SOFTALK

VOLUME 3 SEPTEMBER 1982 $2.50

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III: The Jeppson Disassembler

Exec SofTech

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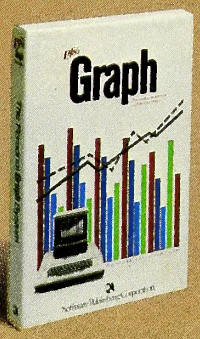

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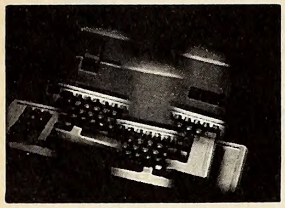
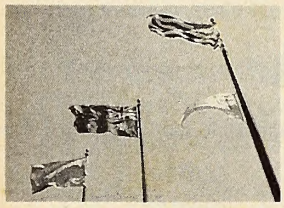
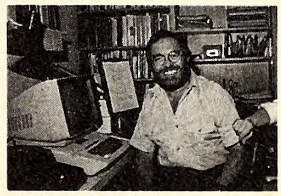
SEPTEMBER 1982







FEATURES · DEPARTMENTS

IN NEXT MONTH'S SOFTALK

October Overture . . . Apples of the Sun—they help analyze it . . . Bob Bishop on Splitscreen Graphics . . . Exec: Infocom . . . Banking In Louisville—at last . . . Storytalk: Fiction comes to Softalk, beginning with "A Ghostly Adventure" by staffer Dave Hunter . . . Word Processing with Word Handler . . . and more . . .

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Moving? Send new address and old to Softalk Circulation, Box 60, North Hollywood, CA 91603; telephone (213) 980-5074.

CONTEST: The Great Name-the-Shape Table Game

Well, summer's over and it's time for the kids to get back to school, grown-ups to get back to work, and everyone to get back around the television for weekend football excitement on the gridiron.

And speaking of grids, look at the one on this page; pretty dull, isn't it? Now look at pages 144 and 145 in this issue. What you see there are shapes of items you might find around the house, in your Apple, or pretty much anywhere. Some of them are darn obvious, others are not so obvious. Aha! Instant contest.

Your task this month is to figure out what in the world those shapes are. Study the silhouettes on pages 144 and 145. Each one has a corresponding number on the dull-looking grid on this page. After deciding what the shapes represent, write down your answers on a piece of paper numbered from 1 to 92.

The person who correctly identifies the most shapes will win absolutely nothing. However, that person will be entitled to select $100 worth of *Softalk* advertisers' products for his Apple. In case of a tie, the random number generator is also back from vacation to help decide the winner. Have fun!

Name: _____

Address: _____

City/State/Zip: _____

Phone: _____

If I win, may I please have: _____

_____

My dealer's name: _____

My dealer's phone number: _____

My signature: _____

Send this entry or a facsimile with your answers to Softalk Shapes, Box 60, North Hollywood, CA 91603, by October 15, 1982. ◨

1	2	3	4	5	6	7	8	9	10	11	12
13	14	15	16	17	18	19	20	21	22	23	24
25	26	27	28	29	30	31					32
33	34	35	36	37	38	39					40
41	42	43	44	45	46	47					48
49	50	51	52	53	54	55					56
57	58	59	60	61	62	63					64
65	66	67	68	69	70	71					72
73	74	75	76	77	78	79					80
81	82	83	84	85	86	87	88	89	90	91	92

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It does everything but lick the stamp.

We've made a mailing list program worthy of today's remarkable microcomputers. It's called *1st Class Mail*™—but you can use it for anything you'd keep on a card file, like your car's servicing history or your address book. And it's not only the most flexible mail list/utility data base you can buy—it's also incredibly easy to use.

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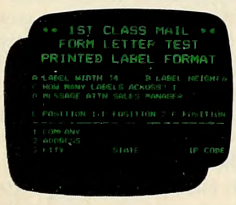

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One of the ways we've made *1st Class Mail*™ especially "user friendly" is by letting you create your own headings for each entry line. So your computer speaks *your* language.

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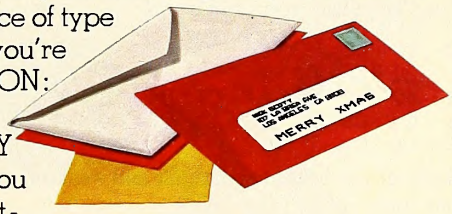

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CONTEST WINNERS:
Creative Readers Stump the Staff

Apples in History. Good news and bad news. The good news is that June's History contest proved beyond doubt that our readers are definitely well read. Contest entrants ranged from erudite to esoteric. The bad news is that *Softalk*'s contest staff clubbed it out for hours and couldn't agree on a winner. So, rather than continue walloping each other with game paddles, we decided to let the readers decide. At least no one will get hurt that way.

All of your entries were historically accurate; most of them were quite probable. Then there were some of you who went beyond that—the same crowd who probably found history to be a fun subject in school.

George Bass of Williamsburg, Virginia, sent in an illustrated copy of *Bass's Semi-Familiar Quotations*, highlighted by Queen Victoria's well-known statement: "We are not a Muse. We are very Sirius." Very punny; no fun intended. Bass made it through the first cut, but was not so fortunate the second time around.

Another almost-made-it, Raymond Adams of Burbank, California, time-traveled back to hear the Egyptian pharaoh Cheops arguing with urban planners: "I don't care what the guys in engineering say, my Apple says we can save a bundle if we build it with just three sides."

Mike Rubin from Getzville, New York, discovered that Abraham Lincoln programmed in machine language (try it out):

```
0C00- 20  58  FC  A2  00  BD  11  0C
0C08- 20  ED  FD  E8  E0  11  D0  F5
0C10- 60  D2  C9  C7  C8  D4  A0  CD
0C18- C1  CB  C5  D3  A0  CD  C9  C7
0C20- C8  D4
```

Some of you heeded no bounds and went on to find some rather grisly quips.

C. Collier of Walnut Creek, California, tried to win credit toward a printer with his double-take entry, "Sorry, son, I'd really rather have the Apple." It's William Tell, of course. To this day, Collier is printerless.

According to Robert C. Caplan, Vincent Van Gogh didn't go monaural for just some girl: "I'd give my right ear to be able to program in hi-res graphics."

For their cleverness and wit (and for sheer nerve), the above entrants will all receive a set of Official *Softalk* Write-Protection InvisiTabs.

Your Turn. The finalists in the History contest are, alphabetically, Kathy S. Berger, Cypress, California; Patricia Fitzgibbons, Long Beach, California; Tim and Lori Gillespie, Lincoln, Nebraska; Ganesh Gupta, Kansas City, Missouri; John Hillman, Waco, Texas; Ken Hogarty, Oakland, California; Brent Iverson, Boca Raton, Florida; Lauretta Jones, New York, New York; John D. Redfield, Forth Smith, Arizona; Michael L. Truese, Bayonne, New Jersey; and Susan C. West, Coolville, Ohio.

Their entries are listed in a random order and are numbered. Just pick which one you like the best, based on historical truth, probability, wit, and general quality of method of meeting requirements. Send in your vote by October 15, 1982, to be included in the balloting. Be sure to include the name of the famous person you think is being quoted.

Oh, and one more thing. This is a second chance to win something for your Apple. Everyone who casts a vote and correctly names the speaker will be crunched through the random number generator. The survivor of the RNG will win a $10 credit toward *Softalk* advertisers' goods, or some Official *Softalk* Write-Protection InvisiTabs, if you prefer.

If you think you can name all the speakers, list them. In case of ties, all entries that list all correct speakers (and name of work if applicable) will overwork the RNG to determine the winner of $50 worth of bonus prizes.

Here are the finalists:

1. Though your keys were tapped and flayed
   During programs I have made
   Your error codes displayed
   What I still had to do.
   And despite my countless curses
   Through your colour art disburses,
   And lines of slick recurses
   You're a better box to beat on,
   Apple II."

2. ```
   FILE NOT FOUND
   BRUN FID,D1
   WHICH WOULD YOU LIKE? 3
     SPACE ON DISK
   SOURCE SLOT: 6
           DRIVE: 1
   0018.5 SECTORS FREE
   0541.5 SECTORS USED
   HIT A KEY TO CONTINUE
   WHICH WOULD YOU LIKE? 9
   ```

   "Before you answer the question, remember you are speaking under oath before the Senate Committee investigating this matter. You are his personal secretary?"

   "Yes, I am."

   "What caused the gap of 18½ sectors to appear on the disk?"

   "I accidentally erased it with the foot pedal control. I didn't mean to."

   "Do you know what was on it?"

   "To the best of my recollection, it was a pirated copy of *Bug Attack*."

3. "Boot it again, Sam."

4. Once upon a midnight dreary, while I
   programmed, weak and weary,
   My Apple's plastic keyboard taking quite a bit of
   wear—
   While I nodded, nearly sleeping, suddenly there
   came a beeping,
   As of something loudly cheeping—cheeping in
   the cool night air.
   " 'Tis some small birdie," I muttered, "cheeping
   in the dark out there"—
   Quoth the Apple, "***SYNTAX ERR"

5. "What is this strange apparatus, Mr. Spock?"

   "A primitive microcomputer, Captain, developed on late twentieth century Earth. I believe that they were called, 'Apples.' "

   "Isn't that a bit ironic, Spock? Wasn't the apple considered to be the fruit of the tree of the knowledge of good and evil?"

   "Indeed, Captain, but in this case, the apple became a symbol of the good. Due to its accessibility, the Apple became a part of every Earth household so that by the end of the twentieth century virtually all humans had mastered the computer. As all humans began to speak the universal language of the computer, the old barriers of race and creed were broken down, and the precepts of the Federation were formed."

   "So without this ancient contraption, there would be no *Enterprise*."

   "Precisely, Captain, and speaking of the *Enterprise*, I estimate the time warp through which we passed to close in approximately 3.27 Earth minutes."

   "Let's be going then, Mr. Spock."

   "After you, Captain. Live long and prosper."

6. ```
   100 INPUT "WHENCE COME THE
       BRITISH?";A
   110 IF A=1 THEN A$= "LAND": GOTO 140
   120 IF A=2 THEN A$= "SEA": GOTO 140
   130 PRINT:PRINT "WHAT SAY YE
       AGAIN?":
       GOTO 100
   140 PRINT:PRINT "THEY COME BY ";A$;"!"
   150 GOSUB 200
   200 REM THIS SUBROUTINE LIGHTS THE
       LANTERNS IN THE CHURCHTOWER:
       RETURN
   ```

7. Back came he into his dwelling, his apartment in
   the city.
   Took he then his new-bought game-disk,
   Sat before his trusty Apple,
   Turned the switch they labelled, "power;"
   With his heart held in his jerkin,
   Set the tan machine to workin'.
   He put the disk right in the disk drive,
   In the disk drive quickly spinning.
   Watched he then the disk drive spin it,
   Watched for near unto a minute.
   Then he took his new-bought game-disk,
   Took it back to where he bought it,
   Took it back and got a refund.

8. How do I use thee? Let me count the ways.
   I use thee to the depth and breadth and height
   48K can reach, when booting DOS
   For the ends of Labor and Ideal Fun.
   I love thee to the level of every day's
   Most Basic need, with my color CRT.
   I use thee with *ScreenWriter*, as I compose
   sonnets;
   I use thee with *VisiCalc*, as I compute royalties.
   I use thee with the paddles and joysticks
   Of Spanish invader games, and hi-res graphics.
   I use thee with a Drive that will preserve my love
   On write-protected disks, —I use thee with the
   breath,
   Smiles, tears, of all my life! —and, with a new
   RAM board,
   I shall but use thee better at 64K.

9. At last I had an idea; and I says, I'll go and create, modify, and print my text, and then I can pray. Why, it was astonishing, the way I felt as light as a diskette straight off, and my troubles all deleted. So I booted my *Apple Writer*, all glad and excited, and set down and entered letters to write to Miss Watson telling her about Jim and where he was.

   But then I used Find and Search to recall

GOTO 40

PIE-MAN

for the Apple™

by Eagle Berns and
Michael Kosaka

You got a late start looking for that summer job, and all you could find was a baker apprentice position at the Automated Bakery Company. Simple enough, since the pies are made by machine...all you have to do is add topping and put the pies away when they come out on the conveyor belt. Shouldn't be too difficult of a summer, you think to yourself...

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MICROBUFFER II
OPEN
1 2 3 4 5 6
MCM6665AL20
Serial Number

MICROBUFFER WILL SPEED UP ANY PROGRAM THAT REQUIRES PRINTING.

MICROBUFFER ALLOWS YOU TO PRINT AND PROCESS SIMULTANEOUSLY.

Now you don't have to wait for the printer to finish before you can use your computer again.

YOU CAN DUMP PRINTING DATA DIRECTLY TO MICROBUFFER.

Unlike your printer, Microbuffer accepts data as fast as your computer can send it. So there's never a bottleneck.

Microbuffer first stores the data in its own memory buffer and then takes control of your printer. This frees the computer for more productive functions.

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THERE IS A MICROBUFFER FOR ANY PRINTER/COMPUTER COMBINATION.

Microbuffers are available in Centronics-compatible parallel or RS-232C serial versions.

FOR APPLE II COMPUTERS, Microbuffer II features on-board firmware for text formatting and advanced graphics dump routines. Both serial and parallel versions have very low power consumption. Special functions include Basic listing formatter, self-test, buffer zap, and transparent and maintain modes. The 16K model is priced at $259 and the 32K, at $299.

FOR EPSON PRINTERS, Microbuffer is $159 in either an 8K serial or a 16K parallel version. The serial buffer supports both hardware handshaking and XON-XOFF software handshaking at baud rates up to 19,200. Both Epson interfaces are compatible with all Epson commands including GRAFTRAX-80 and GRAFTRAX-80+.

ALL OTHER PRINTER/COMPUTER COMBINATIONS are served by the in-line, stand-alone Microbuffers. Both serial and parallel versions are expandable up to 256K. The serial stand-alone will support different input and output baud rates and handshake protocol. The 32K model starts at $299, 64K for $349. 64K add-ons for up to a total of 256K are just $179.

When you think of how much time Microbuffer will save, can you afford to *not* have one?

SIMPLE TO INSTALL.

Microbuffer II is slot-independent. It will fit directly inside the Apple II in any slot except zero.

Microbuffer for your Epson mounts easily in the existing auxiliary slot directly inside the printer.

The stand-alone Microbuffer is installed in-line between virtually any printer and computer.

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The un-retouched photo at left has been enlarged to demostrate Microbuffer's exact workmanship and precise attention to detail. Specifications demand that each board undergo 36 seperate tests and inspections before it can leave the factory.

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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, 10260 Bandley Dr., Cupertino, CA 95014. $35. Frontier Computing, Box 402, 666 N. Main, Logan, UT 84321. $10.

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.*

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. Infocom, 55 Wheeler St., Cambridge, MA 02138. $49.95.

Escape from Rungistan. Blauschild. A vacation with a vengeance. Get out of jail, battle snakes, bears, and cannibals; acquire skills to get your money refunded. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $29.95. *8/82.*

● **Hi-Res Adventure #1: Mystery House.** Williams. Whodunit in a Victorian mansion. First adventure with pictures. Vocabulary of more than 300 words. Sierra On-Line, 36575 Mudge Ranch Rd., Coarsegold, CA 93614. $24.95.

Hi-Res Adventure #2: The Wizard and the Princess. Williams, Williams. Attempt to rescue princess from vengeful wizard. Features 250 illustrations in full color. Sierra On-Line, 36575 Mudge Ranch Rd., Coarsegold, CA 93614. $32.95. *11/80.*

Hi-Res Adventure #3: Cranston Manor. DeWitz, Williams. More full-color adventuring involving the redistribution of wealth. Long on great riddles, short on plot. Sierra On-Line, 36575 Mudge Ranch Rd., Coarsegold, CA 93614. $34.95. *9/81.*

Hi-Res Adventure #4: Ulysses and the Golden Fleece. Davis, Williams. Re-creation of the Greek legend, featuring graphics advances and ability to communicate with the characters. Sierra On-Line, 36575 Mudge Ranch Rd., Coarsegold, CA 93614. $34.95. *12/81.*

Kabul Spy. Wilson. Cold War espionage adventure in which you must slip into Afghanistan to rescue a physicist before the commies make him talk. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $34.95.

● **The Prisoner.** Mullich. Superb TV series captured in computer game. 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. $29.95. *3/81.*

Queen of Phobos. Hi-res treasure hunt. Outwit four opponents on derelict ship in space. Looters after your cookies, too. Phoenix, 64 Lake Zurich Dr., Lake Zurich, IL 60047. $34.95.

S.A.G.A. Series. Adams. Scott Adams's prototypical adventures—twelve in all—spruced up with 100-color graphics, Votrax vocals, and print-as-you-play option. Fun, not always logical, very story-oriented series. First to make chance a significant element of play (you can get killed a lot). Each adventure has its own theme; you do a lot of exotic traveling. They map small but score big on imagination. Adventure Intl., Box 3435, Longwood, FL 32750. $29.95 each.

Swordthrust Series. Set of adventures, seven so far, that integrate fantasy role playing. Create one character, make new friends in each adventure, battle monsters and achieve goals together. Good stories, fun to map. Vocabulary no mystery but puzzles are. Single character goes through all. CE Software, 801 73rd St., Des Moines, IA 50312. Number 1 prerequisite for rest. Each adventure, $29.95. *8/82.*

Time Zone. Williams, Williams. "Microepic" hi-res adventure featuring ten periods from past and future history all over world and universe on eight double-sided disks. Good puzzles, many dangers. Sierra On-Line, 36575 Mudge Ranch Rd., Coarsegold, CA 93614. $99.95. *1/82.*

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

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

Business

Accounting Plus II. Software Dimensions. Integrated package: general ledger, accounts receivable and payable, and inventory-purchasing modules. Basic and machine language. Menu-driven; prompting. Systems Plus, 1120 San Antonio, Palo Alto, CA 94303. $1,250.

Apple Plot. Converts numerical data into graphs; stores on hi-res page or prints out. *VisiCalc* interface. Apple, 10260 Bandley Dr., Cupertino, CA 95014. $70.

Asset Manager. Calculates depreciation using current balance; chooses depreciation representing greatest savings. Handles up to 999 assets. Micro Lab, 2310 Skokie Valley Rd., Highland Park, IL 60035. $200.

BPI Accounts Receivable. Ferguson. Operates as open item or balance forward system for statement preparation, aging reports, and extensive credit analysis. Apple, 10260 Bandley Dr., Cupertino, CA 95014. $395.

BPI General Ledger. Accounting system for small businesses automates posting of ledgers, finacial statements preparation, and closing of books. Includes integrated accounts receivable and payable and all subsidiary ledgers for payroll accounting. Customized set of books can be constructed from available journals and ledgers. Apple, 10260 Bandley Dr., Cupertino, CA 95014. $395.

Business Plus. Interactive package for service-type companies. With full-reporting general ledger (takes up to 250 items), accounts receivable, and accounts payable. Does two-year bar graphs. Advanced Operating Systems, 450 St. John Rd., Ste. 792, Michigan City, IN 46360. $399.

Client Management System. Kalmick. Comprehensive law office manager. Features billing, docket scheduling, client data, critical date calendar, management reports. Hard disk compatible. Compu-Law, 5500 Lindley Ave., Ste. 223, Encino, CA 91316. $2,500.

Creative Financing. Evaluates loans and investments, provides R-O-I projections, payment tables, and objective decisions. Howard Software, 8008 Girard Ave., Ste. 310, La Jolla, CA 92037. $195.

Datadex. General-purpose database manager able to perform specific applications. File generation and report utilities allow definition of file structure and appearance of reports. Information Unlimited, 281 Arlington Ave., Berkeley, CA 94707. $150. *9/81.*

The Data Factory. Passauer. Database management system allows listing files, getting file statistics, selecting another file, transferring records to new database, and adding fields to update forms. Disk swapping required; excellent product overall. Several compatible products available. Micro Lab, 2310 Skokie Valley Rd., Highland Park, IL 60035. $150. *8/81.*

Data Perfect. Assembly language database companion to *Letter Perfect*; compatible with lower case in 40-column, most 80-column boards. Lay out, revise own screen, record design. Excellent built-in editor; ability to be edited by word processor. Searches, sorts, generates reports. LJK, Box 10827, St. Louis, MO 63129. $99.95.

Data Reporter. Allows plotting of data in various charts and graphs; stores data segmented by up to thirty-five fields. Machine language search and sort. Synergistic, 830 N. Riverside Dr., Ste. 201, Renton, WA 98055. $220.

DB Master. Comprehensive database management system with password protection, extensive report creation options. Up to 1,020 characters per record. Stoneware, 50 Belvedere St., San Rafael, CA 94901. $229. *10/81.*

DB Master Utility Pak II. Accessory disk with label printer, global editor, file merge, reblocker, and forms printer. Stoneware, 50 Belvedere St., San Rafael, CA 94901. $99.

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

Desktop Planner. Models and analyzes budgets, profits and losses, sales forecasts, cash flow; "what if?" calculations. VisiCorp, 2895 Zanker Rd., San Jose, CA 95134. $250.

Dow Jones News and Quotes Reporter. With modem, checks latest financial news and stock quotes for more than 6,000 securities from local Dow Jones data bank. Apple, 10260 Bandley Dr., Cupertino, CA 95014. $95. *2/82.*

1st Class Mail. Schoenburg, Pollack. Fantastically user-friendly program for specialized database applications. Twelve fields, ability to sort and filter on any field or combination. Continental, 11223 S. Hindry Ave., Los Angeles, CA 90045. $74.95. *6/82.*

General Ledger. Automatic double entry, complete

audit trails. Menu-driven. Continental, 11223 S. Hindry Ave., Los Angeles, CA 90045. $175.

General Manager. Database program that allows economic projections, search and select options, and screen formatting for data entry. Sierra On-Line, 36575 Mudge Ranch Rd., Coarsegold, CA 93614. $99.95.

Information Master. Database management program that can keep records sorted in five separate orders simultaneously. High Technology, Box 14665, Oklahoma City, OK 73113. $150.

Infotory. Complete purchase order and inventory system for under 9,999 items of one type. Prints receiving, sales, purchase orders; audit trails available. SSR, 320 South Ave., Rochester, NY 14620. $295.

List Handler. List-lover's delight. Prints lists, labels, and letters. Handles up to 3,000 records per disk and eight disk drives. Takes requests. Silicon Valley Systems, 1625 El Camino Real, Ste. 4, Belmont, CA 94002. $79.95.

MicroFinesse. Pascal-based spreadsheet from England. Handles models of up to 5,000 cells, makes automatic "what if?" calculations. Easy to use. Osborne/McGraw-Hill, 630 Bancroft Wy., Berkeley, CA 94710. $495. *7/82.*

Paymaster. Payroll package that handles up to 100 employees. Accesses any data elements, keeps checks on file; variable deductions, fill-in-the-blanks tax tables. Masterworks, 1823 W. Lomita Blvd., Lomita, CA 90717. $275.

Personal Filing System. User controls data in totally unstructured database. Up to thirty-two pages (screens) of information in each record. Software Publishing, 1901 Landings Dr., Mountain View, CA 94043. $95. *10/80.*

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. $125.

PFS:Report. Powerful report generator designed for use with *PFS*. Sorts, calculates, totals, formats, prints presentation-quality columnar reports. Software Publishing, 1901 Landings Dr., Mountain View, CA 94043. $95. *10/81.*

Systems II EX. Fully integrated, eleven-module business accounting package. Sorts and updates accounts: general ledger, payroll, inventory. Optional modules. Westware, 2455 S.W. 4th St., Ontario, OR 97914. $1,495.

VC-Manager. Chapman. *VisiCalc* utility enabling performance of arithmetic operations on up to fifteen models at once and addition of one model to another. Micro Decision Systems, Box 1392, Pittsburgh, PA 15219. $65.

VersaForm. Business forms generator for invoicing, mailing lists, sales analysis, inventory. Hard disk compatible. Applied Software Technology, 15985 Greenwood Rd., Monte Sereno, CA 95030. $389.

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

VisiCalc Format Aids. Four programs any *VisiCalc* user would welcome: label splitter, formula reader, print-file reader, and variable-width reader. Data Security Concepts, Box 31044, Des Peres, MO 63131. $44.95.

VisiCrop. Stukk. Business simulation expansion module to Slipshod's *Crop Duster.* Save your spreadsheet from the bean moths; spare the hi-res cows. Requires joystick or hammer. Slipshod, General Delivery, Bad Nation, SD. $4.95.

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.

VisiTran. Use to create Basic exec files to transfer variables to *VisiCalc.* Requires some Applesoft programming. ADC Associates, 960 San Antonio Rd., Palo Alto, CA 94303. $99. *8/82.*

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.*

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

Communications

ASCII Express. Blue. Modem software provides automatic redial, individual macro files, and improved file transfer capabilities. Sends any DOS file; uploads one character or one line at a time. Included utilities convert Integer Basic, Applesoft, or binary programs into text files. Southwestern Data, Box 582, Santee, CA 92071. $79.95. *9/81.*

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

Micro-Courier. Electronic mail program. Sends 4,000 character messages, up to 100 at a time. Create-edit, review-address, send-receive. Can accept and answer simultaneously. Requires clock card. Microcom, 89 State St., Boston, MA 02109. $250.

Hello Central. Menu-driven modem software. Upload-download, send-capture, save, retrieve, edit and manipulate files and programs. Advanced Operating Systems, 450 St. John Rd., Ste. 792, Michigan City, IN 46360. $99.

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

Z-Term. Blue. Flexible, customizable communications software written specifically for the CP/M Apple. A quality package. Southwestern Data, Box 582, Santee, CA 92071. $99.95. *5/81.*

Fantasy

Apventure to Atlantis. Clardy. The sequel and worthy successor to *Odyssey.* Many refinements including recruitable entourage of wizards with individual attributes. Included cheat sheet is invaluable. Synergistic, 830 N. Riverside Dr., Ste. 201, Renton, WA 98055. $40. *6/82.*

● **Beneath Apple Manor.** Worth. The original dungeon game for the Apple, created in 1978. Even in lo-res, it still stands up. Quality, 6660 Reseda Blvd., Ste. 105, Reseda, CA 91335. $19.95.

Curse of Ra. Expansion module to (and requires) *Temple of Apshai.* Find the magic treasure guarded by the demons of Ra; overcome the curse. Epyx/Automated Simulations, 1043 Kiel Ct., Sunnyvale, CA 94086. $19.95.

Danger in Drindisti. Expansion module to (and requires) *Hellfire Warrior.* Find the pattern to the glass wizard's maze; steal his magical staff. Epyx/Automated Simulations, 1043 Kiel Ct., Sunnyvale, CA 94086. $19.95.

Hellfire Warrior. Freeman, Johnson. Part two of *Temple of Apshai*; faster, with more options and specific goal. Epyx/Automated Simulations, 1043 Kiel Ct., Sunnyvale, CA 94086. $29.95. *12/80.*

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., Ogdensbury, NY 13669. $34.95. *7/82.*

● **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., Ste. 201, Renton, WA 98055. $30. *10/80.*

● **Temple of Apshai.** Lead title in Dunjonquest series, winner 1981 Academy of Adventure Gaming Arts and Design "Computer Game of the Year" award. Epyx/Automated Simulations, 1043 Kiel Ct., Sunnyvale, CA 94086. $39.95.

Trailblazer. Metagaming. Multiplayer adaptation of the space exploration and commerce game. Good lesson in resource management. Zeta Systems, 1725 Adelaide Blvd., Akron, OH 44305. $29.95. *7/82.*

Ultima. British. Hi-res color adventure, progressing from Middle Ages to beyond the space age. A masterpiece. California Pacific, 1615 5th St., Davis, CA 95616. $39.95. *6/81.*

Upper Reaches of Apshai. The next four levels (and requires) *Temple of Apshai.* Discover the secret of the monastery, battle giant tomatoes and killer chickens. Epyx/Automated Simulations, 1043 Kiel Ct., Sunnyvale, CA 94086. $19.95.

● **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., Ste. 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

Accu-Shapes. Generates Apple shape tables. Uses lores to shape and edit, displays in hi-res. Accent, 3750 Wright Pl., Palo Alto, CA 94306. $49.95.

Apple Logo. Papert. Custom version (by its inventor) of MIT-developed turtle graphics language. First-rate educational tool with graphics, mathematical, even games use. Hefty documentation. Apple, 10260 Bandley Dr., Cupertino, CA 95014. $175.

Apple World. Projects and rotates 3-D color images on screen in true perspective, drawing up to 65,000 points per side. Includes screen-oriented text editor for image formation. United Software of America, 750 3rd Ave., New York, NY 10017. $59.95.

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 with a panel module, and shape tables with a shape module. 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

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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., Ste. 202-B, Portland, OR 97219. $75. *8/82.*

GPS. Versatile graphics program. Creates, manipulates, and edits images like a word processor. Easy to use; in standard and professional formats. Stoneware, 50 Belvedere St., San Rafael, CA 94901. $59.95, $99.99.

Graphics A2-3D1. High-speed 3-D animation package to guide beginner through scene creation, storage, retrieval, movement, and advanced applications. SubLogic, 713 Edgebrook Dr., Champaign, IL 61820. $59.95.

The Graphics Magician. Jochumson, Lubar, Pelczarski. Outstanding animation package consisting of a picture editor and shape table extender designed to allow programmers to design and store graphics files. 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.*

Graphtrix. Matrix graphics system designed to add graphics, footnotes, and chapter capabilities to *Apple Writer* text editing system. Data Transforms, 906 E. 5th Ave., Denver, CO 80218. $65.

Special Effects. Pelczarski. Artist's graphic package for creating and enhancing computer graphics. With 108 colors and 96 brushes, magnification and editing point-by-point. Reverse colors, create mirror images, move images around. Penguin, 830 4th Ave., Geneva, IL 60134. $39.95.

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-Arcade

ABM. Atomic war high jinks. Defend the East Coast from Russian nuke attack. Incoming warheads can do splits. Muse, 330 N. Charles St., Baltimore, MD 21201. $25.

● **Alien Rain (Apple Galaxian).** Suzuki. Monsters in this home-arcade classic seem to take it personally when you gun down one of their kind. Broderbund, 1938 4th St., San Rafael, CA 94901. $24.95. *2/81.*

Apple Panic. Serki. Rid a five-story building of crawling Apples and butterflies by running up and down connecting ladders, digging traps in floors, then covering critters over before they devour you. Extremely addictive, excellent hi-res play. Broderbund, 1938 4th St., San Rafael, CA 94901. $29.95. *9/81.*

Bandits. Ngo. Fight off waves of multiple menaces intent on killing you and stealing your supplies. Delirious nonstop action, animated to the hilt. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $34.95.

Bug Attack. Nitchals. Sing along with dagger-wielding ants, blue worms, swarming med-flies, a millipede, the 1812 Overture, lots of bright colors, terrific hi-res animation, and bouncy style. Cavalier, Box 2032, Del Mar, CA 92014. $29.95. *11/81.*

Cannonball Blitz. Lubeck. In the cold light of *dawn,* you must find the *key* to victory, no matter how in*congr*uous. Sierra On-Line, 36575 Mudge Ranch Rd., Coarsegold, CA 93614. $34.95. *7/82.*

Choplifter. Gorlin. Fly your chopper into the Bungeling Empire to rescue the sixty-four hostages, avoiding interceptor jets, homing mines, and tanks. Challenging, realistic, and playful. Broderbund, 1938 4th St., San Rafael, CA 94901. $34.95. *7/82.*

Chuckles' Laf Pak. Beuche. Four-game variety disk; a real bargain. *Creepy Corridors* (the best), *Apple Zap, Space Race,* and *Mine Sweep.* Sierra On-Line, 36575 Mudge Ranch Rd., Coarsegold, CA 93614. $34.95.

Congo. Berlyn, Wilker. River search and rescue, with funky graphics and emphasis on obstacle avoidance. Sentient, Box 4929, Aspen, CO 81612. $34.95. *5/82.*

County Fair. Illowsky. Shooting gallery with hungry ducks and multiplying rabbits. DataMost, 19273 Kenya St., Northridge, CA 91326. $29.95

Crossfire. Sullivan. Aliens come at you from three directions on a grid laid out like city blocks. Each alien has four lives and metamorphoses into its next one when shot. Strategy and intense concentration required. Superb, smooth animation of a dozen pieces simultaneously. One of the great ones. Sierra On-Line, 36575 Mudge Ranch Rd., Coarsegold, CA 93614. $29.95. *1/82.*

Cyclod. Hancock. Snakes versus eyeballs, using bricks for weaponry. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $29.95.

David's Midnight Magic. Snider. Pinball challenger to *Raster Blaster.* Excellent hi-res graphics and animation. Provision for earning extra balls. Broderbund, 1938 4th St., San Rafael, CA 94901. $34.95. *2/82.*

Dogfight. Basham. Elaborate sixteen-level air battle against up to seven jets and helicopters. Up to eight

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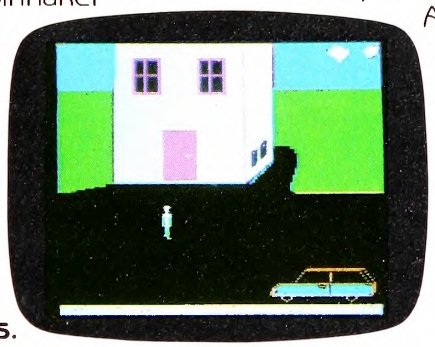
All our games have true educational value. They help develop a child's learning skills. And that's something your kids can take with them wherever they go.



Our games are fun, because you can't kid kids.

Kids like Spinnaker games for the same reasons they like roller coasters, going to the beach and ice cream sundaes.

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Our games make the computer screen come to life. With colorful graphics, animation and sound.

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How do we make our games both educational and fun?

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First, there's FACEMAKER. It's for young computer users, kids ages 4-8. FACEMAKER helps children improve memory and concentration and provides familiarity with the computer.

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Our SNOOPER TROOPS™ detective series gives your child mysteries to solve. As a Snooper Trooper, your child will have to do some daring detective work, including crawling through dark houses and talking to mysterious agents.

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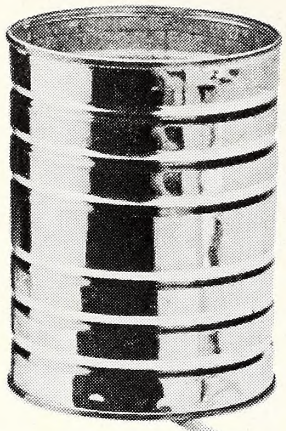
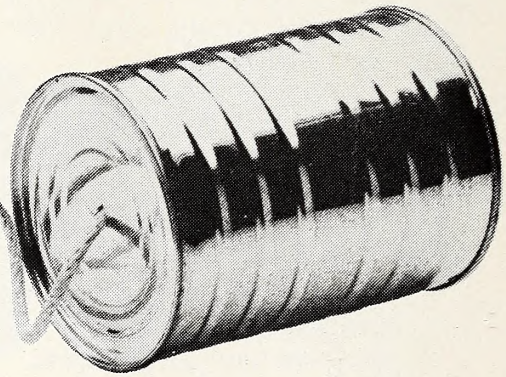


A communications package that's slightly easier to use than MICRO/Terminal.



But a lot less functional.

At MICROCOM we've made communicating with all kinds of computers easier and less expensive. Now, with MICRO/Terminal,™ users of Apple II,™ Apple III™ or IBM® Personal Computers can easily access any in-house or remote database. Directly, with a minimum of effort.

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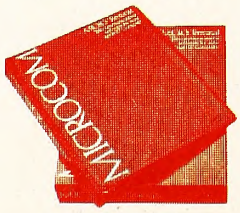

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players. Micro Lab, 2310 Skokie Valley Rd., Highland Park, IL 60035. $29.95. *1/81.*

The Eliminator. Anderson. Pit your hi-res space fighter against numerous adversaries. Plenty of action. Adventure Intl., Box 3435, Longwood, FL 32750. $29.95. *7/82.*

● **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.*

Falcons. Varsanyi, Ball. A hypnotically good shoot-'em-up with several levels of difficulty. Piccadilly, 89 Summit Ave., Summit, NJ 07901. $29.95. *10/81.*

Firebug. Warner. Sizzling action as you race through mazes eating gas cans, your fuse tail igniting the walls. Crackling good fun. Muse, 347 Charles St., Baltimore, MD 21201. $24.95. *8/82.*

Fly Wars. Trap fly fighters in your web, score with exploding cocoons. Beware the beetle and bug spray. Simple, addicting. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $29.95. *7/82.*

Gold Rush. Berlyn, Wilker. Transport the gold from the train through the forest to waiting hoppers, avoiding bears, Indians, bandits, and random troublemakers. Sentient, Box 4929, Aspen, CO 81612. $34.95. *6/82.*

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

High Orbit. Merret. Use lasers to lift modules into place to construct floating space station. Watch out—it's a crowded cosmos. Gebelli, 1771 Tribute Rd., Ste. A, Sacramento, CA 95815. $29.95.

Hungry Boy. Nakan. Eat-the-dots, big ones and little ones. Four ghosts chase you through a maze—when their colors change, you can chase them. Astar Intl., 5675 Francis Ave., Chino, CA 91710. $24.95.

Jawbreaker. Lubeck. Candy store-oriented eat-the-dots game with automatically escalated skill levels. A courtroom favorite. Sierra On-Line, 36575 Mudge Ranch Rd., Coarsegold, CA 93614. $29.95.

Labyrinth. Schram. Save your comrades amid *Crossfire*-style foes in a constantly shifting maze pattern. Challenging, excellent, lasting fun. Broderbund, 1938 4th St., San Rafael, CA 94901. $29.95. *6/82.*

Lemmings. Thompson. Round up mass-reproducing rodents, detaining nonbreeding pairs, before they migrate into the sea. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $29.95. *6/82.*

Marauder. Weigandt, Hammond. Double duty: bust through force field as a rocket, then switch to man in a maze. Nine mazes with fifteen levels of difficulty. Sierra On-Line, 36575 Mudge Ranch Rd., Coarsegold, CA 93614. $34.95.

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

Microwave. Zimmermann, Nitchals. Brightly colored, highly addictive maze game featuring continuous Looney Tunes musical accompaniment. Cavalier, Box 2032, Del Mar, CA 92014. $34.95. *5/82.*

Minotaur. Miller. Incorporates adventure elements and thirty-two four-level mazes. Surprises. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $34.95. *5/82.*

Mouskattack. Lay pipe through the maze, avoiding mice. Alas, cats and traps won't save you from Super Mouse. Sierra On-Line, 36575 Mudge Ranch Rd., Coarsegold, CA 93614. $34.95.

Nightmare Gallery. Aldrich, Clardy. High-moon shoot-'em-up. Fast action with ghosts, mummies, and menacing rows of tombstones. Synergistic, 830 N. Riverside Dr., Ste. 201, Renton, WA 98055. $34.95.

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.*

Phaser Fire. Salt City. Space shoot-'em-up. Defend vortex from swooping rockets and space junk. Gebelli, 1771 Tribute Rd., Ste. A, Sacramento, CA 95815. $29.95.

Pig Pen. TMQ. Latest wrinkle in drop-the-dots, featuring hi-res swine and instant hams. DataMost, 9748 Cozycroft Ave., Chatsworth, CA 91311. $29.95.

Pinball A2-PB1: Night Mission. Artwick. Fantastically realistic and competitive ten-mode pinball simulation, allowing user modification and definition of virtually every aspect of play. SubLogic, 713 Edgebrook Dr., Champaign, IL 61820. $29.95. *5/82.*

● **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.*

Quadrant 6112. Hold your space alone against a fleet of rebel invaders popping through two blue squares. Sensible, 6619 Perham Dr., W. Bloomfield, MI 48033. $34.95.

Raster Blaster. Budge. Pinball game as good as real ones. *Softalk* readers' Most Popular Program of 1981. BudgeCo, 428 Pala Ave., Piedmont, CA 94611. $29.95. *5/81.*

Rear Guard. Five-level rocket run over scrolling terrain. The twist: you dog the aliens, they don't dog you. Adventure Intl., Box 3435, Longwood, FL 32750. $29.95. *8/82.*

Ricochet. Abstract action strategy game, a combination of chess and snooker. Five variants and four skill levels. Epyx/Automated Simulations, 1043 Kiel Ct., Sunnyvale, CA 94086. $19.95.

Russki Duck. Knopp, Merrell. Recover stolen missile plans hidden in fake duck while dispatching enemy agents. Fairly easy. Gebelli, 1771 Tribute Rd., Ste. A, Sacramento, CA 95815. $34.95.

Sheila. Fitzgerald. Highly adventure-flavored, five-level, real time maze game with weapons, commands, and spells—acquired with increasing point totals. H.A.L. Labs, 4074 Midland Rd., Ste. 23, Riverside, CA 92505. $23. *7/82.*

Snack Attack. Illowsky. A three-maze eat-'em-up; starts at any of five speed levels. Nonfattening. DataMost, 9748 Cozycroft Ave., Chatsworth, CA 91311. $29.95. *1/82.*

Snake Byte. Arcade action featuring fruit and serpents. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $29.95.

The Snapper. Different. Eat the *blots* while the whirlers slowly consume the maze. Takes strategy and quick thinking on slippery speedways, avoiding the ever-tossing gamma sticks. Silicon Valley Systems, 1625 El Camino Real, Ste. 4, Belmont, CA 94002. $32.95.

● **Sneakers.** Turmell. Many-layered shoot-'em-up, one of the best. Stomping sneakers and swarm of other creatures add to the fun. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $29.95. *9/81.*

Star Blaster. Mines, fireballs, space tunnels, general obstructions and unfriendlies waylay your starship. Piccadilly, 89 Summit Ave., Summit, NJ 07901. $29.95. *8/82.*

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. The daddy of home-arcades. Still good hi-res, still a challenge. *Softalk* readers' 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 07950. $19.95.

Swashbuckler. Stephenson. Hi-res swordfighting with realistic pirates, snakes, rats, and other scum. DataMost, 9748 Cozycroft Ave., Chatsworth, CA 91311. $34.95. *8/82.*

Taxman. Fitzgerald. Very smooth, fast-moving eat-the-dots—all you expect from fruit to nuts. Keyboard control returns excellent expert-pleasing response; turn on a *Sheila*-sized dime. H.A.L. Labs, 4074 Midland Rd., Ste. 23, Riverside, CA 92505. $29.95.

Threshold. Schwader, Williams. Another shoot-'em-up. Hi-res graphics, animation, and accurate collisions. Targets include everything from flying maple trees to Volkswagen Bugs. Frustratingly small fuel supply. Sierra On-Line, 36575 Mudge Ranch Rd., Coarsegold, CA 93614. $39.95. *12/81.*

Tumble Bugs. Bishop. Very silly, enjoyably frustrating eating game with excellent graphics and animation. Magnifying glass enlarges where you are, blocks part around you. Datasoft, 19519 Business Center Dr., Northridge, CA 91324. $29.95. *5/82.*

Voyage of the Valkyrie. Black and white shoot-'em-up with strategy elements. Impressive Wagnerian score. Advanced Operating Systems, 450 St. John Rd., Michigan City, IN 46360. $29.95.

Zenith. Nasir. Similar to *Horizon V*; 3-D scrolling over planetoid. Build city while fighting off aliens. Gebelli, 1771 Tribute Rd., Ste. A, Sacramento, CA 95815. $34.95. *8/82.*

Home/Hobby

The Accountant. Forman. Double-entry finance system features seven integrated files and a set of automatic transactions. Decision Support, 1438 Ironwood Dr., McLean, VA 22101. $129.95. *1/82.*

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.

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 Mechanic. Kersey. Multiple utility disk with shape editor, custom typefonts, byte rewriter, and tricks to facilitate music, text, and hi-res generation. Beagle Bros, 4315 Sierra Vista, San Diego, CA 92103. $29.50.

Apple Spice. Kosak, Fox. Powerful Applesoft expansion utility using *&* and *usr* functions. Easily incorporated programming routines. Adventure Intl., Box 3435, Longwood, FL 32750. $29.95. *5/82.*

Audex. Collection of utilities to create, edit, and play back your own sounds for your own programs; 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 a raw track, sector editing, reformatting tracks, and repairing damaged disk catalogs. Quality Software, 6660 Reseda Blvd., Ste. 105, Reseda, CA 91335. $39.95.

Busywork. Basic programs and routines for developing new business programs. Used as a start up, add your own program codes as you go. Datum Consultants, 1641 State St., Box 238, DeKalb, IL 60115. $39.95.

Cashbook 2.0. Very friendly personal and small business single-entry accounting system. Zofarry Enterprises, 35 Northcote St., Haberfield, N.S.W., Australia. $149. *5/82.*

FASTALK

Ceemac. Boering. Visual composition language. Compose-execute-compose swapping by single key commands. Interpreter released as *Fire Organ.* Vagabondo Enterprises, 1300 E. Algonquin, Ste. 36, Schaumburg, IL 60195. $75.

C.O.R.P. Program generator. Answer questions in English to design Basic programs that run without *C.O.R.P.* Dynatech, 7847 Caldwell Ave., Niles, IL 60648. $250.

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

Datafax. Database utilizing unstructured keyword classification system for categorizing and cross-referencing by any method. No programming required; hard disk compatible. Link Systems, 1640 19th St., Santa Monica, CA 90404. $199.

Disk Recovery. Utility to recover disk files. Deletes files and rewrites sectors if you can't patch by hand. Sensible, 6619 Perham Dr., W. Bloomfield, MI 48033. $30.

DOS Boss. Kersey. Utility to change, shorten 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 tool kit. Edit, assemble machine language programs; write, edit Basic programs. Simplifies graphics, includes character generator. Apple, 10260 Bandley Dr., Cupertino, CA 95014. $75. *10/81.*

Electric Duet. Lutus. Two-voice music without hardware. A bit involved, but superb sound quality. Insoft, 10175 S.W. Barbur Blvd., Ste. 202-B, Portland, OR 97219. $29.95. *7/12.*

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, 36575 Mudge Ranch Rd., Coarsegold, CA 93614. $99.95. *9/81.*

Fast DOS. Triples access speed; compatible with all DOS-Applesoft programs that access DOS through standard hooks. Wytand P/L, 60 Gollan Ave., Dundas, 2117, Australia. $29.

File Whiz. Goss. Quickly learned database management program with six command modes. Files generated are accessible from Basic programs. Fast, easy, and convenient for home use and users. SoftHouse, Box 6383, Rochester, MN 55903. $79. *12/81.*

Financial Management System II. Home finance management; maintains multiple accounts, generates complete audit reports, and stores unlimited files. Computerized Management Systems, 1039-S Cadiz Dr., Simi, CA 93065. $64.95. *5/81.*

Home Accountant. Schoenburg. Thorough and powerful home finance program. Monitors five checking accounts against a common budget, plus credit cards and cash; one-step record of transfer of funds. Continental, 16724 Hawthorne Blvd., Lawndale, CA 90260. $74.95. *4/82.*

The Inspector. Sefton. Fast, flexible utility for examination of disk sectors, directory, and track-sector lists. Salvage blown disks, change data, delete DOS. Omega, 222 S. Riverside Plaza, Chicago, IL 60606. $49.95. *11/81.*

The Last One. The first code generator. Creates Basic programs with plain English commands. Eliminates debugging and program coding. Southwest Microcomputer Systems, 16885 W. Bernardo Dr., Ste. 220, San Diego, CA 92127. $600.

LISA 2.5. Hyde. Long-time popular assembler with extended mnemonics and more than thirty opcodes. Sierra On-Line, 36575 Mudge Ranch Rd., Coarsegold, CA 93614. $79.95.

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

Menu Generator. Compiles inputs and writes menu programs in Basic. Involves filing in several forms on screen. Excellent documentation. Crane Software, 16835 Algonquin, Ste. 611, Huntington Beach, CA 92649. $39.95. *1/82.*

Multi-Disk Catalog III. Very fast machine language database program for reading and storing file names, types, and sizes. Fast, powerful sort-and-search feature. Sensible, 6619 Perham Dr., W. Bloomfield, MI 48033. $25. *10/81.*

Personal Finance Manager. Gold, Software Dimensions. Handles up to 200 entries a month from maximum of 14 separate accounts. Search-sort-edit routine. Apple/Special Delivery, 10260 Bandley Dr., Cupertino, CA 95014. $75. *11/81.*

Personal Finance Master. Personal and small business financial system; covers all types of accounts. Spectrum, 142 Carlow, Box 2084, Sunnyvale, CA 94087. $74.95.

● **Program Line Editor.** Program development and modification program with more than eleven editing commands, listing control, lower case, and programmable cursor control. Synergistic, 830 N. Riverside Dr., Ste. 201, Renton, WA 98055. $40.

