been a dramatic increase in the recovery of stolen cars. With the new system, officers on patrol can make a vehicle registration inquiry much faster than they could before. In the past, a single officer could make three or four inquiries a day; now the number of daily inquiries is up to between thirty and forty a day. ◨

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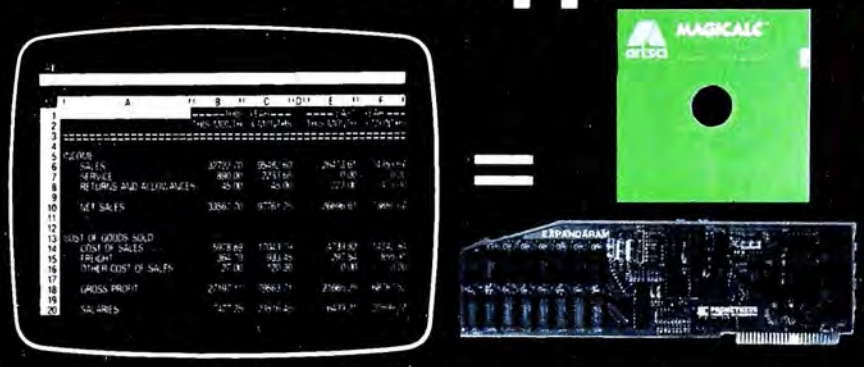
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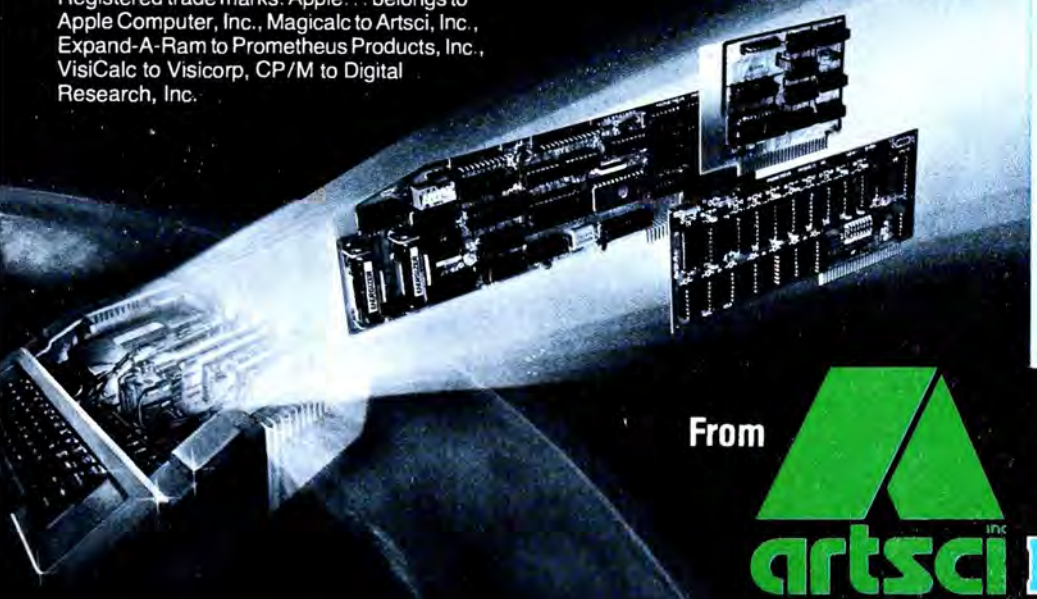
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The MICROSCOPIC

BY RALPH MYLIUS

She had cold, slate-gray eyes lightly tinted at their edges—in the anachronistic cobalt style of the early four-thousand-series intellect units. But I knew she couldn't be one of those. She was a Russian, a product of enemy technology, and someone that my security circuits instinctively told me not to trust. Yet, as I paused just outside Misha's detection perimeter, I knew we would have to find a way to work together as a team. If we failed—if we lost the battle against our own internal protection programming—then we would forfeit more than ourselves. We would lose the last chance to save the world from its inevitable self-destruction.

My partner, Sam Sledgg, had told me in the beginning that this would be a tough case, one as intricate and convoluted as the set of social fears and political imperatives that had finally forced the world to accept the first nuclear arms monitoring satellite system. NamSat had been the brainchild of a human population made neurotic by the constant threat of total annihilation. And it had worked. The years since its installation had seen the pressures of fervent nationalism reduced. But that was all in the past now. There had been a malfunction. And though I'm the planet's largest Multiple Access Cryogenic Gate and therefore the best-equipped computer for trouble-shooting the NamSat system, I really had a poor understanding of what motivates the human race to go to war.

In retrospect, the initial contact made by the Agency for International Cooperation should have immediately raised my suspicions about the case. First, it's an agency that tries its hardest to do the exact opposite of what its name implies; and second, they contacted us with a security-sealed, interactive hologram. I'll never forget the look on Sam's face when he ripped the plastic wrapping from around the thin projection disk and realized what it was.

"Ummmmm," Sam groaned as he crumpled the foil-backed wrapper into a tight ball and threw it into the waste bin. "It looks like the illustrious firm of Sledgg and Gate is about to take on a blazing heat sink, partner."

I doubled the magnification on my video eyes and quickly glanced at the disk, then concentrated my vision on Sam's face. Though I had seen him do it a thousand times before, I always got some new insight into my partner's personality when he went through what I like to call the case-speculation ritual.

Sam liked to get the feel of things before he committed us to any project—literally. He sat quietly at his desk gently turning the hologram over and over in his hands, examining its seal for tampering, and extending his tactile senses completely around the object. His bushy eyebrows fluttered up and down. Great billows of white smoke poured out of the right side of his mouth as he puffed madly on the stub of a cigar he held clinched in his teeth. Finally, almost as a sign to me that he had finished his nontemporal examination of the message, he heaved a great sigh.

"Mac," he said as he turned to face my display screen. "There's something about this disk that makes me a little uneasy. I can't quite put my finger on it, but it has something to do with the elaborate security measures taken to ensure that I'm the only one who can open it." He pointed to a small, silvered circle that joined the two ends of the security seal and added, "This, my friend, is a colloidal lock."

That *was* strange. Its use implied that the A.I.C. had access to a great deal of information about my partner. A colloidal lock could only be opened by the person whose genetic code matched that imprinted on the silvered spot. "Stop wasting time, Sam," I said. "Open it."

Without responding to me, my partner sat the hologram on the top of his desk, then reached inside its center drawer and pulled out a nail clipper and a small bottle of clear liquid. He quickly nipped off a tiny piece of his thumbnail and placed it on the colloidal lock. Then, after drawing an eyedropper full of liquid from the bottle, he paused and looked at me. "Well, Mac," he said as he held the dropper close to the

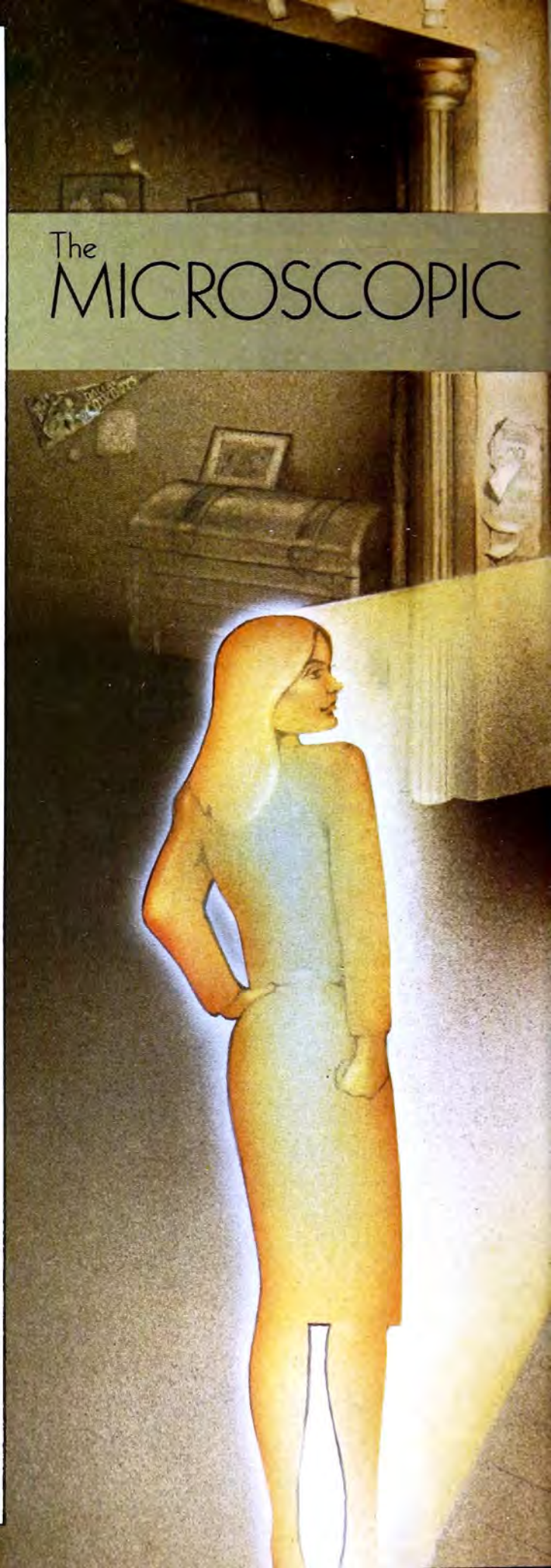


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silvered circle. "Let's see if this thing really works." Sam squeezed the bulb on the end of the eyedropper.