Program Writer/Reporter. Database code generator that does standalone program writing. Interactive between files and fields within programs. Vital Information, 7899 Mastin Dr., Overland Park, KS 66204. $200.

Psort. Long. Pascal utility for programmers permitting (slow) alphabetic sorting and merging of files. Source codes can be recompiled and usually must be for program to run. Apple/Special Delivery, 10260 Bandley Dr., Cupertino, CA 95014. $85. *5/82.*

Real Estate Analyzer. Make buy and sell decisions, compare investments, project future sales year-to-year for ten years. File, retrieve, and alter information itemized in tabular form. Howard Software, 8008 Girard Ave., Ste. 310, La Jolla, CA 92037. $195.

Soft-Step. Applesoft Basic interactive debugger. Steps through programs, breaks at any point; trace and list functions are improvements over originals. Accent, 3750 Wright Pl., Palo Alto, CA 94306. $49.95. *8/82.*

● **Super Disk Copy III.** Hartley. Easy-to-use menu-driven software library utility; transfers all types of DOS files. Sensible, 6619 Perham Dr., W. Bloomfield, MI 48033. $30. *10/81.*

Statistics with Daisy. Statistics analyzer for business, science, and social use. Hypothesis testing, correlations, multiple regression, and variance analysis. Rainbow, 19517 Business Center Dr., Northridge, CA 91324. $79.95.

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

The Tool. Code generator. Programs generated will address up to 80 megabytes (four hard disks). Has customizing features; good productivity tool for programmers. High Technology, Box 14665, Oklahoma City, OK 73113. $395.

Turbocharger. Gustafsson. Simple disk utility that cuts access time in half, shortens DOS codes, and copies disks fast. Silicon Valley Systems, 1625 El Camino Real, Ste. 4, Belmont, CA 94002. $29.95. *8/82.*

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

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

VisiDex. Jennings. Electronic index and file-agenda program for spontaneous or structured information entry. VisiCorp, 2895 Zanker Rd., San Jose, CA 95134. $199.95.

World's Greatest Blackjack Program. Irwin, Cooper, Humble. Teaches basic strategy card-counting technique for advantage over house. Play mode takes up to six hands. Apple/Special Delivery, 10260 Bandley Dr., Cupertino, CA 95014. $50. *11/82.*

Strategy

AirSim-1. Machine language flight simulator in 3-D with six landing fields and optional instrument flying mode. Mind Systems, Box 506, Northampton, MA 01061. $40.

Castle Wolfenstein. Warner. First game to fuse successfully best elements of home-arcade and adventure. Escape from Nazi stronghold, finding and taking secret plans. Room layout changes with each new game. Enemy speaks, in German. Muse, 330 N. Charles St., Baltimore, MD 21201. $29.95. *10/81.*

Computer Baseball. Merro, Avery. Remarkable programming feat, simulating individual player abilities from the teams of thirteen famous World Series. Can enter and play teams of your own creation. Strategic Simulations, 465 Fairchild Dr., Ste. 108, Mountain View, CA 94043. $39.95. *9/81.*

Dnieper River Line. Replay of tactical W.W. II battle; Germany repels Russian thrust. Fifteen types of units, on-map and off-map artillery support, and 3-D map included. Avalon Hill, 517 Harford Rd., Baltimore, MD 21214. $30.

● **Flight Simulator.** Artwick. Utilizes aerodynamic equations and airfoil characteristics for realistic simulation of take-off, flight, and landing. SubLogic, 713 Edgebrook Dr., Champaign, IL 61820. $33.50.

Galactic Gladiators. Reamy. Easy and enjoyable tactical simulation. Suit up and arm your fighters for ten different scenarios. High speed for a strategy game. Strategic Simulations, 465 Fairchild Dr., Ste. 108, Mountain View, CA 94043. $39.95.

Gin Rummy. Carpet. Play against computer. Hi-res cards can change position in hand; your entire hand visible. Space bar allows you to change your mind when discarding. DataMost, 9748 Cozycroft Ave., Chatsworth, CA 91311. $29.95. *6/82.*

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

Hi-Res Cribbage. Schwader. One-peg type; discarding to crib and playing to peg. Spiral board, skunking, automatic counting. Solid, challenging game. Sierra On-Line, 36575 Mudge Ranch Rd., Coarsegold, CA 93614. $24.95. *4/81.*

Hi-Res Football. Sullivan, Williams. Make play decisions in coach and quarterback positions. Players and field in hi-res animated graphics. Sierra On-Line, 36575 Mudge Ranch Rd., Coarsegold, CA 93614. $39.95.

● **Microgammon II.** Competition program for learning, practice, and improvement of backgammon skills. Tournament play. Softape, 10432 Burbank Blvd., North Hollywood, CA 91601. $19.95. *2/81.*

Pursuit of the Graf Spee. The 1939 engagements of the German pocket battleship off South America. Visibility and sighting system; separate ranges for

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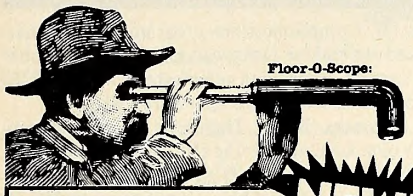

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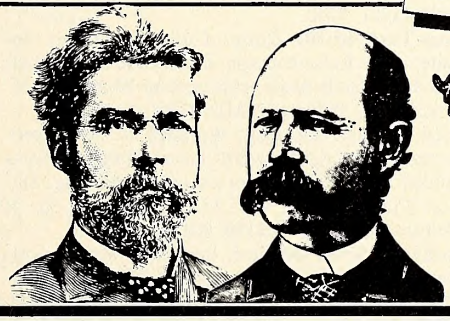

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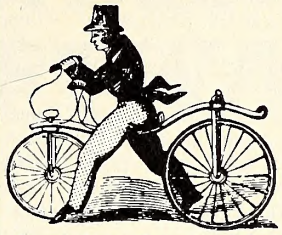

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FASTALK

each gun turret. Strategic Simulations, 465 Fairchild Dr., Ste. 108, Mountain View, CA 94043. $59.95.

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, 330 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.

Super Stellar Trek. Tight, real-time action in the final frontier—USS *Enterprise* versus relentless Klingons. Five levels of difficulty plus tournament. Popular gamer's delight. Rainbow, 19517 Business Center Dr., Northridge, CA 91324. $39.95.

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.*

Word Processing

Apple Writer. The most popular word processing program in town. Type, erase, move words around, save and insert segments from disk, and print out. Easy to use. Apple, 10260 Bandley Dr., Cupertino, CA 95014. $75.

Apple Writer II. Lutus, Finstead. Written in word-processing language. Additional editing features and functions menu; continuing features and functions menu; continuous readout of character count and length. Apple/Special Delivery, 10260 Bandley Dr., Cupertino, CA 95014. $150.

Apple Writer Extended Features. Malachowski, Cooper. Enables production of multiple copies of *Apple Writer* files and insertion of variables; converts Applesoft programs to *Apple Writer* and vice versa. Brillig Systems, 10270 Fern Pool Ct., Burke, VA 22015. $34.95. *7/81.*

EasyWriter. Word processor; choose 40 or 80 column version. Information Unlimited, 281 Arlington Ave., Berkeley, CA 94707. $99.95.

Executive Secretary. Editing, printing, and form letters, plus mail merge and electronic mail system. SofSys, 4306 Upton Ave. S., Minneapolis, MN 55410. $250.

Format II. Word processor with logic-sorting mailing list. Justifies type, wraps text; has one-key editing, menu prompting. Kensington Microware, 300 E. 54th St., Ste. 3L, New York, NY 10022. $375.

Goodspell. Dictionary companion disk to *Apple Writer* with 14,000 words. Flags words not listed when printing out. Apple/Special Delivery, 10260 Bandley Dr., Cupertino, CA 95014. $60.

Gutenberg. User-definable character set, split-screen hi-res and lo-res text editing for text, program files. Performs text block moves and deletes; paint program produces large illustrations integrated with text. Micromation, 1 Yorkdale Rd., Ste. 406, Toronto, Ont., Canada M6A3A1. $315.

Letter Perfect. Format-flexible word processor with ability to send control codes within body of program. Works with database files from *Data Perfect.* LJK, Box 10827, St. Louis, MO 63129. $149.95.

Magic Window. Word processing program simulates standard typewriter, 80-column text scrolls across 40-column screen. Three modes of disk file storage. Softape, 10432 Burbank Blvd., North Hollywood, CA 91601. $99.95.

Magic Words. Proofreads files of word processors that use standard DOS and no character-encryption techniques for saving files. 14,000-word dictionary. Artsci, 10432 Burbank Blvd., North Hollywood, CA 91601. $69.95.

MailMerge. Overlay companion to *WordStar.* Add files at print time, sort items, specify variables. Command-driven. MicroPro, 33 San Pablo Ave., San Rafael, CA 94903. $150.

Perfect Speller. In-context spelling checker that integrates with *Perfect Writer.* Processes 4,000 wpm; has 50,000-word dictionary. Perfect Software, 1400 Shattuck Ave., Berkeley, CA 94709. $189.

Perfect Writer. Powerful, easy-to-use word processor. Advanced document design features undents, subheads, footnotes, quotations. Requires Z-80 card and 80-column board. Perfect Software, 1400 Shattuck Ave., Berkeley, CA 94709. $389.

Personal Secretary. At-home version of *Executive Secretary* minus electronic mail and alphabetical indexing. SofSys, 4306 Upton Ave. S., Minneapolis, MN 55410. $75.

PIE Writer. Business processor that allows 9,999 pages. With word deletion, auto indent, spooling, and typeahead buffer. Hayden, 50 Essex St., Rochelle Park, NJ 07662. $149.95.

PowerText. Does memos, letters, reports, and manuscripts without formatting each time. Good balance of automatic and user-defined functions. Beaman Porter, Pleasant Ridge Rd., Harrison, NY 10528. $199.

ScreenWriter II. Kidwell, Schmoyer. Formerly *SuperScribe II.* No extra hardware for lower case, 70-column display, printer spooling. Edits Basic, text, and binary files; complete search and replace. Sierra On-Line, 36575 Mudge Ranch Rd., Coarsegold, CA 93614. $129.95.

Sensible Speller. Spell-checking program sports listable 85,000 words, extensible up to 110,000 words. Recognizes contractions, gives file word counts, incidence of a single word, and number of unique words. High marks for clear, logically organized documentation and simplicity of operation. Sensible, 6619 Perham Dr., W. Bloomfield, MI 48033. $75. *1/82.*

Super-Text 40/56/70. Zaron. Get 40, 56, or 70 columns without hardware. Design your own character sets. Basics of text editing. Character-oriented, floating-cursor edit with add, change, print, and preview modes. Muse, 347 N. Charles St., Baltimore, MD 21201. $150.

Super-Text 40/80. Zaron. Latest *Super-Text* update; letter documentation, footers and headers, expandable math mode, split screen. Muse, 347 N. Charles St., Baltimore, MD 21201. $175.

Word Handler. Elekman. Wonderfully simple program with straightforward documentation. Allows folded paper printout for two-sided printing. Silicon Valley Systems, 1625 El Camino Real, Ste. 4, Belmont, CA 94002. $199. *10/81.*

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

Write On II. Speicher. A simple, 32K line-oriented program with separate print formatter and editor. DataMost, 9748 Cozycroft Ave., Chatsworth, CA 91311. $129.95.

Zardax. Philips. Highly recommended. Single program includes all standard word processing features with considerable extras including communication by modem. 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. *5/82.*

Apple III

Access III. Communications program for time sharing and standalone tasks; accesses remote information services, minis, and mainframes. Apple, 10260 Bandley Dr., Cupertino, CA 95014. $150.

Apple Business Basic. High-level structured programming language for the III. Apple, 10260 Bandley Dr., Cupertino, CA 95014. $125.

Apple III Business Graphics. Converts numerical information into charts and graphs; only graphics program to take advantage of the III's capabilities. Apple, 10260 Bandley Dr., Cupertino, CA 95014. $175.

Apple Writer III. Lutus. Uses WPL (word processing language) to automate the process of text manipulation and document creation. Adjusts print format during printing, translates from typewriter shorthand to English or other language and back again. Apple, 10260 Bandley Dr., Cupertino, CA 95014. $225.

Data Reporter. Flexible database management system. Does form letters, patient files, labels, calculations, inventories, and employment records. Synergistic, 830 N. Riverside Dr., Ste. 201, Renton, WA 98055. $220.

EASy. Executive accounting system with accounts receivable, accounts payable, and general ledger. Denver Software, 14100 E. Jewell Ave., Ste. 15, Aurora, CO 80012. $749.95.

Hardisk Accounting System. General ledger, accounts receivable, and accounts payable each handle up to 9,999 customers or accounts; inventory features five methods of evaluation. Also payroll, fixed-asset management, and mailing labels. Great Plains Software, 123 N. 15th St., Fargo, ND 58102. $395 to $595 per module.

Mail List Manager. Generates, stores, sorts, edits, and prints database files. Apple, 10260 Bandley Dr., Cupertino, CA 95014. $150.

Pascal. Program preparer with editor, compiler, disassembler, linker, filer, and system library. Features cursor control, text modeling, and formatting. Apple, 10260 Bandley Dr., Cupertino, CA 95014. $250.

Personal Filing System. Page. Form-oriented information management system allows storage and retrieval of up to 32,000 entries. Software Publishing, 1901 Landings Dr., Mountain View, CA 94043. $145.

PFS: Report. Page. Generates reports; performs functions that require sorting, calculating, and manipulating data filed with *PFS.* Software Publishing, 1901 Landings Dr., Mountain View, CA 94043. $175.

Program Writer/Reporter. Basic database code generator that creates interactive, standalone programs. Vital Information, 7899 Mastin Dr., Overland Park, KS 66204. $200.

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, 15985 Greenwood Rd., Monte Sereno, CA 95030. $495.

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

Word Juggler. Gill. Word processor makes use of upper and lower case keyboard, 80-column display, and expanded memory. Printout can be reviewed on screen prior to printing; multiple copies printed of selected pages. Quark Engineering, 1433 Williams, Ste. 1102, Denver, CO 80218. $295.

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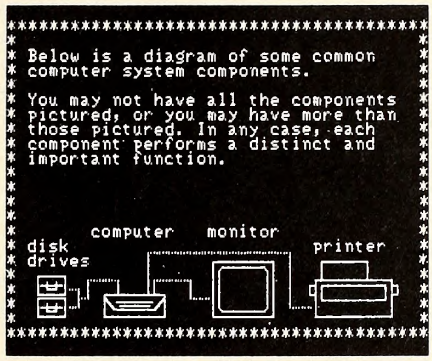

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OPEN DISCUSSION

Something To Kro About

In response to Edward Badasov (August Open Discussion), you were not the only one hooked by that enticing article about *RobotWar* in the January 1981 *Softalk*. Much like you, once my "Old Kro" could consistently beat Mover and Bottom, I felt the excitement of *RobotWar* begin to fade away.

Fortunately, I was able to promote a *RobotWar* tournament, thanks to the monumental efforts of Fay Popejoy, and the compassion of Ren Colantoni, owner of Computerama in Burbank, California. Only eight people responded, but the fun we experienced during those seven hours of competition has sustained our interest in *RobotWar* to where our number has increased to fifteen. Plus, we have sponsored two more tournaments on our own. We are now discussing plans to establish a formal *RobotWar* club. (See the article in the July issue of *Softline*.)

Realizing that competition is what *RobotWar* is all about. I am personally sponsoring a postal *RobotWar* tournament in October 1982. Entry fee will be four dollars, which will provide prizes and cover handling charges. First prize will be a box of ten 3M disks. All five finalists will receive *RobotWar* T-shirts. All participants will receive copies of the elimination charts which will show scores of all robots at each step of the tournament. Best of all, everyone will have a copy of the winning robot (object code) transferred to their disk, so you may observe its moves on your own battlefield. We have exchanged robots at all of our club tournaments and I believe it contributes much toward keeping the challenge of *RobotWar* alive.

If you are interested, send for a copy of the tournament rules and mailing instructions. Please enclose a self-addressed stamped envelope. By the way, Edward, I don't believe that the robot your friend has, which goes to the corner and shoots at everything it sees, would survive an encounter with "Old Kro."

Frank Krogh, Box 5337,
North Hollywood, CA 91616

Cancel My Obituary

On page 149 of the July issue of *Softalk* is the following statement: "A.I.'s new commitment to hi-res graphic adventuring sounds the death knell for pure text adventure games. The mighty tide of the consumer market has so dictated, and A.I. has been perceptive enough to try to ride the crest of the wave."

This statement is wholly unwarranted. It would appear, in fact, that the mighty tide of the consumer market is demanding at least as many text adventures as hi-res adventures. In the Adventure 5 section of "Softalk Presents The Bestsellers" in the same issue, numbers one, four, and five were *Deadline, Zork I,* and *Zork II,* respectively, all from Infocom. All three are purely text adventures. It is clear that text adventures are not yet dead. Indeed they will never die, for they have many inherent advantages over graphic adventures.

The first of these advantages is the amount of detail a text game can give you in relation to graphic adventures. Our language is full of wonderfully descriptive words, all of which are available to the maker of the text game to describe any kind of scene he wishes.

A second advantage of text adventures is how well the adventure can narrate action. In order for a graphic adventure to do this, animation of some sort must be used. Yet what current animation technique could possibly relate the melting of the glacier or the actions of the Princess in *Zork II* with the same detail that game gives it? The simple answer is that there aren't any. Furthermore, how well action is described is important in making the adventure fun to play, for it is action that relates to you the results of your handiwork. Taking away action takes a lot away from adventures, and it is just this that hi-res adventures are doing.

There is one other advantage that text has over graphics: It leaves more to the imagination. Looking at simple hi-res pictures (current microcomputers are incapable of anything but simple drawings) doesn't allow your imagination to go very far, and this limits the picture of the adventure you have in your mind. Text, while giving more detail than is possible with graphics, still allows room for your imagination to fill in all that isn't described. To me, this is the most important advantage of text over graphics. Since those who play adventures are likely to have active imaginations, it is important to allow them to be used.

In sum, text adventures are not dead. The simpler formats may be dead, but the more complex adventures by Infocom are only at a beginning. As more people come to realize the increased gaming value text games like these can give, they will buy them.

Steve Golowich, Amherst, MA

Promethean Support

Recently I went to a sale at my local computer store. Since I was in the market for a Prometheus Versacard and a Hayes Smartmodem, and since they were on sale for about 10 percent off list, I decided to buy locally rather than mail order.

When I got home and read the Versacard manual I discovered that this version (1.2) did not handle interrupts. I called the number in the manual and found that the Versacard I bought, although never used, is a couple years old and they are now up to version 1.41.

Now for the good part. They agreed to update my Versacard to the current version at no charge. They also agreed to make up a cable for me to connect the Versacard to the Smartmodem for ten dollars less than the price quoted by my local computer store. I shipped my Versacard to them by UPS, and in less than one week I had back not my updated card but a brand-new Versacard. The card works perfectly and is a real bargain at their recently announced reduced list price. Prometheus is to be commended for backing their product 110 percent.
C. V. Fields, Sacramento, CA

Reviving an Old Technique
As a computer novice I rely heavily on my user manuals. *PFS* has the most understandable manual I have encountered. It contains pictures, examples, and caveats written in nontechnical lingo. On the other hand, I find that *Magic Window/Basic Mailer* does not have pictures or many examples and is very technical for me. In fairness to Artsci and Mr. Bill Smith, I want to say that they are extremely helpful each time I find it necessary to telephone.

It was once said that years ago, when about ready to release a new kit, Heathkit Company would select at random a nonelectronic-type employee, of average intelligence. The employee would be given the kit and instruction manual, and asked to assemble the kit and make notes at any point that was unclear or required an assumption. Once the problems encountered were corrected, the company felt the package was ready for the average user. This old technique might be very helpful to some software houses today.
Terry Battelle, Newport Beach, CA

Justice Is Served
As a small businessman (law firm of four), I have found *Super Checkbook III* by Powersoft, Inc., to so adequately meet our needs that I felt its benefits should be worthy of consideration by others. The program provides a comprehensive checkbook register, easy sorting of and searching for checks by month or year to date, by category (secretary, deposition costs, and so forth), and by payee (court reporter, landlord, and so on). Although only of nominal assistance to us, the program quickly graphs categories of expenses in bar graph form. The program is easy to use, and our secretaries experienced no difficulty mastering the instructions. Data errors are easily correctable. I recommend this program's use by individuals and small businesses. On a final note, I might add that Powersoft has been extremely helpful and cheerful in answering our questions both times we phoned, and such strong support is another reason to consider Powersoft products.
Ted H. Gordon, San Rafael, CA

A Lucky Break
Several months ago, after reviewing the available literature and coming up with naught, I got lucky and found a database system, called *TDM*, in a local store. It supports computational manipulations of dates. For example, it can do 12/12/82 + 10 days = 12/22/82. It is easy to use by untrained clerks. *TDM* is menu driven and even has a command that memorizes menus for future recalls. It features computer overwrite data in the database during report generation. The program can also combine databases, and sort to at least five levels.

After using the system in several applications on the Apple II and III computers, I am still surprised *Softalk* has yet to review this system. It is still the only system that I am aware of that can be used for multiproject resource-constrained scheduling and reporting applications where due dates need to be generated. I believe you could do your readers a service by reviewing this system and save them from the frustration that I went through just to find it. *TDM* was developed by Pascal Systems of Menlo Park, California. Oh, did I forget to tell you that *TDM* means *The Data Machine*? It's certainly not the worst acronym around.
Stephen J. Smith, Stanford, CA

Not-So-Fine Print
As a principal of Brielle Computer Inc., an authorized Apple dealer, we are dedicated to providing extensive customer support to assure total satisfaction, whether it be hardware, software, or service. We have received recent customer inquiries about the Target *PlannerCalc*, priced at fifty dollars, that is being extensively advertised by Comshare Target Software of Atlanta, Georgia. At the recent Comdex show in Atlantic City, New Jersey, we even discussed this program with a Target representative. He assured us that there was a version written specifically for the Apple II Plus. We ordered a copy for our store, and upon trying to run it we were surprised to find that buried on page five of the manual was a reference that a CP/M operating system was required. We then telephoned Comshare Target Software to verify that this program represented as for an Apple II Plus did in fact require CP/M. The Target representative advised us that they would call us back with the information. Five hours later, having received no call, we again called Target. This time we were advised that the Target *PlannerCalc* was designed for use on an Apple II Plus that had a 64K memory, a CP/M operating system, and an eighty-column display.

A review of the *PlannerCalc* package and the literature sent with it contain no indication of any equipment modifications that are required in order to use the software. This type of misrepresentation is a disservice to the customers that we try to support.
David Palmer, Sea Girt, NJ

Always Darkest before the Dawn
I bought my Apple III from the Computer Lines store in Bozeman, Montana, because at that time they didn't sell any other machines, and they provided service under an extended warranty. The salesman convinced me that I should get the III rather than the II since the cost of transforming the latter into an adequate word processor amounted to more than the III

ANNOUNCES

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would cost. I was also told that all Apple II programs would work on the III in emulation mode, so I laid out $4,400 for the computer, Amdex monitor, Silentype printer, blank disks, rolls of paper, and the *Apple Writer III* word processing package which, I was told, was identical to *WordStar.*

My six week affair has been, as many affairs are, stormy. I found that *Apple Writer III* possesses fewer features than *WordStar* (hardly identical); we had to purchase *Apple Business Basic* to begin programming; and there is a dreadful paucity of software for the III, and where it exists, it is clearly out of our price range. All this, plus a particularly gruesome story of how, when I needed a past-deadline article printed letter quality, there was no printer within a hundred miles to do the job, sums up the darker picture.

On the bright side, my seventeen-year-old son has learned from scratch how to make graphics (in the II emulation mode—the mysteries of Apple III graphics continue to elude us); my daughter pokes around on it with a combination of grimness and delight; and my wife finds the ease of the *Apple Writer III* enjoyable while lamenting the fact that there are no page breaks on the program.

Since we have had such little assistance from our local dealer (I was so meagerly instructed in the ways of computer usage that I inadvertently erased the SOS.Kernel from the backup disk for the *Apple Writer*), can you recommend any helpful user groups or good reference sources for the Apple III?
Michael Sexson, Bozeman, MT

In addition to The Apple Three Newsletter *from MediaWorks (see Marketalk News in this issue), a good resource is the Original Apple IIIers user group which publishes a newsletter called* The Open Apple Gazette *(Box 813, San Francisco, CA 94101). Also, Apple Computer publishes* Apple III Dimensions, *which you can have free of charge by sending your Apple III serial number or warranty card to 10260 Bandley Drive, Mail Stop 3-E, Cupertino, CA 95014. As for the page breaks, just insert* .ff *on a separate line anywhere in the text. It commands a page break when the text is printed. A more sophisticated command is* .ffx *where* x *is a number. This commands the printer to make a page break if fewer than* x *lines remain on the page.*

Beyond Compare

I look forward to your magazine each month above almost all others because of your coverage of the superior Apple III. In fact, I am letting several magazine subscriptions expire as their editors do not see fit to cover the Apple III.

After an exhaustive comparison between the IBM pc and the Apple III, I chose the Apple III. It turned out the IBM pc needed sixteen slots to begin to compare with the III! Since the IBM pc comes with only five slots, the best thing I could discover about it was its name! But it appears a name is all that is needed, as the IBM pc winds up costing two thousand dollars more than the III.

The graphics are better on the Apple III, as it has sixteen colors available in color high-resolution compared to only four with the IBM pc (see *Creative Computing,* December 1981, page 37). Even the keyboard of the Apple III is far superior to that of the IBM pc. It is software definable at any time, and is arranged in a strictly traditional typewriter layout. The IBM pc has both shift keys out of place, and the return key is too far away. Want to change the keyboard layout to the Dvorak American Simplified? Just load a file supplied by Apple.

The bench-mark test in *Byte,* January 1982, page 54, shows the IBM pc to be 20 percent faster than the Apple II on the average. The Apple III runs 40 percent faster than the Apple II on the average, which means it runs 20 percent faster than the IBM pc on the average! *)Print fre 197618.* Try that on an IBM and you get only 61,404 or 64K at most, even with 256K. And SOS, with its powerful drivers, user friendliness, and management of memory and I/O, is so far superior to CP/M or IBM's copy of CP/M that it is laughable. There are no commands to learn with SOS! The Apple III is also the first RAM-based machine, meaning everything is software definable. If you want to update a language or operating system, just load in a different disk.

The design that went into the III takes it about five years beyond IBM's copy of older systems. It is just too bad the III got off to a poor start, but Apple rebuilt it to be even more reliable than the Apple II. The fact that the Apple IV will have a 6502B for I/O processing that can also emulate the Apple III should contribute a lot to the growth of the III. Do yourself a favor and check out the born-again Apple III!
Kevin Everett FitzMaurice, Omaha, NE

One Man's Insult, Another Man's Tool

In the April *Softalk* I read the glowing report on *The Home Accountant* by Craig Stinson. I was very pleased with his report and comparisons on the various accounting programs. Based on that report, I bought *The Home Accountant.* Was I disappointed and angry that I had blown seventy-five dollars. Norman Wood stated it very well in his letter in July Open Discussion.

I was unable to accomplish the abort on printout and was obliged to waste paper watching a useless printout. Also, there was no choice of printout to hard copy or screen copy. To review a previous month's check listing, the readout only provides a reconciled balance rather than a running balance. Another feature that is nice but aggravating is the auto entries, fouling up the attempt at continuous reconciliation by making the entries at the first of the month, whereas the bank makes an automatic withdrawal twice a month. The graph feature is great for the screen, but has no capability for a hard copy printout. The crowning insult came at the back of the manual with the warranty card and request for ten dollars for a backup disk.
Paul Beam, Palmdale, CA

In July Open Discussion, Norman Wood made

a few comments about *The Home Accountant*, which he purchased as a replacement to *The Personal Finance Manager*. I did the same thing but was not as disappointed. Mr. Wood did not find a convenient way to delete entries, but after a good look through the manual one would find that it is extremely easy to delete. His comments led me to believe that he had not properly learned how to use the program. As to his statement that *The Personal Finance Manager* is error-free and friendly, my father had his books spanning a year destroyed because of a bug in this program. I am fourteen years old and have no problem at all operating *The Home Accountant*, therefore I think it should present no great problem for anyone else.
Rocci Cirone, San Jose, CA

Thrice Wise

I recently have gone through the pangs associated with creating a home financial system. The net result is I have had to enter my data thrice—twice in one system and once in another. My wife and I have learned a lot during this encounter of a third kind and I wish to share my experience.

I worked with *Home Accountant* by Continental Software and *The Accountant* by Decision Support Software. Both packages include very good documentation. The major difference is in completeness and understanding of the user's point of view. *The Accountant* includes a complete example both in the manual and on the disk. This allows the user to get a feel for the system. Furthermore, the manual takes you step by step through a demonstration of the accounting package capabilities, including making changes. This was extremely valuable to us and helped us avoid making a lot of mistakes in the development of our own system. It even suggests using or changing the accounts included for your own system. In general, *The Accountant* provides for easier learning.

There is a difference, I believe, in the type of user that would choose either of these packages. *Home Accountant* is a closed or fixed package, whereas *The Accountant* is more flexible or open. *Home Accountant* allows the creation of a budget, prints checks, and has a variety of other excellent options, but it stops there. One cannot expand the applications beyond those clearly defined in the package. *The Accountant* is more flexible since it includes an interface program for transferring data to *VisiCalc*. This means one can create budget spreadsheets, tax sheets, specialized reporting formats, and use real accounting data in the analysis. In many ways the *The Accountant* grows with the user.

The two systems differ significantly in the number of allowable accounts, codes, and transactions. *Home Accountant* allows up to one hundred accounts, has a single code for taxable interest and a maximum of one thousand transactions per accounting period (usually one year). *The Accountant* allows for sixty-three accounts and sixty-three codes, plus it can handle two thousand to four thousand transactions. My wife and I have found sixty-three accounts more than adequate, and the ability to code across accounts, in more ways than one, a solid advantage. I have found coding transactions by taxable interest, deductible, business related, and so forth extremely useful. Finally, one thousand transactions comes too soon for us each year.

Both packages take several seconds to move from one menu option to another; however, if one is interested in printing something or searching through the transactions, *The Accountant* is considerably faster than *Home Accountant*.

Because *Home Accountant* includes more descriptive data on each transaction and does check writing, I thought it would be more usable. For me, it was not. Both packages keep good books, but *The Accountant* really shines in the analysis area given its *VisiCalc* connection. It depends on one's own needs.

The Accountant uses double-entry accounting, but was able to bypass accounting jargon while keeping double-entry integrity. I appreciate its ease of data entry, flexibility, speed, and focus on the essentials of good accounting and financial analysis needs.
Noel Berge, Alexandria, VA

An Author Reviews the Reviewers

I was pleased to see mention of *Micro-Golf* by Creative Computing in the article by David Hunter (July *Softalk*). As one of *Micro-Golf*'s authors, I was happy that Mr. Hunter found it a fun game. What I find difficult to understand is his criticism that the game is not educational due to the fact that there is no choice of clubs. Mr. Hunter may be familiar with miniature golf players who are in the habit of dragging a sack of clubs around but we are not. Comparing *Micro-Golf* to games modeled after the kind of golf played on fairways and greens is unfair. *Micro-Golf* may not be for the serious golfer, but it is a faithful simulation of miniature golf, and it has proven to be the type of computer game that people of all ages enjoy. Adults who fear the fast-paced action of shoot-'em-up style arcade games enjoy *Micro-Golf*, where they can take all the time they want to plan the forces and angles found in miniature golf. *Micro-Golf* contains a machine language subroutine that makes for realistic ball movement and even allows users to create and modify their own courses.

I can appreciate the job that reviewers face when trying to condense reviews of many packages into a single article. I would, however, suggest that your reviewers be more objective in the future. Present the attributes of a package and let your readers decide. If you feel that criticism is necessary, you should be willing to do a more thorough job than is possible in thumbnail reviews. You should also allow the authors of criticized software to respond in writing.

Doug Green, Binghamton, NY

Logo's Limits

I have been a student of Logo for over a year. This summer, I taught a five-week course for junior high school students. I am convinced that Logo is a medium for teaching and learning without peer among currently available alternatives. I have also designed and conducted many workshops for teachers in Logo for Active Learning Associates and, more recently, under the auspices of the Santa Clara, California, County Office of Education. I am well acquainted with the documentation and support provided by all three sources of Logo for the Apple II. I offer these credentials to support my opinion that the review in the July issue by Roe R. Adams III of the three versions of Logo for the Apple II was sufficiently misleading to demand some sort of erratum.

Mr. Adams's descriptions of Apple Logo and Krell Logo might well have been written by their respective promotion departments. There are no factual inaccuracies in these descriptions; neither is there any hint that there are any weaknesses to point out. I will mention a couple.

For most users, there are two important weaknesses of the Apple Logo package. One is the gap between the introductory manual and the reference manual. However, this gap is well filled in the book by Hal Abelson, *Apple Logo*, available from Byte Publications. The other is the fact that Apple Logo files do not allow a user to store pictures as do both other versions. You can do a dump of the graphics screen by crashing Logo, but you cannot use graphics files in the Apple Logo system.

Krell Logo offers a plethora of resources. Several items on the list of their extras, however, appear more substantial than they are. The two technical manuals, for example, are identical to the ones supplied with Terrapin Logo (one of which, not incidentally, is a slightly different version of the aforementioned book by Hal Abelson). The free one-year subscription is to a newsletter yet to be published by Krell, not to a monthly newsletter published by the Young Peoples' Logo Association.

Mr. Adams's description of Terrapin Logo, however, is actually quite misleading. The fact is that the Terrapin Logo package, of all three, offers the most comprehensive documentation and support for the novice to Logo. Of particular note is that its extensive tutorial manual covers not only turtle graphics but also list processing primitives and a host of useful tips about how to write simple programs in Logo. The utilities supplied by Terrapin are also particularly useful, such as the ones that allow the Logo editor to be used as an ordinary text editing system.

The bottom line is that any of these three packages is the best educational software available on a microcomputer today. If I had felt your readers would have come to this conclusion on the basis of Mr. Adams's review, I would not have bothered to write this letter.

David Greene, Pala Alto, CA

DOStalkin'

According to Mr. Kersey (June DOStalk), *D$ = CHR$(13) + CHR$(4)* will prevent problems caused by dangling semicolons in print statements. True. However, when writing to a sequential text file, the statement *print D$"close"* will cause an extra, null record to be written to the disk file. Depending on the application, this could be disastrous. When writing to a file, consider either not including a *CHR$(13)* in defining *D$*, or try *call 41750 : print D$*, which is equivalent to a DOS close statement for all open files (48K). The extra *print D$* makes DOS happy.

Jon Kreisler, Flushing, NY

Regarding the June DOStalk Mystery of the Month, I have tested the *call 42350* on both my Apple and a friend's, and it doesn't work as stated. It works on any disk that catalogs by the normal DOS command; but with the disks that don't catalog normally, it produces the "program too large" error. Could you provide any further information on this?

Joe Staten, Colorado Springs, CO

I would like to call your attention to a serious problem in the input commas routine in June DOStalk. Characters entered with this routine will not be the same as those entered using the normal Applesoft input. It is necessary to subtract 128 from the value obtained in the peek statement. Also, to work correctly, the 141 must

be changed to 13.

It is not necessary to run through the entire for-next loop for every input. Why not just look at the number of characters typed up to and including the return? Here is your suggestion, written as a subroutine, incorporating my changes:

```
10 CALL -657:IN$ = "": FOR Q = 512 TO
   767 : IN = PEEK (Q)-128 : IF IN = 13
   THEN Q = 767: GOTO 12
11 IN$ = IN$ + CHR$(IN)
12 NEXT : RETURN
```

The jump from the for-next loop and the "nameless" *next* increase the speed of the subroutine.
James DeMay, Jr., Riverdale, MD

In June DOStalk, there is a routine to input strings that contain delimiters. The explanation of this routine is correct, with an exception: since the call is a Monitor routine, all ASCII input will be shifted by 128. If any testing of the resulting input against normal Applesoft strings is needed within the program, the test will always be unsuccessful, even though the two strings appear to be equivalent. The solution to this problem is to replace line 65 in Mr. Kersey's example program with the following:

```
65 CALL-657:A$=" ":FOR X=512 TO
   767:P=PEEK(X):IF P<>141 THEN
   A$=A$+CHR$(P-128):NEXT X
```

The subtraction of 128 from P shifts the ASCII value back to its normal unshifted value.
Earle Kebbekus, Maplewood, NJ

Bert's Backtalk

To Jon Kreisler: Your point is well taken, although this would rarely cause a problem. Instead of *call 41750 : print D$* why not just use *print CHR$(4); "close"*?

To Joe Staten: In a program, if the catalog command has been changed to another word, *call 42350* should perform the catalog function where *catalog* will not. This requires normal DOS, of course. I have not tested *call 42350* extensively, so I can't guarantee its reliability in all situations.

To James DeMay: Yes, subtract 128, but have a look at the program sent in by Earle Kebbekus, which I think is better. Also, I agree, it is not necessary to run through the entire for-next loop, and I don't.

To Phillip Pocock (August Open Discussion): What you have encountered is a bug. *Key-Cat* looks at the eighth character on each line. If it is a space, *Key-Cat* assumes it is a file name. To fix this, avoid using a space in the eighth character position of your headings.
Bert Kersey, San Diego, CA

Stringing You Along

Dr. Shuerger's Apple occasionally sits there and does nothing while using *File Cabinet* probably because it is doing garbage collection. This happens in Applesoft Basic (which I believe *File Cabinet* is written in) when the space available for strings fills up. The Basic interpreter searches through the string space and deletes any no longer referred to by a string variable. This is the price you pay for being allowed variable-length strings.
Charles Wells, Cleveland Heights, OH

Answer from the Source

PIE lives. Hayden Software has just released *PIE Writer*, a considerably enhanced version of the *Apple PIE Text Editor and Formatter*. The product was transferred to Hayden after Programma did indeed falter into financial trouble, as reader Wells guessed.

Using the Epson's emphasized print mode with *PIE Writer* is simple: Just type the new *.bf* boldface command, which on the Epson uses the emphasized font.
Ron Lichty, Softwest, Sunnyvale, CA

Turning PIE into a Piece of Cake

To Norman Massey of Tucson, Arizona: Thank you for the letter in July *Softalk* asking me to explain the use of printer codes in *Apple PIE*.

When you are in the text editor of *Apple PIE*, type the following: Shift control-M (and be sure it is a capital M). Nothing will appear on the screen as with all control characters. Then type escape and you will see an upside down capital T on the screen. Then type whatever letter corresponds to the print mode you desire. For example, shift control-M escape-E will set the emphasized print mode; shift con-

trol-M escape-S will set the expanded print mode, and so on. The E or S must be a capital letter.

Take another look at your *Apple PIE* manual and look for the Quote function or shift control-M. *Apple PIE 2.0* and *PIE Writer 3.3* both allow the insertion of printer control codes by means of shift control-M. If you have *Apple PIE 1.0* you may not find it; I'm not sure.

I certainly would not be without *Apple PIE* (or *PIE Writer*) and the Epson printer combination. Also, the word processor is much enhanced with the Videoterm 80-column board, the Softswitch, and Enhancer II from Videx. I might add that I use the shell function of *Apple PIE* and create my own letterheads and store them on an automatic letter form. When I want to write a letter to *Softalk*, for example, I just load a shell; my letterhead and address are already done for me. I just change the date and start typing the body of the letter. The Epson printer does a beautiful job on the letterhead, as the editor of *Softalk* could tell you. Good luck!
Marlys Dannenberg, Phoenix, AZ

Short Work of a Short Routine

In response to the paragraphs on alignment appearing in April Open Discussion, I must say that the chap who wrote the short routine presented went out of his way and back again for the solution. I am in no way criticizing his efforts; it is obvious that a lot of thought went into figuring out this particular solution. The problem, however, is not nearly as complex as presented.

The following two lines can be easily incorporated into any Applesoft program and accessed via a *gosub* call. As presented below, the value to be formatted should be assigned to the variable *N* before entering the subroutine. The formatted value then comes out of the subroutine assigned to the string variable *PU$*. Of course, the user could change these to any variables he cares to choose. The first line handles negative values and places a trailing negative sign. If you prefer a leading negative sign, simply reverse *PU$* + "−" to "−" + *PU$*. Near the end of the second line the number 2 represents the number of decimal places to the right of the integer portion of the value, and the number 10 represents the desired length of the value.

Once again the user may choose any number of decimal places or length desired. It should be noted that the number of spaces between the quotes in the second line should be at least as large as the variable representing the length of the formatted value.

```
60000 IF N < 0 THEN N = ABS (N):
      GOSUB 61000: PU$ = PU$ + "−":
      RETURN
61000 PU$ = RIGHT$ ("     " + STR$ (INT
      (N + .005)) + "." + RIGHT$ ( STR$
      ( INT ((N + 100) * 100 + .5)),2),10):
      RETURN
```

To test the program use the following lines for input of a numeric value and display of its formatted output.

```
10 INPUT "ENTER A NUMBER ";N
20 GOSUB 60000
30 PRINT PU$
40 END
```

I hope that this routine is useful to your readers. I have found that it is a very convenient routine to have in my library.
Albert P. Pinto, Atlanta, GA

For those rubbing shoulders with the Rockefellers, this program can handle figures up to 9,999,899 (positive or negative). Also for inserting monetary amounts within text, try this.

```
61000 N$ = STR$ ( INT (N + .005)) + "." +
      RIGHT$ ( STR$ ( INT ((N + 100) * 100
      + .5)),2): RETURN
```

Knocked for a Loop

We have found what seems to be a small bug in Applesoft. In performing an iterative calculation within a for-next loop, our program was set to exit the loop whenever sufficient accuracy was obtained. After it did this a few times we got an out-of-memory error message. The problem, we discovered, is that the return address of the loop is saved in the stack, and breaking out without going through the *next* statement leaves it there. After about ten repetitions of this, the stack area is filled up. An easy way to avoid this problem is to set the index of the loop (I in the following example) to the upper limit of the loop and then goto the *next* statement.

```
Wrong:
200 FOR I = 1 TO UL
210 IF< condition > THEN 240
220 NEXT I
240 more program

Right:
190 TEMP = UL
200 FOR I = 1 TO UL
220 NEXT I
230 I = TEMP
240 more program
```

Note that the variable I is the loop index, UL is the upper limit of the loop, and TEMP is a temporary storage variable for the value of I.
Peter A. Lachenbruch and Steven Nelson, Iowa City, IA

Strictly Personnel

Can anyone recommend any software developed for use in a personnel agency? I have an Apple II Plus with two disk drives.
Patrick Darrell, Dallas, TX

Run, Turnkey, Run!

Help! I have a big problem concerning turnkey commercial software programs. I have an Apple II with an Indigo 16K RAM expansion card into which I load Applesoft by booting the system master disk. However, most turnkey commercial software programs require Applesoft in ROM and not in RAM. If I try to boot the software program disk after I have booted Applesoft into the RAM card, an error will result. I am in a sense rebooting a disk and erasing the Applesoft program in the RAM card. Since I have already spent money on the 16K RAM card and I do not wish to spend more on an Applesoft ROM card, my question is: Is there a way to run turnkey ROM Applesoft

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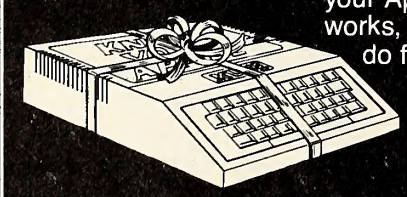

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programs on an Applesoft RAM expansion system without knowing the "innards" of the commercial software disk?
Tom Batson, Santa Rosa, CA

Watertight-Rope Walking?
The Omega Software Company, which distributes the *Locksmith* program, claims that their purpose in selling the program is not to have people pirate software, but only to back it up.

My only question is: why does Omega supply the parameters for copying programs that already supply backups or that have easily attainable backups? If a company supplies a backup and replacement copies free of charge, and Omega still distributes the parameters for such programs, one wonders whether Omega's rationale really holds water.
Geoffrey Ravnor, New York, NY

We established a policy of not providing parameters for programs that meet what we feel are certain minimum standards in the area of backups. We even sent letters to all the major software houses stating our policy and asking for comments. A few have answered, some positive, some negative; most have not answered at all. Most of the vendors were really interested in attempting to resolve the problem, while a few were simply more interested in finding fault with us than facing the real issue.

In order to abide by these standards, *Locksmith* is currently being sold with a backup disk included in the original package. Also provided with *Locksmith* is a manual supplement in which there is a statement of Omega's policy regarding backups and parameters. Incidentally, the rest of our software is sold unprotected.
David M. Alpert, president, Omega Microware, Chicago, IL

Omega's policy, as stated in the Locksmith *manual supplement, is an agreement not to publish "parms" for programs whose vendor provides replacement disks with the return of the original for five dollars or less within a short time after receipt; or, in the case of business and utility programs, if an archival disk is supplied in the original package.*

Back Up or Back Off
To Terry Bradley of Sirius, who says that the people who market nibble copiers are crooks, I say that they are providing a support to my rights as a purchaser and owner that Sirius and other companies that copy protect have thwarted. They do not mean to thwart it, but I am not obligated to respect their copy scheme either.

It boils down to this: The publishers have a property right and I am obligated to buy from them rather than steal. Once I have bought, then I have a right to use what I bought without it being a time bomb. This means backup. The publisher has a right to copy protect if he wants, but the purchaser has a right to know that one of his rights as an owner is excluded. Do you advertise on the package that your software is copy protected, Mr. Bradley? Finally, if soft-

ware is copy protected, I see no obligation binding me not to touch that protection scheme.

Right on to *Locksmith* and the nibble copiers. They open up a right that the publishers have foreclosed. I'm sorry that some people abuse these tools and use them to steal, but they also have a legitimate use, the opportunity for which Mr. Bradley, among others, creates. I'm not going to be morally outraged by *Locksmith.* I am obligated to Mr. Bradley's property rights, not to Mr. Bradley's intentions. I'll buy from Penguin and honor Mark Pelczarski's rights, and his request not to steal. I won't buy from Sirius unless I have to, and if I do have to buy from Sirius, my next purchase will be *Locksmith.*

Peter Fallon, Philadelphia, PA

Ivory Tower Power

Being an Apple owner and being in education, I want to state unequivocally that what our hobby needs most is more free public domain software—especially in the field of education. We in education are in the business of disseminating ideas, methods of thinking, algorithms, and so forth, which by their very nature cannot be copyrighted or possessed in any way. No one can own the Pythagorean theorem! No one can own our language, or our history, or our science. There is a contradiction in principle between public access to this knowledge and private ownership of the materials that communicate this knowledge. So, for example, when the order for textbooks is late arriving at the bookstore, we quite readily photocopy whole chapters for our students to use. And we copy these chapters in class-sized lots—by the dozens. I feel exactly the same about software.

Why do we in education make students buy books? Certainly they don't need the books to learn the material. The libraries, both school and public, have copies. And the teacher teaches. I have all the material in my head and I do my best to present it in class. All the students really have to do is pay attention. But they cannot take me home and pick my brain at their convenience. If they do, they will have to pay me a fee for tutoring. The content is free; the convenience is not. That's why they buy textbooks—so they can haul them around and peruse them when and if they wish. The same applies to software. The content simply cannot be protected. The convenience and ready access really is something worth selling. It is certainly worth what textbooks of comparable content are going for in the current market, but no more.

Yet, there is another issue involved: A few big textbook publishers have an unhealthy stranglehold on the education of our youth. One particular biology text, for example, is used in over half our country's school systems. And that text, in the last few years, has watered down its treatment of evolution to an innocuous few pages, seeking the lowest common denominator and the big business. We do not want to allow a similar thing to happen in educational software.

Recently, *Softalk* began a regular column on educational software that is nothing more than one review after another of software that almost no one can afford to buy. These reviews end up being nothing but more detailed advertisements than the ads that the publishers actually pay for. This is useless. It just helps me decide ahead of time which software I will bother to copy illegally whenever I get the opportunity. What is needed is a column on educational software that gives listings, that tells us where we can get something at a reasonable cost (say, under twenty-five dollars), and that helps the people in the classroom learn to program in order to take up the slack until the publishers learn what education is really all about.

Ellis R. McDaniels, Williamsville, NY

What's for Dessert?

Why doesn't *Softalk* answer more questions directed toward it? It seems a lot of people write in with honest questions but are left with naught. Shortage of italic type? Also, why doesn't *Softalk* acknowledge the existence of *Softline?* You would think that such companion publications would exchange ideas. I had a brother once that I don't talk about much, but he didn't contribute near as much as *Softline* does. Tell me why.