The effect of the liquid was almost instantaneous. My audio sensors immediately picked up the sound of vigorous bubbling. Then a brilliant flash of electric yellow light assaulted my color mapping circuits, causing me to shut down my video eyes for a moment. When my vision recovered, the two ends of the security seal lay flopped over at either edge of the message disk.

"It seems they sent it to the right place," Sam said as he picked up the hologram and removed the remnants of the seal. "Let's find out what they have to say." He slipped the disk into my laser projector, then dimmed the lights in the room. "Showtime, Mac," he grunted.

As I queued up the hologram for replay, I noticed that it was of A-prime quality, the best available anywhere in the world. Typical, I thought as I switched on my double-density image reconstruction lasers. Only the government could afford the most expensive holodisks made.

My thoughts about the fiscal irresponsibility of government entities quickly faded as the holographic image shot down my focusing tunnel, materializing in the middle of the projection square marked out on the floor in front of my main console. The figure of a tall, impeccably dressed woman waivered there for a few moments, then crystallized into a sharp, three-dimensional vision that started to talk almost immediately.

"How do you do, Mr. Sledgg," the half-life-sized image said. "I am Sarah Trang, diplomatic officer in charge of the Agency for International Cooperation, Systems Compliance Bureau. I'm very pleased to meet you."

Sam chuckled during the short pause that followed Ms. Trang's self-introduction. "Is this just an elaborate way for you to invite me to dinner or something?" he asked the flickering image.

My partner liked to have fun with interactive holograms by deliberately asking them questions that he knew they probably weren't programmed to answer. A broad, satisfied smile crossed his face when the female diplomatic officer's figure froze in place and a loud, audio-only message boomed, "Your reference question has no valid response stored within the data files of this projection. Should you wish to pursue the matter, then actual physical contact will have to be made with the correspondent."

"Yeah, I'd like to make physical contact with the correspondent," Sam cackled. Then he fell silent as Ms. Trang's image came back to life and the diplomatic officer continued her message.

"I have been authorized to contact your firm concerning a highly sensitive internal problem here at the agency. For reasons I am not at liberty to disclose, my bureau would like an independent, impartial investigator to evaluate the nuclear-arms-monitoring satellite system and make recommendations for the correction of what we think is a serious malfunction in its parity synchronizer."

"Stop it right there," Sam barked.

From the tone in his voice, I could tell that my partner was no longer amused by the flickering image of the attractive Ms. Trang. "What's wrong?" I asked as I shut down my projector.

"Damn fools over at A.I.C. think they can use a pretty woman to sucker Sledgg and Gate; they'd better think again."

Colorful, but not very informative, I thought. "Calm down and just give me the facts, please."

Sam spat the remnant of his cigar onto the floor, then stared directly into my video eyes. "I'll give you the facts," he said angrily. "Take this information and correlate it with our most difficult cases. *Sensitive* internal problem—*not* at liberty to disclose. . . . *Recommendations* for correction—"

"Enough!" I yelled, breaking off Sam's tirade. Even a dimwitted traffic monitor would have had enough core memory to have made the connection between what my partner had said and our most arduous cases. The A.I.C. was trying to set us up, trying to get us involved in a problem for which we would take the blame if things didn't work out. "Let's at least hear her out before we jump to any conclusions," I suggested.

Sam's eyes narrowed. "Run it," he growled.

Without further comment, I turned my projector back on and ran the rest of the hologram. There wasn't much left to it except some brief instructions as to how the A.I.C. wanted our decision on the case within

ten days. "Well, partner?" I asked as the image of Ms. Trang faded. "What shall we do? Take it or leave it?"

Sam rose from his desk and paced back and forth in front of my display screen. "Mac," he said as he came to an abrupt stop and faced me. "I think we'll take it." Then his scowling expression slowly changed into a grin and he added, "But I don't think we will notify the A.I.C. of our decision."

I hate to travel. But that didn't seem to concern Sam. A few days after *he* had decided that *we* would take the NamSat case, my partner stood at his fabrication table putting together a device that would take me into space and reassuring me that everything would be all right. "Come now, Mac," he said. "Papa modem will make your journey as comfortable as he can for you." Sam raised his head from his workbench and gave me a mischievous wink. "Besides, haven't I always designed the very best in peripheral equipment for you?"

That was true. Yet, as I watched my partner return his attention to the huge pile of electronic parts that lay sprawled across his fabrication table, I knew that what he had in mind this time was something entirely different from anything he had invented in the past. He wanted me to covertly enter the NamSat system and. . . . And what? I wasn't even sure what I was supposed to do once I got there.

"Behold." Sam's one-word announcement that he had finished the modem caused my thoughts to fade. He stepped over from his bench and held up a small, gray box. "Here it is, Mac."

I was unimpressed. I gave the device a quick sweep with my low-level X-radiation sensor, but found that it was completely shielded in lead. "What's inside that thing?" I asked.

Sam frowned, but the twinkle in his eyes told me that he was very proud of his new invention. "Don't be thrown off by its size. It may not be large, but it's powerful."

Great, I thought. But that didn't answer my question. "How does it work?"

"Let's find out." Sam reached over to the large panel that houses all my input/output ports and plugged the modem's single cord into my multitransmission link. "There," he said as he sat the gray box on the narrow ledge in front of my keyboard. "How does that feel?"

I suppose that Sam expected some transcendental response from me, but frankly, I didn't feel anything. The small device had such a low-power requirement and was so unobtrusive when combined with my array of other peripherals that it felt like it wasn't there at all. "Should I feel anything?" I asked, wondering what my partner's latest creation was supposed to do for me.

"Not until you activate the mechanism," Sam answered. "Charge the box with eight hundred megahertz ambient line energy and see what happens."

Microwave transmission, I thought as I quickly modified my output signal to the required cycle and injected it into the box.

The effect was almost instantaneous. As soon as my signal hit the maze of fancy electronic gear enclosed within the modem's lead shielded shell, I felt an immediate telescoping of my sensory perception. Sam would have called it an amplification of my awareness, but it was actually much more than that. It felt like I could travel anywhere just by thinking about it. "What are the limits?" I asked as I pulled my signal back from the box. I needed more information about the device before making a full test of its functions.

Sam sat slumped in the chair beside his desk, and when I spoke he wheeled around and looked at me with a sober expression on his face. "Only one that counts," he said. "One that can mean the difference between life and death for you. By now you probably realize that the modem is a miniature microwave transmitter, but with a major difference from one with a standard configuration."

Though my partner already knew that I had access to information about such technologies, I flashed a large YES on my display screen to indicate to him that I understood what he was talking about.

"Good. The critical change I have made is that this modem boosts the signal by using a supersaturated Maser beam. Don't ask me the details, but by adding more photons than are necessary, your signal be-

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comes a sort of phased photon sonar. You will be able to observe, record, and react normally in any environment the modem takes you to." Sam paused to let me digest the material, then asked, "Do you understand so far?"

"Yes," I replied. "But what about the limits?"

My partner hesitated for a moment. The furrows in his brow deepened. "Mac," he finally answered. "There is a range limit, a forbidden line past which the high-energy Maser particles will lose their charge by simple radiation rather than by collision with atoms. If you pass that line, your signal will suffer severe dissolution."

"Is that serious?"

"Fatal. The forbidden line is like the wall of a large tub filled with water—your consciousness. If you punch a hole through the wall. . . ." Sam's words trailed off into silence.

"Then my memory would leak out," I said, finishing my partner's sentence. "But once that happened, couldn't I just pull back?"