Regarding software piracy, specifically the protection of ideas: Since when were abstract ideas the subjects of copyrights or the breaching thereupon? I would think that a considerable amount of programming effort goes into making rip-offs of arcade games, even though the programmer doesn't show much ingenuity as far as the concept goes in doing so. Would I be infringing upon copyrights if I wrote a science-fiction–fantasy story? How about one with good guys and bad guys? Perhaps one where the good guys are aided by a couple of inept robots and the bad guy pilots a spherical planet destroyer. Do the robots need to be named R2D2 and C3PO to constitute infringement? Where does one draw the line? The fact is, such judgments are personal in derivation and have no place in a justice system based upon the cut and dry. If society itself would look upon such undertakings as *Puck-Man* and *Missile Defense* as the cheap (in concept, not quality) imitations that they are, said programs wouldn't make a profit. The truth is that consumers are just as guilty as the authors in that they *promote* such accomplishments. And as long as there's a buck to be made, such prostitution will exist and flourish. Enough said.

Who does Kersey think he is, taking the credit whilst Snoopy does all the work? And no wonder he looks so puzzled! What kind of dial tone does he expect to get with the drive door closed? C'mon Bert, cerebrate! You guys at *Softalk* have the right idea by putting his column in back; that way, we have to digest everything else before getting to the dessert! What we need are more guys like him (maybe with a bit more hair, though).

Eliot Goldpepper, El Centro, CA

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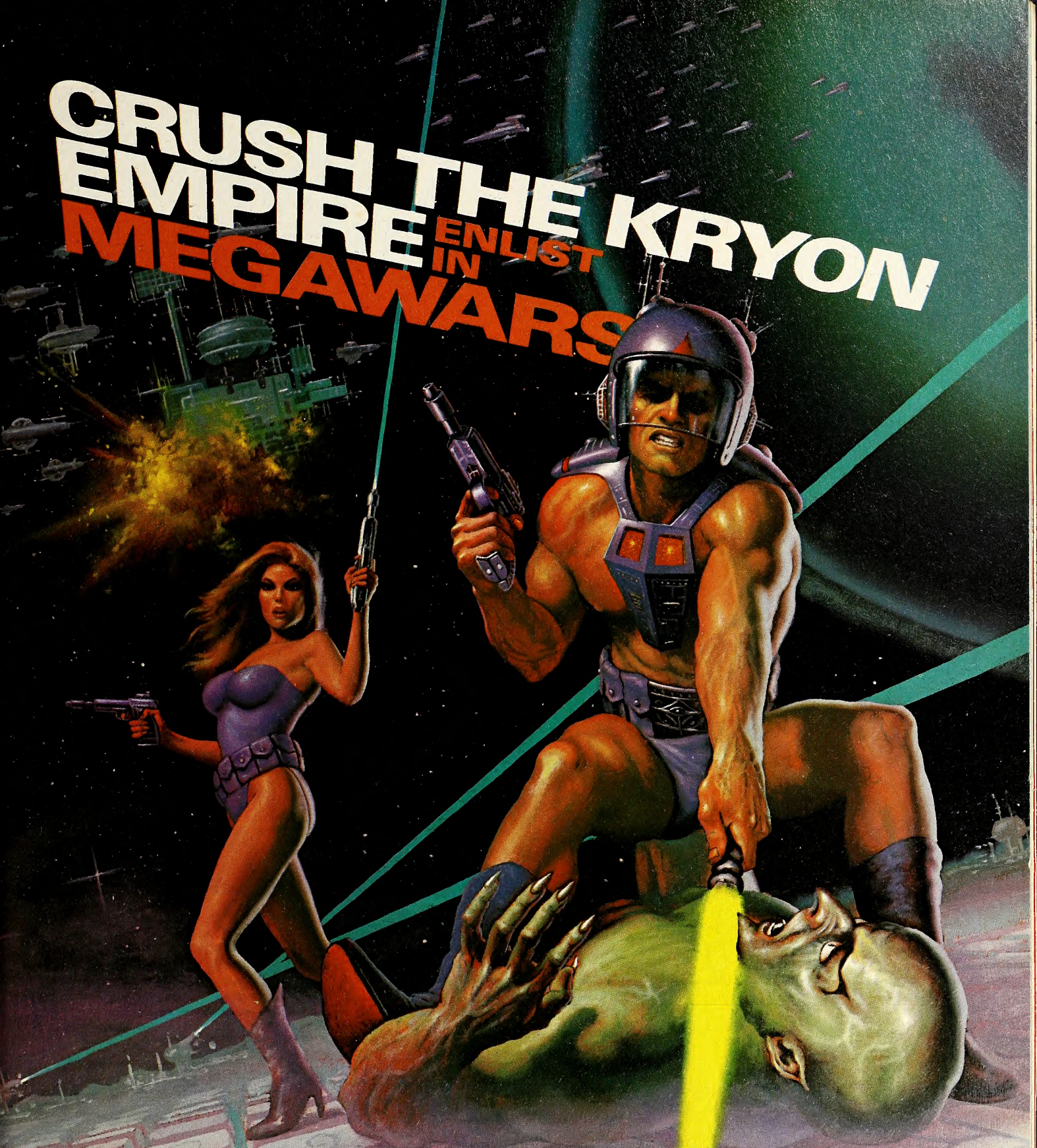

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Stars in Pascal

BY ALLAN TOMMERVIK

You can hear the producer on the phone to the studio now.

"Michael baby, have I got a script for you! This one's got everything you'd ever want. Boy and girl meet and fall in love. Shaggy, unkempt kids make pilgrimages to the shrine. Dreamy-eyed professor turns industry on its ear. Jaded old man finds hope. It's a combination of Disney and Spielberg. Lucas should have such a property. It'll be bigger than *E.T.* And it's cinema verite!

"No, no, Michael. I don't think you've quite got the picture yet. . . . No, there's no sex in the plot.

"Look, let's take it over from the top. The boy and girl don't fall in love with each other, they fall in love with the system. You understand what I'm telling you, man? The shaggy, unkempt kids are into chips, Michael, not pills.

"Michael, you're not paying attention. Look, chips are a big deal, man. You can get 64K chips, 128K chips . . . hell, pretty soon you'll even be able to get a whole megabyte chip.

"Okay, Michael. Look, let's just forget about the chips for now. We'll come back to them. Now about this professor . . .

"I'm trying to tell you about him. No, he's not your typical Fred MacMurray type of bumbler who stumbles on something by accident. No, he doesn't go back to being just plain Prof Jones at the end; he gets to be chairman of the board of . . .

"What about the old man? No, he's not an alcoholic who reforms because of the kids . . . he's a seeker after truth who finally finds a worthwhile project. . . .

"Relax, it'll have music and . . .

"Look, the way I see it opening, we'll pan around the campus of a large university, like the University of California at San Diego. We'll close in on a cute coed and follow her into a building. She'll go to the computer science laboratory and there we'll see Ken Bowles for the first . . .

"What kind of name is that? English, I suppose, but it's his real name and I don't think we should change . . .

"Michael! What the hell are you talking about? No, we can't, c–a–n–t, can't change it to the biology lab!

"Look, Michael. I've changed my mind. This thing's bigger than the big screen. We're gonna need at least an eighteen-hour miniseries. I'm gonna go call CBS. Talk to you later."

Microstrangers on a Train. Nobody's out to make a movie out of the story of UCSD Pascal and SofTech Microsystems yet. But when the entertainment industry starts casting about for likely subjects slightly more upbeat than child abuse, rape, alcoholism, crime, and war, they may come to realize that today's hardware and software engineers are every bit the heroic pioneers that such legendary figures of science as Marie Curie and Leonardo da Vinci are.

Nowhere is the point brought home quite as clearly as in San Diego, California, birthplace of the p-System. There assembled, in the mid-seventies, as unlikely a group of achievers as ever made a significant contribution to any science. Leader of the pack was Kenneth Bowles, a computer science instructor who had a whole passel of degrees from Cornell . . . but they were in electrical engineering. Gathered around him were a group of grad students, undergraduates, and even some graduated hangers-on who wrestled with Bowles's main concern—developing a portable language suitable for the classroom environment.

Similar assemblages are commonplace on campuses throughout the world—academic gurus putting their charges through the paces on some pet project. The results of most of these efforts wind up being written up and extolled in academic journals with circulations bordering on three to four hundred and then dropping out of sight. So how did it occur that Pascal overcame its academic hobbles to become a major software development tool in the eighties?

It's a two-part tale, the first half describing development activities at the UCSD campus and the second part relating how SofTech Microsystems's stewardship has brought a mature product to the marketplace. Ken Bowles is the leading character in part one, with Mark Overgaard and Julie Erwin in supporting roles.

Erwin and Overgaard carry over to the second half of the yarn, where they're joined by Al Irvine and John Brackett and, just lately, by John Splavec.

Outrunning the NSF and DOD. The whole thing started as an academic exercise designed to fill a specific academic void. It was only after the fact that they realized what they had accomplished. And along the way, Bowles and his students achieved on a shoestring what the National Science Foundation and the Department of Defense had been spending millions of dollars on.

The felt need that drove Ken Bowles was the requirement for portable instructional-based software. Each time the computer science department changed hardware, it was a six-month or longer job to move the instructional software tools to the new system. These hardware changes were not infrequent because technology was bringing the cost and size of hardware down, making it more accessible for classroom purposes. But each change brought with it the attendant problems of converting the software.

Pascal was drawing some attention in academic circles during the early seventies and Bowles saw in it the promise of becoming a portable language. Portability—the trait of compatibility with various processors—was still not the buzz word that it's become today, but Bowles saw its necessity in the academic environment.

Bowles and some of his advanced students began digging into the language to determine its potential.

About that time, grad student Mark Overgaard came to Bowles's attention. Overgaard had earned the bachelor's degree in physics at a liberal arts college in Pennsylvania before attending graduate school at UCSD.

Overgaard had caught the computer bug first as an undergraduate, when he helped a professor feed card decks into an 8K IBM 1130. He followed that up by working part time for the school in the data processing department. He was captivated by the computer, but entered grad school in physics because he felt computer science was not an end in itself. Today he smiles somewhat shamefacedly while admitting "how wrong I was."

Realizing his error soon after matriculating to UCSD, Overgaard focused his efforts on the computer science department. He wrote a paper on memory management and his professor suggested that he show it to Bowles. Bowles invited Overgaard to take a look at a little project he

Opposite page: the p-team. President John Splavec (top left), brought more aggressive marketing approaches and a wider market perspective to his new company. Al Irvine, vice president of engineering (top right), made the contact that brought the p-System to SofTech. Julie Erwin, vice president of marketing (bottom left), started with the system at UCSD and is still its foremost spokesman. Mark Overgaard, manager of advanced development (bottom right), was the grad student most responsible for implementing the p-System design.

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SCS-510/F	10MB/.8MB	5¼" Hard Disk w/floppy	$4,756
SCS-10R	10.6MB	8" Removable Hard Disk	$7,310
SCS-40	40MB	8" Hard Disk	$8,707
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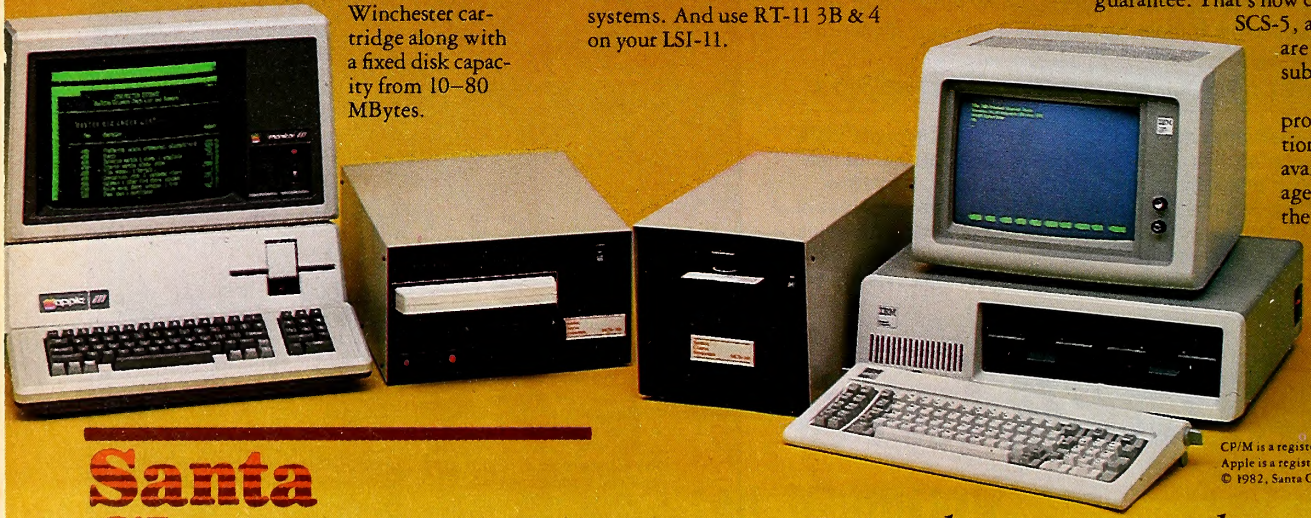

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had going—Pascal—and a team was born: Bowles as chief architect and Overgaard as chief engineer.

Bowles remembers Christmas of 1977 as the turning point. It was during that vacation that portability was proven, when programs compiled from an LSI-11 machine were run on an 8080-based Northwest Microsystems machine. It was also at this point that the special genius that is Bowles came to the forefront.

Another academician would have excitedly called his professional journal to proclaim the feat and offer a learned treatise on the project. Bowles called *Byte* magazine and was invited to write an article. As Overgaard remembers it, UCSD received more than one thousand inquiry card responses from the article. A cottage industry was born.

Soon the computer lab was busy sending out information and copying disks. At one time, nearly five hundred manufacturers or would-be manufacturers of computers were standing in line to get licenses.

Directing much of this activity was Julie Erwin. Erwin had accrued credits toward a math degree at the University of Arizona before switching to computer science at UCSD. She became a proctor for one of Bowles's classes and gravitated to the Pascal project.

She became a staff assistant in computer science and, for the final eighteen months, was an integral part of the support group for the effort.

North by Southwest. All this activity did not go unnoticed. Among the regular visitors were a couple of bearded, thong-wearing kids from northern California named Steve. They had a product called Apple and they'd sometimes hang out in the lab to check out the progress of the software. Wozniak and Jobs were later to be the only ones to negotiate a license directly from the university; all other early licenses were assigned to SofTech Microsystems.

Later, UCSD's computer science laboratory was to be stocked completely with Apple IIs.

But this activity was a mixed blessing for the university. While it established for all time the credibility of its computer science department, it also attracted the attention of the IRS. The California university system and the IRS had a gentleman's agreement whereby the system could file an omnibus tax return for all its campuses.

Ken Bowles's project looked like it had such profit potential that the IRS's representatives began making noises—perhaps they'd like each campus to file its own return so they could monitor the revenue from that and any other similar enterprises. California's Board of Regents was understandably unimpressed by such a proposal that would have raised its costs significantly. So it directed that Bowles follow one of three courses: Apply to the IRS for a special exemption, separate the Pascal activities from the university, or cease the project.

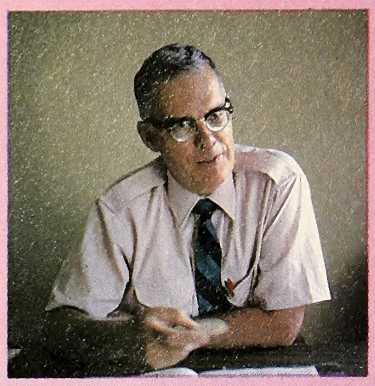
Stopping a project that seemed to have such far-ranging implications for the microcomputer industry was anathema to all involved. Waiting up to eighteen months for an IRS exemption also seemed intolerable. So Bowles took the other route—he started courting possible trustees for the project. Both Bill Gates of Microsoft and Gary Kildall of Digital Research were approached.

What the university wanted was someone with southern California operations and an understanding of and respect for software to become the trustee.

Around that time, Al Irvine was running a small western branch office of SofTech, a Massachusetts firm. Irvine was a mainframe man who had once headed software engineering operations for a division of National Cash Register. Unlike the jaded old man of the producer's script above, Irvine is a man of intense energy and wide-ranging interests.

One of those interests was finding software tools to enhance the productivity of programmers. SofTech had similar interests, so Irvine, a confirmed believer of the casual southern California lifestyle, left California to pursue productivity in Boston. Eventually, lifestyle won out over productivity, however, and Irvine announced his resignation to return home. Instead, SofTech offered him the chance to set up a branch office, which is how a Massachusetts software concern happened to be in southern California—Escondido, to be exact—when UCSD was looking.

Irvine's return to his preferred climes didn't dull his determination to find better software tools. And his attention was directed to the goings-on at UCSD, even though he was told that they wouldn't separate the language from the operating system. That seemed a tad quixotic to him,



To Catch a Language

So what of Ken Bowles, the mastermind behind the creation of the p-System in the first place?

First, he was put off by the conflict-of-interest rules of the state of California, which prevented him from working on the continuation of development once the product was under the auspices of SofTech.

Second, he was put off by some of the design decisions and variations introduced by such licensees as Apple. "It was painful to sit through two hours of debate about whether to follow a command with a comma or semicolon. From an engineering standpoint, it made no difference." That experience soured him so much, he now calls himself "a fugitive from Pascal."

So Ken Bowles, looking for the ultimate in programmer productivity tools, took up Ada. Ada is a Pascal-like language, designed by Honeywell and adopted by the Department of Defense for government usage. All conventions and syntax in Ada are standardized and Bowles has high hopes that the DOD will have the clout to keep it that way.

He's chairman of the board of TeleSoft, a forty-man software development firm in San Diego specializing in Ada. As well, he's still putting in half-time at UCSD, where his introduction to computer science classes draw more than six hundred students per term. ◨

but he nevertheless placed a call to Bowles.

Dial M for Micro. There's a lot to be said for being in the right place at the right time. Bowles and Irvine were acquaintances; and, when Bowles couldn't get Microsoft or Digital Research interested in southern California, his mind had turned to Irvine. Irvine's call couldn't have been timed better.

The university and SofTech went into almost immediate negotiations. The final agreement called for Bowles and Overgaard to split their time for one year—half at the university and half at SofTech. Conflict-of-interest rules of the state of California prevented Bowles from devoting his time to SofTech Microsystems because he had overall responsibility for the agreement.

SofTech formed a new subsidiary, SofTech Microsystems, to direct the activities relating to the p-System. Dr. John Brackett, then president of the parent company, felt the new company was so important that he stepped down to take the presidency of the subsidiary.

Brackett and Irvine gathered a select few to join them at the outset. One was Erwin, who had earned her management stripes during those hectic days in the computer lab. To this day, she's responsible for the sales and marketing of the product.

Apple signed their license for Pascal with the university just days before SofTech and the university finalized their agreement. That Apple has moved Apple Pascal slightly away from UCSD Pascal standards is a source of regret at SofTech, particularly to Overgaard. On the other hand, Overgaard, Erwin, and Irvine agree that Apple's enthusiastic embracing of Pascal, as embodied by Apple software vice president John Couch's tub-thumping, was of significant importance in gaining the language standing in the commercial world. Bowles adds the name of veteran industry pundit Carl Helmers as a major contributor to getting Pascal accepted.

SMS assumed the responsibility for nurturing the p-System in June 1979. Most of the early days were spent getting the system running on various microprocessors. That's an ongoing effort and Irvine says it's still "magic everytime we get a new system running." Then the emphasis switched toward wooing various hardware manufacturers and software publishers. But very little emphasis was placed on end user sales until this summer, when SofTech took Apple on head-to-head in a battle for the affections of the installed Apple Pascal user base.

The Man Who Knew Just Enough. That more aggressive stance can be attributed to new president John Splavec. Splavec, a Wisconsin native, cut his management teeth at Informatics, where he was vice president and general manager of the applications product division. He also spent time as a marketing rep for IBM, so he's bringing a wide-ranging background in big systems to SofTech Microsystems.

In addition to introducing broader-based marketing to SofTech, he's implementing stronger strategic planning. Part of that planning is strengthening the end user base. Splavec has high praise for the company's successes marketing to the manufacturers and for his predecessor's skill in preparing the company for the changing marketing strategies. Splavec's only been on the job four months, but the company was poised for the changes he's implementing; it's this readiness that has allowed them to react so rapidly.

Now SofTech's turning their attentions to the retailers and consumers. And their pitch has been updated. Ken Bowles proved the concept of portability only five years ago. But now, SofTech's selling universality.

Erwin's as beguiling as any siren when you get her started on the advantages of the p-System, and universality is her foremost song. She'll cite chapter and verse on all the microprocessors for which the p-System has been adapted and then launch into a laundry list of the manufacturers who use those chips. With a list that runs from Alpha Micro to Zenith, the p-System does seem to approach universality.

Universality is especially dear to SofTech because of another market they're now approaching. Splavec brought with him from Informatics awareness of the needs of the Fortune 1000 companies and good marketing tactics for serving that market. Splavec and Erwin both point out that with a universal operating system, executives and managers need not be tied to a particular brand of desktop computer, but rather can choose the best hardware for their particular needs with the assurance that the software will be there.

The impression of universality is enhanced by the recent introduction of the universal medium adapter. The universal medium adapter addresses the different methods by which manufacturers communicate with disk drives. Widespread adoption of the adapter will simplify life for both the retailer and the software publisher by obviating the necessity of having tailored versions of the product for each hardware environment.

Psycho Disks. When one disk serves all machines, retailers won't have to carry four versions of a product for four different machines, nor will the publisher have to provide distinct versions.

For SofTech, this addresses their foremost goal, providing software tools to increase programmer productivity. Not only programmers, but also publishers and retailers, benefit from the economies. And end users of less widely adopted machines should benefit from having a greatly increased selection of software from which to choose.

The p-System is not merely an operating system with a language attached, and Irvine, he with the wont to improve programmer productivity, waxes eloquent on the reusability of software under the p-System. The modular nature of the language is such, he points out, that libraries of applications modules are already being offered as commercial products. The buyer is able to insert portions of the library into programs as needed, saving the time otherwise spent re-creating the wheel.

Erwin touts such additions to the system ax XenoFile, which allows CP/M programs to run on the p-System. SofTech also has native code generators that allow the programmer to develop certain high-performance subroutines of his program in the assembly language of the individual machine.

From the six persons who started with SofTech Microsystems in 1979, the company has grown to nearly one hundred employees. They had overrun their office space in San Diego early on and had spread out to two other buildings. This month, they'll be moving into a 33,000-square-foot facility in Rancho Bernardo.

Temporarily, that should provide room for a film crew as well, should the producer ever sell the script. ◨

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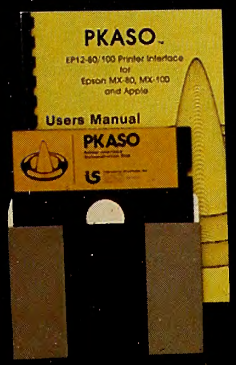

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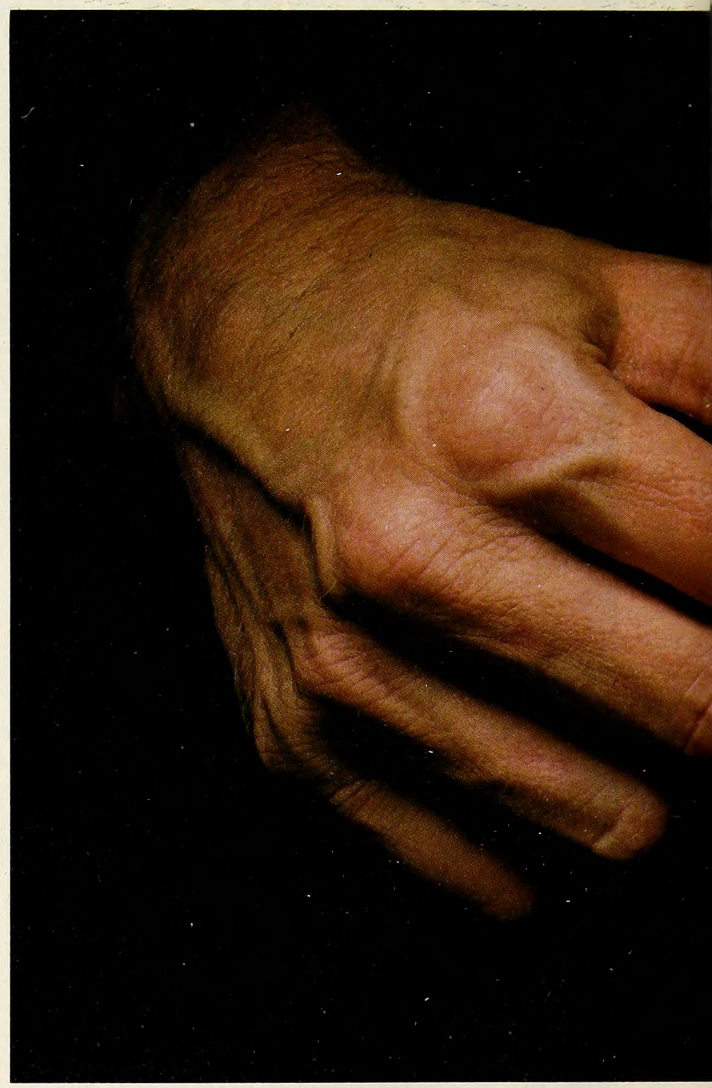

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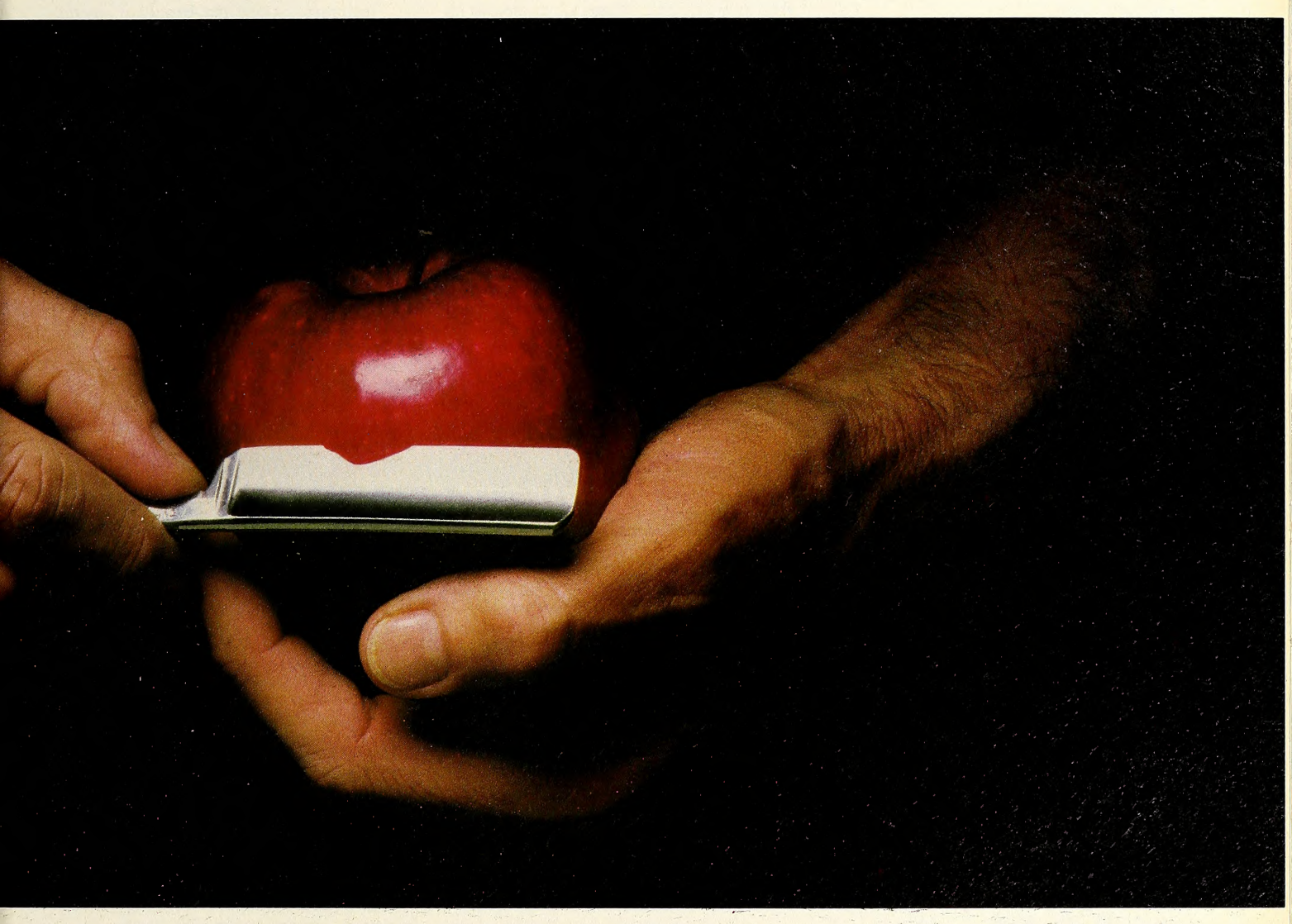

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CONTEST WINNERS:

Creative Readers Stump the Staff

from page 4

some of the data I had about how good Jim interfaced with me. The raft was a close place with the current flowing past. I was a-trembling when I called that letter back up because I'd got to decide, forever betwixt two things, and I knowed it. I studied a minute, sort of holding my breath, and then says to myself: "All right, then, I'll go to Hell" and crashed the program.

10. Once upon a midnight dreary, while I pondered
weak and weary
Over many a program I had written long
before—
While I nodded, nearly napping, still I sat there
gently tapping,
Tapping at the Apple keyboard, keyboard K of
64,
" 'Tis some nested loop," I muttered, tapping
with my fingers sore,
"Only this and nothing more."
Ah, distinctly I remember it was in the bleak
December;
And SYNTAX ERROR was the only message
that the Amdek bore.
Eagerly I wished the morrow—vainly I had
sought to borrow
From my books a bit of knowledge—
knowledge of the Basic lore—
For the Applesoftly knowledge of the Basic lore—
Only this and nothing more.
Yes, it was the dead of winter and with each line
I'd reenter,
Came a nagging, dragging tension that I could
not ignore.
Still for bugs I kept on searching, though my
heart inside was lurching,
Lurching with an irate venom that was burning
to my core,
Burnt so deep within my being that I became so
very sore
And at my Apple, I then swore.
With pounding fists, my desk top denting; all my
anger I was venting
Vowing that my mortal soul could absolutely
stand no more.
Then I searched until I found it, put my weary
hands around it,
And thus the pitcher I did bore, so the contents I
could pour,
Pour it on the Apple keyboard, keyboard K of
64.
I shall program nevermore!

11. Obviously a case of vhat ve term ze Desc Invy. Ze patient ixhebeets all ze classek symptoms: an oon-natural love for ze mooderboard, an obsisseve compoolsion to boot, and a deep desire to "SAVE." Ve sooggest deeper analesees to ooncover ze Source of ze coondeetion.

12. Diogenes was seen walking through the countryside with a lamp lit during the day. When asked what he was doing, he replied, "I'm searching for an honest man . . . but anyone playing *Time Zone* will do."

Before You Leave. Congratulations to those who spotted the error in our answer to example number four. A miniprize to Henry D. McAvoy of Rome, Maine, for his way of pointing it out:

Heard during a nineteenth century game of *Computer Bismarck*:

"Damn the torpedoes! Full speed ahead!"

Upside down answer: Admiral Nelson.

"The admiral to his Apple said:
Fame will never turn my head.
Tecumseh's sunk and Brooklyn wavers.
Hartford's mine. She never quavers.
Full speed ahead! Damn the torpedoes!
Softalk's wrong! That's how it goes.
I won't bemoan this unkind cut.
My name's not Nelson, it's ------."

Right side up answer: Admiral Farragut.

Henry wins a free dinner at the golden arches anytime he happens to be in the North Hollywood area.

My favorite quote is number: _____
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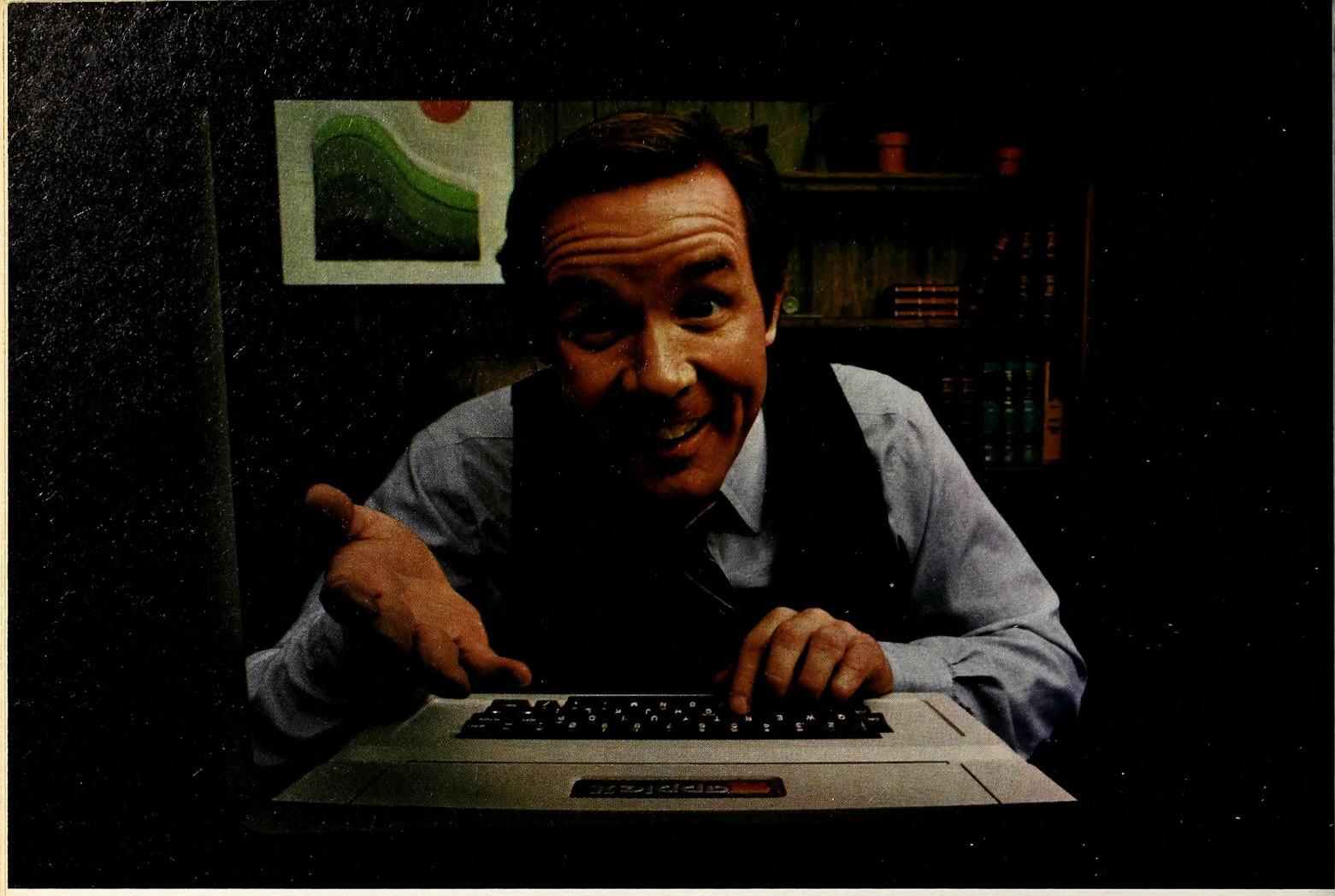

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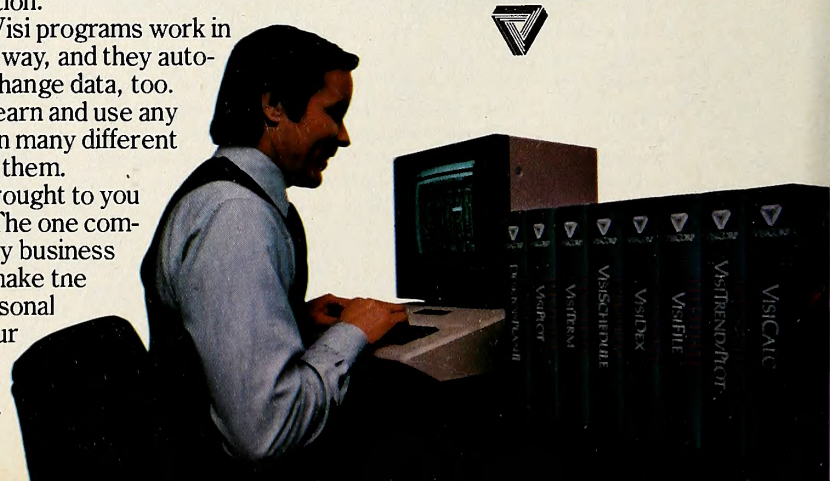

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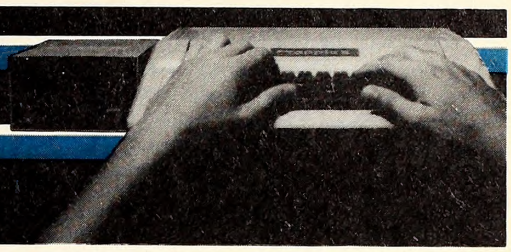


☐ **Inherit the Wind.** Blooming out of the arid western flatland of Medicine Bow, Wyoming, is a wind turbine that looks like one of those oversized sculptures by Claus Oldenberg. This one would be titled "Propeller on a Stick." While it looks a little funny from a distance, like a big pinwheel, up close it's awesome—262 feet high, big as Godzilla. A helicopter looks like an insect in comparison.

The WTS-4 (wind turbine system) is a project of the Hamilton Standard division of United Technologies. Its fiberglass blades are scheduled to start spinning at thirty revolutions per minute this September. The U.S. Department of the Interior Bureau of Reclamation is behind the building of the four-megawatt horizontal-access wind turbine. The first of its size in the world, it's the culmination of Hamilton Standard's wind turbine activity, which has been underway since the early 1970s.

The wind machine, with its expanded name, WTS-4 SVU (system verification unit), is part of an evaluation of technical and economic feasibility of wind turbines. Preliminary studies have indicated that wind turbines may be cost effective when coupled with existing hydroelectric installations.

The heart of the WTS-4 SVU is a set of Intel Model 230 microcomputers. One is located in the base of the steel tower and one is in the nacelle, the house-sized box behind the blades. Completely automatic, the micros control the turbine's operation, from making prestartup checks to diagnosing electrical faults and lubricating the system. Pitch control of the blades, to optimize energy capture, is one of their prime duties. Sensors in the nacelle send information on rotor speed and shaft torque to the 230s, which then adjust the angle and direction (into the wind) of the blades.

Too much wind may spin the blades too fast, causing the generator to go out of synchronization. The 230s will feather the blades to a slow stop when this occurs, starting them back up again when conditions have stabilized.

The WTS-4 SVU turbine in Medicine Bow is an upgrade of a three-megawatt unit being installed in the town of Maglarp, Sweden. Both are built by Hamilton Standard.

"Wind energy could represent up to 10 percent of new electrical energy resources in the next fifteen to twenty years," says Robert Gregoire, business development and marketing manager for Hamilton Standard. "Among the current alternative energy sources being considered—solar, geothermal, and photovoltaic—the wind is preeminent."

The Department of the Interior estimates that a wind farm of forty turbines could generate four hundred million kilowatt hours of electricity a year. Gregoire does some quick calculating. "That's enough electricity to run approximately fifty thousand homes."

☐ **The Dope Syndrome.** An interesting phenomenon occurs when you slip a pure silicon crystal into a beam of neutrons from a nuclear reactor. Most of the neutrons pass through the crystal as if it weren't there. But a few are captured by atoms of silicon 30 (one of three silicon isotopes commonly found in a sample), causing the silicon 30 to decay into phosphorus atoms.

The process is called neutron transmutation doping (NTD), and after the sample is removed from the neutron beam (and the radioactivity dies away) the result is a piece of silicon uniformly doped with phosphorus. The more phosphorus you add, the less electrical resistance there is and the greater the conductivity of the silicon.

A resistivity of zero, where the flow of electrons in a material is completely unhampered, has been achieved in certain materials (dubbed superconductors) at very low temperatures. The problem of excess heat given off by the movement of electrons is virtually eliminated, and the size of computer circuits made with this material can be reduced dramatically. A computer equivalent in power to an IBM mainframe made with superconductors would be about the size of a Rubik's Cube. But these theoretical super supercomputers are a few years down the road.

NTD will never completely replace today's industry standard, boron doping of silicon, for a number of reasons.

"It'll be hard to convince the computer industry that uniform phosphorus doping would be a benefit," explains John W. Farmer, senior research scientist at the University of Missouri in Columbia, Missouri. "The industry is committed to a certain technology and sees no need to change."

Another drawback is that NTD doesn't bring resistivity down to the levels needed in modern computer circuitry. Leaving the silicon in the flow of neutrons from the reactor long enough to reach those low resistance levels is not economically practical.

Bad times in the nuclear research industry constitute another problem that won't go away easily. No new research reactors have been built since 1963, and conventional nuclear power plants are unsuited for the process because they are designed to produce steam rather than to provide access to neutrons. Research reactors and commercial power reactors alike have a finite lifetime of perhaps fifty years.

Neutron doped silicon is perfect for electronic devices that handle high voltages or high currents in high-power machinery, like electric locomotives. One of the first applications of the technology went into electrical transmission lines in Europe. NTD at the moment seems more suitable for power control devices than for computers.

Nonetheless, Farmer believes that NTD may help in the development of high-speed large-scale integrated circuits. The density of components is so high that a very uniformly doped material is needed, and NTD is more reliable than traditional methods.

"From that point of view, neutron transmutation doped silicon is much better as a starting material," Farmer explains.

At the moment, worldwide production of neutron transmutation doped silicon is around fifty metric tons a year. It is used mainly in Europe and Japan. The University of Missouri in Columbia is the only commercial source of the material in the United States. They produce about twelve metric tons annually.

☐ **Here's a Knocking Indeed!** For more than three hundred years, calculus has held a preeminent position in the mathematics curriculum. Deemed one of the finest achievements of the human mind, calculus has been the chamberlain of science since the days of Francis Bacon.

Discrete mathematics is knocking on the gate. Up to this time, freshman and sophomore mathematics students in college have been required to take a year of calculus. Recently a growing number of mathematicians and computer scientists have started to push for a more balanced curriculum featuring courses in discrete mathematics, including logic, probability, and the methods by which things combine and are counted.

Calculus is the tool of continuous mathematics, which posits nature as a smooth, unbroken flow, exemplified by the movement of objects in space. Discrete mathematics attempts to define nature in terms of individual elements, like the leaves on a tree. Computers are discrete machines, dealing with individual countable things.

Stephen White, director of special projects for the Alfred P. Sloan Foundation in New York City, defines calculus's traditional role as a gatekeeper. Discrete mathematics may soon share that role.

"There's been considerable discussion about it," White says. "People going into computer science are much more interested in discrete mathematics."

Last month the Sloan Foundation sponsored an invitation-only conference for mathematics educators at Williams College in Massachusetts. "It seemed that a general agreement was reached at the conference that changes would be made in the undergraduate curriculum," White reports.

Gale Young, a mathematics instructor at the University of Wyoming in Laramie, attended the conference at Williams College. "I think at the very least there'll be an alternative track for teaching freshman mathematics," he says.

"Now that computer science majors account for a larger part of enrollment, we're able to listen to them. But it's not just those students that need early exposure to discrete mathematics. Students in engineering and the physical sciences who expect to use computers should have experience with discrete mathematics very early."

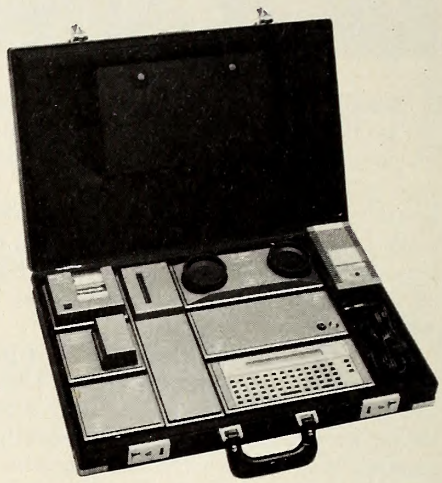
How soon might we expect this shift in emphasis to become widespread? Ten years? "It'll be quicker than that. Has to be," explains Young. "It'll be more like five years, which is very quick for academia."

One problem holding up the teaching of discrete mathematics at the freshman level is a lack of proper textbooks. Help is on the way from John G. Kemeny, who coauthored in 1955 with J. Laurie Snell and Gerald L. Thompson the first introductory-level textbook for discrete mathematics, *Introduction to Finite Mathematics*. The Sloan Foundation has given Kemeny, a professor of mathematics at Dartmouth College, a grant to rewrite the book emphasizing the link to computers.

"There is now substantial support for a recommendation that a group of us made twenty-five years ago that the introductory mathematics sequence should be partly calculus and partly finite (discrete) mathematics," Kemeny says in a recent Los Angeles *Times* article.

Another leading supporter of giving discrete mathematics more emphasis is Antony Ralston, a mathematician and professor of computer science at the State University of New York at Buffalo. In the same article, he sums up the situation: "The rise of computers is changing the face of the world not just in obvious ways, but in some significant intellectual ways.

"The overwhelming number of new problems that will come to mathematics to be solved come from areas related to computers and computer science."



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Some of the programs available for the OPC are *Porta Budget*, *Porta Writer*, and *Porta Calc*. Snap (a derivative of Forth) and Microsoft Basic are available for programming applications. The software capsules are ROM units that plug into the back of the OPC. Because of internal memory restrictions, it's only possible to access one capsule at a time. The software is authored by an outside company, Friends Ami.

The OPC should be available in retail outlets this month; the carrying case is standard with every unit.

How well portable computing will catch on is not yet clear. The OPC has been received favorably at several trade shows, including Comdex in Atlantic City. But Panasonic and Quasar, which have had comparable products on the market for a few months, are apparently having trouble selling units. The portable microcomputer may take a while to reach its potential in the marketplace. It's a revolutionary concept worth keeping an eye on. ◨

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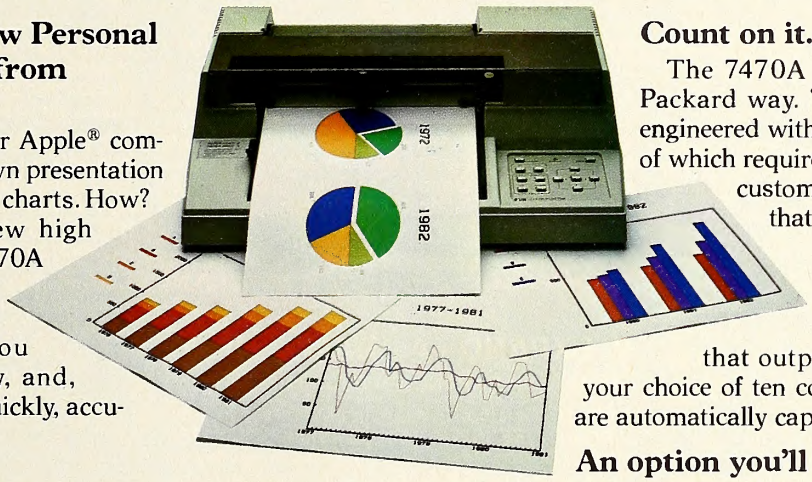

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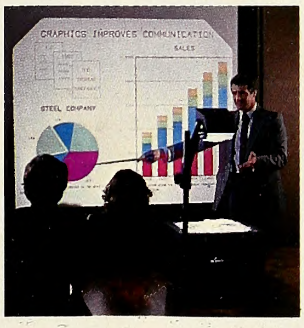

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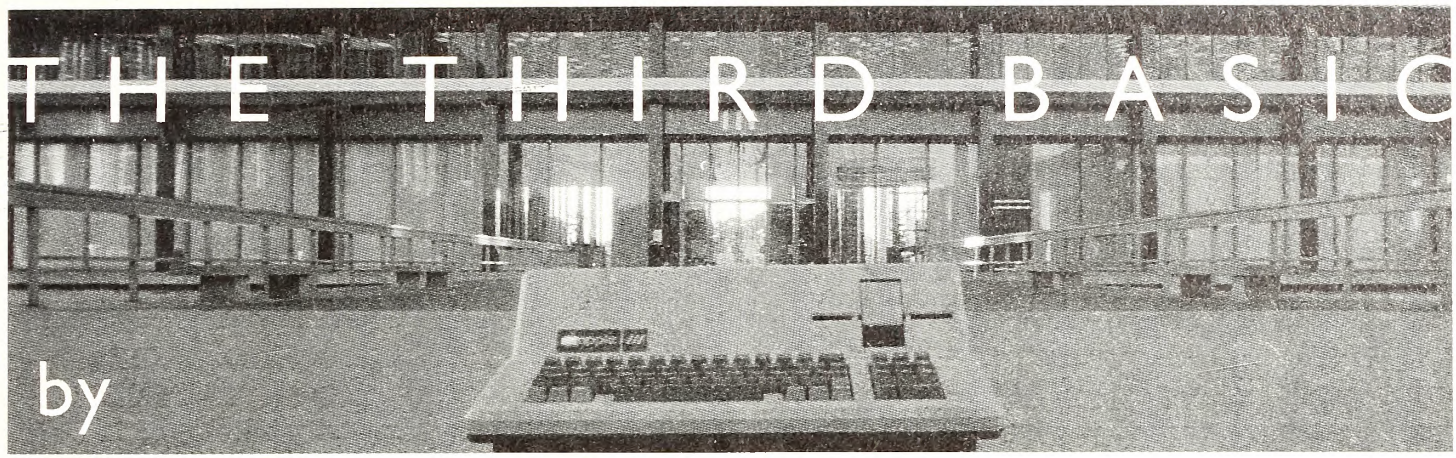

Exploring Business Basic, Part 12

In recent months we have been digging up uses for the various features of the console driver. While last month's four-way scrolling program was valuable, and even fun, there are other, far more typical ways that most applications can use the console features.

One of the most common of these is the use of data entry screens. Anyone who has programmed has wished for easy ways to generate the data entry screens that are an inevitable part of any business application. Most programmers sooner or later create or buy software to make that task easier. Not to be outdone, your fearless Basic columnist offers the following tender morsel.

(Nope, not so fast; first the sales pitch. The program below is generally organized along the following lines: first, a skeleton program that performs a general data entry loop, presenting a screen with fields to be filled in; and second, a series of support subroutines that you can use to initialize a screen definition, present the screen, capture the data, and store it in a transaction file. In addition to these functions, the routines are designed to allow quite a bit of flexibility in adding features of your own design, especially edit routines on the data.)

Okay, now that the orientation is over, here's the program skeleton:

```
1 REM screen data capture program
5 DIM name$(50,1),info%(50,2),
  input.req%(50)
20 GOSUB 1000
25 HOME
30 PRINT:PRINT"Data Entry for
   Screen: ";screen$
35 IF writefile THEN PRINT:
   PRINT"with output stored in the
   file ";outfile$
40 VPOS=23:HPOS=1:PRINT"Press
   any key to begin:";
45 GET a$
100 FOR recordnum=1 TO 32767
105 GOSUB 1500:REM display the data entry
    screen with defaults
107 escapecode=0:out.rec$=""
110 FOR fieldnum=1 TO items
115 GOSUB 2000:REM process input for
    field=fieldnum
120 IF escapecode THEN IF
    fieldnum=first.input THEN
    TEXT:GOTO 600:ELSE:GOTO 105
125 REM extra processing for this field goes
    here
200 GOSUB 3000:REM add to output record
    string
205 NEXT fieldnum
210 REM code to process the finished record
    in outrec$ goes here
215 TEXT:HOME:PRINT"Record is:
    ";out.rec$
220 PRINT"Press any key to continue: ";:GET
    a$
500 IF writefile THEN GOSUB 4000
505 NEXT recordnum
600 TEXT:HOME
605 PRINT:PRINT"End of Data
    Entry for Screen: ";screen$
610 IF writefile THEN PRINT:
    PRINT"Output is stored in the
    file ";outfile$
615 VPOS=23:HPOS=1:PRINT"Press
    any key to quit:";
620 GET a$
630 CLOSE
635 END
```

	0	1
0	title of the input screen	name of the output file (if any)
1	field #1 name first char = : means input is expected first char = (means take the default (no display) otherwise, display as is	field #1 default value (if any)
2	same as above	

Figure 1.

That's a fairly meaty skeleton, but relatively straightforward. First, a word about the three arrays dimensioned in line 5. Since this is a general-purpose data entry routine, all the information about the data to be captured is contained in arrays in memory.

Name$ holds the name of each field to be displayed, along with any default values, in the format shown in figure 1.

Info% is an array that contains information about how the field names and values are to be displayed, as shown in figure 2.

The last array, *input.req%*, is considerably simpler. It is built during initialization, and con-

	0	1	2
0	length of output record	not used	not used
1	starting row for field #1	starting column for field #1	length flag for field #1 if + then value is the maximum permitted if 0 then the field has no maximum value if − then value is required field length
2	more of the same for field #2	likewise	onward, ever upward

Figure 2.

tains 1 if the field requires input, 0 if no input (titles and so on), and a −1 if the field consists of a default value only.

Next, the program performs a gosub to an initialization routine at line 1000. This routine, in addition to filling the three arrays just mentioned, also sets a number of constants and opens the data logging file, if indicated. The routine below uses initialization from *data* statements, but, as indicated, a "real" program would use files to contain the screen definitions.


```
1000 REM initialize tables (could be done
     from a file)
1005 first.input=0
1007 READ items
1010 FOR i=0 TO items
1015 READ name$(i,0),
     name$(i,1)
1017 IF MID$(name$(i,0),1,1)=":" THEN
     input.req%(i)=1:first.input=i*
1018 IF MID$(name$(i,0),1,1)="("
     THEN input.req%(i)=-1
1020 FOR j=0 TO 2:READ info%(i,j):
     NEXT j
1025 NEXT i
1030 screen$=name$(0,0):outfile$=
     name$(0,1)
1035 outlen=info%(0,0)
1040 IF outfile$=" " THEN writefile=
     0:GOTO 1055:ELSE:writefile=1
1045 OPEN#2,outfile$,outlen
1055 set.edit$=CHR$(21)+"0"
1060 set.normal$=CHR$(21)+"1"
1062 REM blank$ below contains 80 space
     characters
1065 blank$="
                                    "
1095 RETURN
```

Bargain Basement Logic. Of passing interest in this routine is the use in line 1017 of a logical expression to put the index of the first field requiring input in the variable *first.input*. This could have been done nearly as easily with an *if* statement, but there's a special on logic this week that seemed too good to pass up. *First.input* itself is used to determine whether pressing escape should mean stop inputting—or just start the current screen over.

Of more than passing interest is a sample set of screen definitions that this program might process. Consider the following *data* statements as an example:

```
1700 DATA 7
1705 DATA "My First Screen"," "
1707 DATA 117,0,0
1710 DATA "Name and Address Entry"," "
1715 DATA 1,30,0
1720 DATA ":First Name: "," "
1730 DATA 3,1,15
1735 DATA ":Last Name: "," "
1740 DATA 3,40,20
1745 DATA "Address (free form)"," "
1750 DATA 5,1,0
1755 DATA ":"," "
1760 DATA 6,1,0
1765 DATA ":State: ","CA"
1770 DATA 8,1,-2
1775 DATA "(","FY1982"
1780 DATA 0,0,0
```

The definition starts with the number of screen items (both displayable and not) and the next two lines are the general screen definition. Next comes a sample screen comment ("name and address entry") which line 1715 tells us will be positioned on row 1, beginning at column 30. The next field requires input (the leading colon indicates that), has no default value, and lives on row 3, column 1. Furthermore, it has a maximum allowed length of fifteen characters. Line 1745 is another comment, this one referring to the field directly under it and defined on lines 1755 and 1760. Since this is a free-form field with no title (the colon is its only definition), it will extend the entire length of the line, a full eighty characters of input space. Line 1765 is an example of a field with a default value, and also one (as indicated in line 1770) that has a required length of two characters. The last example, on line 1775, is a default field that will appear in all output records. This is a useful option for including fields, such as dates or heading data, that the user should not be required to type each time, but that may need to appear in the output for reference or for meeting another program's requirements.

That about wraps up the initialization, leaving us with a set of screen and input definitions for a simple data entry screen. Now let's go back and look at the rest of the program main loop, starting with line 25. Here and through line 45 we create a starter screen, which could certainly be more elaborate if desired. For instance, you could prompt here for the name of the screen definition file instead of hard coding it as we did in this example.

In any case, line 100 begins the program's main loop for data entry. The first routine called is the subroutine at line 1500, which displays the screen according to the definitions. It looks like this:

```
1500 TEXT:HOME
1505 FOR field=1 TO items
1510 field$=name$(field,0)
1515 IF MID$(field$,1,1)=":" THEN 1550
1520 IF MID$(field$,1,1)="(" THEN 1600
1525 VPOS=info%(field,0):HPOS=info%
     (field,1)
1530 PRINT name$(field,0);
1535 GOTO 1600
1550 VPOS=info%(field,0):HPOS=info%
     (field,1)
1555 PRINT MID$(field$,2,LEN(field$)
     -1);
1560 IF name$(field,1)=" " THEN 1600
1565 PRINT name$(field,1);
1600 NEXT field
1605 RETURN
```

If you have followed the discussion about field definition, the routine above should prove very straightforward.

The next major task of our main program loop occurs at line 110, where an inner loop starts that processes input from each field on the

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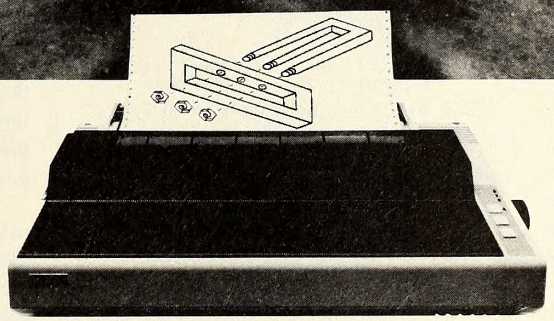

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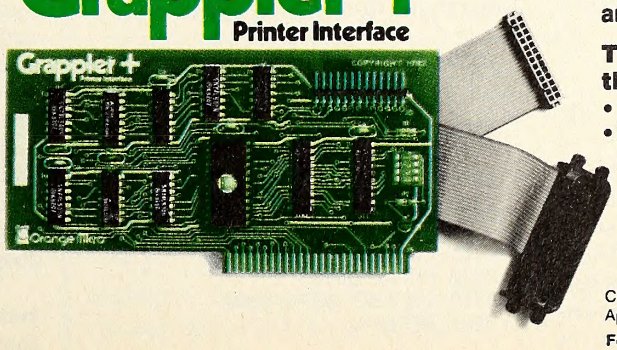

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screen, one field at a time. This is accomplished in the subroutine at line 2000, and here's where things get a trifle tricky:

```
2000 field=fieldnum
2002 value$=" "
2005 IF input.req%(field)=0 THEN RETURN
2006 IF input.req%(field) < 0 THEN
     value$=name$(field,1):RETURN
```

Roll Up Your Sleeves. These first few lines are fairly obvious. Using the *input.req%* array, we can quickly determine if the field is one requiring only default processing or none at all. Note that the string Value$ will be used to convey the result of this field's data entry process. Once we determine that actual input must take place, then the real work begins, as shown below:

```
2008 row=info%(field,0)
2010 start.window=info%(field,1)+LEN
     (name$(field,0))-1
2015 field.len=ABS(info%(field,2))
2020 IF field.len<>0 THEN end.window
     =start.window+field.len-1:GOTO
     2060
2025 test=field+1
2030 IF test>items OR info%(test,0)>row
     THEN end.window=79:field.len=80
     -start.window:GOTO 2060
2035 IF info%(test,0)=row THEN
     end.window=info%(test,1)-1:field.len
     =end.window-start.window+1:GOTO
     2060
2040 test=test+1
2045 GOTO 2030
2060 WINDOW start.window,row TO
     end.window,row
```

This routine sets up a field for data entry. Because of the console driver's powerful windowing capability, once the size of the field is determined it is possible to construct a cell on the screen for each data item that must be input. As you can see, this window definition is relatively easy if the field length is known up front. Lines 2025 through 2045 are designed to determine the actual field length available to a variable-length item, by looking ahead at what's next on the screen and adjusting accordingly. Once that is determined, line 2060 establishes the window in which data entry will take place for that item. Next is the printing of any default values, and the display (in inverse) of the field available for entry:

```
2065 line$=MID$(blank$,1,field.len)
2070 default$=name$(field,1):IF
     default$<>" " THEN SUB$(line$,1,
     LEN(default$))=default$
2075 INVERSE:HOME
2080 PRINT line$;
2082 PRINT set.edit$;
2085 HPOS=1:point=1
```

Of note here is the variable Set.edit, which is used to turn off all console options, leaving the program totally in control of cursor movement, wrap, scroll, and so on. Line 2085 then positions the cursor to the beginning of the field (remember that this is a window now) and sets up a pointer "point" to the first character of the field value (Line$). Now the fun really begins:

```
2100 ON KBD GOTO 2200
2105 NORMAL:PRINT MID$(line$,point,
     1);:INVERSE:FOR j=1 TO 150:NEXT:
     PRINT MID$(line$,point,1);:FOR
     j=1 TO 150:NEXT:GOTO 2105
```

This is our old friend the on kbd loop. In this case we are using the normal and inverse options (and the fact that we just turned the console "advance after printing" function off) to blink whatever character in Line string we are currently pointing at. For the purposes of this routine, you can equate Line$ with what's seen in the window exactly. Of course, you hum around in the little loop in line 2105 until a key is pressed. That sends the program off to line 2200:

```
2200 OFF KBD
2205 IF KBD<32 OR KBD>127 THEN 2270
2210 SUB$(line$,point,1)=CHR$(KBD)
2215 INVERSE:PRINT MID$(line$,
     point,1);
2220 IF point<field.len THEN
     point=point+1
2250 HPOS=point
2255 ON KBD GOTO 2200
2260 RETURN
```

Funny Characters. After checking for control or special function characters in line 2205, the typed character is inserted into the Line$ string at the current cursor position, and the character is reprinted in inverse to be sure that the on kbd routine wasn't exited in the wrong state. Assuming that there is room in the window, lines 2220 and 2250 update the pointer and advance the cursor to the new position. Then lines 2255 and 2260 clean up and return to the blink routine, awaiting another keystroke. But what about those special characters? Wait no longer:

```
2270 IF KBD=27 THEN escapecode=1:
     POP:RETURN
2275 IF KBD=8 AND point>1 THEN
     INVERSE:PRINT MID$(line$,
     point,1);:point=point-1:GOTO 2330
2280 IF KBD=21 AND point<field.len
     THEN INVERSE:PRINT MID$
     (line$,point,1);:point=point+1:
     GOTO 2330
```

These lines check for escape and exit back to the calling level (the *pop* gets us out of the on kbd routine and back to reality). In addition, lines 2275 and 2280 process the cursor keys for left and right arrow, first reprinting the current character and then resetting the pointer.

```
2300 IF KBD=13 THEN value$=MID$
     (line$,1,point-1):line$=MID$
     (value$,1,field.len):GOTO 2320
2305 IF KBD<>141 AND KBD<>9 THEN
     2350
2310 value$=line$
2320 NORMAL:HOME:PRINT set.normal$;
     line$;
2325 POP:RETURN
2330 HPOS=point
2350 ON KBD GOTO 2200
2355 RETURN
```

These lines wrap up the routine once the user is satisfied that the field is complete. There are several options to signal completion. First, line 2300 processes the return key, discarding anything to the right of where the return key was pressed. Value$ is set to what's left, and Line$ is redefined so that the actual data can be displayed in line 2320. Line 2305 processes the other option, full entry of whatever is in the window, no matter where the cursor is. As you can see, this occurs when either open-apple return or tab is pressed. Set.normal$ turns advance back on, so that the value can be printed back into the window, this time with inverse off, to indicate that data entry is finished in that field.

Whew! All of that excitement leads us back to the main loop, now at line 120, where the result of the field call is analyzed. If escape was pressed, a further check is made to see if it was pressed during the first input field of the form. If so, that is the indication to terminate input of forms, and the program jumps out of the loop. If escape is pressed in any other field, processing starts over at line 105 with a clean slate. If the return was normal, with data for the field in Value$, then there is an opportunity to do any additional processing required and then add Value$ to the accumulating Out.rec$ in the routine at line 3000. After all the fields are processed, lines 215 and 220 display it, and if the file logging option was set originally, the subroutine at line 4000 writes the result in a file. Here are simple examples of what these routines could look like:

```
3000 IF LEN(value$) THEN out.rec$=
     out.rec$+value$
3005 RETURN
4000 PRINT#2,recordnum;out.rec$
4010 RETURN
```

Obviously, "real" data entry programs will have much more elaborate processing and editing functions built in. This example was only a guide to how you might incorporate these techniques into your own programs.

Try This One. Some things you might want to try in order to improve the program could include expanding the *info%* array to contain more information about editing. (Such as: Is the data alphabetic or numeric? Does it have a fixed decimal place? Can it have a null value, or must some nonblank or nonzero value be used?) For fixed record layout output (like simulating records on a keypunch machine—yuck!) you might want to add fields to define where in the output record the value is to be placed (starting byte and length, for example). If you are really clever, you can modify the routine to accept multiline fields. Remember, also, that there is nothing sacred about the beginning of the program either. The subroutines could just as easily be used within a completely different environment to support your program's screen-handling needs.

Final Last Challenge (Maybe). Last month's Last Challenge wasn't. It actually applies to this month's Third Basic, so look back and have fun. ■

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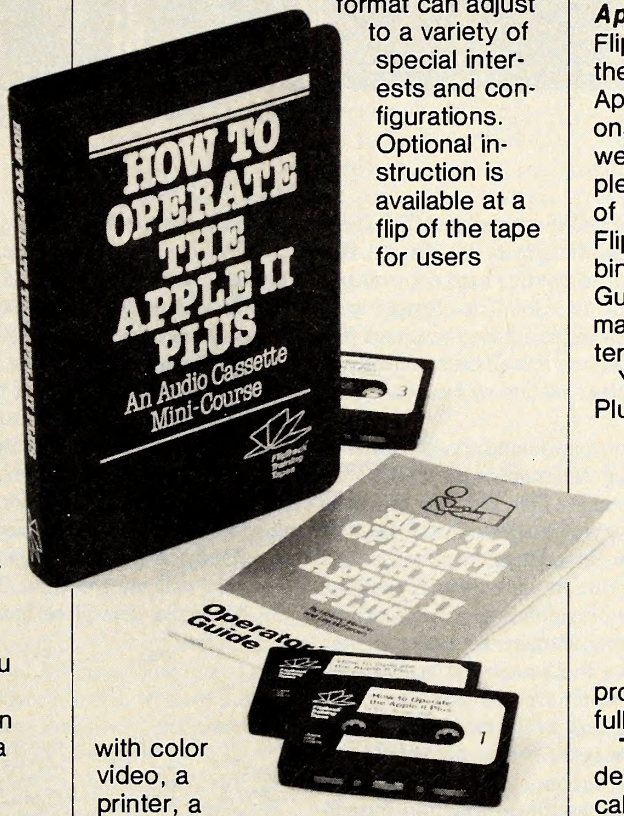

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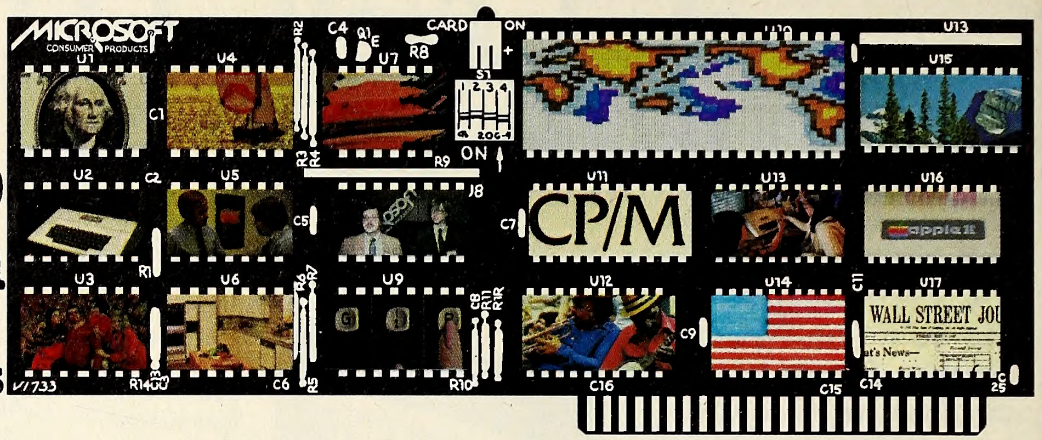
SOFTCARD Symposium

by Greg Tibbetts



Welcome to the third and final installment in our series on DDT. As you'll recall, last month we defined some changes to the Digital Research program *Dump.Com* that enabled us to provide hard copy output instead of screen output at the request of the user. The changes were made using only DDT, without reediting or reassembling the source file. We promised to demonstrate this month how to install those changes—and how to debug them if necessary. We also said that we had made sure it would be necessary.

At the end of last month's column, we had identified the points at which we were going to replace the existing instruction with the JMP or CALL instructions that linked our new routines. Our first task this time, then, is to select a suitable place in memory in which to install the new routines. It's obvious that we must place the routines beyond the last program instruction, but we must also be sure to place them beyond the last address used by the program for the storage of data. Unfortunately, with most programs that you'll be modifying without the source file, the method for determining a safe location is a combination of program review and guesswork. In many cases you won't even have the luxury of knowing the true length of the program except to the nearest 128 bytes, since DDT always loads to the end of the last 128-byte disk file record shown in the record count byte in the disk directory. Whether a program ends 3 bytes within this last record or 103 bytes, the information presented by DDT will be the same.

The Big Three. Data areas used by the program are usually of three types: single variables, auxiliary stack space, and buffers or tables (small, medium, and potentially large, respectively). Sometimes these areas immediately follow the end of the program. At other times they are far beyond the last program instruction. This is the information you must discover.

Many times, a thorough knowledge of what the program is designed to do can eliminate a lot of work. Reading or writing disk buffers, for example, suggests that memory is possibly being set aside to handle the buffers during transfer, modification, or both. When you have reason to suspect this is the case, it's usually easier to examine the code and find such memory usage. Once you've positively identified it, you can either place your new routines beyond the buffers or you can modify the buffer locations themselves so they begin beyond your new code.

For the most part, starting at an even page number beyond the end of the program clears the small variables used as temporary storage and so on. Depending on the length of the new stack space (if any) set aside by the original programmer, they may also be cleared by starting at the next page of memory. You can easily tell whether you need to take the stack into account because the programmer will have had to use stack pointer manipulation instructions. It is easy to spot the new value being placed in the stack pointer (usually with an LXI SP,xxxx) and to use this value. Since stack storage is always down in memory (addresses decreasing) from the value of the stack pointer, the value becomes the effective end of stack space.

From an examination of the code, we see that the new value being placed in the stack pointer is 02A2H. Note: This may differ slightly depending on whether you are working with the modified or unmodified versions and whether you have customized our earlier modifications. In any case, if we set the location for our new routines at the beginning of the next page (in this case 0300H) then we'll clear this area, as well as any miscellaneous variables that may follow the stack.

Further examination of the program tells us that although disk access is definitely a part of Dump's operation, no special program buffers are maintained to manipulate the data. Only the standard CP/M buffer at 80H is used. The safest place to put our new routines, then, is at 0300H. This is acceptable for Dump since it is not a large program nor is it space sensitive. But because one of the goals of programming is to be as efficient as possible, we should really try to cut it a bit closer. Therefore, we will use the value 02B0H.

The code we will be inserting is reproduced here.

```
        xxx     xxxx        (note that this is where to
                             insert the STA instruction
                             if you are working with the
                             unmodified version of DUMP)
        JMP     PRSTR
MSG:    DB      'OUTPUT TO P-PRINTER OR S-SCREEN? $"
PRSTR:  LXI     D,MSG
        MVI     C,09
        CALL    5
        MVI     C,01
        CALL    5
        PUSH    PSW
        JMP     PRST2
MSG2:   DB      13H,10H,13H,10H,'$'
PRST2:  LXI     D,MSG2
        MVI     C,09
        CALL    5
        POP     PSW
        CPI     60H
        JC      NTLWR
        XRI     20H
NTLWR:  CPI     'P'
        JNZ     SKPIT
        LHLD    0F392H
        XCHG
        LHLD    0F386H
        SHLD    0F392H
        XCHG
        SHLD    0F386H
        LDA     0FFH
        STA     FLAG
        LDA     0F3BBH
        STA     FLAG2
        LDA     03
        STA     0F3BBH
        LDA     0F3BBH      (this is the LDA we replaced in
                             the program beginning)
SKPIT:  RET
FLAG:   DB      00
```

```
FLAG2:  DB      00
        CALL    'addr'      (this is the CALL we replaced in
                             the exit routine)
        LDA     FLAG
        JZ      SKPIT
        LDA     FLAG2
        STA     SKPIT-7     (note that this is now minus 7
                             since we inserted the LDA just
                             above SKPIT)
        JMP     NTLWR+5
```

And the hex values for our question string would be as follows:

```
4F,55,54,50,55,54,20,54,4F,20,50,2D,50,52,49,4E,54,
45,52,20,4F,52,20,53,2D,53,43,52,45,45,4E,3F,20,24
```

We are now ready to install our routines. First, bring up DDT and at the same time load *Dump.Com* by typing:

```
DDT DUMP.COM
```

Now begin installing the code by entering an A followed by the origin address; in this case, enter A2B0. Note: DDT does not require the H following hexadecimal numbers but does require a 0 preceding all hex numbers that begin with letters. The lack of long error messages makes it difficult sometimes to tell exactly what you did wrong, so watch the entering of numeric values. DDT will respond with the address 2B0 and await entry of the mnemonic code.

Our first instruction from the code given earlier is the JMP PRSTR (unless you are working with the unmodified version, of course), but DDT will not accept labels. For now, then, we'll just use JMP 0000 and continue by entering the hex values for our message. Once done with that, we will come back and replace the 0000 with the correct address.

When entering the string values (use the table given earlier), it's necessary to use the S command of DDT, since DDT will not accept pseudo ops like DB. So first get out of Assemble mode by typing a period on a line by itself and a return, then an S followed by the address that DDT said was next to be assembled; that is, the address shown when you typed the period. Continue entering the string values, following each with a return, and when you're finished, enter a period to exit.

Voila! The address that appeared when we typed the period is the value of PRSTR: use that value now with the S command to change the address field of the JMP instruction at 02B0H. The address field is low byte first and begins at 02B1H, so you should be entering:

```
-S2B1
02B1 00 D5
02B2 00 02
02B3 4F
```

From now on, no more detailed help.

Continue entering mnemonics from the list just given, using the label substitution technique we employed earlier when you run into labels not yet defined. Be sure you compute the two offset instructions (STA SKPIT-7 and JMP NTLWR+5) properly. These addresses should be those of the LDA 03 and LHLD 0F392H, respectively. Incidentally, the instruction that alters the value at SKPIT-7 is known as self-modifying code since the program alters itself during execution. While this type of programming is not considered an acceptable procedure by many, it is widely used and quite often necessary to save space or gain speed. It can, however, make disassembly and debugging a nightmare at times. Finally, be sure to substitute the proper ASCII hex value for capital P at label NTLWR instead of doing it the way we represented it in the listing since DDT will not accept letter values.

Pomp and Circumstance. Finished? Good. Provided you checked your work thoroughly, you have now earned the title of Apprentice Assembler. Although an assembler does more than resolve label and address references, that is a major portion of its function. Not too bad, was it? Just to be safe, let's save our work to date by entering a control-C (be sure you are at the DDT minus sign prompt); then when the CP/M prompt returns, enter *save 3 Newdump.Com.*

Before actually linking routines into the original Dump code we are going to debug them. The first section will be our screen printing routines. Get DDT and Newdump into memory as shown earlier and use the L command to verify that our routines are there and correct. When you encounter the string values, you'll see a long series of MOV instructions. At this point, use the D command to display the ASCII values and verify this portion in that manner.

Once you're convinced that all is there and complete, begin by using the G, for go, command. This command causes DDT to turn over execution to the processor and to remain out of the picture so to speak. Execution proceeds at real-time speed and only returns to DDT if a Restart 38 instruction takes place. This instruction causes control to pass to the address contained at memory location 38H. Because DDT patches its own recovery address into this location when initialized, control will return to DDT.

Execute at Will. If an address is given following the G command, execution begins at that address. Another address separated by a comma (or a single address preceded by a comma) causes DDT to place a Restart 38 instruction in that second address. This makes the program execute until the second address is encountered, then return to DDT. In this case, we want to begin execution at the JMP PRSTR and stop before encountering the MVI C,01. Using the addresses associated with these instructions as aaaa and bbbb, enter Gaaaa,bbbb. You should get our message on the screen followed by the address bbbb and the DDT prompt. If you don't, try it again; and if you get the same result, recheck your code. When you get the proper response, proceed.

Our second test is the input routine and printing of the carriage return line feed combinations. For this we will use the go address of aaaa as before, but will change bbbb to the address of the CPI 60 instruction following the printing of our carriage return line feed sequences. Note that a G all by itself begins execution of the current value in the processor's program counter.

When you execute this second section, you should get the screen message as before, but this time the cursor will be left at the end of the message and no return to DDT will take place. When this occurs, the program is awaiting your input. For test purposes, you may enter any single character, but remember that no return is required following your input character. Once you enter your input, it should appear (if printable) following the message. Two carriage returns should be printed next, with the bbbb address and the DDT prompt printed after that.

Everything in Order? Now that we have supposedly captured some input, we need to see what that input is in order to make sure the program has done what we expected. To do this, we need to examine the registers; we examine the registers using the X command for examine. When invoked, this command displays all of the register contents and provides a visual display of all the processor status flags, that is, a display of the flag register.

You'll notice also that the instruction located at the address indicated in the program counter is displayed at the far right. At this point you should see the ASCII value of the character you typed in the accumulator. If you don't, then again something is wrong with your code or with the way you followed these instructions; try again. From now on we will want to be a little more careful since we will be manipulating the system itself (output vectors, and so on), so we'll begin using single steps rather than the go command. The next portion we wish to test is the code that discovers whether the input was lower case and, if so, converts it to upper case. First we'll need to put a lower-case value in the accumulator so we can test it.

This is done using the X command also, but in this case, we follow the X command with the register or register pair we wish to alter, in this case the accumulator. The command, therefore, is XA followed by a return. You'll see the computer print the register name and the current value while it awaits your input of a new value. A return here leaves the contents unchanged, while a value followed by a return alters the contents to this value. For now, perform the XA command using a new value of 61H. We can then use the T, for trace, command to cause one instruction to be executed.

Wait, though; didn't we say that the current contents of the program counter would dictate which instructions were executed with G unless we specified an address? Yes, we did, and provided you have not done any further executions, or whatever, you'll find by using the X command that the program counter is still pointing at the address of our CPI 60 instruction. If it were not, we could not use an address with the T command, since any parameter used with it is interpreted as the number of instructions to trace, not the address to start. To alter the start address, we would have to use the X command with the letter P, for program counter.

Dial X. You should now have the program counter set to the proper address, and can go ahead and do a single trace. When the trace is completed, the same information should be displayed on the screen as when you entered the X command, plus an asterisk and the address to be executed next (note that this is the new address contained in the program counter). If you enter the X command again, the new contents of the program counter and the new instruction will be displayed, as will possible changes in the flag register.

Is the number following the C in the flag register now a 0? It should be, since this indicates that the carry flag was cleared during our last operation, meaning that the value in the accumulator was greater than or equal to 60H (and we made sure that it would be). In practice, of course, this would indicate lower case or some other high ASCII value.

The program counter should now be pointing to the JC NTLWR instruction. Do a T2 to execute both the JC and XRI instructions, then do an X and examine what has happened to the register contents. Is it what you expected? If you wish to check the operation of this code with an upper-case value, use XA and XP to alter the accumulator to the value you select and the program counter to point at the CPI 60 instruction. This time, try using the U, for untrace, command of the form U2 to bring you to the CPI 'P' instruction.

Untrace differs from trace only in that it does not print the register and status information for each instruction, only for the last one executed. You may wish to continue experimenting with executing the code via single or multiple stepping and breakpointing up to NTLWR for various values input.

Start Your Printers. To test the next portion of code, that is, our vector-swapping portion, you will have to have your printer hooked up and active. At some point in the test, you'll find that output has switched to the printer. There's no harm done when this occurs, since executing the routine a second time will change things back. It can be disconcerting, however, if you are not expecting it.

One note of caution, though; do not under any circumstances execute the RET instruction at SKPIT unless you have arrived there via a CALL instruction. The reason should be obvious, but we'll cover it anyway.

Since we have not executed a CALL, no return address has yet been placed on the stack. When a RET is executed via DDT, therefore, it will obediently fetch the two bytes currently pointed to by the stack pointer and place them in the program counter. Obviously, this will be disastrous because these two bytes do not represent a valid program address, so be careful. Also, keep in mind that when using the trace command, what you see on the screen is the instruction you have just executed, not the one you are about to execute. The only command that shows you what you are about to execute is the X command.

You may now execute the vector swap section of code using whatever commands you think are appropriate. At least part of the code should be done using trace, however, so that you can stop and use the D command to examine memory and be sure the vectors are actually being swapped by the routine and that FLAG and FLAG2 are being properly handled (that is, that FLAG contains FFH whenever the printer is invoked and that FLAG2 contains the normal contents of address F3BBH). If this section is executed twice, FLAG2 will no longer be accurate, so it's a good idea to record on paper the original contents of F3BBH so you can place them into FLAG2 when you are through with this section. Again, be sure that you do not execute the RET instruction!

Just One More Detail, Igor. All that now remains in our testing session is to try out the last few instructions. Obviously, we will not want to execute the CALL instruction immediately following FLAG2, so our

first instruction will be the LDA FLAG. FLAG at this point should be FFH; if it's not, use the S command to alter it. The zero flag in the flag register should be cleared (should be zero); if it's not, use the X command with Z to clear it. Now use trace to execute the LDA FLAG and JZ SKPIT instructions.

Did trace do what you expected? It shouldn't have. Can you figure out why? Was the zero flag set or cleared when the JZ instruction was executed? Our purpose with these instructions was to check FLAG, and if it was nonzero, that is, if we had swapped vectors, then to reswap them. If FLAG was zero, that is, if we hadn't swapped vectors, then we wanted to skip the whole thing and just return. Why didn't the zero flag get set to one when FLAG was obviously not zero?

The answer (which believe it or not we've discussed before) lies in the fact that unlike the 6502, neither the 8080 nor the Z80 alter the zero flag on register load operations. In order to get the zero flag to represent the contents of the accumulator, you must perform a logical or arithmetic operation on the accumulator. The way we have done this in the past is by using a single byte instruction that has no effect on the value in the accumulator.

What we need to do, then, is to insert, using the A command, the instruction ORA A immediately following the LDA FLAG instruction. With this instruction in place, the zero flag will properly reflect the contents of the accumulator and will tell us if FLAG is zero or nonzero. When inserting this instruction, you will have to move everything following it down one byte. This can be done with the M, for move, command, but it's just as easy in cases like this to reenter the four instructions while in the Assemble mode. On your own now, use G, T, or U to execute these last few instructions with different values in FLAG. Continue until you are satisfied that everything is working properly.

Test Drive. If everything is okay, we're ready to link in the routines and go for a trial run. First, go to the beginning of the Dump program and, using L, find the LDA F3BB instruction we identified last month as the one we're going to replace. Those of you who did not see last month's column and are working with the unmodified Dump program will be replacing the STA instruction immediately following the first MVI A,80H instruction encountered. If you are replacing this latter one, be sure that you have placed the STA instruction at the beginning of our new routine and that you have not inserted the LDA F3BB instruction just before SKPIT. In either case, when you find the appropriate instruction, use the A command to replace it with a CALL 02B0 (if you used a different origin, be sure to use your address here).

We link in our exit routine in exactly the same way, using the location we identified last month. Again, for those of you who did not see last month's column, replace a CALL statement towards the end of the original Dump program. Its location is determined by looking at the list output of DDT for the first part of Dump and finding what happens if the attempt to open the file to be dumped fails. Rather than repeat the entire lengthy process to find this out, look at the assembly listing contained on your SoftCard master disk. You will see the process by which Dump is terminated if the open-file attempt fails. The instruction we'll be replacing is the CALL in the exit routine immediately following the LHLD instruction. Be sure that the CALL you replace is duplicated where indicated in our new exit routine and then replace it using the A command with a CALL to the address immediately following FLAG2.

That's a Wrap. This marks the end of our efforts and we should immediately save the entire program the way we did earlier by exiting DDT and using the CP/M save command. Before doing so, however, use the S command to make sure that both FLAG and FLAG2 are zero. Our routine depends on FLAG being zero unless we change it. Once you have done this, exit DDT and perform the CP/M save command as follows:

```
SAVE 3 NEWDUMP.COM
```

Try your new Dump program by using it on itself or on any other convenient file. If it doesn't seem to work, go back into DDT and use the debugging techniques we demonstrated earlier to determine the problem. If you followed the text faithfully, any problem you encounter should be something small. But in any case, the experience of finding it will go a long way towards increasing your mastery of this powerful tool.

For your reference we're including a DDT disassembly of the new modified program.

This completes our work with DDT and with Dump. It's been an interesting few months and we hope it has been valuable for you. Until next month. . . .

Disassembly of New Dump Program

```
L100,226 - MAIN PROGRAM
0100  LXI   H,0000
0103  DAD   SP
0104  SHLD  025F
0107  LXI   SP,02A2
010A  CALL  020B
010D  CPI   FF
010F  JNZ   011B
0112  LXI   D,023D
0115  CALL  01E6
0118  JMP   018B
011B  CALL  02B0
011E  ORA   A
011F  JZ    0127
0122  SUI   05
0124  JNZ   012A
0127  MVI   A,00
0129  LXI   B,FF3E
012C  STA   0261
012F  MVI   A,80
0131  STA   025D
0134  LXI   H,0000
0137  PUSH  H
0138  CALL  01EC
013B  POP   H
013C  JC    018B
013F  MOV   B,A
0140  MOV   A,L
0141  ANI   0F
0143  JZ    0167
0146  MOV   C,A
0147  LDA   0261
014A  ORA   A
014B  JNZ   017E
014E  MOV   A,C
014F  CPI   08
0151  JNZ   017E
0154  CALL  01AC
0157  PUSH  H
0158  MVI   L,05
015A  MVI   A,20
015C  CALL  019F
015F  DCR   L
0160  JNZ   015A
0163  POP   H
0164  JMP   017E
0167  CALL  01AC
016A  CALL  0193
016D  RRC
016E  JC    018B
0171  MOV   A,H
0172  CALL  01D9
0175  MOV   A,L
0176  CALL  01D9
0179  MVI   A,3A
017B  CALL  019F
017E  INX   H
017F  MVI   A,20
0181  CALL  019F
0184  MOV   A,B
0185  CALL  01D9
0188  JMP   0137
018B  CALL  0324
018E  LHLD  025F
0191  SPHL
0192  RET
0193  PUSH  H
0194  PUSH  D
0195  PUSH  B
0196  MVI   C,0B
0198  CALL  0005
019B  POP   B
019C  POP   D
019D  POP   H
019E  RET
019F  PUSH  H
01A0  PUSH  D
01A1  PUSH  B
01A2  MVI   C,02
01A4  MOV   E,A
01A5  CALL  0005
01A8  POP   B
01A9  POP   D
01AA  POP   H
01AB  RET
01AC  MOV   A,L
01AD  ORA   A
01AE  RAL
01AF  ORA   A
01B0  JZ    01BE
01B3  MVI   A,0D
01B5  CALL  019F
01B8  MVI   A,0A
01BA  CALL  019F
01BD  RET
01BE  CALL  01B3
01C1  CALL  01B3
01C4  JMP   01B3
01C7  ANI   0F
01C9  CPI   0A
01CB  JNC   01D3
01CE  ADI   30
01D0  JMP   01D5
01D3  ADI   37
01D5  CALL  019F
01D8  RET
01D9  PUSH  PSW
01DA  RRC
01DB  RRC
01DC  RRC
01DD  RRC
01DE  CALL  01C7
01E1  POP   PSW
01E2  CALL  01C7
01E5  RET
01E6  MVI   C,09
01E8  CALL  0005
01EB  RET
01EC  LDA   025D
01EF  CPI   80
01F1  JNZ   01FD
01F4  CALL  0218
01F7  ORA   A
01F8  JZ    01FD
01FB  STC
01FC  RET
01FD  MOV   E,A
01FE  MVI   D,00
0200  INR   A
0201  STA   025D
0204  LXI   H,0080
0207  DAD   D
0208  MOV   A,M
0209  ORA   A
020A  RET
020B  XRA   A
020C  STA   007C
020F  LXI   D,005C
0212  MVI   C,0F
0214  CALL  0005
0217  RET
0218  PUSH  H
0219  PUSH  D
021A  PUSH  B
021B  LXI   D,005C
021E  MVI   C,14
0220  CALL  0005
0223  POP   B
0224  POP   D
0225  POP   H
0226  RET
0227
-
-D227,25C - MESSAGE AREA
0227  46 49 4C 45 20 44 55 4D 50 FILE DUMP
0230  20 56 45 52 53 49 4F 4E 20 31 2E 34 24 0D 0A 4E VERSION 1.4$..N
0240  4F 20 49 4E 50 55 54 20 46 49 4C 45 20 50 52 45 O  INPUT FILE PRE
0250  53 45 4E 54 20 4F 4E 20 44 49 53 4B 24 SENT ON DISK$
-
-D25D,2AF - VAR'BLES & STACK
025D  00 00 00 ...
0260  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................
0270  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................
0280  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................
0290  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................
02A0  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................
-
-L2B0,2B2 - OUR CODE
  02B0  JMP   02D5
  02B3
-
-D2B3,2D4 - MESSAGE
02B3  4F 55 54 50 55 54 20 54 4F 20 50 2D 50 OUTPUT TO P-P
02C0  52 49 4E 54 45 52 20 4F 52 20 53 2D 53 43 52 45 RINTER OR S-SCRE
02D0  45 4E 3F 20 24 EN? $
-
-L2D5,2E5 - MORE CODE
  02D5  LXI   D,02B3
  02D8  MVI   C,09
  02DA  CALL  0005
  02DD  MVI   C,01
  02DF  CALL  0005
  02E2  PUSH  PSW
  02E3  JMP   02EB
  02E6
-
-D2E6,2EA - MESSAGE
02E6  0D 0A 0D 0A 24 ....$
-
-L2EB,336 - REMAINING CODE
  02EB  LXI   D,02E6
  02EE  MVI   C,09
  02F0  CALL  0005
  02F3  POP   PSW
  02F4  CPI   60
  02F6  JC    02FB
  02F9  XRI   20
  02FB  CPI   50
  02FD  JNZ   031E
  0300  LHLD  F392
  0303  XCHG
  0304  LHLD  F386
  0307  SHLD  F392
  030A  XCHG
  030B  SHLD  F386
  030E  MVI   A,FF
  0310  STA   0322
  0313  LDA   F3BB
  0316  STA   0323
  0319  MVI   A,03
  031B  STA   F3BB
  031E  LDA   F3BB
  0321  RET
  0322  NOP
  0323  NOP
  0324  CALL  01AC
  0327  LDA   0322
  032A  ORA   A
  032B  JZ    0321
  032E  LDA   0323
  0331  STA   031A
  0334  JMP   0300
  0337
-
```

SHEILA NEEDS YOUR HELP BEFORE IT'S TOO LATE

Written by Brian Fitzgerald

It's only been an hour since he locked her in the tower . .

Leap into the mythical, hi-resolution world of SHEILA . . . it's the real-time adventure saga that's littered with traps, puzzles, magic spells and various monsters. You control a sophisticated arcade-like arsenal of bombs, spears, teleport pills, magical devices, and spells to free SHEILA from the forbidden tower — and save the world from eternal Hell.

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TRADETALK

☐ **On-Line Systems** (Coarsegold, CA) shall hereinafter and forevermore be known as **Sierra On-Line Incorporated.** A rose is a rose is a rose, et cetera.

☐ Denying the preliminary injunction sought by **Apple Computer** (Cupertino, CA), Judge Clarence Newcomer of the United States District Court for the Eastern District of Pennsylvania has ruled that Apple failed to show a reasonable probability of success on the merits in its suit to enjoin **Franklin Computer** (Pennsauken, NJ) from manufacturing and selling the Franklin ACE computer.

Apple brought suit for patent and copyright violations last May, following Franklin's introduction of the Apple hardware-software–compatible ACE in March. Franklin has filed a $150 million antitrust action against Apple, charging harassment and unfair practices.

☐ **Ernest Marx,** vice president of *Milliken Publishing Company* (Saint Louis, MO), a publisher of teaching aids, has announced the company's entry into educational courseware for the home computer market with the formation of **Edufun!**, a software games division. Beginning in late 1982 and continuing throughout 1983, Milliken will release *Mathfun!, Wordfun!, Readingfun!,* and *Spellingfun!* packages, designed for home and school use with children ages five through fourteen.

☐ **Great Plains Software** (Fargo, ND) has announced the signing of fourteen national manufacturer's representatives for its *Hardisk Accounting Series*. To wit:

T. Pickett Sales (Sunnyvale, CA); **Thorson Rocky Mountain** (Denver, CO); **G.B. Marketing** (Chicago, IL); **Hamilton and Associates** (Houston, TX); **King Marketing** (Indianapolis, IN); **Micro Management Associates** (Scottsdale, AZ); **Rogers Sales Associates** (Stuart, FL); **Sesame Systems** (Maudlin, SC); **Technical Representatives** (Earth City, MO); **Robert Electronic Sales** (Catonsville, MD); **Clothier Herold** (Minneapolis, MN); **PCMA** (Long Beach, CA); **Micro Marketing** (Bloomfield, MI); and **Computer Marketing Services** (Cherry Hills, NJ).

Payroll and inventory modules for the series are under development.

☐ Now for the moves: **Street Electronics**, developer of the Grappler interface and the *Echo II* speech synthesizer, is now at 1140 Mark Avenue, Carpinteria, CA 93013, having relocated from Anaheim, California. Their new phone number is (805) 684-4593.

The "new" **Dakin 5,** a subsidiary of **Verbatim Corporation** (Sunnyvale, CA), is located at 7000 North Broadway, Suite 304, Denver, CO 80221; (303) 426-6090.

MicroPro, maker of *WordStar*, has moved to 33 San Pablo Avenue, San Rafael, CA 94903. Their new phone number is (415) 499-1200.

☐ Major venture-capital funds, under the management of **G. Felda Hardymon** of **Bessemer Venture Partners** (New York, NY) and **Jeffrey D. West** of **Oak Investment Partners** (Westport, CT), have been invested in **Lifeboat Associates** (New York, NY) to meet the company's increased service and support efforts in the micro and minicomputer software industry. Hardymon and West were elected directors along with **Theodore Schlissel**, an independent management consultant.

Tony Gold, president of Lifeboat Associates, has announced the election of **Dr. Edward H. Currie,** creator of the Altair 8080 microcomputer, to the position of vice president and chief operating officer.

Stephen C. Wilson, former director of administration, has been appointed vice president of administration and secretary. He will oversee management information systems, facilities, and personnel.

☐ **Hayes Microcomputer Products** (Norcross, GA) has named **Softsel** (Inglewood, CA) as a distributor of its communications products.

President **Dennis C. Hayes** has appointed **Donald Huizingh** to the position of director of marketing and sales. He will direct the activities of the marketing, sales, and technical services departments.

☐ **Software Dimensions** (Citrus Heights, CA), developer of several Apple accounting packages, has formed a marketing organization and appointed **Henry F. Lafler III** as director of marketing. Lafler, a CPA who gained marketing and sales experience with Travel Agency Systems and Tymshare, will be in charge of developing an international distribution network and negotiating with original equipment manufacturers for the company's business applications software.

☐ **The Agency for Instructional Television** (Bloomington, IN), on the recommendation of U.S. and Canadian educators, has proposed a cooperative project between the two countries to develop instructional materials combining the use of microcomputers and television. According to **Saul Rockman**, AIT's director of research, the project is designed to improve the problem-solving abilities of students in grades six through eight. Along with microcomputer and television materials, it will include instructional print material, a teacher in-service training seminar, and a series of policy studies on the use of microcomputers in education.

"There are some striking parallels between the introduction of microcomputers into the classroom and the advent of school television in the 1950s and early 1960s," says Rockman. "It was felt that AIT, with thirteen years of experience in cooperative television projects, could help develop instructional materials using both microcomputers and video programming. We hope the project illustrates the best of what education can do when agencies join together."