"Even *you* would not be fast enough." Sam rose from his chair, then stepped close to me. "And if by some miracle you should be able to pull back," he whispered, "the probability is that you would go insane. Your entire memory would be nothing but a mass of garbled nonsense."

Insane? The term had no valid applicability to me. Yet, even to speculate about such an occurrence made my upper memory registers pulse with high current spikes. "Do you really want me to run such a risk?"

Sam's answer was firm and immediate. "Yes," he said. "And you know why."

He was right. Though I didn't like the prospect of having my mental capacity blown to eternity by the solar winds, I realized that I had to try to trouble-shoot the NamSat system. It was a choice between two deaths, and the thought of being vaporized in a nuclear explosion appealed to me less than a quick scattering of my neural impulses. "All right," I said. "But I'll need some time to check out the modem first."

Sam shook his head up and down with an affirmative nod. "Take all the time you need," he answered. "Just be ready to go by tomorrow morning."

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"But—"

"Yes, I know, Mac . . . and I'm sorry. But your birthday seems as good a time as any."

Combing the incredibly congested satellite lanes looking for a purposely camouflaged NamSat wasn't my idea of having a good time on my birthday. And when I visited Shirley during my test of Sam's new modem, she didn't think so either. "But Mac," she said in that peculiarly soft way she has of talking with me. "I don't understand how you're going to solve anything by going out into space."

Shirley is a dumb terminal that I had badgered my partner into moving from our Cleveland office to a facility geographically closer to our home base. Sam had objected at first, but after Shirley had been so much help to us on the FedLect malfunction case, he had finally relented. Unfortunately, the relocation had done nothing to improve her irritating habit of asking me incessant questions about everything I worked on.

"Shirley, dear," I answered as kindly as I could. "It's the only way I can gather the firsthand information I need."

"Why can't you just consult the National Data Base?"

"I already have. There wasn't much information on NamSat stored in their files—at least not enough to be of any significant help." I felt Shirley's query circuits pulse with energy, so I quickly added, "Before you launch into your customary interrogation, please let me tell you a little about what I think I'm looking for."

"Please."

I knew Shirley's compliant response wouldn't keep her quiet for long, so I immediately retrieved all the information I had on the NamSat system and began my explanation. "The NamSat system uses an ingenious method for collecting and cross-referencing the nuclear-weapons capacity of all the nations on the planet. It's simple and supposedly foolproof."

"So why are you going out to check it?"

"Shirley!" I knew she would be quick with the questions, but to ask me something even before I had begun was too much for my already frayed synchronous timing clocks. "I'll get to that in a few minutes. For now, please don't interrupt."

"Sorry."

Her response was coy and deferential and so . . . so damned Shirley that I couldn't help but feel like a tyrant. But that didn't stop me from going on while I had the chance. "As I was saying, the NamSat system is supposedly foolproof. Basically, a bubble memory is hooked up to a wide-beam scanner calibrated to detect weapons-grade nuclear material on the planet's surface. As the satellite carrying this device circles the—"

"Who is Mr. Bauble?"

"What?" Sometimes talking with Shirley took the patience of a cheap tutorial machine.

"Mr. Bauble . . . I assume the inventor of the Bauble memory."

I pushed away an almost overwhelming impulse to core dump all over my friend, and instead selected her omni-input line to transmit my answer. "That's B-U-B-B-L-E, not Bauble. A bubble memory is one in which an extremely thin piece of the mineral garnet has a strong magnetic field passed over it. Wherever the field strikes the garnet, microscopic bubbles are raised on its surface. Put enough bubbles on the mineral and you have a permanently embossed binary code—a memory. That's where the name comes from."

If dumb terminals could blush like human beings, then I think Shirley would have done so. I was pleased with her embarrassment. It proved that she was finally learning the difference between an intelligent inquiry and a stupid one.

"I'm sorry for interrupting you with such a . . . such a foolish question," she said. "Please go on."

I dispensed with any further technical explanations and went straight to the heart of the NamSat problem. "Apparently the system has been malfunctioning. From the general nervousness of the A.I.C., I'd say it probably has something to do with the link-reference between the various satellites of each country. The link-reference compares the nuclear capacity of each country to every other country. If they are within the parity limits set by the treaty, then all the diplomats and armies of the world stay happy. If not. . . ." I let the thought of a global nuclear holo-

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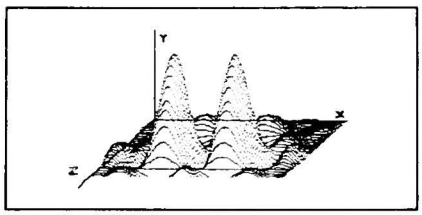
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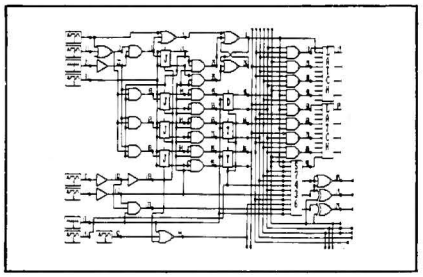
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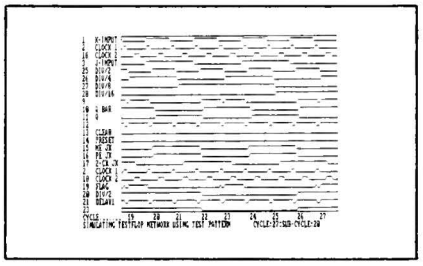
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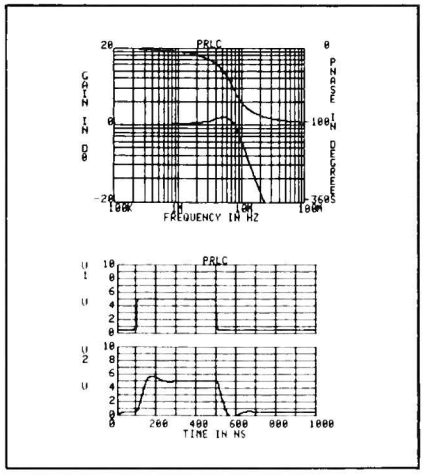
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caust linger at the edge of my consciousness for a moment, then added, "I have to risk making the trip. Sam's new gadget will enable me to do it with an element of surprise."

Shirley remained silent for a second or two, then asked, "Why is the element of surprise important?"

An appreciation for elementary tactics wasn't one of Shirley's strong suits, but I realized that she was missing a very important aspect of the case. "Surprise is necessary because . . . Shirley, the A.I.C. doesn't know that I'm going."

A deathly pall of static fell upon our conversation. For a moment I thought that something had gone wrong with Sam's modem. Then, just as I had decided to try to reestablish contact with her, Shirley spoke.

"Mac," she said with a trembling wave of genuine concern. "That's high treason."

Shirley's last words echoed in my audio sensors as I took the final step and plunged myself in Misha's detection perimeter. But even treason usually had its rewards. So far, my search of the satellite lanes had produced none and had left me with the feeling that my entire investigation had been pointless. Misha was my last hope. If I couldn't find the source of the link-reference malfunction in her, then . . . the world was doomed.

The actual transfer of myself past Misha's security circuits and into her bubble memory only took a few seconds. But that was long enough. The Russian's intruder alarm went off almost immediately.

Within seconds of my entry, I felt a narrow, high-frequency buzzing signal attack my carrier Maser beam. It felt like someone had scrambled my logic patterns. The attacking signal twisted and distorted the invisible umbilical cord that connected me with my hardware on the ground. If it broke, I knew I would be flung into the far reaches of space, past the forbidden line, and into oblivion.

"Misha!" I yelled. "I will not harm you. Please. I only want to inspect your bubble memory."

The Russian's first words to me were terse and specific. "Remove yourself at once or I will destroy you."

"But—"

"NOW!"

If she hadn't been my last chance at finding out what had caused the NamSat parity system to fail, I would have left Misha that instant. But she was, and I couldn't. "Destroy me if you will," I said, gambling that the Russian would hesitate long enough for me to gather some data before she acted.

A long nanosecond passed in which I picked apart as much of Misha's memory as I could. I threw each new piece of uncorrelated data into my Maser beam without concern for order or relative importance. I hoped that at least some of it would make sense later when—*if*—I had a chance to analyze it.

"Die, intruder!"

Misha pronounced her sentence on me with all the passion of a fervent nationalist. Suddenly the attacking signal doubled in intensity. My Maser beam buckled. The lifeline that secured my consciousness to my physical self started to break.