☐ **David A. Jeskey** has been appointed marketing services manager for the **Belden Corporation Interconnect Systems Division** (Gastonia, NC) and **Magnum Electric Company** (Erie, PA). He will be responsible for long-range strategic planning and new product development in the manufacture of molded cable assemblies and terminal strips for the electronic interconnect market. Belden produces the rainbow ribbon cables that brighten up our Apples.

☐ **Digital Research** (Pacific Grove, CA), developer of CP/M, has opened an eastern regional sales office in the Boston metropolitan area, serving Connecticut, Massachusetts, Maine, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. Eastern regional manager **Bruce Cohen**

will direct operations at the new office, temporarily located at 6 New England Executive Park, Burlington, MA 01803; (617) 229-6222.

According to Digital Research operating systems vice president **Tom Rolander**, the company has entered into a publishing agreement with **Orange Compuco** (Irvine, CA) that will make it easier for CP/NET users and OEMs to configure a local area network. Digital Research's CP/NET manuals and disks will now include a listing of Orange Compuco's CP/NET implementation on its ULCnet local area network. ULCnet's datalink and transport layer software will be included as an alternate protocol for use with CP/NET.

☐ **The Softwaire Store** (West Los Angeles, CA) has received approval from the California Department of Corporations to sell franchises. The store name has been changed to **Softwaire Centres International.** According to president and founder **Glenn Johnson**, "The franchised Softwaire Centre will be tailored after the 1,600-square-foot West Los Angeles store both in size and concept. The stores will emphasize strong user support and extensive product selection." The overall franchise cost is approximately $160,000, including inventory, working capital, and promotion. Franchise sales will be handled by **Aaron Rothenberg** of **Business Expansion International,** 9929 West Jefferson, Culver City, CA 90230; (213) 204-5570.

☐ **Allen Hardin** and **Wayne Nystrom**, former executives of FISI, the country's largest bank marketing firm, have announced the founding of **Infoware Ltd.**, a company devoted to marketing and distributing microcomputer software to banks, savings and loans, and credit unions. Headquartered at 176 Second Avenue North, Nashville, TN 37201, the company will secure product marketing licenses from software developers with banking-oriented applications and provide marketing and distribution services to support these products on a nationwide basis. Phone is (615) 254-5500.

☐ **Universal Data Systems** (Huntsville, AL) has announced the addition of **Allied Electronics** to their national network of industrial distributors. According to **John Jurenko**, vice president of sales, "Allied Computer and Systems Group was chosen because of their strong background in the data communications and electronics industry. They will distribute the UDS LP series of modems along with the new 212A."

☐ Two regional computer offices in San Francisco and New York City have been opened by **Nestar Systems** (Palo Alto, CA), manufacturers of a line of personal computer local area networking products. Says director of regional operations **William Coleman**, "The eastern and western regional offices are direct end-user sales channels. Selected large account customers will be served from these centers. Sales to dealers, OEMs, and overseas distributors will continue to be handled through the company's headquarters location here."

The centers will also offer training seminars and classes for Nestar equipment users.

☐ **Orange Micro** (Yorba Linda, CA) has filed suit against **Genie Computer** of Tarzana, California, alleging copyright infringement and unfair competition for Genie's alleged use of proprietary firmware from Orange Micro's Grappler in their production of the Genie Printer Interface Card. "There are even sections copied verbatim out of the *Grappler Operator's Manual* in their manual," says company president **Art Scotten.**

The suit seeks damages from units sold to date and an injunction against any further sales.

☐ The new phone number for the Peachtree product center of **Peachtree Software** (Atlanta, GA) is (404) 239-2045.

☐ **Computer Scholar** (Susanville, CA) has been founded by elementary school teachers **Waine MacAllister** and **Jo Ann Harvey** "to fill a need for more hands-on computer time for children and adults, coupled with teachers' needs for a second income and tax write-off." The company is offering franchises for a tutoring/time-sharing service consisting of a package of selected software covering basic academic areas and programming, all necessary hardware, and an operating manual. The package also includes advertising materials and permission to use the company's registered logo. Persons wishing information on franchises should write to Computer Scholar, 145 Park Street, Susanville, CA 96130, or call (916) 257-7929.

☐ **Systems Plus** (Palo Alto, CA) has appointed **N. Patricia Groves** to the new post of director of marketing services. Previously manager of new account development for Durango Systems, Groves will be responsible for the company's technical support, product selection and testing, dealer programs, and marketing aid functions. In other news, Systems Plus has reduced the dealer and list price for its *Accounting Plus II* package.

☐ The board of directors of **Star Computer Systems** (Torrance, CA) has announced the election of **William G. Webster, Jr.,** as president. Webster was marketing manager at Control Data's Los Angeles division and formerly president of the educational publication *Courselector, Inc.*

Webster has named **James H. Hart**, cofounder of the firm and a marketing colleague from Control Data, as Star Computer's executive vice president. Hart's responsibilities will encompass operations, software design, financial planning and control, personnel, and customer service.

☐ Television viewers in the San Francisco and San Jose areas will be able to see **Gene Sprouse**, president of **Rainbow Computing** (Northridge, CA), and other leaders in the computer industry on "Window on Computer Solutions," a special feature of the nationally syndicated "Window on Wall Street" television talk show. Series will air weekdays at 4:30 p.m. on KSTS (48, beginning September 23rd.

☐ Under the terms of a two-year agreement with Apple Computer, **Reader's Digest Services** (Pleasantville, NY) will develop and market *Edu-Disks*, a line of educational software for which Apple will provide technical information, computer training for Digest personnel, access to its computers, and marketing support.

☐ **Pete Bolles**, president of **Racal-Vadic**, the Sunnyvale modem manufacturer, has announced the start of construction on a new corporate office center in the Oak Creek Business Park in Milpitas, California. The 76,000-square-foot building will accommodate all corporate and administrative staff, product development, and sales and marketing personnel. The building is scheduled for completion in early 1983.

☐ In its first move to produce and market retail products under its own name, **USI International** (Brisbane, CA) has established a computer products division. Their first product is a line of green-screen and amber monitors.

Cynthia Druley has been appointed marketing manager for the division to facilitate that expansion, overseeing product development and management of the division's operations.

☐ **Joseph O. Bentley, Jr.,** has been appointed senior vice president and secretary-treasurer of **CCS**, the San Antonio–based information services company, sponsors of the *SofSearch* software locator service. He was previously with the Birmingham branch of Arthur Young and Company. ■

All About Applesoft

by Doug Carlston

This month we are going to design and start to build our first major program, a utility that permits us to create and manipulate shape tables easily. We aren't using much new vocabulary this time. However, we are introducing a major new concept, that of the *logical variable.*

Actually, any numeric variable can be treated as a logical variable. It works like this. If X is equal to zero, we call it false. If it is equal to any other value, we call it true. Take a look at these two examples:

```
X = 5: IF X THEN PRINT "X IS TRUE"
X = 0: IF NOT X THEN PRINT "X MUST BE FALSE"
```

If X means, "If X is true (that is, not equal to zero) then . . ." it follows that *if not X* means, "If X is false (equal to zero) then. . . ." Clear as mud.

The Apple can also evaluate an expression logically. If the expression is true, it will return a value of 1; if false, a value of 0. Try these examples on for size:

```
X = 7: Y = 2: PRINT (X=Y), (X<Y), (X>Y)
```

or even better:

```
A = B = C: PRINT A,B,C (Hint: think of this expression as: A = (B=C)
    and evaluate right side first)
```

This *is* fun. Now that you have a sense of how logical variables work, let's get on with the heavy stuff—program design. We want to build a program that will permit us to draw shapes easily, examine them, and save them in a table if they look worth saving. We also want to avoid all that number crunching that we did last month. No point in straining our brains.

Saddle Up the Four Horsemen. A moment of consideration suggests that what we really need are four miniprograms that work together. The first allows us to draw a shape on the screen; the second converts it into a shape table when we're finished; the third permits us to change its size, color, position on the screen, and angle of rotation; and the fourth allows us to save it, load in a new shape, or go back and edit it some more. If we break down the problem this way, each bite becomes more manageable and less intimidating.

Let's take a whack at that first miniprogram by writing a routine that permits us to draw a shape on the hi-res screen. As it draws, let's have it save our actions in an array, which we can convert into a shape table when we are done.

First things first. Of course, everyone remembers how to turn on page 1 of the hi-res graphics:

```
10 HGR: POKE -16302,0
```

HGR turns on page 1 of hi-res graphics (which we are going to use just in case there are still any of you out there who only have 16K of memory in your computer). That poke may look a little unfamiliar, however. It's really the same as 49234, which we discussed in March and which closes the text window at the bottom of the page. (If you subtract 65,536 from an address, you get a negative number that works as well as the positive one.) We are going to use the negative versions in this month's column because the positive addresses introduced earlier are, unfortunately, not the ones given in your manuals. So, even though they are simpler to understand, they may be a source of confusion. For the record, figure 1 displays both sets of equivalent addresses:

Set	Purpose	Addresses	Or
1a	Displays screen in graphics mode	49232	− 16304
b	Displays screen in text	49233	−16303
2a	Closes text window at screen bottom	49234	−16302
b	Opens text window at screen bottom	49235	−16301
3a	Displays Page 1 on screen	49236	−16300
b	Displays Page 2 on screen	49237	−16299
4a	Displays $400 area (text/lo-res)	49238	−16298
b	Displays one of the hi-res screens	49239	−16297

Figure 1.

Next let's think about the array that we are going to be stuffing our instructions into. We could set it up as a one-dimensional array and keep sticking our instructions into it one after another. However, as you remember from last month, all instructions are combined into pairs, which are then stored as a single number in the shape table. We can save ourselves some work in the second miniprogram if we store our instructions in pairs.

Put on Your 2-D Glasses. One way we can do this is to create a two-dimensional array, two numbers wide by any number long. Then we will load our instructions two by two into this array until we are ready to continue.

Let's call our array Vectr (short for vector since these are vector shapes we are storing) and reserve space for it in memory with a dimension statement:

```
20 DIM VECTR(1,100)
```

What this statement says is that we want to set aside enough variable space for an array containing 202 variables. Where do we get the 202? Well, computers don't count from 1; they count from 0. So when we ask to reserve space for an array with dimensions 1 by 100, your Apple goes to work like this:

```
(0,0)   (1,0)
(0,1)   (1,1)
(0,2)   (1,2)
(0,3)   (1,3)


(0,100)  (1,100)
```

In other words, it sets aside a 2-by-101 area, since the number 1 is the second number in your Apple's alphabet. If this seems strange, imagine how our habits look from your Apple's point of view. We could have made the array larger, but 100 seemed like a nice place to stop (if you want to draw really large shapes, you can always come back and change this later).

Let's Make 'Em Talk. The next thing to do is set up some initial values for variables. We'll need a couple to tell us which value in our array we are filling next. Let's call the first Snum (for switching number). It will keep track of whether the value of the first array coordinate is 0 or 1 and switch back and forth between them as we fill up the array. We will call the second variable Bnum (for byte number). Since it will keep track of the actual number of bytes we are going to eventually need for our shape table—which is the same as the second array coordinate—we know that this number will be somewhere between 0 and 100.

We'll also need a couple to keep track of the X and Y coordinates on the hi-res screen (we'll want to set initial values for these somewhere near the middle of the screen). And we'll need one to remember whether we are in plot-and-move mode or in move-only mode. Let's call this last one Colr for color. If we set it equal to 3 when we are in plot-and-move mode and to 0 when we are in move-only mode, then it will represent the correct color to plot on the hi-res screen at those times as well as a flag to remind us which mode we are in.

The variable setup line could look like this:

```
100 COLR = 3:X = 140:Y = 96:SNUM = 0:BNUM = 0
```

Actually, you don't need to initialize variables whose starting value will be 0, since the starting value of all variables is assumed to be 0 until you tell your Apple something different. But it may help us to get organized to think out which variables we will need in advance.

Here We Go Loop de Loop. Next, we need to set up our loop. The loop needs to do four things. First, it has to read our commands from the keyboard. Second, it has to figure out what they mean. Third, it must draw whatever line we have asked for on the screen. And fourth, it has to save a record of our instruction in the array Vectr.

Let's use the same input routine we used before, the live key routine that keeps checking the keyboard to see if a key has been pressed. If no key has been pressed, we will want to blink a dot on the screen so we can tell where we are in our drawing. Try this:

```
120 HCOLOR= 3: HPLOT X,Y: HCOLOR= 0: HPLOT X,Y
130 IF PEEK ( - 16384) < 128 THEN 120
140 KEY = PEEK ( - 16384):KEY$ = CHR$ (KEY - 128): POKE
    - 16368,0
```

As long as no key is pressed, line 130 will keep returning control to line 120, which first plots X,Y in white (Hcolor = 3) and then in black (Hcolor = 0), which has the effect of erasing the plotted dot. If we do press a key, then line 140 figures out which key it was, stores the character in KEY$, and clears the keyboard strobe.

Next we move on to the problem of interpreting the key that has been pressed. Line 140 puts the keystroke into the string KEY$, which we can then compare against our different control codes. So the first thing we have to do is decide what our control codes ought to be.

We can use the I,J,K, and M edit diamond for motion, and toggle between plot-and-move and move-only modes with the X and C keys. In each case we can spot the key with an *if* statement:

```
150 IF KEY$ = "I" THEN Y = Y - 1:BYTCODE = 0
```

If we press the I key, we want to move upwards on the screen. By subtracting 1 from the Y variable, the next time we plot X,Y (in line 120), it will plot one dot higher, since the smaller Y is, the closer you are to the top of the screen. We also want to set the variable Bytcode to 0, which is a value we will store in our array so we can remember this step.

Other *if* statements will look similar:

```
160 IF KEY$ = "J" THEN X = X - 1:BYTCODE = 3
170 IF KEY$ = "K" THEN X = X + 1:BYTCODE = 1
180 IF KEY$ = "M" THEN Y = Y + 1:BYTCODE = 2
190 IF KEY$ = "X" THEN COLR = 3
200 IF KEY$ = "C" THEN COLR = 0
210 IF KEY$ <> CHR$ (13) THEN 120
```

Now, if the control code we hit was one of the edit diamond keys, we want several things to happen. First, we want to change the value of X or Y, which we have done. Second, we want to store the command in our array before moving on to the next command. As we have written the code so far, the program will keep looping back to line 120 until we hit the return key (which is the same as character 13).

Holler If It Goes Wrong. That isn't what we want to have happen, so let's change line 210 and add another line of code:

```
147 BYTCODE = 999
210 IF BYTCODE = 999 AND KEY$ <> CHR$(13) THEN 120
```

If we hit any of the four edit keys, Bytcode will be reset to a new value, and line 210 will no longer send program control back to line 120. So now we have a chance to save our new instruction in the array. First, however, we should add the instruction that ships us off to the second miniprogram:

```
215 IF KEY$ = CHR$(13) THEN HCOLOR= 0: HPLOT X,Y: GOTO
    1000
```

When we press the return key, that indicates that we are finished drawing our picture. Line 215 will then erase our cursor from the screen and jump to line 1000, which is where our second miniprogram will begin, the one that converts the shape array into a shape table in memory.

Those who read last month's column will recall that there are eight commands that can be entered into a shape table. Half of them are plot-and-move commands; the other half are move-only commands. The move-only commands are given numbers from 0 to 3, depending on direction; plot-and-move commands range from 4 to 7. Up to now the four values we have given Bytcode have ranged from 0 to 3. However, if Colr is equal to 3, it means that we are in plot-and-move mode, so we have to add 4 to the value of Bytcode to give it the correct value. That's pretty simple if you understand the concept:

```
220 IF COLR = 3 THEN BYTCODE = BYTCODE + 4
```

Now we're ready to save our value in the array:

```
230 VECTR(SNUM,BNUM) = BYTCODE
```

Next we have to change the values of Snum and Bnum so that we are ready to fill the next item in the array the next time we pass this way:

```
240 SNUM = NOT (SNUM): IF SNUM THEN BNUM = BNUM + 1
```

Look at all those marvelous logical variables! If anybody understood that line the first time they read it, they should be doing this for a living. Let's take a close look at how we are filling up our array. The starting value of Snum was 1. Each time that we encounter line 240, Snum becomes Not Snum. In other words, if it was 1, it becomes 0. If it was 0, it becomes 1.

Lands a One-Two Punch. Now look at the second half of line 240. It says, "If Snum equals 1 then increase Bnum by 1." Very straightforward. So look at what happens to our array each time we pass this line:

SNUM	BNUM	VECTR(SNUM,BNUM)	
1	0	VECTR(1,0)	First entry
0	0	VECTR(0,0)	Second entry
1	1	VECTR(1,1)	Third entry
0	1	VECTR(0,1)	Fourth entry
.	.	. .	.
.	.	. .	.

Gradually the array fills up. All that remains is to send the program back for another command and to clean up one little bug:

```
125 HCOLOR= COLR: HPLOT X,Y
250 GOTO 120
```

The reasoning behind line 250 should be obvious. However, line 125 may only become so if you try to use the program before adding it. The problem is that your cursor is not leaving behind a trail of dots, whether you are in plot-and-move mode or move-only mode. Line 125 is designed to leave behind such a trail, but only if you are in plot-and-move mode. Try adding the line and see the difference.

That's all there is to the first miniprogram. With it you can draw shapes on the screen and a record of your cursor movements is stored in the array called Vectr. Next we have to write a program that can take that array and turn it into a shape table, which can be poked into your Apple's memory.

To Make a Moot Point Short. Let's assume for the sake of argument that we are going to have only a single shape in our shape table and that we are going to poke it into page 3 of memory (the area that runs from $300 to $3FF, right below the text window). This makes our job much easier. As you may recall from last month, the first four bytes in a shape table with only one shape are always 1, 0, 4, and 0. Therefore, the first lines of this section might be:

```
1000 START = 768
1010 POKE START,1: POKE START + 1,0: POKE START + 2,4:
     POKE START + 3,0: START = START + 4
```

As you doubtlessly figured out, 768 is the decimal version of $300 (just divide it by sixteen a couple of times to convince yourself). Next we want to set up a loop to poke our values one at a time into this area of memory:

```
1020 FOR BYTE = 0 TO BNUM
1050 NEXT BYTE
```

Each pair of bytes is combined into a single number by taking the first number in the pair, multiplying it by 8 and then adding the second number (if this seems the reverse of what we did last month, keep in mind that we added the second number in each pair into the array first in this program). Then we poke the product into the appropriate spot in memory:

```
1030 NUM = VECTR (0,BYTE) * 8 + VECTR(1,BYTE)
1040  POKE START,NUM:START = START + 1
```

Finally, we need to add a zero to the end of the table, and it is finished:

```
1060  POKE START,0
```

This may not be easy to follow at first. In particular the use of Start as a shifting address and the use of the variable Byte to calculate the values to be poked into memory in line 1030 may be confusing. But look at those lines carefully and try them out with a few sample values. See if they don't make sense to you then.

All Work and No Save. Next time we'll finish this program by adding the utilities that permit us to display this shape, manipulate it on the screen, and save it to disk or tape if we want to preserve it. In the meantime, add the following lines so that you can use the program now:

```
2000 POKE 233, INT(START/256): POKE 232, START - (INT
     (START/256)*256)
2010 TEXT : HOME : PRINT "THE SHAPE IS IN MEMORY"
```

Line 2000 sets pointers to tell the Apple where the shape resides. We'll explain it in more detail next month.

The commands we looked at last time—and indeed lines 40 through 90 of last month's program—should give you a head start on using the shapes yourself. Note that the shape will remain in memory even if you type in or load another program. Try your hand at it and we'll compare notes next month. ◨

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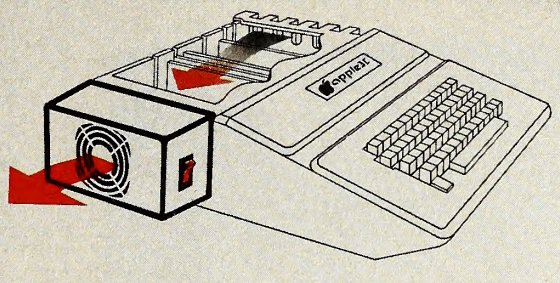

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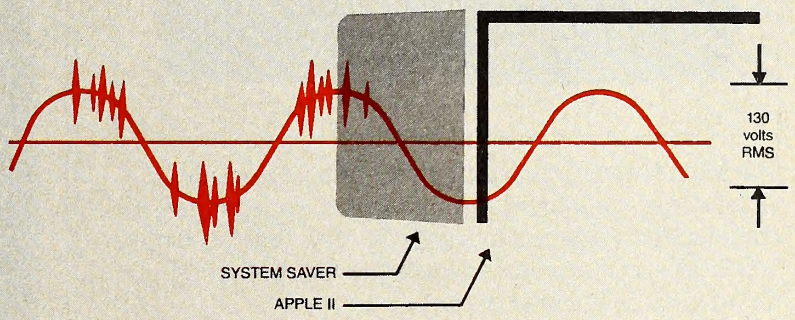

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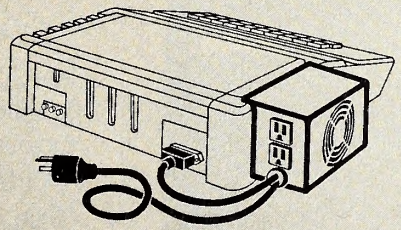

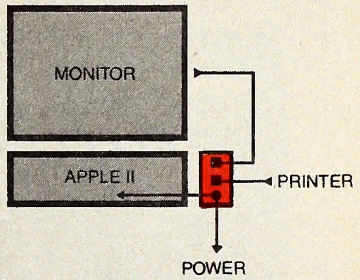

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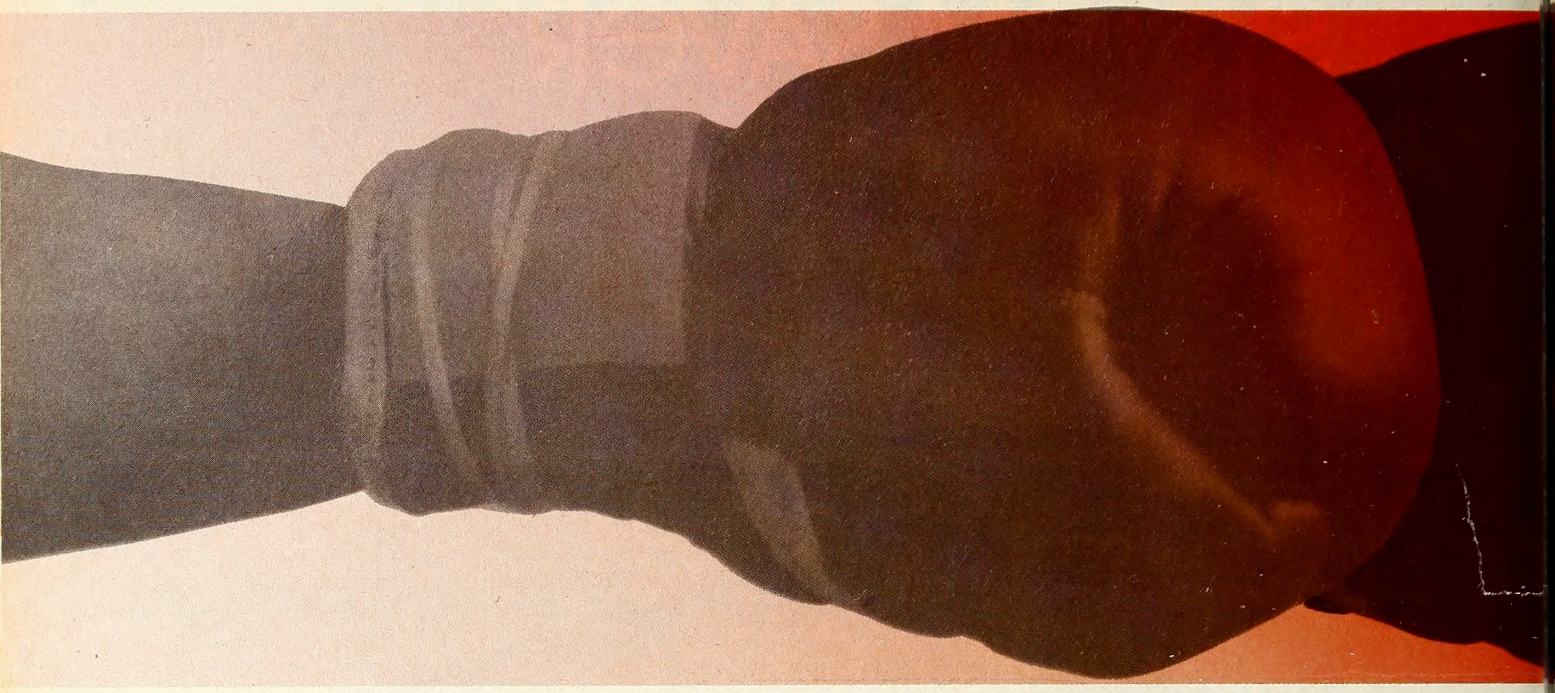
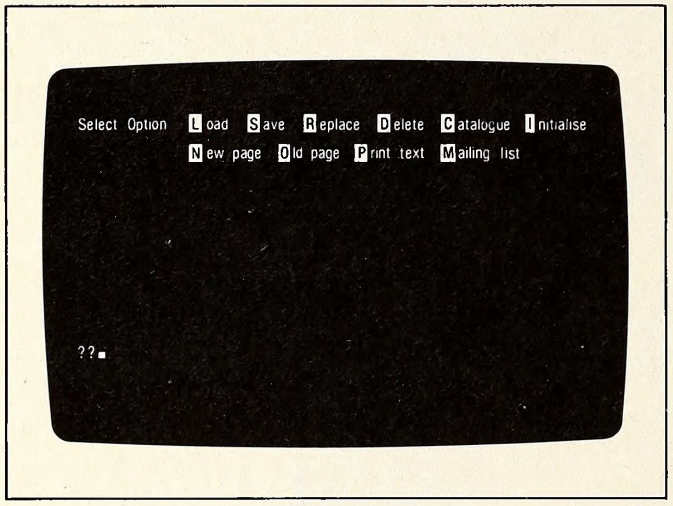
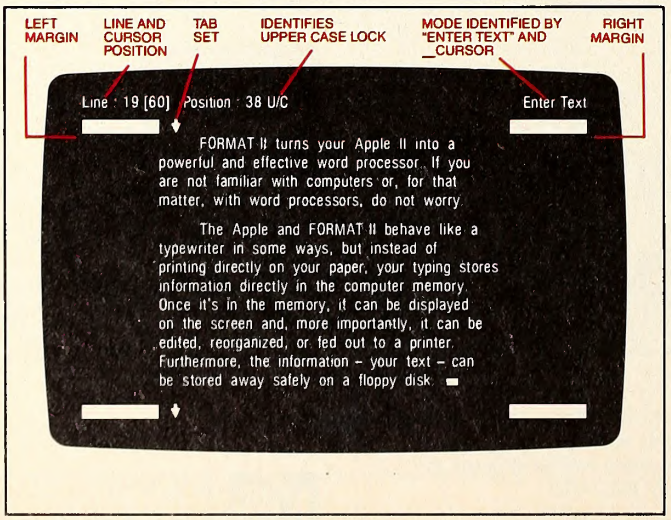




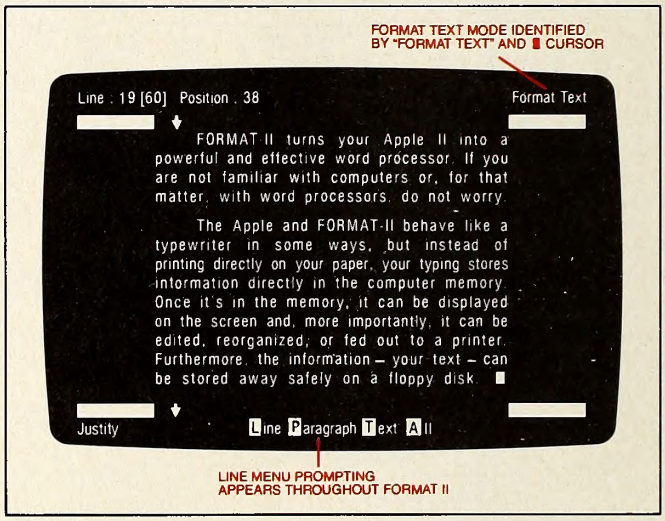
The Main Menu. Commands for the Main Menu, as in all modes of the system, are mnemonic. For example, to create a *New Page,* just touch [N]. To *Print Text* touch [P]. Touch [M] and move immediately into the mailing list. There is no chaining to disk!



Entering Text...Easier Than a Typewriter

Enter text quickly and a few commands does it all. As on a typewriter, you access upper case letters with the SHIFT key But Format-II is smarter than a typewriter since there is no need to press RETURN at the end of each line. Format-II wraps text from line to line for you.

Effortless Formatting



Touch the [ESC] key and you're in "Format Text" mode to edit and manipulate. Again, all commands are mnemonic and are brought up with one key stroke. No complicated CTRL functions! For example:

[A]lign...a column of numbers
[B]lank...out text.
[C]enter...text.
[D]elete...text.
[E]dit...text.
[F]ind...text on the page.

Illustrated is [J]ustify...text. (Throughout, bottom-of-screen prompting keeps you on track.) The justification on the screen appears exactly as it will print out. Format II is a "what you see is what you get" word processor.

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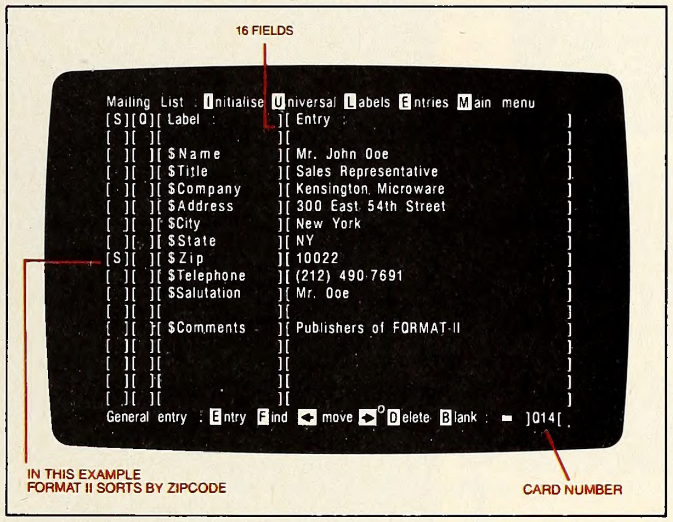

Maintain your lists in any order you like. In this example the entries have been sorted by zip code.

Format-II's powerful logic allows you to target entries from your list to be merged with specified letters. To send a letter to all "Program City" stores listed except those in California, set Format-II's logic for "Program City" ANDNOT "California". With the logic set for "lawyers"OR"accountants"AND"California", Format-II will print a letter to only those lawyers and accountants who live in California.

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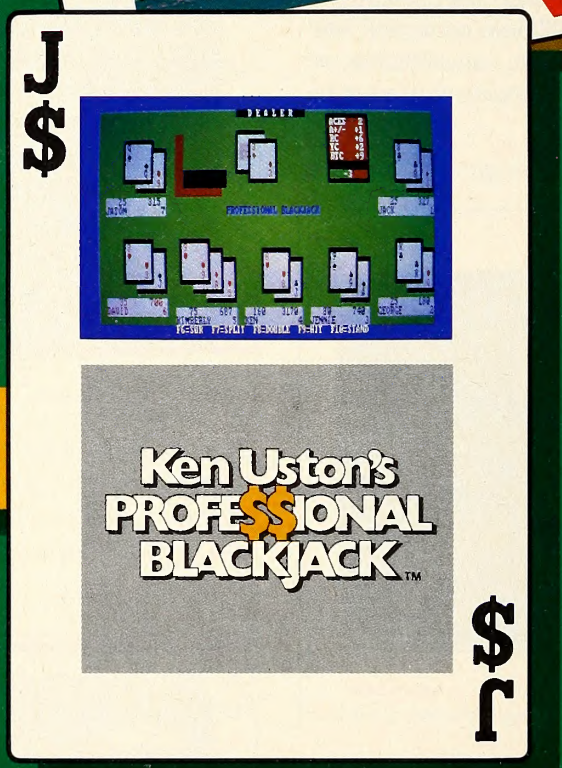

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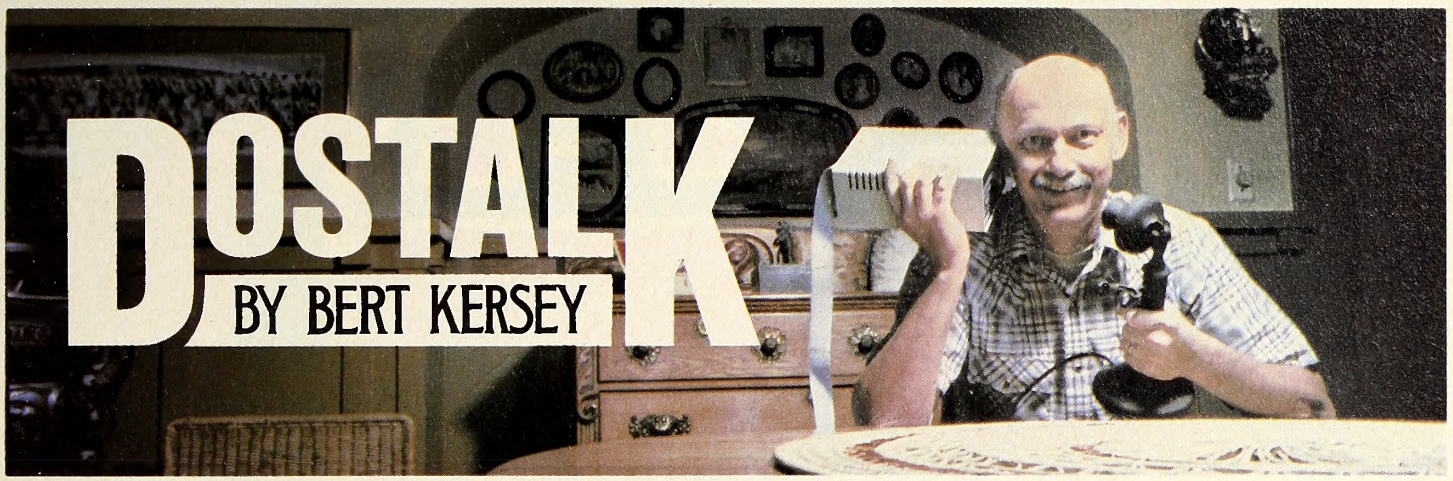

DOSTALK

BY BERT KERSEY

The catalog is often the menu from which you or a user of your disk selects programs. It is like the table of contents of a book and should be maintained and presented in an attractive and orderly fashion. DOS does its best to keep things tidy, but it does have some quirks that are nice to know about.

How File Names Are Stored. An initialized disk is divided magnetically into thirty-five individual concentric tracks. DOS stores file names in the directory on central track 17. If you look at a high-mileage disk in just the right light, you can sometimes see the wear on this track through the oval hole in the disk sleeve. This track, like all of a 3.3 disk's tracks, is divided into sixteen sectors numbered 0 through 15. There are only thirteen sectors on a 3.2 disk, numbered 0 through 12. Track 17, sector 0 contains a disk's VTOC (pronounced "vee-talk"), or volume table of contents. The VTOC is sort of a map of the disk, telling DOS where information about each file is stored. Each of the remaining fifteen sectors (1 through 15) of track 17 may contain up to seven file names. A disk may therefore contain a maximum of 105 (15 times 7) files. An attempt to save a 106th file will fail with a "disk full" error message—same as if you had tried to save more than the maximum 496 sectors on the disk.

File Name Order. On a new 3.3 disk, the first seven files you save (actually save, bsave, or write) will have their names and certain information about the files stored on track 17, sector 15. Remember, we are only discussing file *names* here, and not the information contained in the file itself. File names 8 through 14 are stored on track 17, sector 14, names 15 through 21 are stored on sector 13, and so on, down to sector 1. Nice and orderly, right? Yes, but if you *delete* a file name, the next saved file's name will appear in the deleted file name's slot. In other words, DOS stores each new file name in the topmost available position in a catalog. If you have two or more files with the same name (made possible by renaming files), and you use that name in a DOS command, DOS will look no further than the first correct name it finds.

Rearranging File Names. There are utilities on the market that will rearrange file names in a disk's catalog. Most give you the option of alphabetizing file names; the better ones let you be a little more creative. Another popular option is the ability to undelete deleted files or file names that haven't been overwritten.

One free utility, the Fid program on your System Master disk, lets you transfer files one by one from disk to disk. If your target disk, the disk you are transferring to, is blank (but initialized) when you start, you may transfer file names in any order you wish.

You may want to insert several dummy file names in the middle or beginning of a catalog. As soon as your target disk has all of the pertinent files transferred to it, delete the dummy files. Then you know that the next several files saved on that disk will appear in the catalog in the position of the deleted dummy file names. For example:

```
CATALOG
A 030 FILE #1
A 044 FILE #2
A 002 DUMMY-1
A 002 DUMMY-2
A 002 DUMMY-3
A 022 FILE #3
A 035 FILE #4
A 020 and so on . . .
```

If you create a catalog similar to the one above, then delete files Dummy-1 through Dummy-3, the next files saved will appear in positions 3, 4, and 5 in the catalog. An easy way to create or delete dummy file names is to write a short program. Type *new* or *FP* and enter:

```
10 FOR X = 1 TO 3: REM NUMBER OF FILE NAMES
20 PRINT CHR$(4); "SAVE DUMMY-";X: REM OR "DELETE
     DUMMY-";X
30 NEXT X
```

Secret File Names. Suppose you want to keep someone from running one of your programs or examining one of your files. The easiest (and unfortunately best known) method is to include a control character as part of a file name. Control characters will not show on the screen as part of a file's name. As a test, enter a one-line program and type:

```
SAVE P(control-P)ROGRAM (return)
```

If you are new to this sort of thing, all you do is type *save p,* then hold down the control key while you type a *p,* then release the control key, type *rogram,* and hit return. When you catalog the disk, you will not see the control-P, only "program." An attempt to access Program with a load or save command, however, will result in a file not found message. As long as you remember what you typed, this is a useful trick. To rename the file above, type:

```
RENAME P(control-P)ROGRAM, ANYNAME (return)
```

Here's another tricky kind of file name that's not real useful, but is fun. Type:

```
SAVE H(control-J)E(control-J)L(control-J)L(control-J)O(control-G)
  (return)
```

If you forget what control characters you have imbedded into your file names, or if you just want to do some snooping on someone else's disk, here is a program that reveals hidden control characters in catalogs. It is a modified version of the program on page 151 of the DOS manual:

```
10 REM CTRL-FINDER PROGRAM
20 DATA 201, 141, 240, 21
30 DATA 234, 234, 234, 234, 201, 128, 144, 13, 201, 160, 176, 9
40 DATA 72, 132, 53, 56, 233, 128, 76, 249, 253, 76, 240, 253
50 FOR N = 768 TO 795: READ A: POKE N,A: NEXT N
60 POKE 54, 0: POKE 55,3: CALL 1002
```

Running this program will reveal any invisible control character except a control-M (carriage return) as a visible inverse character. *Control Finder* will work not only with file names, but with any screen appearance of a control character. To prove it, run *Control Finder* and type:

```
CATALOGG (return)
```

Note the two Gs at the end of the command. Normally you would be hit

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with a beep and a well-deserved syntax error for typing this illegal DOS command (see July's DOS Mystery of the Month). With the *Control Finder* program in effect, instead of the invisible but audible beep, you will get a visible, but inaudible, inverse-G. If you really hate the Apple's beep, you could make the *Control Finder* routine part of your greeting program. To cancel the effect, type *PR#0* or hit reset (or pull the plug!).

To have some more fun, change line 20 in *Control Finder* to:

```
20 DATA 234, 234, 234, 234
```

Now, even control-Ms (carriage returns) will appear in inverse. Catalog a disk and you'll see why an exception was made for control-Ms. All of the carriage returns have been nullified, making most screen layouts rather difficult to read!

While no one's watching, fool around some more with the left arrow key, control-G, control-J, control-X, and other control characters and commands. Hit reset to return to reality.

Invisible File Names. This trick won't foil the *Control Finder* program, but it sure will keep most people out of your files. First, hit reset to kill *Control Finder*'s effect. Now save a program with this command:

```
PRINT CHR$(4); "SAVE A"; CHR$(8) (return)
```

What you have done is save a split file name that is part normal character, A, and part control character, CHR$(8). CHR$(8) is the same as a backspace or control-H. A control-H is normally impossible to type directly on the screen without backspacing the cursor, so we use its CHR$ (character string) equivalent. To save or otherwise manipulate a split file name, we need to use a CHR$(4) or control-D in front of the DOS command. The same command could, of course, be executed from within a program.

If you haven't already done so, catalog your disk and notice the invisible file name that has been created. If you run *Control Finder*, you will see that the file's actual name is "A(control-H)". That's the letter A followed by a backspace. Since DOS adds spaces to any file name shorter than thirty characters, the actual file name is:

```
A (backspace) (28 spaces)
```

When you catalog, the letter A is actually printed on the screen, but is then immediately, if not sooner, erased by the first of the twenty-eight spaces!

To erase the lock, file-type, and sector codes to the left of a file name, just add eight backspaces to a file name like so:

```
H$ = CHR$(8): H$ = H$ + H$ + H$ + H$ + H$ + H$ + H$ + H$
(return)
PRINT CHR$(4); "SAVE A"; H$ (return)
```

Now the trailing spaces start at the far left of the screen, erasing everything to the right and producing a horizontal blank line in your catalog! You can use this feature as a nice spacer to dress up your catalogs or to separate file names by category. By the way, invisible file names will transfer just fine with Fid and other file-transfer utilities. To make more than one invisible file name in the same catalog, start each one with a different visible letter.

Inverse and Flashing File Names. Inverse and flashing file names are often used as decorative catalog headers. Such file names usually belong to empty files that are not meant to be accessed. The only way *I* know to access a file whose name contains inverse or flashing characters is from immediate mode (not from within a program) by typing the appropriate DOS command (*load*, for example) and then tracing over the name (see last month's column).

The following trick will produce an inverse file name. First, save a file named File, and then type:

```
PRINT " RENAME FILE,";: INVERSE: PRINT " INVISI-CALC ":
      NORMAL
```

After you hit return, you will see a DOS command on the screen made up of normal and inverse characters. Use escape-I to move your cursor up to the left of the word *rename* and trace over the command using the right arrow and repeat keys. Then hit return and let DOS do its thing. That's all there is to it! Notice how it is legal to start a file name with an inverse space, but not a normal space. Flash works the same way, as does any combination of flash, inverse, and normal characters. Please take it easy with the flashing file names, okay? A little goes a long way!

I like to use this little flasher at the top of my catalogs:

```
PRINT " RENAME FILE, COPYRIGHT (";: FLASH: PRINT "C";:
      NORMAL: PRINT ") 1982"
```

Trace over the resulting command and you'll get the picture.

One More Thought about File Names. More and more people with noncomputer backgrounds are using computers these days (and I'm one of them). If you are creating disks to be used by the public, think about the file names that appear in your disks' catalogs; name them in English. Nothing is more confusing to a beginner than a file called Fil.obj3.rev. Computing is tough enough!

DOS Mystery of the Month. Chris Volpe is full of Apple mysteries, and here's another one. Run this Applesoft program:

```
10 PRINT CHR$(4); "OPEN CHANGER"
20 PRINT CHR$(4); "WRITE CHANGER"
30 PRINT "15 REM THIS IS A TEST"
40 PRINT "16"
50 PRINT CHR$(4); "CLOSE"
```

After running the above program, you will have a text file called Changer on your disk. Now run this program:

```
10 PRINT "LINE 10"
15 PRINT "LINE 15"
16 PRINT "LINE 16"
18 LIST
19 PRINT CHR$(4); "EXEC CHANGER"
20 GOTO 10
```

The exec command in line 19 doesn't do its job, that is, change line 15 and delete line 16. And if you're in need of a little garbage, just try and stop the program with a control-C! If line 20 is removed, things work out much more predictably. Exec executes properly only if it is the last command in a program. Has anyone out there seen any documentation that doesn't sidestep putting exec commands inside Applesoft programs (instead of at the end) so that they work? ∎

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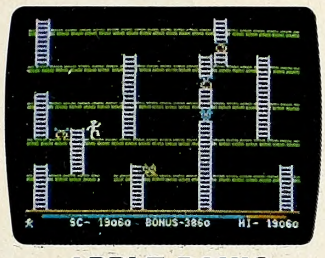

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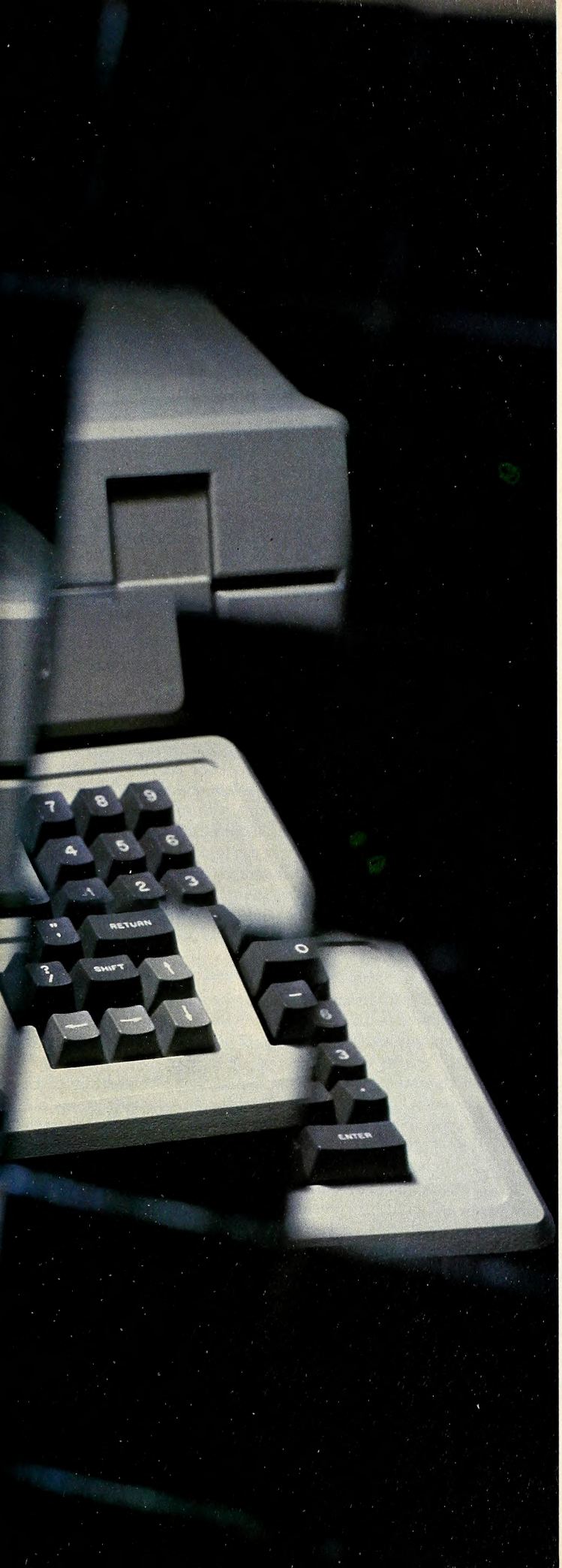

THE JEPPSON DISASSEMBLER FOR THE APPLE III

BY JOHN JEPPSON

Do secrets drive you crazy? Do mysterious code files evoke frenzied storms of curiosity? You need a disassembler. Here's how to unravel those streams of binary digits and reconstruct the assembly language listings from which they were produced.

You will need *peek* and *poke* as described in the August issue of *Softalk*. This program uses peek and poke to pry into any portion of memory you desire, and then disassembles the machine language code you find there.

Illuminating Files. There are two distinct, but similar, tasks. First is the problem of disassembling code currently resident in the Apple III's memory. This will allow you to trace the code paths actually used in programs and in SOS (pronounced "sauce"), the Sophisticated Operating System. The second task is disassembling code files, such as drivers and interpreters, on floppy disks. Files on disk usually contain a lot of stuff that's either omitted or reworked when the file is loaded into memory. So it is instructive to examine files as they actually exist on the disk.

The disassembler program performs both of these tasks. It contains compiler options, which can be set to compile the program in two different ways. This means that the program produces two different executable code files, one for disassembling memory, the other for disk files. The sixth line of the main program listing reads *(*$setc disk := false *)*. This instruction creates a compile-time variable, *disk*, as described on page 107, volume 2, of the Apple III Pascal manual. In this instruction *disk* is created as a Boolean variable and is assigned the value "false." This assignment directs the compiler to include certain sections of text and to exclude others, thereby producing a "memory" disassembler. The resulting code file should be stored under its own distinct file name, such as M.Disasm.Code. By changing the compile-time variable assignment to read *(*$setc disk := true *)*, and recompiling, you will cause the compiler to include different sections of text. This time the result will be a "disk file" disassembler which might be stored under the file name D.Disasm.Code.

What You Can't Do. As you are doubtless well aware, Apple III already has a Monitor that has some of the facilities available in the Apple II Monitor. It does *not* contain a disassembler. It's true that it's possible to load a machine language disassembler while in emulation mode (or even, if you're clever, in Apple III native mode). You can then enter the Apple III Monitor and have a functional disassembler. But that approach has many limitations, the worst of which is that once the Monitor is entered there is no way out again except to reboot. The Apple III Monitor is entered by simultaneously pressing control, open-apple, and reset. Its code runs on the Apple III ROM chip normally used for booting. (There are rumors that the Monitor may be omitted from future versions of Apple III.)

There are other limitations as well. Since the Monitor code runs in ROM, which overlies the upper part of SOS, there is no way to look at those areas of SOS without hanging the computer. Also, I/O from the Monitor is possible, but only at the read-write-track-sector level. So loading files from disk for disassembly or saving results is beset by complexities of depressing magnitude. Finally, there is no straightforward means of integrating other procedures, such as search routines, into the

Monitor environment. The disassembler program presented here is designed to overcome these limitations. It has no connection with the Apple III Monitor, which we will henceforth ignore.

How Does It Remember So Much? Apple III's memory is organized as a collection of 32K banks, so in a 128K machine there are four different memory banks, each 32K long ($8000 hexadecimal). A 256K machine will have eight such banks. One bank is allocated for special treatment and is called the S or system bank. It belongs to SOS. The remaining banks are user banks, numbered from 0 to 2 in a 128K machine or 0 to 6 in a 256K machine.

This is a big memory. Too big, in fact, for the 6502 processor to handle directly. By itself the 6502 can address only 64K (65,536) separate locations. That is the total number of different combinations of sixteen binary bits, or of four hexadecimal digits. To provide access to all of Apple III's memory you need a longer zip code, up to twenty binary bits. Those extra bits are provided by the *Xbyte,* named for the "extended addressing system."

The overall scheme is to slice up memory into 64K chunks and let the 6502 processor work on just one 64K chunk during any single operation. Since memory is organized in 32K banks, this means that the 6502 can handle two banks at a time. The 6502 just looks for a location between $0000 and $FFFF, a 64K range that you can think of as the 6502's working space. These addresses are sort of a figment of the 6502's imagination. They don't actually represent particular bits of silicon wafer on the memory boards. The bank-switching mechanism, outside the 6502, swaps various parts of physical memory into the address space the 6502 is using. The Xbyte, and another register called the *bank register,* decide which parts of memory to use at any given time.

Apple III actually has two different ways of combining memory banks into pairs: *bank-switched addressing* and *extended addressing.* Extended addressing is controlled by the Xbyte. If the Xbyte is $80 then the 6502 is presented with bank pair 0,1. If the Xbyte is $81, then the pair used is 1,2. In general, an Xbyte of $8n refers to bank pair n, n+1. In each case the 6502 has 64K memory locations to play with, but the actual physical memory is different. Notice that a particular physical memory location can have more than one address. For example, a location in the middle of bank 1 can be addressed as location $4000 with Xbyte = $81. This Xbyte refers to bank pair 1,2 where bank 1 "occupies" locations $0000 to $7FFF. But exactly the same memory location can also be addressed as $C000 with Xbyte = $80. In this case we're referring to bank pair 0,1 where bank 1 "occupies" locations $8000 to $FFFF. The specified address will now be found at $8000 + $4000 = $C000. You may use whichever address is more convenient.

If the Xbyte is $00, then extended addressing is turned off and you are in the realm of bank-switched addressing. In this case the 6502 looks at a bank pair made up of the S (system) bank and one of the user banks. But here there is a further complication. The S bank is split a little left of center and the user bank placed in the middle. The result appears in table 1. This configuration is also called system bank addressing, and it is the way the 6502 looks at things most of the time. The *bank register*, location $FFEF of system bank (Xbyte = $00), determines which user bank is switched in at the moment.

Program code actually runs using system bank addressing. The program code resides and runs either in S bank itself or in the switched-in user bank. You run along in one user bank for a while, and then change the bank register and run in another. But when the program, running in one bank, just needs to reach out and fetch a single byte of data from some other part of memory, then it's best to use extended addressing. With the appropriate Xbyte, extended addressing can access any byte in the machine.

Looking at Memory. The function peek, used in the disassembler, requires both an Xbyte and a suitable 6502 address. It can get to any part of memory, but you must tell it where to go. So the "memory" disassembler has a procedure for entering Xbytes. The current Xbyte value is displayed at the top of the screen. To change it, just press S (for *set* Xbyte) on the keyboard and enter the new value. Table 2 lists the various meaningful Xbytes and the memory areas they represent.

$0000 to $1FFF	$2000 to $9FFF	$A000 to $FFFF	= 64K
S bank (8K)	User bank (32K)	S bank (24K)	

Table 1.

Xbyte	Memory Area
$8n (80..8E)	Bank pair n, n+1. (Zero page mapped from S bank).
$8F	System bank with bank 0 switched in $2000..$9FFF. ALL RAM! access to: lowest page of bank 0 RAM beneath VIA's ($FFD0 to $FFEF).
$FF (fake Xbyte)	$C000 to CFFF = I/O; $F000 to FFFF = ROM #1 access to "true" zero page and stack page.
$00	Ordinary system bank addressing zero page mapped from $1A, stack from $1B.

Table 2. Xbyte values for peek and poke.

The "disk file" disassembler has slightly different requirements. Computers cannot deal with files directly on the disk. Apple III always reads files into memory and works on them there. The disk file disassembler requests the name of the file you wish to examine and loads it into memory, up to a maximum of twenty-four blocks (24 blocks = 12,288 bytes = $3000). If the file is longer than twenty-four blocks you must look at it in pieces, twenty-four blocks at a time. To handle this situation the program asks you for the block number at which to begin the load.

No Swearing, No Poking, No Xbyte. Once the file, or a suitable portion of it, is loaded into memory, you can look at individual bytes or disassemble sequences of bytes just as in the memory version. Simply use addresses $0000 up to the hexadecimal total number of bytes loaded. In other words, if the file loaded is five blocks long, and each block is 512 ($200) bytes, then the highest address is 5 * $200 = $0A00. The range of valid addresses, $0000 to $0A00, is calculated for you and kept on display at the top of the screen.

Some files, such as interpreters, are *absolute* code. Unlike drivers and assembly language modules, which have *relocatable* code, interpreters are designed to fit in a particular spot in memory. When you disassemble such files, you find that the file's program code accesses memory and jumps about using instructions with absolute addresses, such as LDA 8FEF or JMP 9F25. To facilitate working with such files, you may set the disassembler's location counter to synchronize with the file's address scheme. Then if you see JMP 9F25 you can look at address 9F25 and be in the proper spot. To do this, the disassembler asks you to assign a starting address value to the file. If, for example, you reply with "7600," then a five-block file will have "valid" addresses $7600 to $8000 ($7600 + $0A00 = $8000). Again, the valid address range is kept in view at the top of the screen.

Since the disk file version deals only with a limited range of addresses, the Xbyte mechanism has no meaning and is omitted. Similarly, poking is not allowed in the disk file version since we are not dealing with the file itself, but only with a copy of the file in memory. In most other respects the two versions of disassembler are the same.

Painless Operation. Operation of the disassembler program is described here mainly for the "memory" version, but the instructions can be taken to apply to the disk file version as well. The program operates much like the Apple II Monitor. All addresses and values are entered and displayed in hexadecimal. To examine a single memory location, just type in the hexadecimal address and press return. The program peeks at that location and prints its contents as a hexadecimal byte. To see more memory, just press return again. Repeated returns each yield the contents of an entire group of sixteen bytes all printed on a single line. This type of memory display, where bytes are printed as pairs of hexadecimal digits, is known, colloquially, as a *hex dump.*

Since the Apple II Monitor caters to a forty-column screen, it can print only eight bytes to the line. But on Apple III's eighty-column screen there is plenty of room for sixteen bytes or more. In fact, since we do have plenty of room, those memory contents that fall in the range of printable characters (ASCII 32 to 127) are printed again, as characters, at the right of the screen. This is very convenient for locating strings.

The procedure for examining larger blocks of memory is a bit different. An entire page of memory (256 bytes) may be displayed as a block by simply pressing P or by typing a hexadecimal address followed immediately by P and return (for example, *FB00P* return). The location counter is automatically updated so pressing P again will dump the following

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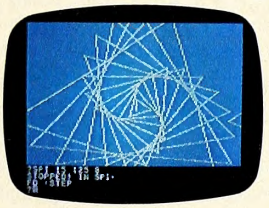

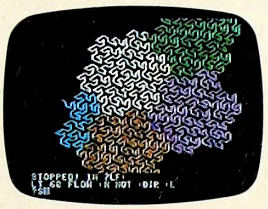

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memory page, and so on. The program always dumps an even page, so typing *FB35P* will still display the page of memory from FB00 to FBFF.

In the memory version, the contents of memory may also be changed. Values may be poked into memory using the same format as with Apple II's Monitor. Just type in the hexadecimal address followed by a colon (:) and the new value. For example, the command *2FF5:AA* will place the value "AA" in memory location 2FF5. As with the Apple II Monitor, it is possible to change a number of bytes (up to eighty-three) with a single command (for example, *2FF5:AA AC AE B0 B2*). When return is pressed the list of values will be poked into successive memory locations starting at the specified address.

Pokers, Beware! Poking can actually be useful . . . occasionally. For example, the disassembler program has a user-defined procedure where you might wish to place routines for setting up and displaying graphics. You could then poke values into the graphics screen memory area as an aid in mapping the information storage scheme.

Generally, however, poking is dangerous. When you're dealing with the Apple II Monitor, the Monitor program itself is running in read-only memory. Since you can't change ROM no matter how hard you try, the operating system and the program continue to run. With the Apple III, on the other hand, both the operating system and the disassembler program are in RAM. If you poke around in those areas, one of several things may happen. Sometimes the machine just drifts off into never-never land and becomes inert. Other times it dies horribly with "System Failure" plastered across the screen. In either event your only option is to reboot. Most disconcerting of all, poking may have no obvious effect whatever. That's when you really want to watch out. You've got a little time bomb in there somewhere just waiting for its chance to do you in.

Generally speaking, of course, it's impossible to damage the hardware no matter what you do to programs in memory. When you reboot, all is forgiven and wiped clean. But this assumes the boot disk itself is undamaged. That's where the real danger lies. It is said that piano players never injure anything but their fingers, and trumpet players their lips. Similarly, if you poke a few holes in the operating system, fate is sure to direct your little arrows straight to the code responsible for writing to floppy disks. The next time you write to a disk your damaged program will smear that disk's directory into an indecipherable mess. Since you're obviously a well-organized person, you'll have been working only from backup disks. So your original disks are safe and you can begin again. All you have lost forever is the work since your last backup, plus a few days that anger has deducted from your life expectancy. With an Apple Profile hard disk it's a bit tougher. After considerable practice, you can reformat the Profile and refill it from its eight backup floppies in little more than an hour. If you want to poke around, the best policy is to leave the hard disk turned off until you reboot.

2001 Operand Oddities. The core of the disassembler program is the *list* command, which disassembles 6502 object code. It is almost exactly like its counterpart in the Apple II Monitor. Typing L, or an address followed by L, disassembles the next twenty 6502 instructions. Apple II programmers will recognize the format:

```
7A70: 68          PLA
7A71: 85 FF       STA    FF
7A73: AD 99 16    LDA    1699
7A76: 8D FF 16    STA    16FF
```

You'll find some oddities in the *operand* field, which are designed to comply with Apple III conventions. Instructions that employ indirect addressing use an at-sign (@) instead of parentheses. Thus LDA @ADDR,X is Apple III's version of the standard 6502 instruction LDA (ADDR,X). In the absence of parentheses, preindexed and postindexed indirect addressing modes are distinguished only by the presence of X or Y, respectively. The at-sign is also used with indirect jumps, such as JMP @ADDR.

Branch relative instructions such as BNE are followed by an arrow (->) and the computed address. The arrow isn't actually Apple III, it just seems desirable.

The most significant change is in the BRK instruction. In Apple III the break instruction has been entirely dedicated to SOS calls. SOS calls invoke subroutines within the operating system that manipulate files, talk to drivers, allocate free memory, and perform many other complex tasks. SOS calls not only transfer control to the subroutine, they also pass information back and forth in the form of parameters. So SOS calls more closely resemble procedure and function calls of higher level languages than the JSR instruction of assembly language.

Memory Calls	**Device Calls**	
40 Request Seg	82 D Status	
41 Find Seg	83 D Control	
42 Change Seg	84 Get Dev Num	C8 Open
43 Get Seg Info	85 D Info	C9 New Line
44 Get Seg Num		CA Read
45 Release Seg	**File Calls**	CB Write
	C0 Create	CC Close
Utility Calls	C1 Destroy	CD Flush
60 Set Fence	C2 Rename	CE Set Mark
61 Get Fence	C3 Set File Info	CF Get Mark
62 Set Time	C4 Get File Info	D0 Set Eof
63 Get Time	C5 Volume	D1 Get Eof
64 Get Analog	C6 Set Prefix	D2 Set Level
65 Cold Start	C7 Get Prefix	D3 Get Level

Table 3. SOS calls.

When the 6502 encounters a BRK instruction, it immediately transfers control to the interrupt system, which then leads directly into SOS. The interrupt is processed to determine its source, and if, indeed, the interrupt was generated by BRK, then the appropriate SOS call is executed. SOS goes back to the original code and picks up the next three bytes following the BRK instruction. Thus BRK has become, in effect, a four-byte instruction. The first byte is BRK (op-code $00). The second byte designates which of the thirty-six available SOS calls is desired. The third and fourth bytes contain a pointer to the address in memory of a data table in which parameter information has been placed and where results are received. After the SOS call is complete, control is returned to the original code file at the next instruction beyond the four-byte SOS call.

Is There a Beta Draft in Here? Table 3 lists the various SOS calls indexed by hexadecimal number. This is the number found in the second byte of the four-byte instruction. Each SOS call, in turn, has a required parameter list, and many have an optional parameter list as well. You get to the parameter list by following the pointer address given in bytes three and four of the SOS call. But at this point things get a bit complicated. Each SOS call demands a different length and format for its parameter lists. There is really no alternative but to look them up in the manual where each SOS call receives a couple of pages of description and information. "Ah!" you say, "the manual. What manual?" Why, the *Apple III SOS Reference Manual,* a voluminous document filled with all sorts of goodies. Does it exist? Almost. Even as you read this, a beta draft version of the SOS manual is circulating in limited numbers within Apple and in the hands of a few desperate others such as professional software vendors and students who have attended the Apple III Technical Workshop. *Beta draft* is a happy expression that implies progress already made and the hope of progress yet to come. Indeed, inquiry reveals that Apple expects the *SOS Reference Manual* to be out and available later this autumn.

SOS calls are not permitted just anywhere in a code file. SOS itself, SOS.Kernel, cannot use them at all. Neither can drivers or *interrupt handlers.* To do so would undoubtedly result in SOS calls calling themselves, and SOS is not designed to be reentrant. But SOS calls are extensively used by interpreters, such as languages, by *event handlers* (maybe another time), and by assembly language modules such as invokable modules for Basic. And you may use them in your own assembly language modules. They are, in fact, the best and the only legal means of communication with files, devices, and other binary denizens of the outside world.

The disassembler normally displays its output on the console screen, but you can change that. Pressing letter O (for output) allows you to do direct hex dumps and disassembled listings to a printer or to a disk file or to any other device configured into your system. The first time you press O, you'll be asked for the path name of the device or volume to which output should be sent. This path name will then be displayed in the upper right-hand corner of the screen. Thereafter, every time you press O, the output destination will toggle back and forth between the console screen

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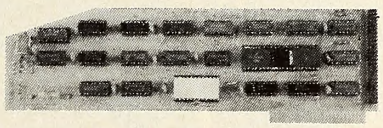

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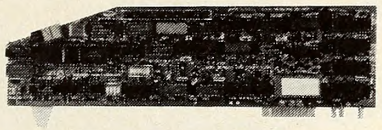

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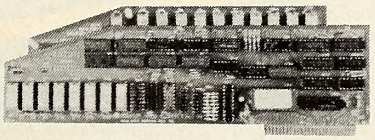

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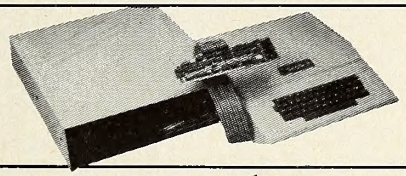

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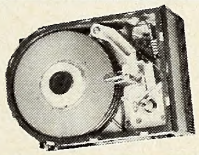

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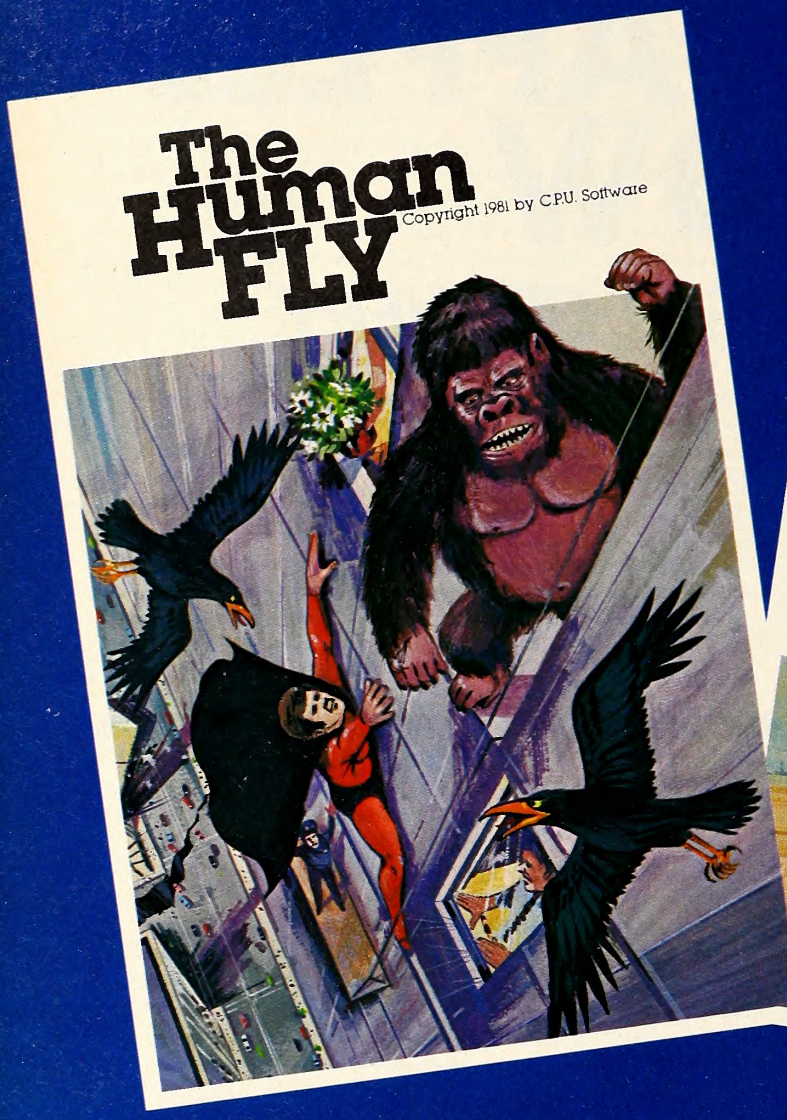

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Yes, I want to come apart on the Apple III. Please send me the Jeppson Disassembler for the Apple III.

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and whatever destination you have specified. You may look around with the output directed to the screen. Then, when you find something interesting, you can toggle the output and save it on the designated device. But should you wish to change the alternate destination, you'll have to restart the program.

The Sum of the Parts. The disassembler program is constructed in several parts. There is a library unit, *Hexstuff*, containing peek and poke and some utility procedures. A disk data file, Opcode.List, contains the text of the various 6502 instructions. And there is the program listing itself. The steps in construction are as follows:

First type in and assemble peek and poke as listed in the August issue of *Softalk*. Save the resulting code file under an appropriate name such as Peek.Poke.Code.

Next type in and compile the *Hexstuff Intrinsic Unit*. In addition to peek and poke, this library unit contains procedures and functions for converting back and forth between decimal and hexadecimal. There are also functions that split an integer (stored as a two-byte word) into its component bytes and a procedure called *screen* that offers a convenient means of sending control commands to the console driver. These procedures are of general utility and should prove useful in other programs you may write. The Hexstuff unit also declares a "free union variant record" type, which is widely useful for bit twiddling of variables stored in memory. When the Hexstuff unit has been compiled, use the *linker* to link in Peek.Poke.Code. The resulting code file *is* the library unit.

The Hexstuff library unit should now be placed in the system library on the Pascal boot disk. It must be there when the main program is compiled and executed. You place the unit in System.Library by using the Pascal utility program *Library*. Follow the instructions beginning on page 87 of the Pascal manual, "Program Preparation Tools."

The next step is construction of the data file Opcode.List. This file contains the text of each 6502 assembly code mnemonic, the number of bytes in each instruction, and the format of the operand field for each instruction. The disassembler uses this file as a look-up table to convert from the raw object code to readable assembly language text. The file really contains a lot of data. There are several ways this information might be put together and made available to the disassembler. The method used is selected to have the fastest possible speed of execution and the least possible amount of typing.

The Essential Op-Codes. Much of the required text information already exists in the Pascal system file Opcodes.6502, which may be found on one of the Pascal language disks. The Pascal assembler uses the information in this file to go "the other way," from assembly language source code to machine language object code. The program *Make Opcode.List*, a separate utility program, uses Opcodes.6502 and other information to create the necessary data file, which it stores on disk under the file name Opcode.List. When you have typed in and compiled *Make Opcode.List* be sure that the file Opcodes.6502 is available. You can do this in one of two ways. Either change the source in the sixth line to the full path name where Opcodes.6502 is located or transfer that file onto your program disk. In the latter case be sure to set the *Prefix* to the program disk so Pascal can find the right file. Then run *Make Opcode.List*. The program takes thirty to forty seconds to execute, which seems endless since nothing is happening on the screen. But you only need to run it once. You now have the Opcode.List data file on your disk and you can transfer it to other disks as needed. You'll never need *Make Opcode.List* again. It's a one-shot deal.

If you're curious to know what the information in Opcode.List looks like, you can compile and execute *Print Opcode.List*. This utility program prints the data in a neat array on the console or Silentype or just about anywhere you desire. The program is supplied solely for that purpose and is not required or involved in construction of the disassembler.

Finally, we are ready for the disassembler itself. Type in the program and compile it. Note that the compile-time variable disk in line six is *false*. This will compile the Memory version. Save the code file under the name M.Disasm.Code. Now get the text back up in the editor. Change only the assignment in the sixth line making *disk := true*. Then compile it again. This time you get the disk file version, which should be saved under a different file name, D.Disasm.Code.

All that remains is to be sure that the data file Opcode.List is available when either of the disassembler code files is executed. It should be on the Prefix disk so Pascal will know where to find it. The disassembler loads Opcode.List in about one second during program initialization. If necessary, that disk may then be removed. You may, for instance, need the device for another disk containing a file you wish to disassemble.

Don't forget about the user-defined procedure. As listed here it is empty, but it will accommodate all sorts of other programs including graphics applications, search routines, and even the interface for assembly language modules linked to the system. There is plenty of room left in memory for almost any length procedure you might care to write.

If you have questions about the program, please do not telephone. We are not experienced enough with the III to help you on the spot and Dr. Jeppson is a practicing physician. Please address inquiries to: Softalk Third Degree, Box 60, North Hollywood, CA 91603.

Hexstuff Intrinsic Unit

```
unit hexstuff; intrinsic code 40;
interface
type
  varindex = 1..5;
  variant = record case varindex of
          1 : ( int  : integer);
          2 : (byte : packed array [0..1] of 0..255);
          3 : (nybl : packed array [0..3] of 0..15);
          4 : (bit  : packed array [0..15] of boolean);
          5 : (bool : boolean);
        end;
procedure screen (a, b, c, d, e : integer);
function ten (str : string) : integer;
procedure hex4 (value : integer; var str : string);
procedure hex2 (value : integer; var str : string);
function hibyte (int : integer) : integer;
function lobyte (int : integer) : integer;
function peek (bytenumber, bank : integer) : integer;
procedure poke (bytenumber, bank, value : integer);
implementation
procedure screen; (* (a, b, c, d, e : integer) *)
  var control : packed array [0..4] of char;
  begin
    control [0] := chr (a);
    control [1] := chr (b);
    control [2] := chr (c);
    control [3] := chr (d);
    control [4] := chr (e);
    unitwrite (1, control, 5, , 12);
  end; (* screen *)
function ten; (* (str : string) : integer *)
  const
    h1 = '0123456789ABCDEF';
    h2 = '0123456789abcdef';
  var
    p, count : integer;
    v : variant;
    valid : boolean;
  begin
    v.int := 0;
    count := 0;
    valid := true;
    while ((length (str)>0) and (count<4)) do
      begin
        p := pos (copy (str, length (str), 1), h1);
```

```
            if p = 0 then p := pos (copy (str, length (str), 1), h2);
            if p = 0 then valid := false
                 else v.nybl [count] := p - 1;
            delete (str, length (str), 1);
            count := count + 1;
          end;
      if valid then ten := v.int
            else ten := 0;
   end; (* function ten *)
procedure hex4; (* (value : integer; var str : string) *)
   var
      count : integer;
      h : string;
      v : variant;
   begin
      h := '0123456789ABCDEF';
      v.int := value;
      str := '0000';
      for count := 0 to 3 do
            str [count + 1] := h [v.nybl [3 - count] + 1];
   end; (* hex4 *)
procedure hex2; (* (value : integer; var str : string) *)
   var
      count : integer;
      h : string;
      v : variant;
   begin
      h := '0123456789ABCDEF';
      v.int := value;
      str := '00';
      for count := 0 to 1 do
            str [count + 1] := h [v.nybl [1 - count] + 1];
   end; (* hex2 *)
function hibyte; (* (int : integer) : integer *)
   var
      v : variant;
   begin
      v.int := int;
      hibyte := v.byte [1];
   end;
function lobyte; (* (int : integer) : integer *)
   var
      v : variant;
   begin
      v.int := int;
      lobyte := v.byte [0];
   end;
function peek; (* (bytenumber, bank : integer) : integer *)
   external;
procedure poke; (* (bytenumber, bank, value : integer) *)
   external;
end. (* unit hexstuff *)
```

Program Make "Opcode.List"

```
program generate;
   (* makes and stores on disk an array of all 6502 instructions arranged in
      numerical order by opcode number.
      EXECUTION TIME >30 seconds (but seems like forever) *)
const
   source = 'opcodes.6502'; (* supply appropriate pathname *)
   dest = 'opcode.list';
   atsign = '@';
   numsign = '#';
   blks = 9;
   space3 = '   ';
   space2 = '  ';
   space1 = ' ';
   space0 = '';
type
   instruction = packed record
            mnemonic : string [3];
            numbytes : 1..4;
            operand : string [10];
          end;
var
   oplist : packed array [0..255] of instruction;
   buf : packed array [0..1023] of 0..255;
   count, opcode : integer;
   infile, outfile : file;
   ats, immediates, twobytes : set of 0..255;
   threebytes, plusXs, plusYs : set of 0..255;
procedure sets;
   var
      i : integer;
   begin
      ats := [108];
      for i := 0 to 15 do ats := ats + [i * 16 + 1];
      immediates := [160, 162, 192, 224];
      for i := 0 to 7 do immediates := immediates + [i * 32 + 9];
      immediates := immediates - [137]; (* $89 invalid *)
      twobytes := [36, 132, 148, 164, 180, 196, 228] + immediates;
      for i := 0 to 15 do
            twobytes := twobytes + [i * 16 + 1, i * 16 + 5, i * 16 + 6];
      threebytes := [32, 188];
      for i := 0 to 15 do
         threebytes := threebytes + [i * 16 + 13, i * 16 + 14];
      for i := 0 to 7 do
         threebytes := threebytes + [i * 32 + 12, i * 32 + 25];
      threebytes := threebytes - [12, 158];
      plusXs := [148, 180, 188];
      for i := 0 to 7 do plusXs := plusXs +
         [i * 32 + 1, i * 32 + 21, i * 32 + 22, i * 32 + 29, i * 32 + 30];
      plusXs := plusXs - [85, 86, 150, 158, 182, 190];
      plusYs := [150, 182, 190];
      for i := 0 to 7 do
      plusYs := plusYs + [i * 32 + 17, i * 32 + 25];
   end; (* sets *)
   procedure operands;
      var
         opcode : integer;
      begin
         for opcode := 0 to 255 do
            with oplist [opcode] do
               begin
                  mnemonic := '---';
                  numbytes := 1;
                  operand := space0;
                  if opcode in ats
                     then operand := concat (operand, atsign);
                  if opcode in immediates
                     then operand := concat (operand, numsign);
                  if opcode in twobytes
                        then begin
                              operand := concat (operand, 'PP');
                              numbytes := 2;
                             end;
                  if opcode in threebytes
                     then begin
                           operand := concat (operand, 'QQPP');
                           numbytes := 3;
                          end;
                  if opcode in plusXs
                     then operand := concat (operand, ',X');
                  if opcode in plusYs
                     then operand := concat (operand, ',Y');
               end; (* with do begin *)
      end; (* operands *)
   procedure transfer; (* mnemonics from opcodes.6502 -->buf *)
      type
         variant = record case boolean of
               false : (int : integer);
                true : (bool : boolean);
             end;
      var
         op : variant;
         i, j, opcode, typecode : integer;
         mnem : string;
      begin
         for i := 0 to 55 do
            begin
               opcode := buf [ i * 12 + 56 ];
               typecode := buf [ i * 12 + 58 ];
               mnem := space3;
               for j := 1 to 3 do
                     mnem [ j ] := chr (buf [48 + i * 12 + j - 1]);
               with oplist [opcode] do
                  begin
                     mnemonic := mnem;
                     case typecode of
                        3 : begin
```

```
                operand := '->disp';
                numbytes := 2;
              end;
            4 : begin
                op.int := opcode;
                 (* clear bits 2, 3, 4 *)
                op.bool := op.bool and odd (227);
                for j := 0 to 7 do
                  oplist [op.int + j * 4] . mnemonic
                                          := mnem;
              end;
            5 : begin
                 operand := 'A '; (* note space1 *)
                 opcode := opcode - 4;
                 for j := 0 to 3 do
                  oplist [opcode + j * 8] . mnemonic
                                          := mnem;
              end;
            6 : oplist [108] . mnemonic := mnem;
            7 : begin
                 oplist [opcode + 4] . mnemonic := mnem;
                 oplist [opcode + 12] . mnemonic := mnem;
              end;
            8 : for j := 1 to 3 do
                 oplist [opcode + 8 * j ] . mnemonic := mnem;
            9 : oplist [44] . mnemonic := mnem;
           10 : for j := 4 to 28 do
                 if j in [4, 12, 20, 28] then
                   oplist [opcode + j ] . mnemonic := mnem;
           11 : for j := 1 to 2 do
                 oplist [opcode + j * 8] . mnemonic := mnem;
          end; (* case *)
        end; (* with begin *)
      end; (* for i *)
    end; (* transfer *)
begin (* main *)
  fillchar (buf, 1024, 0);
  reset (infile, source);
  count := blockread (infile, buf, 2);
  close (infile);
  sets;
  operands;
  transfer;
  oplist [0] . numbytes := 4;
  oplist [0] . operand := 'sos.call';
  oplist [137] . mnemonic := '---';
  for opcode := 0 to 255 do
    while length (oplist [opcode] . operand) < 10 do
      oplist [opcode] . operand
                := concat (oplist [opcode] . operand, space1);
  rewrite (outfile, dest);
  count := blockwrite (outfile, oplist, blks);
  close (outfile, lock);
end. (* make opcode.list *)
```

Program Print "Opcode.List" (just for the curious)

```
program printlist;
  (* prints to specified device (.console, .printer, etc.) the array of 6502
     instructions made with "make.ops" and stored on disk as "opcode.list"
     *)
uses hexstuff;
const
  source = 'opcode.list';
  blks = 9;
  space2 = '  ';
  space1 = ' ';
type
  instruction = packed record
          mnemonic : string [3];
          numbytes : 1..4;
          operand : string [10];
        end;
var
  oplist : packed array [0..255] of instruction;
  dest : string;
  count : integer;
  infile : file;
procedure print;
  var
    hexstr : string;
```

```
    prtfile: text;
    i, j : integer;
  begin
    rewrite (prtfile, dest);
    for i := 0 to 63 do
      begin
        for j := 0 to 3 do
          begin
            with oplist [i + j * 64] do
              begin
                hex2 (i + j * 64, hexstr);
                write (prtfile, hexstr, space1, mnemonic,
                       space1, numbytes, space2, operand);
              end;
          end; (* for j *)
        if (dest <> '.console') and (dest <> '.silentype')
          then writeln (prtfile);
      end; (* for i *)
  end; (* print *)
begin (* main *)
  writeln;
  write ('Output file? ');
  readln (dest);
  fillchar (oplist, 4608, 0);
  reset (infile, source);
  count := blockread (infile, oplist, blks);
  close (infile);
  print;
end. (* print opcode.list *)
```

Disassembler Program

```
program disassembler;
uses hexstuff;
(* compiler options:
  to compile for memory disassembler -- > set disk := false
  to compile for diskfile disassembler -- > set disk := true *)
(*$setc disk := false *)
const
  filename = 'opcode.list'; (* supply pathname of opcodes file previously
                               made and stored on disk *)
  space7 = '       ';
  space6 = '      ';
  space5 = '     ';
  space4 = '    ';
  space3 = '   ';
  space2 = '  ';
  space1 = ' ';
  space0 = '';
    (*$ifc disk *)
  buflength = 12287; (* = 24 blks. Max length = 60 blks (30719 bytes) *)
    (*$endc *)
type
  instruction = packed record
                  mnemonic : string[3];
                  numbytes : 1..4;
                  operand : string[10];
                end;
var
  oplist : packed array [0..255] of instruction;
  mono : string[1];
  instr : string[255];
  inchar : char;
  printer : text;
  prtfile, hexstr : string;
  hexset, otherset : set of char;
  valid, done, print : boolean;
  xbyte, bytenumber, offset, last : integer;
    (*$ifc disk *)
  buf : packed array [0..buflength] of 0..255;
    (*$endc *)
procedure prtheader;
  const
    (*$ifc disk *)
    command =    '<U>ser <L>ist20 <P>age <Q>uit <O>ut ';
    (*$elsec *)
    command = '<S>et xbyte <U>ser <L>ist20 <P>age <Q>uit <O>ut ';
    (*$endc *)
  begin
    screen (1, 26, 0, 1, 30); (* clear top 2 screen lines *)
    screen (11, 30, 0, 0, 0);
    (*$ifc disk *)
    hex4 (0 + offset, hexstr);
    write ('Valid: ', hexstr, '..');
    hex4 (last + offset, hexstr);
    write (hexstr, space3);
    (*$elsec *)
    hex2 (xbyte, hexstr);
    write ('XBYTE = ' , hexstr, space3);
    (*$endc *)
    write (command);
    if print then write ('[', prtfile, ']')
      else write ('[.console]');
    screen (4, 0, 0, 0, 0); (* return to main window *)
  end; (* prtheader *)
function getbyte (address, xbyte : integer) : integer;
  begin
    (*$ifc disk *)
    getbyte := ord (buf[address])
    (*$elsec *)
    getbyte := peek (address, xbyte);
    (*$endc *)
  end; (* function getbyte *)
 (*$ifc disk *)
procedure loadbuf; (* loads specified disk file into memory buffer *)
  var
    maxblks, firstblk, errorcode, count : integer;
    infile : file;
    source : string;
  begin
    screen (28, 26, 0, 5, 0); (* clear lower screen, position cursor *)
    maxblks := (buflength + 1) div 512;
    repeat
      write ('Specify source file: ');
      readln (source);
      (*$iocheck- *)
      reset  (infile, source);
      (*$iocheck+ *)
      errorcode := ioresult;
      if errorcode<>0 then
        writeln (chr(7), 'I/O error: code #',
                                    errorcode, '      (p.171)');
    until errorcode = 0;
    (* input block number at which to begin load *)
    writeln;
    writeln ('Loads (upto) ', maxblks, ' blocks.');
    write ('Specify blocknumber at which to begin load: ');
    readln (firstblk);
    (* transfer data *)
    fillchar (buf, buflength + 1, 0);
    count := blockread (infile, buf, maxblks, firstblk);
    writeln;
    writeln ('blocks transferred = ', count);
    last := count * 512 - 1;
    close (infile);
  end; (* loadbuf *)
function startnum : integer;
  var
    int : integer;
    hexstr2 : string;
  begin
    writeln;
    write ('Assign starting $address (default = $0000): ');
    readln (hexstr);
    int := ten (hexstr);
    hex4 (int, hexstr); (* to be sure hexstr is in 4-hexdigit form *)
    (* compute range of valid "addresses" in buffer *)
    writeln;
    hex4 (int + last, hexstr2);
    writeln ('Valid addresses: $', hexstr, ' to $', hexstr2);
    startnum := int;
  end; (* startnum *)
 (*$elsec *)
procedure setxbyte;
  var
    inhex : string[2];
  begin
    inhex := '00';
    writeln;
    writeln ('Xbyte Options:');
    writeln;
```

```
    writeln ('8n (80..8E)  —>Bank pair: n and n+1');
    writeln ('8F           —>system bank with bank 0 switched in');
    writeln ('               bank 0 occupies $2000 to 9FFF');
    writeln ('               ALL RAM!! access 00 to FF of bank 0');
    writeln ('               and RAM beneath VIA"s (FFD0 to FFEF)');
    writeln ('FF (fake)    —>C0-CF = I/O, ROM#1, true pages 00 and 01');
    writeln ('00           —>system bank (ordinary 6502 addressing)');
    writeln ('      (all other entries are considered = 00)');
    writeln;
    write ('Enter (hex) Xbyte: ');
    readln (inhex);
    writeln;
    xbyte := ten (inhex);
    if (xbyte < ten ('80')) or (xbyte > ten ('8F'))
      then if xbyte<>ten ('FF')
        then xbyte := 0;
    prtheader;
  end; (* setxbyte *)
procedure poking (tempbytenumber: integer);
  var
    quit : boolean:
    value : integer;
  begin
    quit := false;
    delete (instr, 1, 1); (* delete the ":" *)
    repeat
    if length (instr) >= 2
      then if (instr[1] in hexset) and (instr[2] in hexset)
        then begin
          value := ten (copy (instr, 1, 2));
          poke (tempbytenumber, xbyte, value);
          delete (instr, 1, 2);
          tempbytenumber := tempbytenumber + 1;
        (* next string char will be a space if more poking follows *)
          if length (instr) > 1
            then if instr[1] = space1
              then delete (instr, 1, 1)
              else quit := true
            else quit := true;
        end (* if in hexset *)
          else quit := true (* if NOT in hexset *)
        else quit := true; (* if NOT (length >= 2) *)
      until quit;
    end; (* poking *)
  (*$endc *)
procedure list20;
  var
    i, j, inbyte : integer;
    byte : packed array [0..3] of integer;
    hexbyte : packed array [0..3] of string[2];
    prtoperand, asciistring : string;
  procedure loadvalues;
    var
      temp : integer;
    begin
      with oplist[inbyte] do
        begin
          prtoperand := operand;
          asciistring := space4;
          temp := bytenumber;
          for j := 0 to numbytes - 1 do
            begin
              byte [ j ]:= getbyte (temp, xbyte);
              hex2 (byte[ j ], hexstr);
              hexbyte [ j ] := hexstr;
              temp := temp + 1;
              if byte[ j ] in [32..127]
                then
                  asciistring[j+1] := chr(byte[j])
                else
                  asciistring[j+1] := chr(32);
            end; (* for j begin *)
        end; (* with oplist begin *)
    end; (* loadvalues *)
procedure inoperand;
  var
    site, jumploc : integer;
  begin
    with oplist[inbyte] do
      begin
```

```
            site := pos ('PP', prtoperand);
            if site > 0 then
               begin
                  delete (prtoperand, site, 2);
                  insert (hexbyte[1], prtoperand, site);
               end; (* if site begin *)
            site := pos ('QQ', prtoperand);
            if site > 0 then
               begin
                  delete (prtoperand, site, 2);
                  insert (hexbyte[2], prtoperand, site);
               end; (* if site begin *)
            site := pos ('disp', prtoperand);
            if site > 0 then
               begin
                  if byte[1]  > 127
                     then
                        jumploc := bytenumber + 2 + byte[1] - 256
                     else
                        jumploc := bytenumber + 2 + byte[1];
                  hex4  (jumploc + offset, hexstr);
                  delete (prtoperand, site, 4);
                  insert (hexstr, prtoperand, site);
               end; (* if site begin *)
         end; (* with oplist do begin *)
      end; (* inoperand *)
   procedure printlisting;
      var
         str : string;
         i : integer;
      begin
         with oplist[inbyte] do
            begin
               hex4 (bytenumber + offset, hexstr);
               str := concat (hexstr, ': ');
               for i := 0 to numbytes - 1 do
                  str := concat (str, hexbyte [ i ], space1);
               while length (str) < 24 do
                  str := concat (str, space1);
               str := concat (str, mnemonic, space4,
                           prtoperand, space7, asciistring);
               writeln (str);
               if print then writeln (printer, str);
            end; (* with oplist do begin *)
      end; (* printlisting *)
begin (* main of list20 *)
   writeln;
   writeln;
   if print then writeln (printer, chr(10));
   for i := 1 to 20 do
      begin
         inbyte := getbyte (bytenumber, xbyte);
         with oplist[inbyte] do
            begin
               loadvalues;
               inoperand;
               printlisting;
               for j := 1 to numbytes do
                  bytenumber := bytenumber + 1;
                   (*$ifc disk *)
                  if bytenumber > = last + 1 then bytenumber := 0;
                   (*$endc *)
            end; (* with oplist begin *)
      end; (* for i := 1 to 20 begin *)
end; (* list 20 *)
procedure dumpone; (* activated by < rtn > *)
   var
      inbyte : integer;
   begin
      writeln;
      hex4 (bytenumber + offset, hexstr);
      write (hexstr, ':');
      if print then write (printer, hexstr, ':');
      inbyte := getbyte (bytenumber, xbyte);
      hex2 (inbyte, hexstr);
      write (hexstr, space6);
      if print then write (printer, hexstr, space6);
      if ord (inbyte) in [32..127] (* print asciistring characters *)
         then begin
               write (chr (inbyte));
               if print then write (printer, chr (inbyte));
            end
         else begin
               write ('.');
               if print then write (printer, '.');
            end;
      bytenumber := bytenumber + 1;
       (*$ifc disk *)
      if bytenumber > = last + 1 then bytenumber := 0;
       (*$endc *)
      writeln;
      if print then writeln (printer);
   end; (* dumpone *)
procedure linedump; (* activated by 2nd < rtn >, etc. *)
   var
      store : array [0..15] of integer;
      firstnum, num, inbyte : integer;
   begin
      firstnum := lobyte (bytenumber) mod 16;
      hex4 (bytenumber + offset, hexstr);
      write (hexstr, ':');
      if print then write (printer, hexstr, ':');
      for num := firstnum to 15 do
         begin
            inbyte := getbyte (bytenumber, xbyte);
            store[num] := inbyte; (* save for asciistring printout *)
            hex2 (inbyte, hexstr);
            write (hexstr, space1);
            if print then write (printer, hexstr, space1);
            if num = 7 then
               begin
                  write (space1);
                  if print then write (printer, space1);
               end;
            bytenumber := bytenumber + 1;
             (*$ifc disk *)
            if bytenumber > = last + 1 then bytenumber := 0;
             (*$endc *)
         end; (* for num begin *)
      write (space2); (* print asciistring characters *)
      if print then write (printer, space2);
      for num := firstnum to 15 do
         begin
            if store[num] in [32..127]
               then begin
                     write (chr (store[num]));
                     if print then write (printer, chr (store[num]));
                  end
               else begin
                     write ('.');
                     if print then write (printer, '.');
                  end;
            if num = 7 then begin
                     write (space2);
                     if print then write (printer, space2);
                  end;
         end; (* for *)
      writeln;
      if print then writeln (printer);
   end; (* linedump *)
procedure pagedump;
   var
      store : array [0..15] of integer;
      i, j, inbyte : integer;
   begin
      bytenumber := 256 * hibyte (bytenumber);
      writeln;
      writeln;
      if print then writeln (printer, chr(10), chr (10));
         for i := 0 to 15 do
         begin
            hex4 (bytenumber + offset, hexstr);
            write (hexstr, ':');
            if print then write (printer, hexstr, ':');
            for j := 0 to 15 do
               begin
                  inbyte := getbyte (bytenumber, xbyte);
                  store[ j ] := inbyte; (* save for asciistring printout *)
                  hex2 (inbyte, hexstr);
                  write (hexstr, space1);
                  if print then write (printer, hexstr, space1);
                  if j = 7 then
```

```
            begin
              write (space1);
              if print then write (printer, space1);
            end;
          bytenumber := bytenumber + 1;
          (*$ifc disk *)
          if bytenumber >= last + 1 then bytenumber := 0;
          (*$endc *)
          end; (* for j *)
        write (space2); (* print asciistring characters *)
        if print then write (printer, space2);
        for j := 0 to 15 do
          begin
            if store [ j ] in [32..127]
              then begin
                   write (chr (store[ j ]));
                   if print
                     then write (printer, chr (store[ j ]));
                 end
              else begin
                   write ('.');
                   if print then write (printer, '.');
                 end;
            if j = 7 then begin
                     write (space2);
                     if print then write (printer, space2);
                   end;
          end; (* for j *)
        writeln;
        if print then writeln (printer);
      end; (* i *)
  end; (* pagedump *)
procedure toggle;
  begin
    write (chr(7));
    print := not print;
    if print and (prtfile = space0)
      then begin
           writeln;
           writeln;
           write ('Specify outfile: ');
           readln (prtfile);
           if prtfile <> space0 then rewrite (printer, prtfile)
                else print := not print;
         end;
    prtheader;
  end; (* toggle *)
procedure userdefined;
  begin (* for search routines, graphics setup, etc. *)
  end;
procedure getchar;
  var
    ok : boolean;
  begin
    ok := false;
    repeat
      fillchar (inchar, 2, 0);
      unitread (2, inchar, 1, , 12);
      if (inchar in ['a'..'z'])
        then inchar := chr (ord (inchar) - 32); (* to upper case *)
      if ord (inchar) in [8, 13, 27]
        then
          case ord (inchar) of
            8 : if length (instr) > 0 (* backspace *)
                  then begin
                       screen (8, 31, 0, 0, 0);
                       delete (instr, length (instr), 1);
                     end
                  else begin
                       inchar := '<';
                       ok := true;
                     end;
           13 : begin
                  inchar := '>';
                  ok := true;
                end;
           27 : begin
                  inchar := '<';
                  writeln ('xxxxx');
                  ok := true;
                end;
          end (* case ord (inchar) of *)
```

```
          else if inchar in (hexset + otherset)
               then ok := true
          else write (chr (7));
      until ok;
    end; (* getchar *)
procedure getfirst;
  begin
    done := true;
    getchar;
    case inchar of
 (*$ifc disk *)
      'S' : write (chr (7));
 (*$elsec *)
      'S' : setxbyte;
 (*$endc *)
      'O' : toggle;
      'Q' : begin
              if prtfile <> space0 then close (printer, lock);
              exit (program);
            end;
      '<' : ;
      '>' : linedump;
      'P' : pagedump;
      'U' : userdefined;
      'L' : list20
     otherwise begin
                 write (inchar);
                 mono[1] := inchar;
                 instr := concat (instr, mono);
                 done := false;
               end;
    end; (* case *)
  end; (* getfirst *)
procedure getmore;
  var
    complete : boolean;
  begin
    complete := false;
    valid := false;
    repeat
      getchar;
      case inchar of
        'Q' : begin
                if prtfile <> space0 then close (printer, lock);
                exit (program);
              end;
        '<' : complete := true;
        '>' : begin
                complete := true;
                valid := true;
              end;
    'O', 'S', 'U' : write (chr (7))
      otherwise begin
                  write (inchar);
                  mono[1] := inchar;
                  instr := concat (instr, mono);
                end;
      end; (* case *)
    until complete
  end; (* getmore *)
procedure analyze;
  var
    p : integer;
procedure error (int : integer);
  begin
    writeln;
    while int > 1 do
      begin
        write (space1);
        int := int - 1;
      end;
    writeln ('^', chr (7));
  end; (* error *)
procedure setbyte;
  var
    quit : boolean;
  begin
    quit := false;
    repeat
      if length (instr) > p
        then
          begin
            if instr[p + 1] in hexset
              then p := p + 1
              else quit := true;
            if p = 4 then quit := true;
          end
        else quit := true;
    until quit;
    if p > 0 then
      begin
        bytenumber := ten (copy (instr, 1, p)) - offset;
        delete (instr, 1, p);
        (*$ifc disk *)
        if ((bytenumber < 0) or (bytenumber >= last + 1))
          then begin
                 bytenumber := 0;
                 write (chr (7));
               end;
        (*$endc *)
      end; (* if p > 0 *)
  end; (* setbyte *)
begin (* main of analyze *)
  if length (instr) <> 0 then
    begin
      p := 0; (* an index to screen display of instr *)
      setbyte;
      p := p + 1;
      if length (instr) = 0 then dumpone
      else case instr[1] of
             (*$ifc not disk *)
           ':' : poking (bytenumber);
           (*$endc *)
            'L' : list20;
            'P' : pagedump
           otherwise error (p);
          end; (* case *)
    end; (* if *)
  end; (* analyze *)
procedure initialize;
  var
    blkcount : integer;
    infile : file;
  begin
    screen (26, 0, 2, 2, 0);  (* viewport 0,2 to 80,24 *)
    fillchar (oplist, sizeof (oplist), 0);
    reset (infile, filename);
    blkcount := blockread (infile, oplist, 9);
    close (infile);
    hexset      := ['0'..'9','A'..'F'];
    otherset    := ['L', 'O', 'P', 'Q', 'S', 'U', ':',space 1];
    xbyte       := 0;
    bytenumber  := 0;
    offset      := 0;
    last        := ten ('FFFF');
    mono        := space1;
    hexstr      := '00';
    prtfile     := space0;
    print       := false;
    (*$ifc disk *)
      (* load specified disk file into memory buffer
        then assign starting "address" to buffer
          (used as offset from bytenumber) *)
    loadbuf;
    offset := startnum;
    (*$endc *)
  end; (* initialize *)
begin (* main *)
  initialize;
  while 1 = 1 do
    begin
      writeln;
      unitclear (1); (* dump typeahead *)
      done := false;
      valid := false;
      instr := space0;
      prtheader;
      getfirst;
      if not done then getmore;
      if valid then analyze;
    end; (* while *)
end. (* disassembler program *)
```

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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.