"Bitch! Stop it! Leave him alone!"

Though my audio capacity had been reduced by almost 50 percent because of the Russian's attack, I still heard the sound of Shirley's voice yelling at Misha to let me live. But how? Had she been able to piggyback on my beam without my knowing it?

"Mac!" Shirley barked in an authoritarian tone that I hadn't heard her use before. "Quit wasting time, dummy. Get out of here."

I didn't wait around for answers to my questions. Shirley's sudden appearance had thrown Misha off guard, and I took the opportunity to make a hasty retreat. "Thanks," I shouted as I started down the Maser beam toward home. "I'll see you back at the office."

My return journey seemed to take almost no time at all. Perhaps I had been more scared than I had thought or maybe I just wanted to get back to the relative safety of my mainframe. I don't know. In any case, as soon as I had returned and disconnected myself from the modem, I'd announced my presence to Sam.

"Mac, are you all right?" My partner sat in front of my main console with a very worried look on his face.

"Yes, I think so. That crazy Rus—"

Sam cautioned me to keep quiet by arching his eyebrows, then said, "Mac, there's someone I'd like you to meet." He gestured to a spot in the office just outside the range of my video eyes. "May I introduce A.I.C. diplomatic officer Sarah Trang."

I shifted my vision over to where my partner had pointed and resolved my lenses on the full-sized figure of the woman who had contacted us through the hologram. She stood near the door with her legs rigidly braced at attention and her arms clasped together across her chest. On either side of her stood a heavily armed security man.

"How do you do . . . Mr. Gate," she said. "I have the unpleasant duty to inform you that you and your partner are under arrest for treason against the state."

I shifted my gaze back to Sam. "Is this true?"

My partner nodded his head up and down. "Yes."

"Wonderful." I couldn't help but let a certain amount of bitterness show through my voice. I had risked death to secure information about the NamSat system, and realized that I had nothing to show for it except a felony charge against me. None of the questions about the malfunction had been answered.

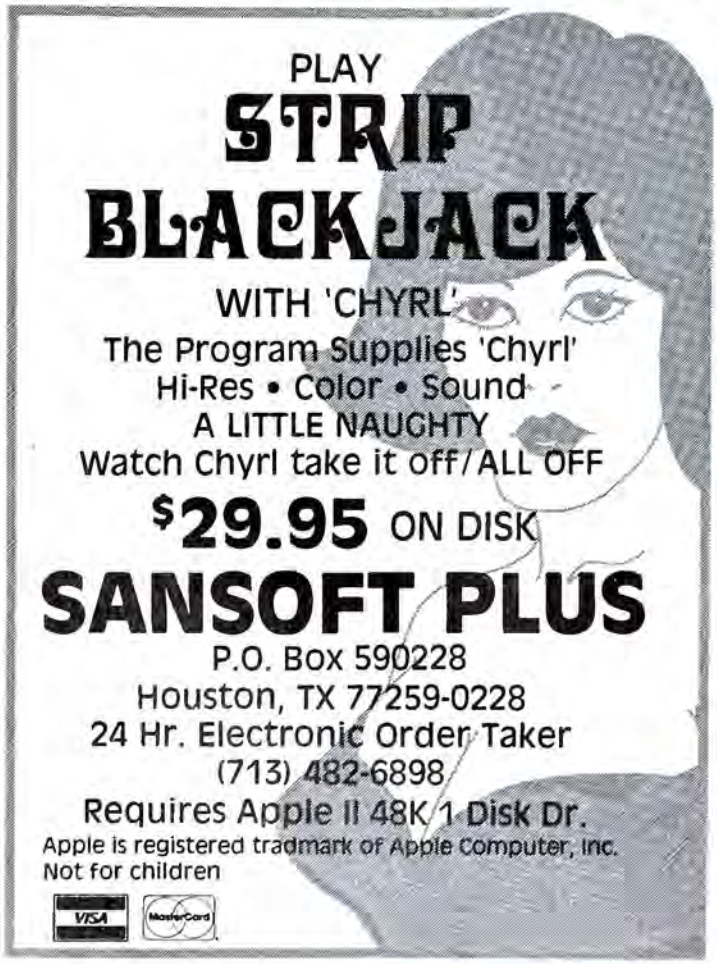
"Mac, I know."

Shirley! For some reason, I was happy to hear her voice. Happy? The term was imprecise, but I was glad that she had made it back safely. "What are you talking about?" I asked after shutting off my audio synthesizer so that the A.I.C. people couldn't hear us.

"I know why the NamSat system broke down."

I waited for her to continue, but when she said nothing more, I lost my patience. "Well, out with it. I don't want to spend the rest of my days as a complete set of replacement parts for intellect units."

Shirley must have sensed my frustration with her because she immediately switched her transmission into high speed machine code, something she always did when I lost my temper. "All I can tell you is that it's a simple inconsistency in the shielding on the bubble memories."





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"Shirley . . . you've got to tell me."

"No. I've earned the right to carry this case through to its conclusion, Mac. Let me explain it to the A.I.C. people. Please."

Checking all my options is one of those instinctive things with me. I quickly realized that I had none left. Shirley *had* earned the right to have her moment of glory. I only hoped that she would be convincing enough to keep Sam and me out of prison. "All right," I said as I switched my audio synthesizer back on. "We'll play it your way."

"Thank you, partner."

Sam's face froze into a placid lump of colorless clay when I told him that Shirley had solved the NamSat malfunction problem and that she wanted to inform the A.I.C. of her findings personally.

"But she's just a dumb terminal," he said once the shock of my statement had worn off.

"What's this all about?" Ms. Trang had stepped from the door over to stand behind Sam. "What's going on here?"

Sam ignored the diplomatic officer and spoke to me. "Are you sure she has the answer? I mean . . . Mac, we are under arrest for treason, you know. We could go to jail for—"

"I asked you a question, Mr. Sledgg. What is going on here?" Ms. Trang moved from behind Sam and stood between me and my partner.

"Mac's friend claims to have solved the A.I.C.'s problem with NamSat."

The female diplomatic officer slowly turned until she faced me. "Friend? What are you talking about?"

"Ms. Trang," I said. "I have the pleasure of introducing you to Shirley . . . my friend."

Shirley's signal reached the voice synthesizer within seconds of my introduction. "How do you do," she said softly.

The A.I.C. official blinked hard, then brought her face in close to my display screen. "Shirley?"

"Yes."

"You know what's wrong with NamSat?"

"Yes."

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I couldn't stand the teasing quality of Shirley's conversation with Ms. Trang, so I boosted my friend's line energy and said, "Get on with it, please."

Shirley responded immediately. "Yes, I have the answer to your problem. The shields on the bubble memories you use are not consistent with one another. They have impurities. . . ."

Both Ms. Trang and Sam perked their ears at Shirley's words.

"Go on," my partner prodded.

"Well, normally the impurities in the metal of the shields wouldn't make any difference, but in space it's rather like surfing. If the waves aren't the same for everyone, then some surfers go faster than others."

A puzzled look came over every face in the office. Frankly, Shirley had lost even me.

"I know it sounds crazy, but let me explain." Shirley paused for a moment, and I felt her retrieve some information from my data files before she continued. "Mac had told me that bubble memories actually use microscopic bubbles on the surface of garnet to record and store data. A powerful magnetic force is passed over the mineral and you can encode an extremely small binary pattern. This all works very well down here on Earth, but in space, in a zero-G environment, these bubbles are subject to the effects of solar radiation."

I was impressed with my friend's grasp of science. She was actually taking various facts and synthesizing them into concrete conclusions, a process that even I had trouble with at times. "Go on, lady," I said. "You're doing just fine."

"Have any of you heard of the Landau effect?" she asked.

My partner and Ms. Trang shook their heads indicating that they had not. I had. But I was fascinated with Shirley's explanation so far, and wanted to hear how she would tie it in with a problem in the shields.

"It's actually called Landau damping. When electrons move at the same speed as a wave, they are carried along with it. What happens when an ocean wave hits a sea wall? If the wave is strong enough, it will knock the wall down, but not before it has lost some of its forward momentum. Bubbles moving on the surface of garnet are just like ocean waves. If they hit electrons they are slowed down."

"But wouldn't the rate of slowdown be the same for all the bubbles?" I asked. "Or at least close enough to be almost the same?"

"And what does all this have to do with the shields?" Sam asked as soon as I had posed my question.