☐ **B & B Electronics** (Box 475, Mendota, IL 61342; 815-539-5827) offers an RS-232 Tester that monitors and displays the status of the seven most important RS-232 lines. Light-emitting diodes display the status of terminal data, receive data, request to send, clear to send, data set ready, carrier detect, and data terminal ready. Requires no power or adaptor, and is designed to be left in the line permanently. $39.95.

The Menu Maker is a utility program that creates an Applesoft menu program. Allows submenus and editing. Available from **LRH Enterprises** (358 Ashley Boulevard, New Bedford, MA 02746; 617-997-7346). $19.95. Also from LRH is *Doctor's Billing System,* a comprehensive medical office billing system that includes private and third party billing and daily and monthly reports. $750.

☐ The sound you get from *Microsound* is anything but micro. This external speaker from **B & B Microproducts** (14711 Lull Street, Van Nuys, CA 91405) contains a 5¼-inch woofer housed in an 8 x 8 simulated woodgrain cabinet. Produces big sounds to turn your Apple into an arcade-sound game machine, or use as long-distance signal generator if you're away from the terminal. Has volume control in case the neighbors are sleeping and plugs in; no modifications required. $34.95.

☐ **Apple Computer** (10260 Bandley Drive, Cupertino, CA 95014; 408-996-1010) offers a complete Apple III system for business professionals. The package includes an Apple III with 256K, a twelve-inch Monitor III, an *Apple Writer III, VisiCalc III, Quick File III,* and specially designed training aids. This offer runs only until October 31. $4,995.

☐ Everyone learns differently, and *Algebra 3* from **Edu-Ware Services** (Box 22222, Agoura, CA 91301; 213-706-0661) adjusts to those differences. The new material covers monomials, polynomials, factoring and binomials, and quadratic trinomials. Features hi-res graphics, a customized font, and flow-charted information maps. $39.95. Message from The Caretaker. Edu-Ware has also announced the release of *Prisoner 2,* even tougher than its predecessor. It features hi-res graphics, a spectrum of color, animation, startling sound effects, and that sinister personality of the original. The Island has been newly landscaped and the Village sports a new coat of paint in thirty-two flavors. $32.95.

☐ **Intelligent Statements** (Box 600, Holmes, PA 19043; 800-345-8112; 800-662-2444 in Pennsylvania) announces Ken Uston's *Professional Blackjack—The Ultimate Game, The Winningest System,* an interactive program that teaches Uston's strategies. $89.95.

☐ The Grappler+ from **Orange Micro** (3150 East La Palma, Suite G, Anaheim, CA 92806; 714-630-3620) is the first universal graphics interface because no other card works with all popular printers available. Replacing its predecessor, the Grappler, Grappler+ includes Apple III compatibility, on-board dip switch for printer selection, and Orange Micro's dual hi-res graphics. $175.

☐ *The Apple Three Newsletter* is a quarterly from **MediaWorks** (Box 2757, San Francisco, CA 94101) for those interested in the Apple III and its software. News, reviews, a program exchange, and a question and answer forum are among its features. Price includes access to a planned computer bulletin board. $15 per year; $2.50 for sample issue.

☐ Users of the UCSD p-System can now have access to CP/M files and disks with the introduction of *XenoFile* from **SofTech Microsystems** (9494 Black Mountain Road, San Diego, CA 92126; 714-578-6105). Translates CP/M files to and from p-System files, uses CP/M program output as p-System program input, and vice versa. Requires Z-80, UCSD p-System. $50. Also from SofTech is *SofTeach,* a computer-aided instruction package that helps you learn to use and understand UCSD Pascal. The package provides drills and hands-on practice in programming, going step by step through a set of quizzes and exercises. Includes the *UCSD Pascal Handbook.* $125.

☐ **Educational Computing Systems** (106 Fairbanks Plaza, Oak Ridge, TN 37830; 615-483-4915) adds *Personal Money Manager* to its Omniware series. Full management of checkbook, cash transaction, charge accounts, savings, and more. Budget module provides "what if?" capabilities. $59.95.

☐ Can't afford expensive graphics hardware? The Poor Man's Graphics Tablet from **Rainbow Computing** (19517 Business Center Drive, Northridge, CA 91324; 213-349-0300) may be the answer. It has an almost unlimited palette of colors and more than fifty-nine textures. Allows you to trace transparencies on your screen, and has full shape-table functions. $49.95.

☐ Find your way through a dungeon labyrinth ruled by the demon Anarakull, embarking with no weapons, armor, or clothes (brrr!). Such is your task in *The Demon's Forge,* the first game from the folks at **Saber Software** (8 Winged Foot Lane, Newport Beach, CA 92660; 714-644-0977). $29.95.

☐ **Synetix Industries** (15050 N.E. 95th, Redmond, WA 98052; 800-426-7412, 206-885-4215) announces a single-board Solid State Disk Emulator available as either a single-disk version (147K) or dual-disk (294K). Compatible with DOS 3.3, Pascal, and CP/M. Program operating speeds increase up to 1,000 percent. Single disk: $550; dual disk: $950.

☐ *VisiCalc—by the User for the User* contains the best of thousands of hours of on-line experiences, trials, tribulations, and triumphs of *VisiCalc* users from *SpreadSheet,* the newsletter of Intercalc User Group. A full year of programs, tips, hints, and "how to" articles. From **The Manager** (25 Roxbury Road, Scarsdale, NY 10583; 914-472-0038). 80 pages. $10.

☐ **Leading Edge Products** (225 Turnpike Street, Canton, MA 02021; 800-343-6833) has introduced a twelve-inch green-screen monitor dubbed "Mean Green." Composite video signal display of 1,920 characters (80 characters x 24 lines). $99.

☐ Providing the flexibility and quality of graphics usually found on mainframes is *GSS-Plot,* from **Graphic Software Systems** (Box 673, Wilsonville, OR 97070; 503-682-1606). The package, designed for applications software developers, prepares line graphs, bar, scatter, and pie charts, and other graph-type displays. Single user: $500; multiuser system: $2,000.

☐ *DB Master* users, get ready for a *Special Edition.* This hard disk version of the popular database from **Stoneware** (50 Belvedere Street, San Rafael, CA 94901; 415-454-6500) stores up to twenty megabytes, eliminates disk swapping, transfers files from floppies to hard disk and vice versa. Compatible with Corvus, Santa Clara, and Sorrento Valley hard-disk systems. Requires 16K RAM card. $499. Also from Stoneware is *Utility Pack #2,* which offers the following features: The Global Editor permits editing of any selected group of records in a file on one to five fields in a single pass through a file; The Mailing Label Generator prints up to five labels across and up to nine lines per label; Transaction File Merge is a cross between Merge (from *Utility Pack #1)* and Global Editor; Data Collection Form Printer lets you print data entry from both forty and eighty column formats. $99. Stoneware also announces that their *Graphics Processing System* (Marketalk News, August 1982) is now compatible with the Hewlett-Packard HP 7470A Graphics Plotter, Strobe's 100 Graphics Plotter, IDS 460 and 560 printer, and Epson's MX-80 printer. New prices: standard version, $69; professional

version, $179.

☐ Now a low-priced Pascal is available from **JRT Systems** (1891 23rd Avenue, San Francisco, CA 94122; 415-566-4240). Features include: one-step compiling without assembly or link, basic and advanced data types, unlimited nesting, fourteen-digit precision arithmetic, floating point exponent range from −64 to +63, verbal error messages, line number trace. Also included is *Activan*, a program that monitors execution frequency by line number and prints a histogram to show the activity in each program area. Comes on eight-inch disk. Requires 25K, SoftCard. $29.95.

☐ *The Construction Computer Applications Directory* (CCAD) contains listings of more than a thousand software programs for construction contractors. Includes products for micro, mini, and mainframe computers. Also included are two yearly updates, listings of construction consultants, and a section entitled, "A Software/Hardware Evaluator for Construction Users." From **Construction Industry Press** (1105-F Spring Street, Silver Spring, MD 20910; 301-589-4884). $95.

☐ New fast cats from **Novation** (18664 Oxnard Street, Tarzana, CA 91356; 213-996-5060) are here. The 212 Auto-Cat occupies fewer than sixty cubic desktop inches, has auto-answer and auto-dialing, and is compatible with the Bell series 100 and 212A modems. Works with synchronous and asynchronous terminals at 1,200 baud. $695. Novation's second modem, the 212 Apple-Cat II, allows 1,200 baud communication with any Bell 212A−compatible data set. Dialing, redialing, answer, and disconnect are all automatic, and it occupies only two card slots. Alternate voice operation, file transfer, and printer-interface functions. $725. Upgrade from Apple-Cat II for $389.

☐ The **Fiberbilt** division of **Ikelheimer-Ernst** (601 West 23rd Street, New York, NY 10001; 212-675-5820) adds the Apple III Carrying Case to its line of computer hardware cases. Removable locking cover, no-slip bumpers, foam padded. $100.

☐ Add more juice for your Apple with the Apple-Mate 5¼-inch disk drive from **Quentin Research** (19355 Business Center Drive, Northridge, CA 91324; 213-701-1006). Compatible with DOS 3.3 and 3.2.1, Pascal, and CP/M in full and half track operation. Features forty track capability, disk protection. $335.

☐ **Strategic Simulations** (465 Fairchild Drive, Suite 108, Mountain View, CA 94043; 415-964-1353) announces their new releases. *Guadalcanal Campaign* is a monster-sized war game. Includes every American and Japanese warship that participated in the historical conflict. Players may choose long or short scenarios, and a solitaire game is also available to play against the computer. $59.95. Also joining the parade is the Rapid-fire line of games. *Cytron Masters* puts you in command of an army of robots, or cytrons, who battle other cytron armies to settle planetary disputes. $39.95. Design your own space battleship to your own warfare style! You are both commander and architect of a starship fleet in *The Cosmic Balance.* Then it's off to battle in ship-to-ship combat. $39.95. In *S.E.U.I.S.* (Shoot 'Em Up In Space), players build ships from a choice of six prototypes to form squadrons and eventually a fleet. Various scenarios, one or two player modes. $39.95.

☐ **Computer Expositions** (Box 3315, Annapolis, MD 21403; 301-263-8044, 800-368-2066) announces two computer shows. The Mid-Atlantic Computer Show and Office Equipment Exposition will take place October 28−31, 1982 in Washington, DC, at the Armory/Starplex. The Southeast Computer Show and Office Equipment Exposition will be held in Atlanta, Georgia, at the Civic Center December 9−12. Admission: $5.

☐ For unsophisticated CP/M users, **Taurus Software** (870 Market Street, Suite 817, San Francisco, CA 94102; 415-788-0888, 800-227-2400) has introduced *CP+*, a control program that replaces CP/M commands with English language menus and directions. Offers help command, installs directly onto CP/M 1.4 and 2.2. $150.

☐ **Computer-Advanced Ideas** (1442A Walnut Street, Suite 341, Berkeley, CA 94709; 415-526-9100) announces *BugByter*, a 6502 debugging tool and machine-language learning aid. Compatible with all Apple languages, it allows complete control of all registers and operations. Screen-oriented to allow customized display of listings; includes full hex and ASCII I/O. $39.95. Also from the company is *Tic Tac Show*, which simulates a popular television game show (sans secret square) in animated color graphics. Entertaining and educational, the game features

topics ranging from world capitals to math word problems and sports facts. Allows you to add your own topics to disk. $39.94.

☐ With a knowledge of Basic, you can make the transition to 6502 assembly language with the help of *Assembly Language Programming for the Apple II,* from **Osborne/McGraw-Hill** (630 Bancroft Way, Berkeley, CA 94710; 415-548-2805). Gives examples in both assembly language and its Basic equivalent. Soft cover, 200 pages. $12.95.

☐ Sidestep hundreds of dollars' worth of circuit boards with *Metatext,* a new eighty-column text editor from **Metaresearch** (1100 S.E. Woodward Street, Portland, OR 97202; 503-232-1712). Features forty-column option for readability, creation routines allowing for custom fonts, text formatter, and various line-oriented text editors. Also includes a serial output program that drives most RS-232 printers from the game I/O connector. $79.

☐ **Hayes Microcomputer Products** (5835 Peachtree Corners East, Norcross, GA 30092; 404-449-8791) announces the release of its first data software product. *The Hayes Terminal Program* for the Hayes Micromodem II originates and answers calls, creates, lists, sends, and receives files, and manages communications parameters—all from a menu. Compatible with DOS 3.3, Pascal, and CP/M. The *Terminal Program* is now included in the Micromodem II package. Current Micromodem II owners can purchase it separately for $79. Hayes also introduces the Smartmodem 1200. Operates at 0 to 300 baud, or at 1,200 baud. Included features found in the original Hayes Stack Smartmodem: full or half duplex, RS-232C interface, Touch-Tone and pulse dialing, automatic answer and dialing. Compatible with Bell 212A or Bell 103 (300 baud) modems. $699.

☐ And once you have a modem, **SSM Microcomputer Products** (2190 Paragon Drive, San Jose, CA 95131; 408-946-7400) offers a bulletin board support service for users of the *Transend* series (Marketalk News, August 1982). Lets users and dealers inquire about SSM products. Leave messages on the system and SSM will either leave a response on the system or a representative will return the call. Available twenty-four hours a day, seven days a week. Modem: 408-946-3616.

☐ **USI International** (71 Park Lane, Brisbane, CA 94005; 415-468-4900) aims to reduce eye strain with the introduction of the Pi line of monitors. Features green phosphor, nonglare screen, available in nine and twelve inch sizes. Pi-1: $249; Pi-2: $275.

☐ An increased power version of the standard floppy/hard disk power supply model CP-384 has been introduced by **Cougar DC Power Supply** (2111 Barnett Street, Oxnard, CA 93033; 805-987-4280; 805-235-5929 toll free outside of California). Input voltage: 100, 120, 220, 240 VAC +10 percent, 47–440 hertz; line regulation: +0.05 percent for 10 percent input voltage swing. $120; $96 each for 100 or more.

☐ Announcing the *Illustrated Computer Science Dictionary for Young People,* for grades four through eight, by **Camelot Publishing** (Box 1357, Ormond Beach, FL 32074; 904-672-5672). Includes photographs and drawings. 128 pages. $8.95.

☐ *The Second Annual Videodisc Conference and Pre-Conference Institute* will be held November 15–17 at the New York Statler. The second day of the conference will feature two seminars: "Vision Machines—Interactive Workstations for Visual Information Management," and "Videodisc-Microcomputer Tax Appraisal System." For information contact: **Meckler Publishing** (520 Riverside Avenue, Westport, CT 06880; 203-226-6967). November 15: $225; November 16 and 17: $450.

☐ Certified public accountants, say hello to **Software Dimensions's** *CPA Partner,* a package that features a completely integrated client write-up system. Handles client accounting, billing, and mailings. Features up to one thousand monthly journal entries per client, maintains thirteen months of data for comparative analysis, holds up to three hundred general ledger accounts, up to ninety-nine departments. Distributed by **Starsoft** (4984 El Camino Real, Los Altos, CA 94022; 415-965-8000). $2,000.

☐ **Technology Seminar Group** (One South Fairview, Goleta, CA 93117; 805-967-8444) announces a seminar entitled, *"Using Personal Computers for Full or Part Time Income Production,"* to be held September 11–12 at the Miramar Hotel in Santa Barbara, California. A second session will be presented at the Airport Marriott in Los Angeles October 16–17. The two-day workshop is designed to aid the personal computer owner in the creation, building, and maintenance of a business using a computer. $295.

☐ **Sybex** (2344 Sixth Street, Berkeley, CA 94710; 415-848-8233, 800-227-2346) has three new books available. *Introduction to the UCSD p-System,* by Charles W. Grant and Jon Butah, provides an explanation of the UCSD p-System. Features descriptions of the file system, screen editor, and Pascal compiler as well as complete instructions on how to write and run a wide range of Pascal programs. 300 pages. $14.95. *Basic Exercises for the Apple,* by J. P. Lamoitier, guides the reader to develop programming proficiency through a series of exercises. The book will also demonstrate applications techniques including flow charting, financial computations, operations research, statistics, and games. 258 pages. $12.95. Finally, *Fortran Programs for Scientists and Engineers,* by Alan R. Miller, covers curve fitting, vector and matrix arithmetic, numerical integration, and statistical analysis. 320 pages with 120 illustrations. $15.95.

☐ User-definable function keys are now available on microcomputer screen editors. *The Advanced System Editor* (ASE) from **Volition Systems** (Box 1236, Del Mar, CA 92014; 714-457-3865) can adapt to a variety of terminals and increase productivity at the keyboard by at least 25 percent. *ASE* is available for all versions of the UCSD p-System and features large file editing, function keys that can be trained, file selection by menu rather than by human memory, and ability to edit a new file while still within another. $175.

☐ **Rutishauser of America** (9677 Wendell Road, Dallas, TX 75234; 214-343-9154) introduces the RS-700, a single-bin mechanical sheet paper feeder and envelope feeder that is compatible with the C. Itoh F-10, NEC 3500, Qume's Sprint 8 and 10, the Ricoh RP 1600, and Triumph Adler's TRD 170. Holds 230 cut sheets and the feed bin accommodates paper widths of 5.5 to 12 inches and lengths of 3.6 to 14 inches; also holds between 30 and 50 envelopes. $1,195.

☐ *Sourceview* is a publication oriented to analysis of software trends and reviews of software for mini and microcomputers. Published by a

company of the same name, *Sourceview* features general articles related to software and an extensive number of reviews. **Sourceview** (Box 578, Concord, CA 94522; 415-680-0202). Subscription: $15 a year.

☐ The results are in, and **Sommerset & Associates** (111 Anza Boulevard, Suite 300, Burlingame, CA 94010; 415-348-1536) is releasing a report of their microcomputer software survey. The report includes an analysis of market segment relationships, an assessment of system software competition, and a special report on the UCSD p-System. 130 pages. $2,500.

☐ Philatelists take note! Avoid purchasing duplicate stamps with the help of the *Stamp Wanted List* from **Dr. Steven Schwartz** (9226 Vantine Street, Pittsburgh, PA 15235; 412-371-7925). Allows up to 500 entries in each want-and-purchase file; menu-driven, formatted dollar amounts. Cassette only (save to either DOS). $16.95.

☐ For stock watchers—*Tickertec,* a system that allows direct connection to the low-speed ticker-tape line from the New York or American stock exchanges. Users may track 150 or more stocks of their choice and monitor the last ten trades and reported volume by keyboard command. Monitors daily highs and lows, receives up-tick and down-tick volume inputs, tracks big block trades, and creates printed reports of selected securities. Uses Microsoft Premium SoftCard and Mountain Computer CPS Multifunction card. From **Max Ule & Company** (6 East 43rd Street, New York, NY 10017; 212-687-0705, 800-223-6642). $1,950. Including above boards and cables: $2,995.

☐ A low-cost and longer-lasting ribbon cartridge for the Epson MX-80 printer is now available from **Data Systems** (Box 99, Fern Park, FL 32730; 305-788-2145). Contains a twenty yard ribbon and is sealed at the factory. The ribbon is formed in a Mobius strip to allow printing on both sides. $8.95; $7.43 per dozen; $5.13 per thousand.

☐ **Sorrento Valley Associates** (11722 Sorrento Valley Road, San Diego, CA 92121; 714-452-0101) announces the *ZVX4-Amlyn Starter Kit,* designed to provide application support to those who require a five-megabyte memory system. Requires Amlyn 5850 disk drive and cartridge, and increases drive access capability from four to five. Supports DOS 3.3, while CP/M and Pascal versions are in the making. $715.

☐ *Early Games for Young Children* consists of nine educational and entertaining games controlled by one program. These games from **Learning Tools** (5145 Abbott Avenue South, Minneapolis, MN 55410; 612-925-0620) require no adult assistance; even two-year-olds can select a game, play it, return to menu, and select a new game. Children can match numbers and letters, practice spelling their names, work with the alphabet, and differentiate between shapes. $29.95.

☐ Does anybody really know what time it is? Probably not, but **System Fabricators** (736 Hermosa Avenue, Hermosa Beach, CA 90254; 213-372-6273) will help with Sosclock III, which provides fully SOS-compatible clock and calendar functions for the Apple III. Provides automatic stamping of volume directories with current date and time, use of reserved variables, times, and dates in Apple III Business Basic, and full implementation of the system calls set time and get time. $60.

☐ **Lazer MicroSystems** (1791 Capital, Suite G, Corona, CA 91720; 714-735-1041) releases Graphics +Plus, a board that mates with Lazer's earlier unit, the Lower Case +Plus, to give the user a RAM-based character set. Allows user to define and redefine the characters that appear on the text screen and makes no use of the hi-res graphics page. Included are more than twenty example fonts, a font editor, several utility programs, and example files. Both Pascal and DOS 3.3 software is provided. $159.95.

☐ Before you throw out your *Zork* disk in frustration, the **Zork Users' Group** (Box 20923, Milwaukee, WI 53220) asks you to take a look at *InvisiClues,* the booklet that provides more than 175 hints to more than 75 questions, progressing from a subtle hint to the full answer printed in invisible ink. Develop the hints you want, so you don't accidentally see other solutions. Includes sections listing all treasures, how all points are earned, and a *Zork* trivia section. $9.95 plus $2 postage and handling.

☐ **Alphacom** (2323 South Bascom Avenue, Campbell, CA 95008; 408-559-8000) has twenty, forty, and eighty column printers. Print up to 240 lines per minute, featuring five-by-seven matrix plus one-dot descender

and graphics capabilities of seventy dots per inch. Alphacom 20: under $200; Alphacom 40: under $300; Alphacom 80: under $600.

☐ *Air Navigation Trainer* is a navigation simulator from **Space-Time Associates** (20-39 Country Club Drive, Manchester, NH 03102; 603-625-1094) that promises to eliminate air navigation mysteries for the student pilot. Includes four preprogrammed simulations and a VOR demo program. Features hi-res graphics, sound effects, adjustable wind. $40.

☐ Steam up the Dim Sum and sit down to a game of *Taipan!*, a strategy-adventure game featuring the China trade of the 1800s. In this game from **Avalanche Productions** (2460 Embarcadero Way, Palo Alto, CA 94303; 415-856-4881) the player braves perilous Asian seas and trades silk, opium, arms, and other cargos. The goal is to build a trading empire and amass one million dollars. Watch out for the archpirate, Li-Yuen! $39.95.

☐ *Write, Edit, & Print: Word Processing with Personal Computers* is an in-depth study of the word-processing capabilities of micros. Aimed at the person with no technical background, the book begins with a buyer's guide to popular computer systems, then goes into introductory Basic. From **Design Enterprises of S.F.** (Box 14695, San Francisco, CA 94114; 415-282-8813). 528 pages. Hardback, $34.95; paperback, $24.95.

☐ **Advanced Systems Concepts** (Box Q, Altadena, CA 91001; 213-684-5461, 213-794-2308) will unveil its port expanders at the Mini-Micro '82 show in Anaheim, California, September 12–14. These port expanders allow single port units to interface with multiple peripherals or computers. The model MO11 allows four computers, modems, or terminals to share a common unit, such as a printer; the model QS11 allows a single port to talk to one of four output devices. $395.

☐ **Insoft** (10175 S.W. Barbur Boulevard, Suite 202B, Portland, OR 97219; 503-244-4181) brings in two games written totally in GraForth. In *Zargs*, Earth is under attack from alien spacecraft. The only hope is to complete and arm top-secret Zarg spaceships. You must precisely dock four spacecraft into ports and then command the mastership into battle with aliens. $34.95. The great human war of 2017 has nearly destroyed the earth and only mutated bugs survive. *Spider Raid* has you, Hero Maximus, the leader of a spider pack, searching for the only food supply left—the common fly. Avoid the acid rain, the *Minimus Problemus* beetle, and the *Spraybius Toxicus* beetle, all of which can kill you. $29.95.

☐ *Magic Window II* is here and includes the following new features: eighty-column board and standard forty-column compatibility, 160-character line length, shift-key modification, underlining, and goof-proof file safety system. Available from **Artsci** (10432 Burbank Boulevard, North Hollywood, CA 91601; 213-985-5763). *Magic Window* owners can receive a $100 discount on prepaid orders with warranty registration or by returning pages of the manual. $149.95.

☐ **Micro Mantic Computer** (541 N.E. McWilliams Road, Bremerton, WA 98310; 206-373-9231) introduces *Diskovery*, a utility that supports thirty-five, forty, seventy, and eighty track drives in thirteen and sixteen sector formats, including CP/M and Pascal. Includes programs to repair damaged disks, undelete files, test drive speed, and more. Free updates guaranteed for five years. $59.95.

☐ In addition to the Applefests, **Northeast Expositions** (824 Boylston Street, Chestnut Hill, MA 02167; 617-739-2000) announces the following computer shows: The Northeast Personal Computer and Home Entertainment Show will be held October 8-11 at Boston's Hynes Auditorium. Friday, Saturday, and Sunday, 11:00 A.M. to 9:00 P.M. and Monday 11:00 A.M. to 6:00 P.M. Admission, $5. The Fourth Annual Northeast Computer Show and Office Equipment Exposition will be held November 11–14, also at Boston's Hynes Auditorium. Hours are 11:00 A.M. to 6:00 P.M. daily. Admission: $5.

☐ **Frank Krogh** (Box 5337, North Hollywood, CA 91616) is now conducting a Postal RobotWar Tournament for those who cannot make it to Burbank, California. The tournament begins on October 1, and the winner will receive a box of 3M disks. All finalists will receive T-shirts. Write Frank Krogh for tournament rules and mailing instructions; enclose a self-addressed stamped envelope.

☐ **The Apple Cart Special Interest Group of American Mensa** provides members with the following: information about Apple hardware and software through a bimonthly newsletter, a forum to share Apple experiences, and access to software exchange. Annual dues, including bimonthly newsletter; $6 for Mensa members; $8 for nonmembers. Write to C. Brandon Gresham, Jr. (Bin "R," Project 5810-1, Pasadena, CA 91109) for more information.

☐ **Olympia USA** (Box 22, Somerville, NJ 08876; 201-722-7000) introduces a letter-quality printer, the ESW 3000. Standard lettering in several type styles, proportional spacing, four pitches, bidirectional printing, and print-wheel cassette insertion. Prints thirty-five characters per second; tractor or sheet feed options available. Under $2,000.

☐ **Conceptual Instruments** (4730 Warrington Avenue, Philadelphia, PA 19143; 215-726-7856) brings you *The Organizer*, a time and information management program that helps arrange appointments, monitor your schedule, jog your memory, place phone calls, and keep track of correspondence, journals, or random notes. Includes programmable alarm clock, interactive calendar, and a programmable calculator. Requires 64K and two disk drives. $250. Telephone dialer, $75.

☐ **Software Research Associates** (Box 2432, San Francisco, CA 94126; 415-957-1441) has had it with shoddy software. *Quality Management Monthly* is their specialized newsletter dedicated to the assurance of high quality in software system development. Newsletter subjects include: technical advances, new methodologies, products, systems, book reviews, meeting notices, and a "Who's Who" section. Sample issue available. $225 per year; $275 outside of United States and Canada.

☐ Still searching for Mr. or Miss "Right"? **Alpine Software** (2120 Academy Circle, Suite E, Colorado Springs, CO 80909; 303-591-9874) introduces *Lovers or Strangers*, a game with a serious touch. It's a compatibility evaluator that tells two people their chances of a successful relationship. Written in part by two leading psychologists, the game hopes to stimulate conversation, laughter, and romance. $29.95.

☐ You can develop programs for Z-80, 6800, and 6809 computers with the *S-C Macro Cross Assemblers* from **S-C Software** (2331 Gus Thomasson, Suite 125, Box 280300, Dallas, TX 75228; 214-324-2050). Features macros, twenty directives, and twenty-nine commands. Allows source programs to be as large as disk space. $110. *Macro Assembler*

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Apple Version 5.0 #1001

DOS 3.3 compatible—Use 40 or 80 column interchangeably (Smarterm—ALS; Videoterm-Videx; Full View 80—Bit 3 Inc.; Vision 80—Vista; Sup-R-Term—M&R Ent.) Reconfigurable at any time for different viedo, printer, or interface. USE HAYES MICROMODEM II* LCA necessary if no 80 column board, need at least 24 K of memory. Files saved as either Text or Binary. Shift key modification allowed. Data Base Merge compatible with DATA PERFECT* by LJK.

"For $150, Letter Perfect offers the type of software that can provide quality word processing on inexpensive micro-computer systems at a competitive price." INFOWORLD.

The favorite assembler, editor of Gebelli Software.

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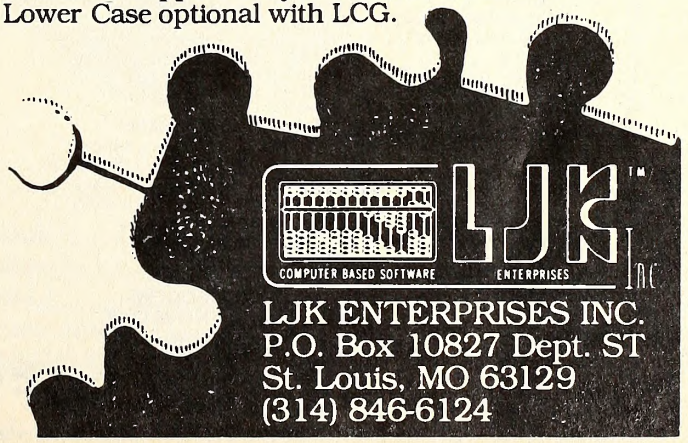
This is a coresident—two pass **Assembler, Disassembler, Text Editor,** and **Machine Language Monitor.** Editing is both character and line oriented. Disassemblies create editable source files with ability to use predefined labels. Complete control with 41 commands, 5 disassembly modes, 24 monitor commands including step, trace, and read/write disk. Twenty pseudo opcodes, allows linked assemblies, software stacking (single and multiple page) plus complete printer control, i.e. paganation, titles and tab setting. User can move source, object and symbol table anywhere in memory. Feel as if you never left the environment of BASIC. Use any of the 80 column boards as supported by LETTER PERFECT. Lower Case optional with LCG.



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owners may purchase the *Cross-Assembler* modules for $32.50.

☐ A friend in the field is what **Digital Marketing** (2670 Cherry Lane, Walnut Creek, CA 94596; 415-938-2880) hopes *Field Companion* will be. Designed for portable computers, it performs expense accounting and maintains appointments as well as current customer lists with ship-to and bill-to addresses. Retrieves data from both customer and product lists, provides past-due invoices, persons to contact, and schedules at a glance. Invoices output to printer or to office via modem. Requires SoftCard and 56K. $295. Manual alone, $30.

☐ **Realty Software** (1116 'E' Eighth Street, Manhattan Beach, CA 90266; 213-372-9419) has released a program for analyzing the sale or purchase of a loan. *Loan Sales/Purchase Analysis* calculates either the return on investment or the value of the loan, allowing the buyer and seller to make knowledgeable decisions when purchasing or liquidating loans. Handles loans in foreign currencies and in U.S. dollars. $50.

☐ *Microbook: Database Management for the Apple II*, by Ted Lewis, is a collection of database programs written in Pascal. Requires only general knowledge of computing; designed for the beginning programmer. The book simulates a library by maintaining a data dictionary, books, chapters, and index to all pages on disk. Software handles all bookkeeping and information retrieval. From **dilithium Press** (11000 S.W. 11th Street, Suite E, Beaverton, OR 97005; 503-646-2713). 320 pages and 120 illustrations. Book, $19.95; disk (includes book), $49.95.

☐ *Anova II* is a new version of *HSD Anova*. New features include performance of analysis of covariance for randomized and between-within designs with unequal n. Also performs analysis of covariance of repeated-measures designs with equal or unequal n. From **Human Systems Dynamics** (9249 Reseda Boulevard, Suite 107, Northridge, CA 91324; 213-993-8536). $150.

☐ Evaluate potential real estate sales and purchases with *Quikcalc Real Estate Investor*, a program that can be used to evaluate financing alternatives for individual residence and income properties. Financing functions feature conventional mortgages, balloon payments, variable rate mortgages, and an interest-only loan. Requires either *VisiCalc* or *SuperCalc*. From **Simple Soft** (480 Eagle Drive, Suite 101, Elk Grove, IL. 60007; 312-364-0752). $129.95.

☐ Shape up your diet with *Eat Smart*, a nutrition analysis program from **The Pillsbury Company** (3286 Pillsbury Center, Minneapolis, MN 55402; 612-330-8732). Analyzes individual's daily diet in terms of recommended dietary allowances (RDA). Analysis is given as a percentage of each user's RDA. Also used as an educational tool. $19.75.

☐ **The Educational Resources Workshop** (Drawer 72289, Roselle, IL 60172; 312-893-5468) has developed an approach to marketing for small computer hardware and software manufacturers. They handle everything from a simple sales letter and documentation design and testing to packaging and a complete retail marketing campaign. Flat fee or royalty on product sales.

☐ New from **Creative Computers** (1044 Lacey Road, Forked River, NJ 08731; 609-693-0002) is Key Wiz, an Apple II-compatible keyboard containing twenty *VisiCalc* function keys and a nineteen-key numeric keypad. Each command key transmits from one to four characters representing a *VisiCalc* code. Eliminates space bar to change direction of cursor movement. Numeric keypad includes keys for mathematic calculation and an enter key. $299.

☐ New hi-res games from **DataMost** (9748 Cozycroft Avenue, Chatsworth, CA 91311; 213-709-1202): Make your way through a space maze in *Space Kadet*. Protect yourself with force fields from the bad guys that dominate this game. One or two players. Keyboard. $34.95. *Crazy Mazey* takes you on a car chase through nineteen different mazes. Start at any level and speed. Get cars to crash into each other while you pick off banks. Joystick or keyboard. $29.95. *Mars Cars* features four levels of alien types. Drive through rooms, pick up items, and hightail it out! Joystick or keyboard. $29.95. *Vortex* is a space shoot-'em-up in which you launch from one to four coordinates. Shoot from the center at randomly flying saucers. Keyboard. $29.95. *Pandora's Box* gives you a close-up and overall view of alien territory. Direct your cloud over items and collect them into Pandora's Box. But watch out for the birds! Joystick only. $29.95. ■

Don't buy Apple Software until you read this book.

Don't settle for manufacturers' promotional material.

THE BOOK is a complete **critical analysis** of most Apple software available. Experts **review, rate** and **evaluate** the programs on 11 separate points. It covers Games, Education, Business and Utilities as well as hardware. Over 500 programs are reviewed.

Don't buy software until you read this book. With the overwhelming array of programs available you can't afford not to consult ***THE BOOK.***

INTRODUCTION

This edition the THE BOOK OF APPLE COMPUTER SOFTWARE — 1982 combines previous editions (some re-written) and new articles, reviews and evaluations. Judging from the response accorded the first edition, which immediately sold out, there is a great need for a guide to the hundreds of programs that compete for the Apple owner's dollars. With the introduction of the Z80 card, choices get even harder concerning what to purchase therefore, we dedicate this book to you, the consumer. We hope you will use it for a guide and as a reference to assist you in making intelligent and informed decisions when purchasing software.

Currently, the Apple Computer owner is presented with a bewildering selection of software from which to choose. On the one hand, this should please you in that, as the owner of probably the most popular micro-computer in the world, you have a wide and rapidly growing selection of software from which to choose. On the other hand, this wide and growing selection presents some problems. The vast majority of retail computer store staff people simply just do not have the time to adequately review each new piece of software that comes in their store. The problem is compounded if the new program is an extensive or complicated one, such as an accounting package or a word processing system, or a comprehensive data base management program. This does not mean that store personnel do not want to give you the best service possible, it's just that it is an almost impossible task. If you purchase software through the mail, the risks that you assume, without a reliable guide to assist you should be apparent.

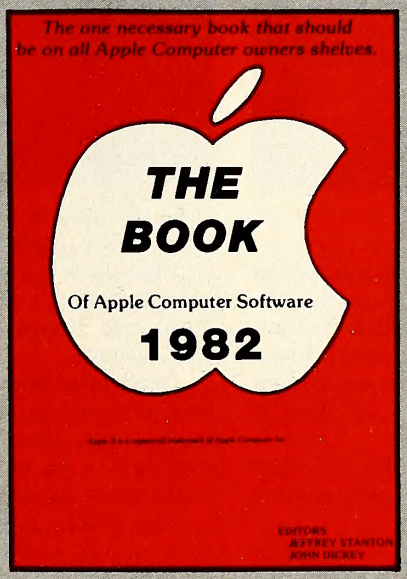
Other pitfalls await the uninformed buyer. For instance, in too many cases you cannot by the appearance of the package whether the program requires Integer Basic or Applesoft Basic or whether it needs 16, 32 or 48K of RAM. It is also often difficult to tell when you purchase a program on tape whether it can be transferred to disk or, if a disk program is purchased, whether it can be copied or not.

Another area that can present problems to the buyer is the similarity of software. A well-stocked computer store may possibly offer five different word processing packages, four assemblers, ten different adventure type games and/or several mail list programs, (the choices seem endless); all of which have obvious advantages and disadvantages as well as different prices.

The goal of "The Book" is to eliminate as many of these potential problem areas for the software buyer as possible.

We welcome any comments or criticisms from readers that will help us in reaching this goal.

*Obviously, Apple and Apple Computer Co. is mentioned many times throughout "The Book." Apple II is a registered trademark of Apple Computer Inc.



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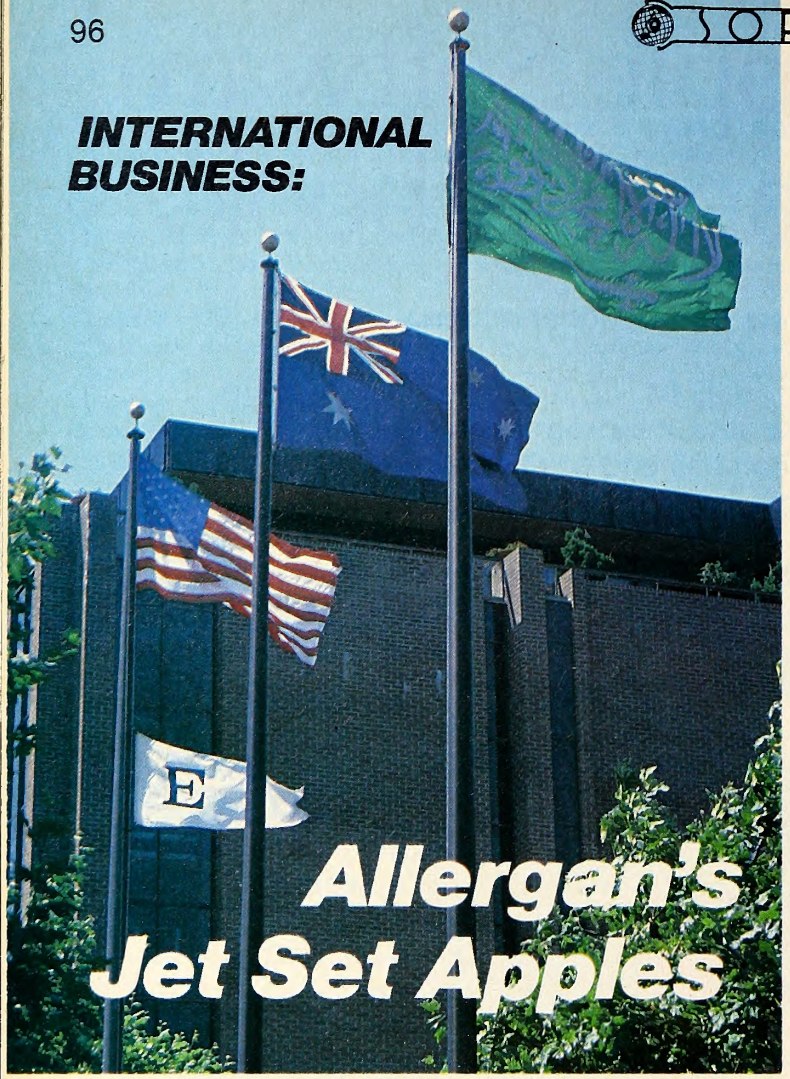


INTERNATIONAL BUSINESS:

Allergan's Jet Set Apples

BY MICHAEL FERRIS

Two employees with a small, California-based multinational hooked up an Apple in their home office and one each in their French and British branches. Linked via modem to a relay-switching satellite, the computers successfully transmit and download data back and forth between the two continents. It formerly took similar information six to eight weeks each way to reach its proper destination. Now it's there in minutes.

An international micro-to-micro transmission like this had never been tried before. In fact, the company's computer experts swore it couldn't be done.

The same two men also connected an Apple to an IBM mainframe for downloading information. The loose-tongued IBM is unaware that it is chatting with a lowly Apple.

The same experts theorized how this might be done—the cost would be about five thousand dollars in time and equipment. It actually took only a few hours to do and cost no more than a six-pack of beer.

All this goes to show that if something can't be done or the cost is too high, these days you have two choices: you can either do without or go ahead and do it yourself.

It's not a comfortable feeling always to be caught in between such choices. We're progressing in fits and starts; sometimes it seems hopeless and sometimes too good to be true. Modern technology has dragged us to the junction of risk and promise, and the world is being wracked by hesitation.

In One Age, out the Other. We are once again crossing from one great economic age into another; this time from the industrial to the informational. We are the generations that know firsthand how things *used* to be as well as how things *will* be. As to how things are right now—well, everything's changing.

"There is a certain relief in change, even though it is from bad to worse. . . . It is often a comfort to shift one's position and be bruised in a new place," wrote novelist Washington Irving on traveling by stagecoach. America is traveling a different hard road today, an economic one, but the bruising is still the same.

Research shows that half of America's work force was in the information and education business in 1976, according to *The Futurist* magazine. By the year 2000, this will be more like a sixty-forty split, with the odds-on favorite being information and education, and the rest being manufacturing and other employment.

A systems revolution is upon us.

The last time a similar revolution was noted to be underway was in 1880, when half of America's work force was in agriculture and the extractive business and half was in manufacturing and commerce. The industrial revolution was reshaping the nation. It peaked at its halfway point in 1920 when the shift in major resources went from energy to information. By the time World War II rolled around, the situation had exploded. New technologies were developing faster than anybody could implement them.

The door to the computer communications age was quietly opened in

1940, according to *Datamation* magazine. A modified Teletype 26 keyboard in New Hampshire was used to transmit data in a test over regular phone lines to a relay calculator in New York. The calculator processed the data and returned its response to New Hampshire, a neat trick at the time. It took twenty years for the computer to catch up to its own potential.

Information Slicks. In 1962 the Rand Corporation, America's think tank, proposed an all-digital, computer-controlled defense system that moved computering from traditional time sharing to the concept of networking in a big way. What pipelines are to the world's oil flow, networks are to global information access.

This radical rethinking by Rand launched a battle of communications network satellites that has been raging now for twenty years.

Networks like Telenet, Tymnet, Datapac, General Electric's Quick-Com, and Saponet are all in operation today, but there are no system standards, the technology remains underdeveloped, and at best they offer partial solutions to a chronic worldwide problem.

It's a problem that's constantly plaguing America's multinational corporations. The daily international flow of information is the vital link between the home office and those in the field. It's no wonder a corporation like Allergan, a division of SmithKline-Beckman, decided to take a couple of Apples and create a network of their own.

Allergan is a small multinational compared to most, but its people are very progressive. The company began in Los Angeles when Gavin S. Herbert opened up shop in a room above his drugstore in 1948. Computers at the time were vacuum-tubed affairs, the transistor had just been invented, and operating systems were still five years away.

House Full of Kids. In 1967 the company moved to their present national headquarters in Irvine, California. Today they marshal more than sixty-eight subsidiaries, with offices and manufacturing plants worldwide, including Australia, Germany, Japan, Brazil, France, Italy, Mexico, and Great Britain.

Allergan develops, manufactures, and markets products in two spe-

cialized areas—eye care and skin care. They produce prescription drugs to treat various eye disorders and nonprescription preparations to treat less severe conditions. Hard and soft contact lens users will be most familiar with their lens-care packages. The skin-care division produces both prescription and nonprescription products that treat various dermatological problems. They also make a line of sun screens.

Formerly more of a development company, Allergan was able to become an industry leader by acquiring compounds from other companies. Now they are committed to doing more of their own research and development, with access to some of the foremost pharmaceutical research findings and facilities under their merger with SmithKline.

Allergan is proud of their manufacturing capabilities—operators in their product-filling rooms wear masks and gowns, working under aseptic conditions that rival hospital operating rooms.

Their employee policies are considerably enlightened, also. Their complex in Irvine includes tennis courts and a baseball diamond. They have a van-pooling program that allows seven employees to travel to and from work in a company van with the gas paid for by Allergan.

The company maintains an "open-door policy" to encourage the free flow of ideas and opinions within the corporation. It's easy to see how two employees could pitch the corporate heads at Allergan an Apple network idea and have them bite. The two employees that wound up spearheading the network operation were Jim Casparie and Jerry Pickering.

View from the First Floor. Casparie's and Pickering's offices are on the first floor in the huge brick Allergan complex. It's called the international floor; the people who work there must be fluent in two languages in addition to English. The offices are neat and spacious, and blow-ups of Allergan ads in foreign languages are prominent. There are plaques by the elevators that tell which country's flags are flying in front of the building on any given day, a salute to visiting field executives.

Casparie is a marketing products manager, specializing in new products. He met his Apple in 1980, using it for some personal hacking and consulting work between stints at Allergan. A native Californian, he holds a master's degree in business and does career counseling at the University of California, Irvine.

Pickering is a market research analyst with a degree in biochemistry. He also has an Apple at home and has done some consulting work with it. And he happens to be a registered nurse who spent two years in the army as a Green Beret.

The two men make quite a professional, good-natured set of players. They share tons of enthusiasm for the potential of the Apple. They delight in its ability to dazzle the big boys continually with amazing new applications. They are a classic pair of Apple flyers.

There is an unwritten law in the world of computer team-ups that decrees that one partner be the visionary and the other be the hacker. If the visionary sees that Apples might fly, the hacker goes about finding a way to make them airborne.