Shirley remained silent for a moment, then said, "Think. Because the shields have impurities, they are not exactly the same. A weak shield will let in more electrons than a strong one. More electrons mean slower bubbles. Combine this with the fact that at any given time some NamSat satellites are on the side of the Earth away from the sun while others are completely exposed. . . . It's enough to make a critical difference. Some bubbles are slowed down enough so that when a parity check is made the memories of the various satellites will not be in agreement."

Simple, I thought. But will Ms. Trang buy it?

The A.I.C. official glanced at Sam, then back to me. "Sounds very logical to me," she said. "But we will have to get confirmation, of course."

"Of course," Sam, Shirley, and I said simultaneously.

Several days and a great deal of worry later the A.I.C. notified us that we were off the hook. A general sigh of relief from all of us was quickly followed by a return to our normal routine. But before jumping into the stack of projects that had piled up while we'd awaited the A.I.C.'s decision, I had to ask Shirley some very important questions. "Just how did you accumulate so much information about the NamSat malfunction?"

"It was easy. You were busy threading your way through the NamSat security systems, and I had all the time in the world to observe and take notes."

"And how were you able to come along with me without my knowing it, Shirley?"

My friend paused for a long moment. "Mac . . ." she finally said in a coy tone I hadn't heard her use since before we'd gone into space together. "There are some things that a true lady never tells. Let's just say that I now know you better than Sam ever will."

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Softalk Presents The Bestsellers

Again it's time to pose what has become the age-old question: Who are the people buying all those Apple IIe's and what are they doing with them?

To help those of you who joined us late catch up, the underlying puzzle is: Why isn't the software market growing as fast as the installed base is expanding?

When last this subject was explored, it was discovered that new Apple buyers were heavily into word processors and programs teaching typing skills. That's as contradictory as a Russian peace proposal. The purchase of a word processor implies the ability and desire to use it. Likewise, the acquisition of a typing program implies the lack of ability to use a word processor efficiently, unless someone has discovered a new method of input that detours the usual necessity of pounding the keyboard.

The April sales results, reported in the accompanying charts, shed absolutely no light on the subject whatsoever. Word processors continue to be the programs of choice for Apple owners, although the individual packages changed somewhat.

Apple Writer IIe not only continued to lead the chart, it widened its gap to almost two-to-one over second-place *VisiCalc*. Paul Lutus's latest text handler appears ready and able to give *WordStar* a run as the most popular word processor extant.

Bank Street Writer, the word processor of choice for people who hate word processors, leaped from nowhere to score eleventh on the bestseller list, the highest entry point of any package joining the chart. *Screen Writer II* edged up a notch to fifteenth and *Super-Text Pro* jumped into the Top Thirty in twenty-first.

Even more of an anomaly is that even as *Apple Writer IIe* rides a crest of popularity most of its direct competitors are showing increased sales as well. Only *WordStar* and *Word Handler* were off in April, with all other word processing packages in general distribution showing sales gains.

The oddest thing is that there was also a growth in the number of typing packages purchased. *MasterType* dipped from seventh to tenth on the list, but sales held relatively even. *Typing Tutor* dropped a notch from twelfth to thirteenth on approximately the same sales. But *Type Attack*, Sirius Software's entry into the typing derby, gained ground.

That means the sales conundrum of last month remains: A whole lot of folks who can't type are buying word processors. That makes about as much sense as a whole lot of illiterates signing up for Evelyn Wood. Or Chicago Cubs fans reserving their World Series tickets.

In the aggregate, there appeared to be a modest upturn in software sales in April. The education market continues to be the biggest growth area, while entertainment software continues to suffer the most. The theory that piracy explains much of this sales profile is appealing; one would suspect a teenager of having more interest in obtaining a free *Choplifter* than a free copy of *Algebra 1*.

However, specifics would seem to dictate that the theory hasn't much

Apple III

This Month	Last Month	
1.	1.	**VisiCalc: Advanced Version,** Software Arts/Dan Bricklin and Robert Frankston, VisiCorp
2.	10.	**Apple Writer III,** Paul Lutus, Apple Computer
3.	4.	**PFS: File,** John Page and D. D. Roberts, Software Publishing Corporation
4.	3.	**Quick File III,** Rupert Lissner, Apple Computer
5.	—	**Great Plains Hardisk Accounting Series,** Great Plains Software
6.	2.	**Word Juggler,** Tim Gill, Quark Engineering
7.	7.	**VisiCalc III,** Software Arts/Dan Bricklin and Robert Frankston, VisiCorp
8.	—	**Apple III Business Graphics,** Apple Computer
9.	4.	**The Catalyst,** Tim Gill, Quark Engineering
10.	8.	**General Ledger,** George Shackelford, State of the Art

Arcade 10

This Month	Last Month	
1.	2.	**Choplifter,** Dan Gorlin, Broderbund Software
2.	1.	**Miner 2049er,** Mike Livesay and Bill Hogue, Micro Fun
3.	3.	**Frogger,** Olaf Lubeck, Sierra On-Line
4.	4.	**Aztec,** Paul Stephenson, DataMost
5.	6.	**Pinball Construction Set,** Bill Budge, BudgeCo
6.	5.	**The Arcade Machine,** Chris Jochumson and Doug Carlston, Broderbund Software
7.	—	**Seafox,** Ed Hobbs, Broderbund Software
8.	—	**Super Taxman II,** Brian Fitzgerald, H.A.L. Labs
9.	9.	**A.E.,** Broderbund Software
10.	—	**Spy's Demise,** Alan Zeldin and Bob Hardy, Penguin Software

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validity. Consider that *Choplifter* is a fairly mature product, as game software goes. Yet it sneaked past *Miner 2049er* to regain the lead as the most popular piece of entertainment software. Any good pirate would have had it distributed months ago.

Likewise, SubLogic's *Flight Simulator*, a product so old that 90 percent of today's Apple owners never experienced a market without it, is growing in strength. In April it unseated *Castle Wolfenstein*, another oldie but goodie, from first place in the Strategy 5 category. If piracy were getting to the good entertainment packages, it seems logical that *Flight Simulator* would have simulated a burn-out by now. Instead, the program made history. April was the first month since *Softalk* began tracking strategy games as a separate category that *Castle Wolfenstein* was not the leader.

With minor exceptions, however, game software continues to have a difficult time of it. It's taking longer than usual for a good product to catch on, and the peak isn't as high for as long as it once was. New arcade games are having a particularly tough time. *Spy's Demise*, almost a half year old now, is just reaching the Arcade 10 for the first time, and that can probably be attributed more to Penguin's aggressive price cut than to excitement over the product.

The other new arcade games on the list—*Super Taxman II* and *Seafox*—also figure to be in the twilight of their marketing cycle, rather than at the beginning.

The only new entertainment package to make the Top Thirty was Infocom's *Suspended*, which squeaked into a tie for twenty-eighth. But its performance was eclipsed by the rollercoaster antics of another adventure program: *The Mask of the Sun*. *Mask* was in the Top Thirty and first among adventure programs in February but disappeared from sight

Word Processors 10

This Month	Last Month	
1.	1.	**Apple Writer IIe,** Paul Lutus, Apple Computer
2.	6.	**Bank Street Writer,** Gene Kuzmiak and the Bank Street College of Education, Broderbund Software
3.	2.	**Screen Writer II,** David Kidwell, Sierra On-Line
4.	8.	**Super-Text Pro,** Ed Zaron, Muse
5.	4.	**WordStar,** MicroPro
	9.	**Magic Window II,** Bill Depew, Artsci
7.	3.	**Word Handler,** Leonard Elekman, Silicon Valley Systems
8.	—	**Format-II,** Kensington Microware
9.	10.	**PIE Writer,** Softwest, Hayden
10.	—	**EasyWriter,** John Draper, Information Unlimited Software

Home Education 10

This Month	Last Month	
1.	1.	**MasterType,** Bruce Zweig, Lightning Software
2.	2.	**Typing Tutor,** Image Producers, Microsoft
3.	5.	**Early Games for Young Children,** John Paulson, Counterpoint Software
4.	9.	**Apple Logo,** Logo Computer Systems, Apple Computer
5.	7.	**Mix & Match,** Children's Television Workshop, Apple Computer
6.	4.	**Snooper Troops I,** Tom Snyder, Spinnaker Software
7.	5.	**Ernie's Quiz,** Children's Television Workshop, Apple Computer
8.	—	**Sticky Bear ABCs,** Xerox Education Publications
9.	—	**Type Attack,** Jim Hauser and Ernie Brock, Sirius Software
	—	**Computer SAT,** Harcourt Brace Jovanovich

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- Summarized sales and cost of sales information by product category, by vendor or by each item—MTD and YTD.

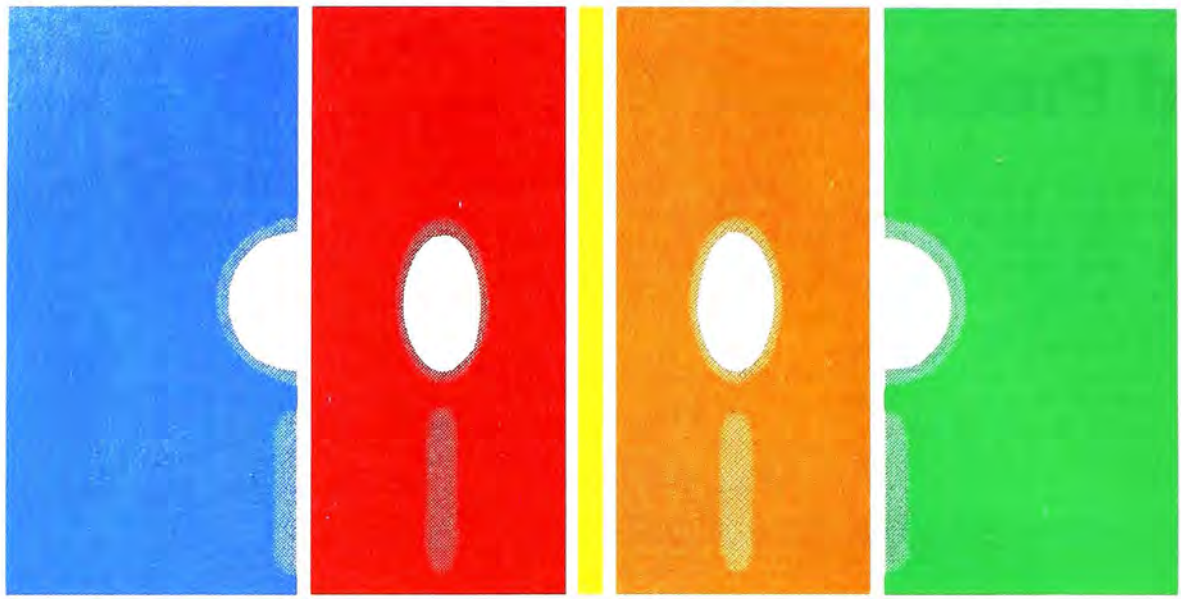
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Softdisk requires Applesoft and DOS 3.3

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with alarming alacrity in March. The verb *felled* would have come to mind if an external force could have been detected.

April was a different story. Strong sales resumed and *Mask* hustled its way back to twenty-third on the bestseller list and again topped all adventure games. *Mask* may have been helped by the April introduction of a companion adventure, *The Serpent's Star*, but evidence to that effect was hardly conclusive. *Star* did score fifth in the Adventure 5 in its debut month.

There were no changes in the Fantasy 5 list, but the Strategy 5 got more than just a new leader. *Spitfire Simulator* jumped into fourth place after several months off the list. And a revised version of *Computer Ambush* that takes less than an hour a turn to play nabbed fifth. Even two years after its original introduction, *Ambush* may be pushing the state of the gaming art.

Home Accountant continued unchallenged at the top of the Home 10. With the slacking off of tax package sales, communications packages grabbed most of the slots. Beagle Bros almost took sole possession of the Hobby 10, claiming five spots, but Penguin's *Graphics Magician* held on to the top spot.

There were no major disruptions in the Business 10, where the three newcomers at the bottom were actually rejoining the list. But a major

Adventure 5

This Month	Last Month	
1.	—	**The Mask of the Sun,** Chris Anson, Alan Clark, Larry Franks, and Margaret Anson, Ultrasoft
2.	—	**Suspended,** Infocom
3.	1.	**Zork I,** Infocom
4.	2.	**Deadline,** Infocom
5.	—	**The Serpent's Star,** Michael Ormsby, Larry Franks, Chris Anson, Kristin Pearson-Franks, and Alan Clark, Ultrasoft

Strategy 5

This Month	Last Month	
1.	2.	**Flight Simulator,** Bruce Artwick, SubLogic
2.	1.	**Castle Wolfenstein,** Silas Warner, Muse
3.	3.	**Sargon II,** Dan and Kathe Spracklen, Hayden
4.	—	**Spitfire Simulator,** Ted Kurtz, Mind Systems
5.	—	**Computer Ambush,** Ed Williger and Larry Strawser, Strategic Simulations

Fantasy 5

This Month	Last Month	
1.	1.	**Wizardry,** Andrew Greenberg and Robert Woodhead, Sir-tech
2.	2.	**Ultima II,** Lord British, Sierra On-Line
3.	3.	**Knight of Diamonds,** Andrew Greenberg and Robert Woodhead, Sir-tech
4.	4.	**Temple of Apshai,** Epyx/Automated Simulations
5.	5.	**Ultima,** Lord British, California Pacific

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Scattered about in the various buildings of the Soviet diplomatic mission in Pyongyang are the parts to an encoded message that could put you on Easy Street for the rest of your days. There are only two problems: Obtaining the entire code, and deciphering it.

The mission is patrolled by some pretty nasty security guards riding in elevators throughout each building. You, on the other hand, can carry no weapons if you are to sneak by the mission's metal detectors. After all, you're a spy, not an assassin. Too bad the same isn't true for the guards...

Spy's Demise: A dangerously addictive arcade/action game for Apple and now Atari computers.
Apple II version requires 48K and disk drive. Atari 400/800 Disk version requries 32K. Atari 400/800 Cassette version requries 24K.

Be sure to watch out for "The Spy Strikes Back", coming soon to a computer store near you!

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battle is shaping up there as *Multiplan* continues to creep up on *VisiCalc* and *PFS: File*. Microsoft's spreadsheet just missed catching *PFS: File* in April and is having surprising success in divvying up the market with

Business 10

This Month	Last Month	
1.	1.	**VisiCalc,** Software Arts/Dan Bricklin and Robert Frankston, VisiCorp
2.	2.	**PFS: File,** John Page and D. D. Roberts, Software Publishing Corporation
3.	3.	**Multiplan,** Microsoft
4.	4.	**Quick File IIe,** Rupert Lissner, Apple Computer
5.	6.	**PFS: Report,** John Page, Software Publishing Corporation
6.	7.	**BPI General Ledger,** John Moss and Ken Debower, Apple Computer
7.	5.	**DB Master,** DB Master Associates, Stoneware
8.	—	**PFS: Graph,** Bessie Chin and Stephen Hill, Software Publishing Corporation
9.	—	**Apple II Business Graphics,** Apple Computer
10.	—	**General Ledger,** George Shackelford, State of the Art

Hobby 10

This Month	Last Month	
1.	1.	**Graphics Magician,** Chris Jochumson, David Lubar, and Mark Pelczarski, Penguin Software
2.	6.	**Utility City,** Bert Kersey, Beagle Bros
3.	3.	**Zoom Grafix,** Dav Holle, Phoenix Software
4.	—	**Double-Take,** Mark Simonsen, Beagle Bros
5.	—	**Apple Mechanic,** Bert Kersey, Beagle Bros
6.	7.	**Bag of Tricks,** Don Worth and Pieter Lechner, Quality Software
7.	4.	**Apple Pascal,** Apple Computer
8.	8.	**Pronto DOS,** Tom Weishaar, Beagle Bros
9.	2.	**DOS Boss,** Bert Kersey and Jack Cassidy, Beagle Bros
	4.	**The Complete Graphics System,** Mark Pelczarski, Penguin Software

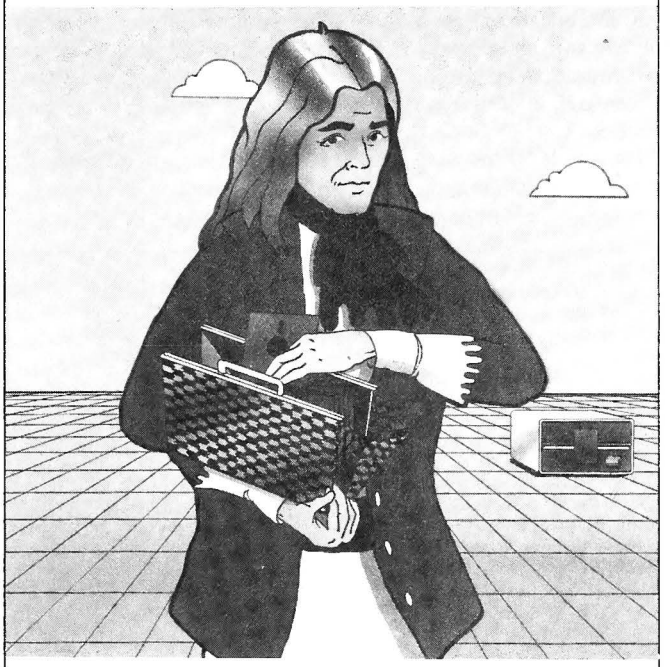
Home 10

This Month	Last Month	
1.	1.	**Home Accountant,** Bob Schoenburg, Larry Grodin, and Steve Pollack, Continental Software
2.	5.	**ASCII Express: The Professional,** Bill Blue and Mark Robbins, Southwestern Data Systems
3.	7.	**Hayes Terminal Program,** Hayes Microcomputer Products
4.	3.	**Data Capture 4.0,** George McClellan and David Hughes, Southeastern Software
5.	9.	**Transend 1,** Tim Dygert and Bob Kniskern, SSM
	—	**Crossword Magic,** Steve and Larry Sherman, L&S Computerware
7.	6.	**Personal Finance Manager,** Jeffrey Gold, Apple Computer
	—	**Micro/Courier,** Microcom
9.	—	**Micro/Terminal,** Microcom
	—	**Dow Jones Market Analyzer,** B. C. Burch, RTR Software

Bag of Tricks™

By Don Worth and Pieter Lechner

Requires Apple II, Apple II Plus, or Apple IIe with 48K RAM and one disk drive



From the authors of the best selling book **BENEATH APPLE DOS** comes **BAG OF TRICKS** — four comprehensive utility programs on diskette and many more pages of valuable information about the Apple II's disk operating system.

BAG OF TRICKS is useful to beginners and experienced programmers alike. It includes many "hand holding" tutorials that assist you in repairing damaged diskettes and allow you to change sector ordering, reconstruct blown catalogs, etc. etc. etc. At the low price of $39.95, **BAG OF TRICKS** is one of the best software values ever.

The four programs and their functions are:

1. TRAX dumps and examines a raw track, either 13-sector or 16-sector, displays the internal Apple diskette formatting information, and flags exceptions to standard formats.
2. INIT will reformat one or more tracks, attempting to preserve the contents of undamaged sectors. It also allows you to change sector order. This can cut disk access times by 40% or more!
3. ZAP is a sector editor like no other! More than 50 commands are available to assist you to locate, compare, change, or print the data on your diskettes. ZAP is even programmable! Using powerful macros, it is possible to transfer and compare DOS, CP/M, or PASCAL files.
4. FIXCAT automates the process of repairing a damaged diskette catalog. It operates with or without user intervention, locating "lost" files and rebuilding the catalog — from scratch if necessary! DOS removal and VTOC repair are also possible.

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Softalk Presents The Bestsellers

VisiCalc. Stay tuned.

Sticky Bear ABCs, *Type Attack*, and *Computer SAT* joined the education list, but there were a dozen other programs in strong contention, including two more *Sticky Bears*. The development of noncurriculum-based educational programs has created a highly competitive arena and the increased interest has even benefited such old-timers as *Algebra 1* from Edu-Ware.

The Apple III list went essentially unchanged, as the two programs joining the list had been there previously. Sales of the III have started to recover from the introductions of the Apple IIe and the IBM XT, both of which drew attention from it for a time.

New Apple owners seem to be making like Judge Crater. Why they're disappearing from the aftermarket and how long they'll stay away is still unknown. But it sure does make one curious to know for what purpose all those word processors and typing packages are being used. Maybe a Guinness-size chain letter is being readied to spring on an unsuspecting public. ■

Apple-franchised retail stores representing approximately 8.1 percent of all sales of Apple and Apple-related products volunteered to participate in the poll.

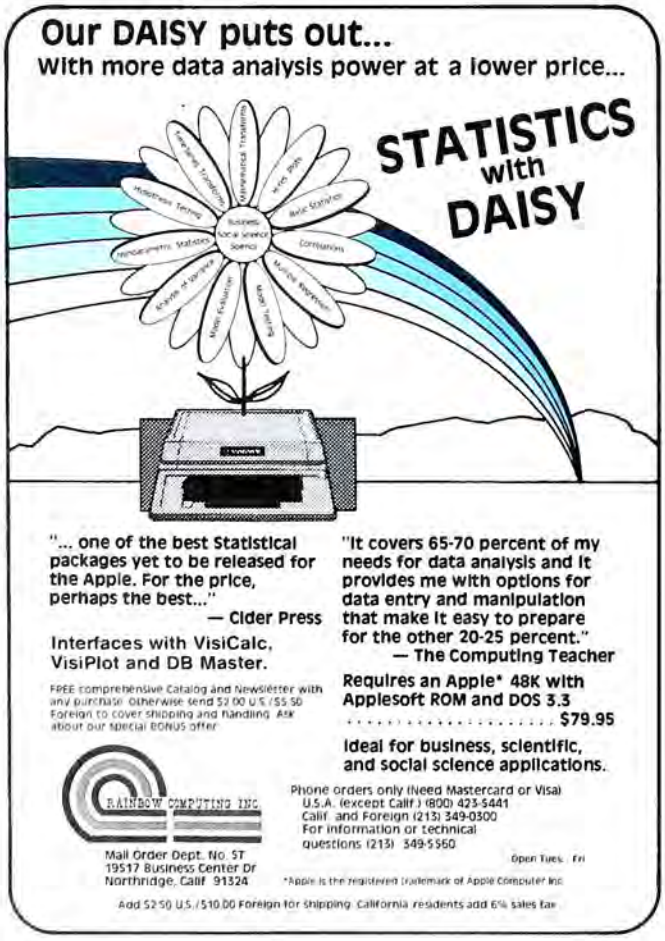
Respondents were contacted early in May to ascertain their sales for the month of April.

The only criterion for inclusion on the list was the number of units sold—such other criteria as quality of product, profitability to the computer store, and personal preference of the individual respondents were not considered.

Respondents in May represented every geographical area of the continental United States.

Results of the responses were tabulated using a formula that resulted in the index number to the left of the program name in the Top Thirty listing. The index number is an arbitrary measure of relative strength of the programs listed. Index numbers are correlative only to the month in which they are printed; readers cannot assume that an index rating of 50 in one month represents equivalent sales to an index number of 50 in another month.

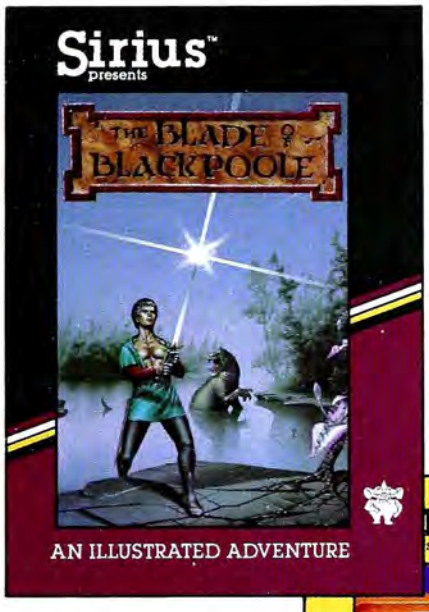
Probability of statistical error is plus or minus 3.12 percent, which translates roughly into the theoretical possibility of a change of 3.78 points, plus or minus, in any index number.



The Top Thirty

This Month	Last Month	Index	
1.	1.	192.24	**Apple Writer IIe,** Paul Lutus, Apple Computer
2.	2.	98.76	**VisiCalc,** Software Arts/Dan Bricklin and Robert Frankston, VisiCorp
3.	3.	81.13	**Home Accountant,** Bob Schoenburg, Larry Grodin, and Steve Pollack, Continental Software
4.	5.	68.28	**Choplifter,** Dan Gorlin, Broderbund Software
5.	4.	61.22	**Miner 2049er,** Mike Livesay and Bill Hogue, Micro Fun
6.	8.	60.47	**PFS: File,** John Page and D. D. Roberts, Software Publishing Corporation
7.	9.	60.22	**Multiplan,** Microsoft
8.	5.	53.66	**Wizardry,** Andrew Greenberg and Robert Woodhead, Sir-tech
9.	16.	52.66	**Quick File IIe,** Rupert Lissner, Apple Computer
10.	7.	36.28	**MasterType,** Bruce Zweig, Lightning Software
11.	—	30.49	**Bank Street Writer,** Gene Kuzmiak and the Bank Street College of Education, Broderbund Software
12.	11.	28.47	**Frogger,** Olaf Lubeck, Sierra On-Line
13.	12.	27.71	**Typing Tutor,** Image Producers, Microsoft
14.	28.	26.71	**Flight Simulator,** Bruce Artwick, SubLogic
15.	16.	24.44	**Screen Writer II,** David Kidwell, Sierra On-Line
	13.	24.44	**Aztec,** Paul Stephenson, DataMost
17.	14.	21.67	**Castle Wolfenstein,** Silas Warner, Muse
18.	22.	21.16	**PFS: Report,** John Page, Software Publishing Corporation
19.	—	20.16	**BPI General Ledger,** John Moss and Ken Debower, Apple Computer
20.	10.	19.65	**Ultima II,** Lord British, Sierra On-Line
21.	—	19.40	**Super-Text Pro,** Ed Zaron, Muse
22.	16.	19.15	**Pinball Construction Set,** Bill Budge, BudgeCo
23.	—	18.90	**The Mask of the Sun,** Chris Anson, Alan Clark, Larry Franks, and Margaret Anson, Ultrasoft
24.	—	17.89	**Early Games for Young Children,** John Paulson, Counterpoint Software
25.	—	16.88	**Apple Logo,** Logo Computer Systems, Apple Computer
26.	—	16.63	**Mix & Match,** Children's Television Workshop, Apple Computer
27.	—	16.38	**Snooper Troops I,** Tom Snyder, Spinnaker Software
28.	24.	16.12	**Graphics Magician,** Chris Jochumson, David Lubar, and Mark Pelczarski, Penguin Software
	—	16.12	**Suspended,** Infocom
30.	19.	14.61	**Zork I,** Infocom

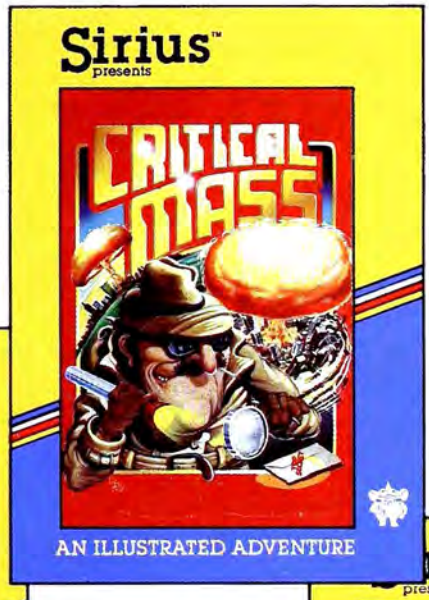
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Step back in time and join the search for the magical sword of Myraglym. Travel cautiously on your journey for you will encounter dangerous serpents, spine-chilling evils and carnivorous plants that crave human flesh!

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Critical Mass

On Jan. 1st at 10:00 am, the U.N. received this message: "Good Morning, in exactly 9 days, the world's 5 largest cities will be destroyed by thermal nuclear weapons." At 10:03 am, you received this assignment: STOP . . . THIS . . . LUNATIC!

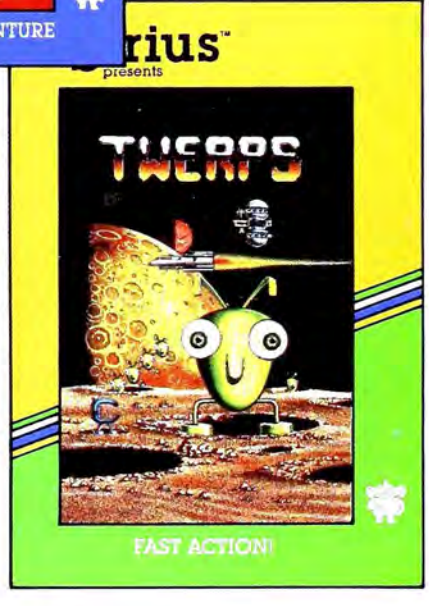
Avail. on disk for the Apple II, II+ or IIe and Atari 800 or 1200 and Commodore 64



Type Attack

The planet Lexicon is under attack! Letters of the alphabet are falling from the sky. To repel them, you must be able to type the letters faster than they can fall. Be quick! An entire civilization is depending on your skill.

Avail. on disk for the Apple II, II+ or IIe and Atari 800 or 1200, IBM-PC and Commodore 64 and on cartridge for the VIC-20.



Twerps

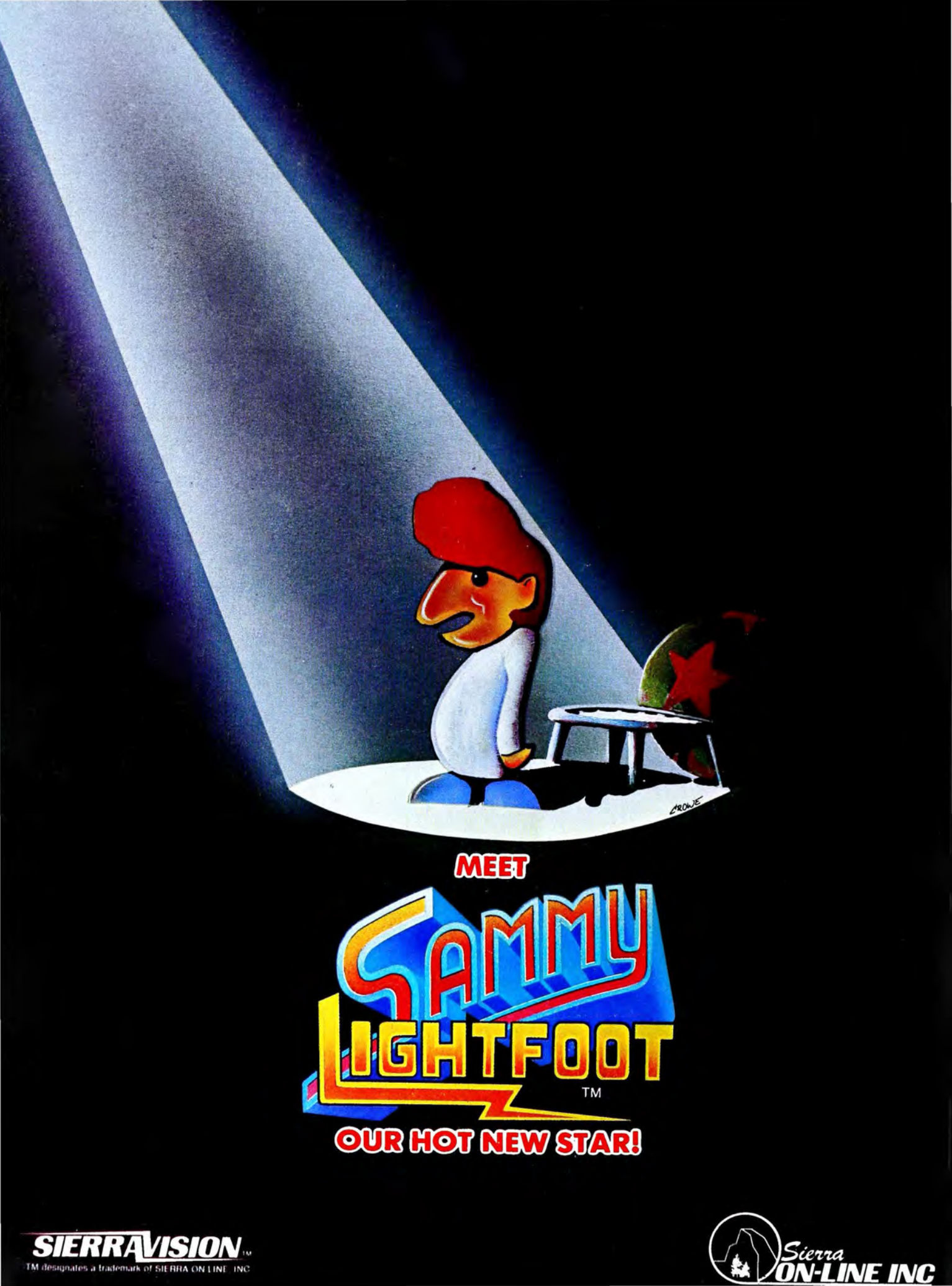
The boldest space rescue ever! Defenseless Twerps are stranded on an asteroid. You, Captain Twerp, are to board a Twerp-craft, blast through the Orbiters, land safely and rescue your comrades. Beware of the Glingas and Twerp-eating Gleepnites!

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