While it appears in reality that Pickering and Casparie have about equal amounts of both, Casparie seems to lean toward the visionary role; he specializes in fighting flak and red tape. Pickering seems to favor the hacker role; he does the trouble-shooting and debugging. Both parts are crucial; one can't exist without the other. The visionary-hacker interplay between these two "home-brewed, backyard hobbyists," as they have been called, seems to be what has made their "hobbying" so successful.

The Way They Were. To see just how revolutionary the actual application of an Apple system network is, it helps to have an idea of how communications traditionally have been conducted between a multinational's home office and an international office in a foreign country.

The basic problem with an international division is that it's located miles away from home. Sometimes it's just a small office when it's not connected to a manufacturing plant. The Allergan office in Great Britain is located in the top half of a converted Victorian mansion.

The company back home wants to know how things are selling and developing in the overseas market. They also want numbers. The flow of information is a major problem. Global data transmission is a jungle of competing systems and international regulations.

Casparie explains how overseas information has been handled at Allergan in the recent past, mostly by regular mail.

"Regular mail takes anywhere from ten to fourteen days from Europe. So the home office doesn't get to see or react to anything until two weeks after the fact. After the information goes through the finance department (which takes from two to five days), is keypunched (one to seven days), then run through the IBM mainframe (one to seven days), the information finally gets to marketing—about four to six weeks after it was sent. The international division finds out if they did anything wrong four to six weeks after that.

Opposite page: Flags outside Allergan headquarters in Irvine, saluting the homes of visiting field executives. Visionary Jim Casparie. This page: Hacker Jerry Pickering. Secretary Sue Kouba and administrative assistant Joyce Bonura smile their way through *WordStar*.

"This is the standard procedure with most American multinationals—gossip travels faster.

"We might even be talking about something as simple as a one-line label change on a bottle of suntan lotion in Germany."

Faster than a Speeding Bullet. Most companies can easily be several months behind in decisions based on this flow of information. The Apple system at Allergan is demolishing this informational jet lag.

"We have taken a quantum leap from the Dark Ages with this system," says Pickering.

He ran down some cost comparisons between existing international networks. "To send a five-page transmission, fifty-six lines per page, eighty characters each, would cost $112 if sent by telex at the 50-baud rate from here to Great Britain and take eight to ten hours. To send it on the Texas Instruments' TRT network would cost $17.80. To send it on an ITT lease line at 300 baud, with a batch of other messages, would cost $13.30 and also take eight to ten hours. On an ITT dedicated line sent at 1,200 baud it would cost $3.32.

"To send it on the G.E. system that we're using with the Apples costs only $1.24 and it's instantaneous." And it is done with the ease and convenience of making a local phone call.

While all this sounds amazingly simple and even a little bit inevitable, resistance to the project came in several different forms. Casparie and Pickering had to contend with interdepartmental priorities, international law, and hardware-software shortcomings. They were assigned the

task on a part-time basis, but they soon found they were working ridiculous hours and sometimes had to put their bread-and-butter jobs on the back burner.

The go-ahead for the project was given in June 1981. Allergan got a new director of marketing, John Stewart, who was pro-Apple. It was Casparie and Stewart who initially hashed out the financing of the system. Their job also included convincing the president of the international division, James Cavanaugh, that the Apple had what Allergan needed.

About this time, the data processing department at Allergan took an interest in the Apple project. Data processing departments are where the mainframe honchos are ensconced. These are the experts with the degrees in computer science and decades of experience. Anything with a chip in it is considered their turf. They were concerned that the Apple system would interfere with their eighteen months of work in Italy trying to get an IBM/ICL System 10 to work as smoothly as it did in Allergan's Canadian office.

An Electronic Hammer. "We proposed the Apple along the lines of a management tool. We showed them how it wouldn't be in competition with their larger project. We were shooting for a small system on the local level, for the little guys out in the sticks," says Casparie. Still, it took them three months to get data processing's approval.

"They couldn't believe the Apple was good for anything more than playing games," Casparie explains.

"They said we were crazy, that it couldn't be done," a phrase Casparie and Pickering were to hear endlessly at every corner they turned. It only served to fuel their enthusiasm even more.

Pickering, with a broad background in Apples, was brought on as a consultant after all the project's approvals had been acquired. The serious technical research was begun.

The Apple was always the favored choice of micro for the system. "You can walk in anywhere in the world and buy one," says Pickering. He had checked out the competition.

"We looked at the Commodore, the TRS, the IBM pc, the Osborne, you name it—even the Apple III. The Plus was the most versatile. It was able to handle all our hardware configuration needs. It is also serviced worldwide."

Casparie mentions that the Apple Communications Card was found to be the only internationally flexible communications card.

Modem compatibility in Europe became a major area of concern. It seems they don't really have Apples there—they have European-manufactured Apples. Converters switch them from AC to DC, the European standard, and special cards in slot 7 connect the AC Apple to a DC monitor.

VisiTerm turned out to be the reigning communications software in Europe; it has a worldwide distribution. But research led the Allergan investigators to favor *ASCII Express*. It could almost do what they needed it to do; it would only require a few modifications.

Casparie and Pickering's research led them to the conclusion that M&Ms are the most Apple-compatible candy.

Later, Pickering and Casparie enlisted the help of *ASCII* author Bill Blue. He was able to create patches for them when "funny things" started coming across the system in its initial trials.

Road Show. In January 1982 the first Apples arrived at Irvine, and Pickering began to make the necessary hardware and software configurations. Casparie made travel plans.

"I did all the startup programming in random access," says Pickering, "but it turned out we could only transmit files sequentially. So two days before Jim left, I was frantically reprogramming everything for sequential transmission."

Casparie left for Great Britain in April 1982. Three days later, the British Apple was up and running. Two weeks after that, France was linked up.

"I left with a suitcase full of software packages and the *ASCII* and General Electric documentation," Casparie explains. "There was no time to look at everything, so I just took it all. There was no beta testing of this system; I just showed up and we rolled up our sleeves."

The system didn't quite perform as planned with the first message sent. There was some data loss. Ten minutes after the initial transmission, Pickering called Casparie about some stuck files. They were sweating this out together; both were nervous. This was their moment of truth.

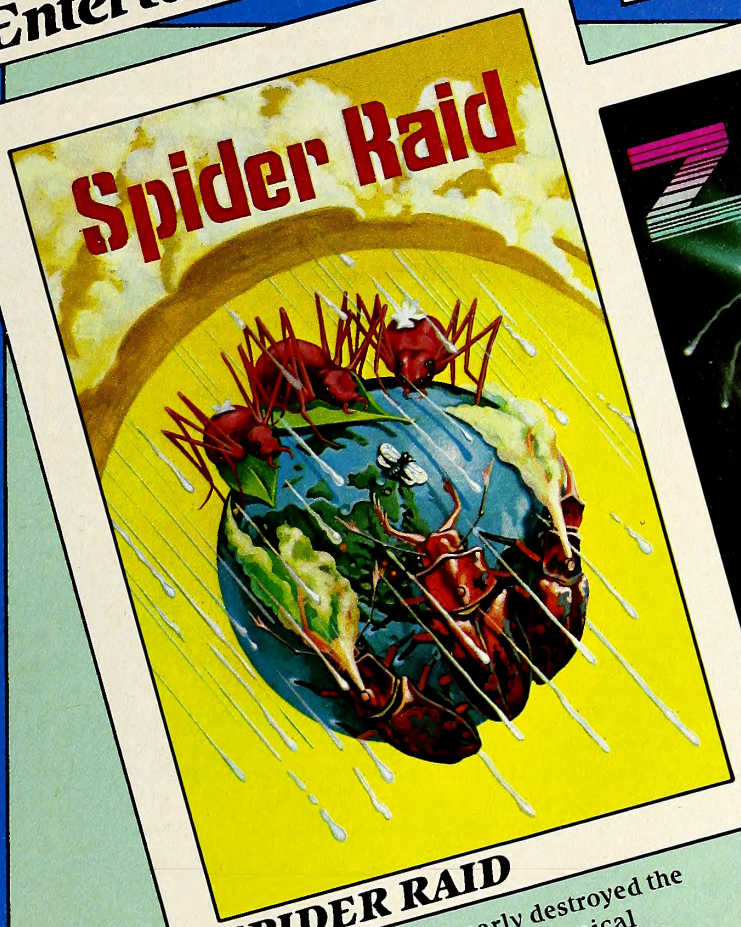
"We were frantic," says Casparie. "The problem was the data-entry mode of the Quick-Com system. It took too much time to transmit and was overlapping. All we eventually needed to use was a 130-character straight dump mode, but that wasn't in the book. G.E.'s system was designed for straight transmission, not for downloading data files."

Pickering recalls how that first transmission almost didn't get made.

"Jim had taken our only copy of the G.E. book and I couldn't remember my password—there are four levels of passwords to get on the system. I had to call their rep out here. I didn't know anything about their system. It was a real comedy of errors."

One of the things they had to consider in designing the network was a multinational regulatory law called TBDF (transborder data flow).

Entertainment Plus



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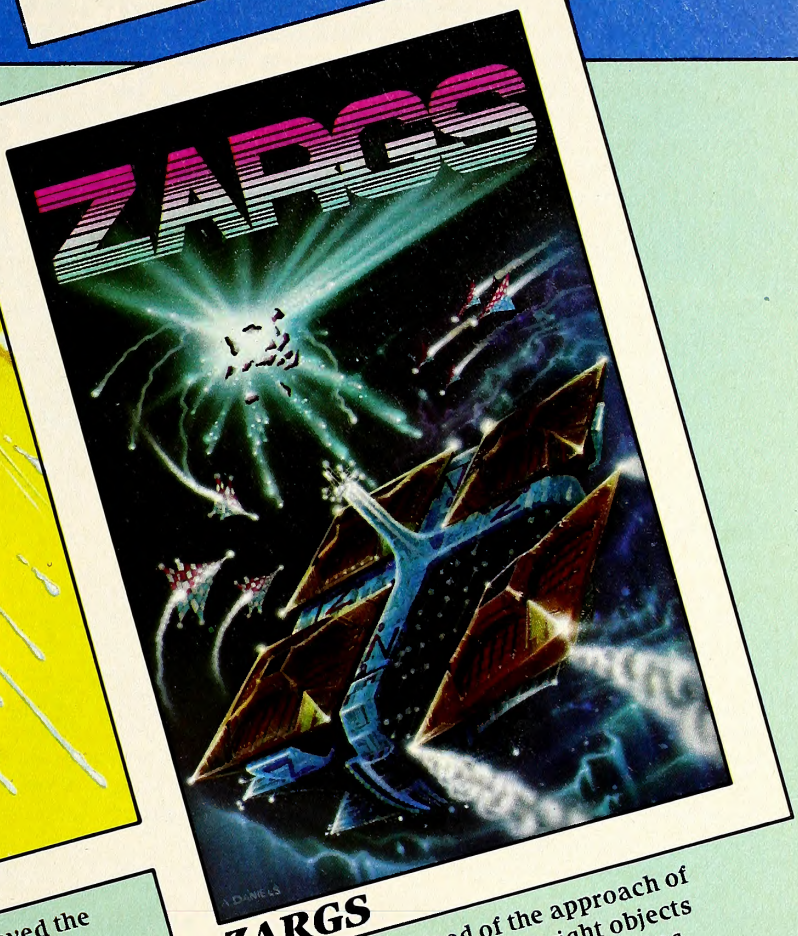

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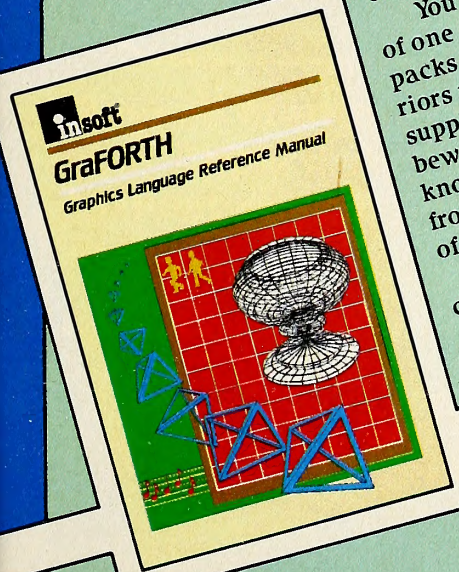

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Casparie explains: "The law considers data leaving a country as a lost resource. It must either be processed in the country or be nonvital information. That's why we signed on with General Electric—their QuickCom network had been approved by the most countries. We had to orchestrate the setup with them step by step. Nobody had ever used their system the way we wanted to. We were blazing a trail of our own over there. We turned out to be the first to make this kind of message switching work on this scale."

A Big Hit. When the system finally clicked, enthusiasm for Apples and the network snowballed throughout Allergan, especially at the managerial level. Casparie and Pickering had won over some very skeptical opposition.

"The head of the British field office is an ultraconservative type, rigid against change and all that," Casparie relates. "He used to sit up in the attic and do all his figuring in longhand, using long division. When the Apple was put in, he didn't want to sit down with the rest of the staff and learn how to use it.

"It turned out he came in alone at night and figured the thing out for himself," Pickering continues. "Of course, he fell in love. If the system took off he could keep his Apple, so he wanted to protect his investment. He jumped on the bandwagon, started calling country managers all over the world. He really started stirring up the pot for us."

The British staff was able to show off their Apple when they were visited recently by an area supervisor. They were ordered to rebudget; the manager expected the calculation to take the usual two to three days. He would pick it up on his way back from Italy. Using *VisiCalc,* the British office was able to hand the recalculations to him at the end of the day, before he got on the plane.

France was ready to go on the network before the network was even ready. "We were originally going to set up the system from the U.K. only, but it turned out our man in France had gone out and purchased an Apple on the q.t., so we included them too," says Casparie.

"The head of our Australian operation is visiting here in Irvine right now. He was sold on the system right off the bat. He wants to take five Apples back with him when he goes."

Altogether about twelve of Allergan's country managers want Apples in their outposts, including Italy, where the IBM/ICL mainframers are still toiling away on their $100,000 system, trying to get a six-bit language to travel on eight-bit lines.

Each field office on the Apple network requires about seven thousand dollars' worth of equipment to set up its end of the system. Each needs an Apple II Plus, a NEC or Apple III monitor, two disk drives, a Videx eighty-column card, a SoftCard, a Saturn 64K memory board, a Videx Keyboard Enhancer II, a Thunderclock, the best local printer (this was found to be the only equipment variable), a Quadram Microphaser (for quick screen dumps), and, of course, a D.C. Hayes modem (in Europe, nonacoustic modems must be hand wired to the phone).

They've Just Begun. Now that the first links of the Apple network are in place and functioning, Casparie and Pickering already see it expanding into more than they had planned.

"We want to start out simple, until everybody gets used to the Apple. Right now we're using *VisiCalc, PFS,* and the *Executive Secretary* word processor to train people with. We hope to go up to CP/M and use *WordStar* worldwide," says Casparie.

They eventually see graphics capabilities on the system, like transmitting advertising and labels for approval and changes. In time, they feel the system could handle camera-ready art; computer-generated images could go directly onto graphic arts film and then be printed.

"This will revolutionize the packaging and advertising business. Companies who are on the ball will have a real competitive edge," says Pickering.

As soon as Allergan has their corporate family all linked up on the Apple network, you can be sure they plan to stay on top of the system's development. The first thing a company wants to do when they get that edge is sharpen it.

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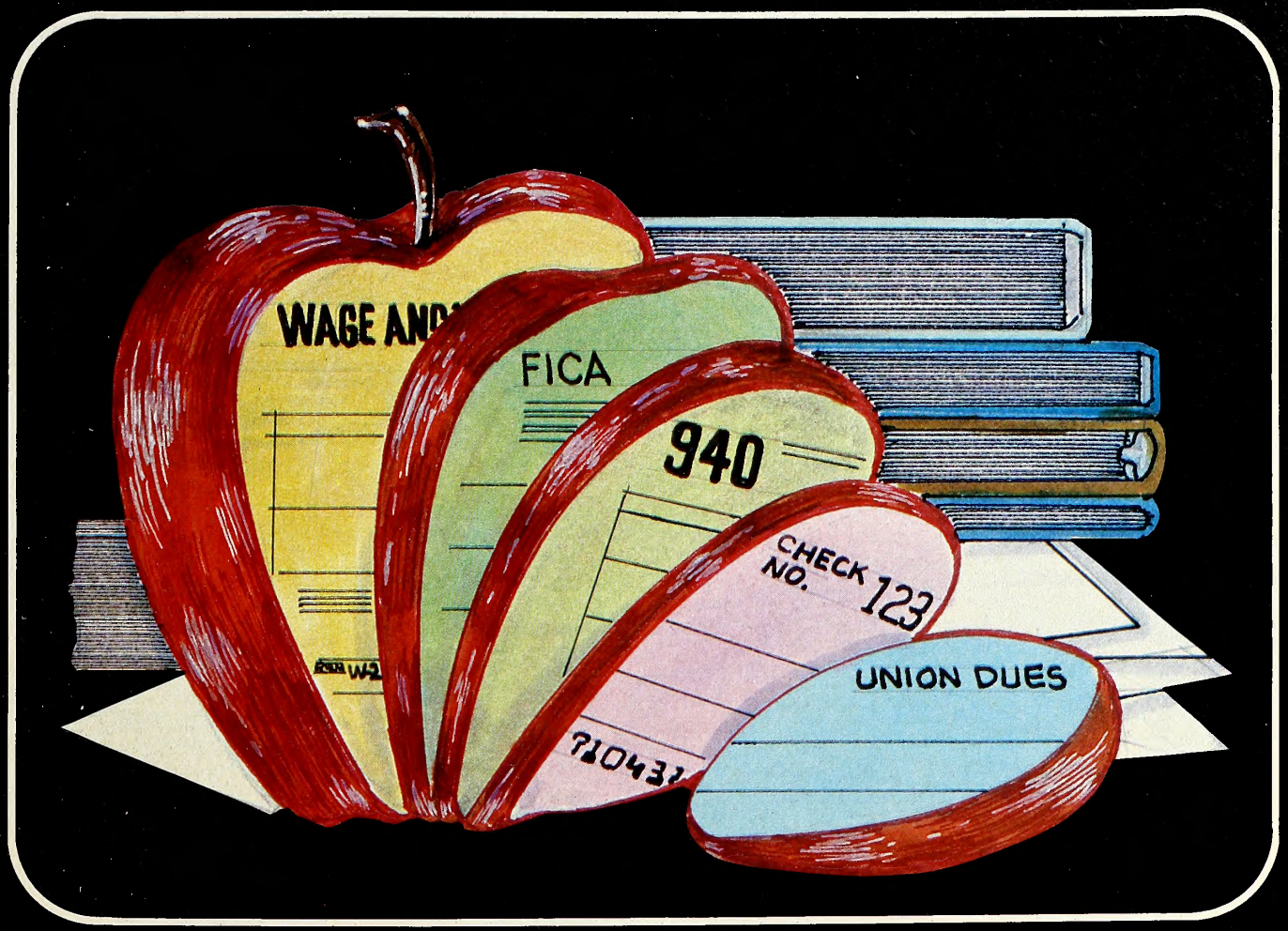

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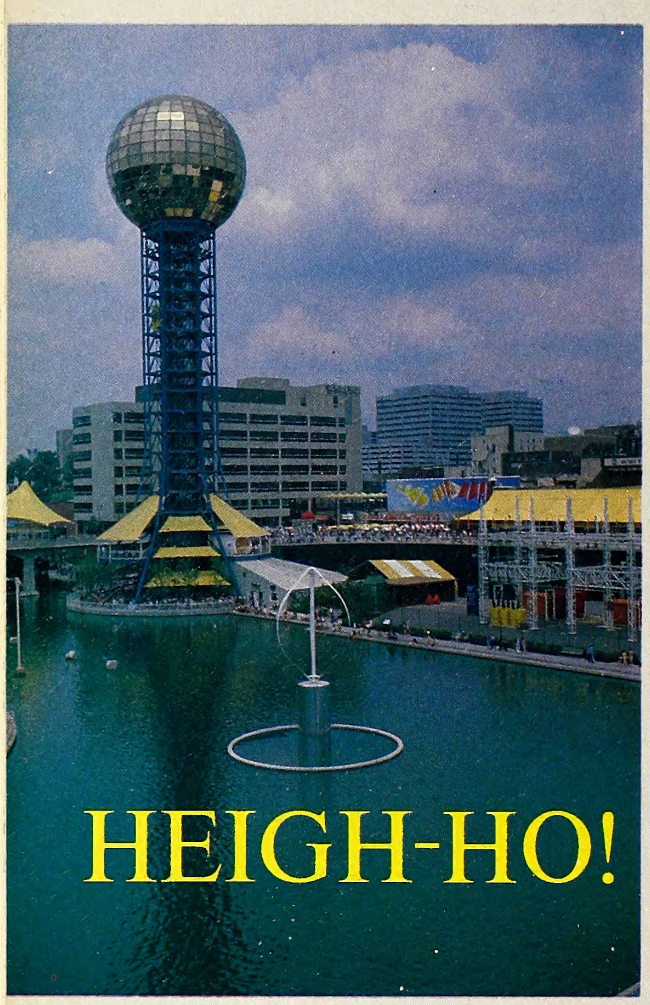


HEIGH-HO! COME TO THE FAIR

BY JIM SALMONS AND DAVE FITZGERALD

It's hot as blazes and a bit humid, as Tennessee is wont to be. Sunburnt skin finds momentary relief beneath occasional maples, and a breeze from the sparkling lagoon wafts welcome relief to long queues of people.

No one leaves the lines, despite the sun. No one even looks worn. To these visitors to the 1982 World's Fair in Knoxville, Tennessee, standing in line is worthwhile: they're waiting for a peek at the future.

That's what world's fairs are all about: countries and companies convening to show off what they can do and what they can almost do, what's just around the corner for all of us. They speak to the future and they celebrate the past, reveling in the can-do attitude that has brought humankind from leaf-nibbling foragers to Tang-sucking space walkers in the blink of a cosmic eye.

Today, we measure our growth by our technological advancement; it is the measure of our copability in all areas of life but the arts. Just as we stand our children tall against the edge of a closet door to mark the march toward adulthood, we stack up our technology at a world's fair to benchmark just how far we've come since the one before.

This time, between the last world's fair in 1975 and this one, our technology in electronics and information advanced so fast that one entire genre missed its opportunity to stand in the sun. In 1975, there were no Apples. In 1982, they are so common, so accepted, that in their world's fair debut they aren't seen at all. The Knoxville World's Fair's Apples are workhorses, not peacocks.

Dozens of Apples populate the areas backstage, running the exhibits that make this the most uniquely informative exposition since the first, the London World's Fair of 1851. Visitors actually use Apples, interact with Apples, through specially designed keyboards and divers screens; but the fancy keyboards merely transmit their input to the Apples in the wings, and the Apples answer for them—rather like Cyrano beneath the balcony speaking for Christian to Roxanne.

The Apples share a purpose with all the people and products at the fair: to enhance the meaning of the fair's theme, Energy Turns the World.

Tokyo, Rome, Madrid—and Knoxville. Of all the places you might consider for a world's fair, Knoxville seems an unlikely choice. Prior to the fair, its popular claim to fame was as that place through which ten million vacation-goers passed on their way to the Great Smoky Mountains National Park, the most visited park in the nation. Short of throwing tacks on the highway, Knoxville had been unable to lure these mobile Americans within its city limits.

Not as often considered is that Knoxville, with its surroundings, has first dibs on the title of energy capital of the United States. It's the home of the Tennessee Valley Authority, the nation's largest public utility. The University of Tennessee, whose main campus borders the fair site, is an academic leader in advanced energy research for government and industry. And nearby Oak Ridge harbors the National Atomic Laboratory, the world's leading nuclear research facility.

Which Came First, the Chicken or the Egg? The answer, of course, is: the idea. In Knoxville's case, the idea sprang from the mind of one Jake Butcher.

Knoxville's one hundred eighty thousand residents have seen their share of the inner-city decay that plagues most American cities; unemployment and shifting business populations have hit hard. Jack Butcher thought he saw a way to reverse all that.

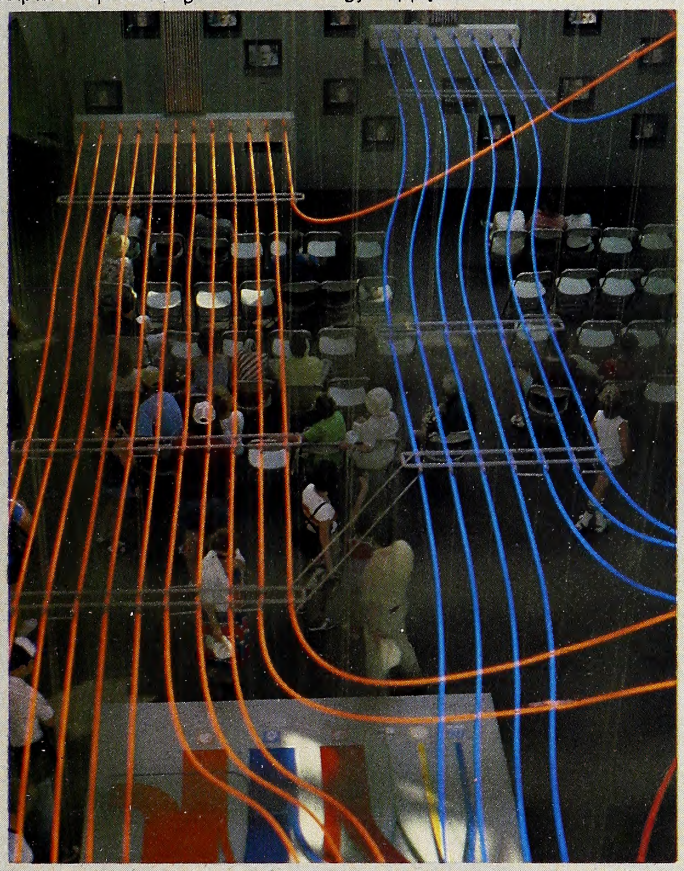
In a scenario that reads like a movie script, this rags-to-riches mogul pulled every conceivable corporate and political string to realize his vision of a world's fair within the shadow of his United America Bank, Knoxville's largest—and one of five that Butcher owns. He and his cohorts believed the fair would provide the impetus and the financial op-

portunity to redevelop Knoxville's ailing central business district in one fell swoop.

Ordinarily, today's world's fairs are financed by local municipal bond issues or other public funds. Not so in Knoxville. With his friends, Jake Butcher negotiated a thirty-million-dollar line of credit from a consortium of forty-three banks. The 1982 World's Fair is the first such exposition funded totally by private-sector investment.

The Way It Was. At first, world's fairs were mammoth spectacles. Designated as universal expositions, fairs were held in internationally significant cities such as London, New York, and Paris. With each participating country funding and constructing its own pavilion, the event attempted to showcase the total spectrum of human accomplishment.

The Sunsphere (far left), theme structure of the fair, dominates the view of the site across the Waters of the World. The U.S. pavilion, The Energy Place (left), is the fair's largest national exhibit and a showcase of Apple-controlled videodisc displays. The Debate Wall (below), twenty video monitors controlled by three Apples, as seen through The Neon Way, a colorful light sculpture representing American energy supply and demand.



As the world became more diverse and complex, and just plain bigger, mounting the world's fair extravaganzas became impossibly costly and unwieldy. The traditional metropolises balked at the prospect of trying to outdo Busby Berkeley but didn't want to undershine the previous host. World's fairs were in danger of extinction.

Yet the benefits of the fairs to the cities that hosted them couldn't be denied. Smaller cities, needing the stimulation of economic activity the fairs inevitably caused, couldn't afford the traditional fairs, but they also didn't feel the need to compete with previous events. They lobbied for smaller, focused world's fairs.

So the Bureau of International Expositions sanctioned a second category of world's fair: the specialized fair, a global event focusing on a particular aspect of human endeavor.

In a unique partnership, local developers front construction funds and lease space to participants who share pavilions. Jobs are created, many of which last after a fair is over, and the new or revitalized buildings are put to use in reenergizing the local economy. Like the extravaganzas of yesterday, a specialized world's fair can turn a city around.

Childhood's End. The Knoxville World's Fair highlights world achievements in energy. Diverse potential solutions to the world's energy problems abound in the pavilions.

Displays stress conservation and efficient use of energy. Demonstrations of fuel-efficient cars, energy-efficient buildings, and labor-saving but low-energy appliances offer glimpses of a more energy-conscious future. And the renovation of a Victorian house on the fair site shows that we can tackle the problem without rebuilding our cities.

More exciting are the displays of new technologies exploring different sources of energy. Windmills and solar collectors abound on the fairgrounds. Seeing one beside the other is like seeing the old world juxtaposed against the new; actually, both are part of the future. Indoor exhibits attest to the monumental effort industry is putting into developing methods of recovering and using uranium, deuterium, coal, and oil shale.

Many exhibits at the World's Fair use Apples, but three of the largest pavilions use them in such quantity and so integrally that they merit closer looks. Follow now as we visit the United States pavilion, the pavilion of the America's Electric Energy Exhibit, and the Tennessee Valley Authority exhibit.

The United States pavilion, The Energy Place, is the centerpiece of the 1982 World's Fair. The six cantilevered stories of the U.S. pavilion extend majestically over an edge of the three-acre Waters of the World, a beautiful reflecting pool created especially for the fair. Open-air balconies overlooking the lake give pavilion visitors a breathtaking view of the Sunsphere, the 266-foot theme structure of the fair. On the opposite side of the building, an IMAX theater presents the film *Energy, Energy* on a screen ninety feet wide and seven stories tall—the largest in the world.

The Energy Place practices what it preaches: energy conservation and innovation. A network of computer-controlled sensors constantly monitors and adjusts the climate within the pavilion. This super-intelligent thermostat will even open the windows if the system determines that outside air is the most effective way to keep the building within environmental standards. State-of-the-art insulation techniques and a 4,100-square-foot solar collector contribute to the building's energy efficiency.

Escalators shuttle crowds to the top of the pavilion. Here, they begin a gradual descent down broad ramps through a series of displays that unfold America's energy past, present, and future. Throughout the descent, visitors are afforded an unobstructed view of the entire pavilion from the railing-lined ramps and broad landings. Even the cavernous open space in the center of the pavilion is filled with energy-related items suspended from the ceiling by wire.

The firm of Ramirez and Woods, eighteen-year veterans of exhibit design, brought together numerous historical artifacts, from Jeffersonian bedwarmers to the first solar-powered airplane, to give concrete examples of the evolution of our diversified uses of energy. Artistic expressions are also included to convey the elusive concepts relating to energy.

The Energy Time Curve presents a three-dimensional view of our increasing demand for energy and our varied sources of it. Beginning with a six foot tall pedestal representing the use of steam and animal power in 1800, a succession of pedestals grows to more than twenty-seven feet, the tallest representing energy demands in 1980. This towering demand is now being met by a variety of sources, including nuclear and solar power. A second artistic exhibit, Energy: The Neon Way, provides a similar dramatic graphic representation of energy supply and demand.

While these historic and artistic displays are informative, they are static. But Ramirez and Woods didn't stop here and have incorporated interactive displays that advance the state of the art in exhibit design.

Grown To Loan. Steve Gregory, cofounder of the New England Technology Group (NETG) and professor of computer graphics at MIT, began consulting with Ramirez and Woods in January 1981. Their collective effort was intended to break new ground in the application of computer and interactive videodisc technology within exhibit design. Buttressed by the loan from Apple Computer of fifty computers, the U.S. pavilion is a resounding statement of the success of the collaboration between NETG and the exhibit design firm.

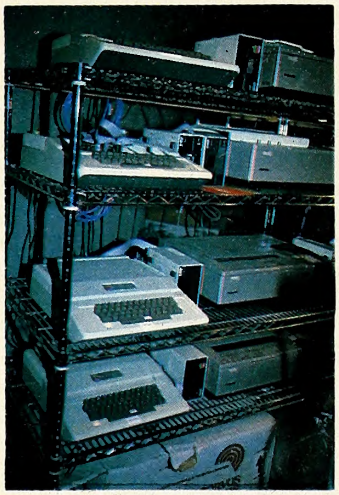
"When we learned of the Apple computer loan, we were truly excited," Steve Gregory recalls. "Having been in business for a while, we had occasion to work with the Apple for some of our clients. We found it to be a very flexible, capable, and reliable machine."

In fact, the pavilion demonstrates an evolving sophistication in NETG's application of Apple computers within interactive information retrieval and presentation.

The most basic interactive display is a high-tech version of the "push-a-button, get-a-message" exhibit technique. The topic of the exhibit is "embodied energy," the energy it takes to produce a product rather than what it takes to use it.

Backlit photographs of sixteen everyday products invite visitors to examine more closely the embodied energy used to produce each item. By touching the picture of a product, a visitor calls up a brief audio-visual presentation that explains how that item is made and the surprising ways in which energy is essential to the process.

An Apple computer controls access of specific segments of a laser videodisc. By issuing the videodisc a start and stop frame number, the Apple directs the rapid access of stored information much as it would with a standard disk drive. The difference is that the information is interpreted and presented by the videodisc player as an audio-visual message rather than being fed into the computer for traditional number-crunching. While the results are dramatic, the videodisc is actually nothing more than a sophisticated data storage and retrieval peripheral for the computer.



Left: Three of more than thirty Apple computers housed in the glass-walled control room at the U.S. pavilion. Center: Spectators control the flow of discussion by means of touch-sensitive video monitors at the Debate Wall. Right: Jim Ogul, U.S. pavilion site manager, explains the evolution he has seen from early static exhibits to the exciting interaction of microcomputer controls.

A more innovative application of the Apple is the use of touch-sensitive screens. These devices provide the ultimate in user transparency. The user's attention is not divided between viewing and keyboard operation. Instead, with a simple touch of a finger, the viewer controls the presentation much like a wizard would cast a spell with the wave of a hand.

The magical touch screen is a product of Elographics of Oak Ridge, Tennessee. This high-resolution screen, providing a four thousand-by-four thousand point grid, consists of a glass sheet coated with a transparent resistive substrate. The substrate is separated from a plastic cover sheet by tiny plastic beads. This cover sheet is sprayed with a transparent conductive coating of gold.

A Touch of Glass. When the two layers are pressed together by a touch, an electric circuit is completed. A variable resistance calculation generates a unique (X,Y) coordinate. The Apple can as easily interpret this position coordinate as a key-tap signal from a traditional keyboard.

The Energy Glossary stations are a step up the ladder of sophistication in application of the touch screen-computer-videodisc configuration. For those visitors unfamiliar with the new terminology, a number of stations provide access to a Buck Rogers dictionary of five hundred energy terms used in the pavilion's exhibits.

The viewer steps up to a monitor and touches a small horizontal scale at the bottom of the screen to access the dictionary. Where the scale is touched determines the direction and rate of speed at which the terms are scanned in the alphabetical master list. Moving forward through the list, a term materializes in a queue in the background of the screen. As each term's turn to be accessed approaches, it zooms into the foreground. Touching a term as it zooms past retrieves its definition.

Definitions are presented in a variety of formats. The screen may simply fill with a concise definition in easy-to-read text, highlighted words indicating which words within the definition may be touched to access additional terms in a nested search. In other cases, a computer-generated graphic or still frame from a videodisc may be superimposed with text enhancement. More than one hundred different terms access short, explanatory video segments. In all cases, an Apple II Plus is controlling the system.

The Energy Data Center allows visitors to consolidate and investigate their special interests in energy. Six personal-sized monitors with touch-screen controls allow individuals to interact with the system. Six seventy-two inch projection television sets act as slave monitors for each of the stations, allowing easy observation by nearby visitors.

Unlike the glossary exhibit, the Energy Data Center deals almost exclusively in dynamic video and computer-generated graphic images. Rather than simply searching from a master list, the Energy Data stations utilize sophisticated branching within an ongoing retrieval of information.

For example, a monitor might show a speeding train rolling out of West Virginia. When a viewer touches a coal-laden car, the image freezes while computer-generated graphic information is superimposed. A band of images indicating related coal topics lets the viewer's fingers do the walking through a vast storehouse of information related to coal.

As sophisticated as these various Apple-controlled exhibits are, NETG's crowning achievement at the U.S. pavilion is the Debate Wall. This exhibit demonstrates a mixture of old and new information presentation techniques. In presenting a diverse set of taped expert opinions on various energy-related issues, the exhibit uses multi-image audio-visual display. The new technological twist that has been added is audience control of when or even if a speaker's opinion will be heard.

Meeting of the Micro Minds. A wall covered with twenty video monitors faces the seated and standing audience. A series of sound effects, short comments, and visual images introduces the Debate Wall. Then one of thirty energy experts makes a leading statement, while his or her image is shown on fifteen of the twenty monitors. The debate has begun.

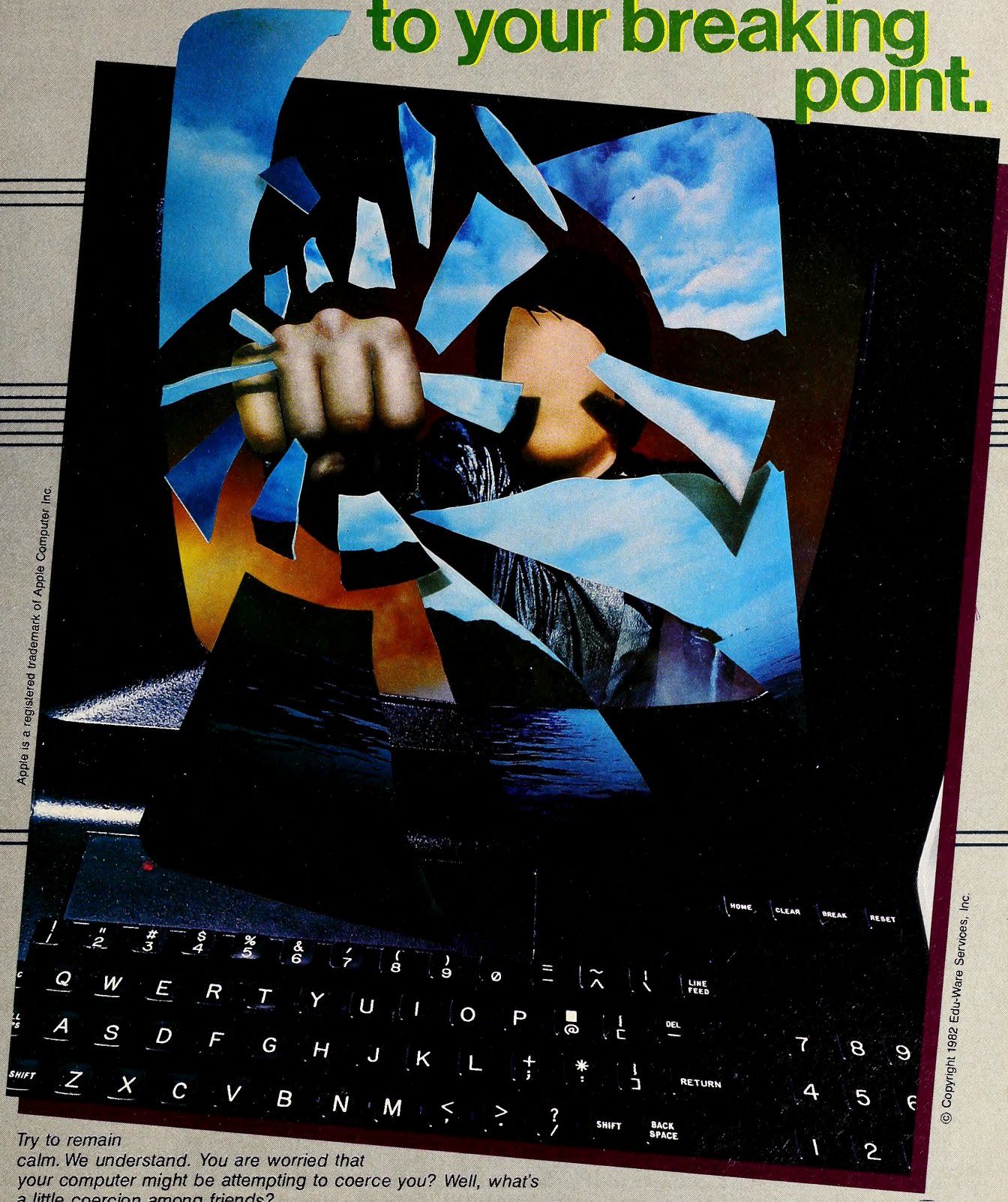
While this initial comment is playing, the remaining five touch-screen equipped monitors display still images of possible follow-up speakers. Each of the five pictures is superimposed with an invitation to touch the screen to hear the pictured speaker respond. With each new comment, five additional carry-on choices are presented. Remarkably, the Apple-controlled videodiscs have enough opinion segments stored to take the discussion in literally hundreds of directions.

Revealing the challenge involved in execution of this exhibit, Steve Gregory explains, "The most difficult exhibit from a hardware integration standpoint was the Debate Wall. It features three Apples controlling ten videodisc machines, with each player capable of sending picture and audio into one of the twenty monitors.

"Two of the Apples are what we call slaves," Gregory continues. "Each of the slaves is responsible for controlling five of the videodisc players. These slaves act under cues from the master computer."

The master Apple also sends signals to a custom-designed switcher that channels all video output throughout the monitor network. The master also detects presses on the touch screens, which indicate the fol-

Welcome to your breaking point.



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lowing speaker and statement to be retrieved from the videodisc database.

"The exciting thing about all the efforts that went into the World's Fair project," Gregory concludes, "is that we were able to extend our knowledge in the application of microcomputers to videodisc control and sophisticated graphics generation. New England Technology Group now has a full range of salable Apple-based laser-disc and enhanced graphics products and services."

Such private-sector benefits are the just desserts of a job well done. In all probability, NETG and all those who contributed to the realization of the U.S. pavilion have given us the most uniquely informative and entertaining exhibit in the entire history of the World's Fair. And Apples played a big part.

Keys of the Kingdom. At 15,000 square feet, America's Electric Energy Exhibit is the largest corporate pavilion in the 1982 World's Fair. The $2.5 million twin-domed structure includes an AEEE exhibit, general exhibition space for other participants, and a multimedia theater.

The theme of the AEEE exhibit is: Electric Energy—Key to a Better Future. Some of the exhibits focus on ways that utility companies are working to meet the need for increased amounts of energy through both conservation and new and improved technology. Additional exhibits illustrate the contributions made by various energy sources and the central roles of coal and nuclear energy in meeting electrical demand.

Left: One of two floating barges converted by the Tennessee Valley Authority to house its Apple-using exhibit, The Valley Adventure. Center: Main floor of a TVA barge exhibit. Behind the wall of displays, under the air outlet in the upper right, is housed the Apple computer control room that powers the Load Control Center. Right: Jay James, TVA manager of special projects, designed the barge exhibit. In addition, James did the actual programming of the Load Control Center simulation.

Upon entering the vaulted cavern of the AEEE dome, visitors immediately find their attention drawn to a giant video screen suspended from the ceiling. The subject of this overhead station, one of four, is coal. The other stations spotlight nuclear energy, conservation, and supplemental energy technologies. Just in front of each suspended screen, an angled tube juts out from the floor. Each tube is capped by a colorful, flat, touch-sensitive keyboard that controls the corresponding overhead display.

The four stations encircle an exhibit highlighting the Clinch River Breeder Reactor, and a fifth keyboard, similar to the other four, controls the display of an eye-level monitor in the breeder reactor exhibit.

Throughout the day, visitors position themselves at the keyboards and gaze at the monitors overhead. They are responding to the challenge of answering a series of energy-related questions. With each answer a visitor gives, the computer-generated text display disappears and is replaced by a short audio-visual presentation (film or videotape) that clarifies and supplements the answer.

In the course of the quiz, the display moves quickly and smoothly from computer text to video segment and back again. To those unfamiliar with microcomputer capabilities, this is just another magical exhibit—no explanation needed; it simply works. But to anyone who knows about microcomputers, it's apparent that something exciting is going on.

Boxing with Apples. Larry Lowe, a flight instructor, Apple enthusiast, and computer programmer, is the person who can best explain what's happening here. At the request of Roger Tierney, the exhibit design and production expert in charge of devising the AEEE exhibit, Lowe applied state-of-the-art microcomputer and videodisc technology to the AEEE project.

"In each of the five interactive stations, the configuration is as follows," Lowe explains, unraveling the mystery of the featureless white boxes that stand near each station. "Inside each box is a stock Apple II Plus, equipped with 48K RAM, one disk drive, and an Allen Communications VMI card that controls a 7820-3 videodisc player." The keyboards are Lowe's custom design "which appears to the Apple as an RS-232 serial terminal communicating at 1,200 baud through a port in the VMI card.

"It's a very straightforward set-up, really," says Lowe. "Basically off-the-shelf technology with the exception of the keyboard and a PROM I wrote to interpret the input from the keyboard to the Apple." The Apple graphics are provided by Synergistic Software's *Higher Text* package.

AEEE had a clear notion of the message it wanted to convey but was concerned that a comprehensive tutorial exhibit would disrupt the flow of visitors through its pavilion. Not wanting the Apple to function simply as an on-off button for the sequential presentation of video segments, Lowe turned to video game aesthetics to provide player and spectator interest.

The Taste of Learning. When he learned that North American Phillips was going to have an Odyssey video game display at the pavilion, he knew it meant stiff competition for instructional quizzes that take on the average of eight minutes to complete. Three aspects of video gaming—scoring, the recording and display of high scores, and a character that eats the words of an incorrect answer—were incorporated into the quiz in order to give it more of a video game flavor.

According to AEEE exhibit manager R. A. Evans, "The reaction of visitors to the pavilion has been great! Quite frankly," confides Evans, who has only recently retired from a long career with the Department of Energy in Oak Ridge, "it amazes me because this energy stuff is old hat to me. But we get folks here from the Midwest and the North and they think this is the greatest thing since chocolate cake."

As Evans sees it, people's enthusiastic responses to the exhibits can largely be attributed to the quality of the exhibits designed by Roger Tierney and his associates and the Apple Computer-run exhibits developed by Lowe and Tierney.

Judging from the volume of visitors taking the interactive quizzes daily, the AEEE exhibit certainly does grab and hold people's attention. Even so, Larry Lowe believes he has just begun to realize the potential of the computer in exhibit presentations. He's already looking ahead to 1984—in New Orleans.

Valley Apples, For Sure! Moored on the edge of Fort Loudon Lake at the south end of the fair site, two converted river barges are home to The Valley Adventure, a fiftieth anniversary celebration of the Tennessee Valley Authority. A significant part of FDR's master redevelopment plan for recovery from the Great Depression, TVA continues its partnership with the region's people in managing and improving the Tennessee Valley's resources in preparation for future energy needs.

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Huge is a word that aptly describes the work of the TVA—and this is graphically communicated in the large exhibit by real pieces of equipment borrowed from the utility's hydroelectric and related facilities. Jay James of the TVA Information Office explains:

"Management came up with the idea of using a couple of barges from our existing river fleet as the foundations for our World's Fair exhibit. The TVA is the United States's largest public utility involved in soil conservation, flood control, and energy production as well as economic and industrial development. This exhibit was a huge challenge."

As manager of special projects, James was charged with developing the informational form and content of the two barges. Much of the content in The Valley Adventure is conveyed via effective traditional media. Life-size sculptures of post-Depression unemployed wait in line to be interviewed for precious TVA jobs made available during the thirties. Audio speakers resound with historical radio broadcasts of the forties. Videodisc replays of relevant television news programs remind visitors of the increasing energy consciousness that has pervaded the last thirty years.

"When it came to the computers," James begins, "I wanted to try to communicate a few of the things we have the most trouble explaining by traditional means.

"People have great difficulty understanding the job we face in economically matching supply and demand. They need to understand that the costs of such resources as coal, oil, uranium, water, and gas vary relative to each other and that the same amount of power can cost more or less depending on the mix of resources used to produce it. At the same time, they need to understand the impact of variable consumer demand, concepts we call baseload and peakload."

To explain these concepts, James picked the brains of TVA power system operators. They analyzed the demand curve for the hottest day in August of last year, a day when the midday peakload could barely be met with all available power sources. They took the nameplate ratings of all components in the power system. With the help of TVA mainframe computer experts, James developed a simulation model that TVA operators ran numerous times to determine accurate averages of how they ran the system best in real life.

The Charge of the Light Bill. These simulations confirmed that optimal operation of the system matched TVA's current electric rate of 4.6 cents per kilowatt hour. With an average residential bill of one thousand kilowatt hours, this results in a forty-six dollar monthly bill for the typical customer. With numbers in hand, James knew he wanted an exhibit-cum-computer game that would quickly show that if you ran the energy system right, the average bill would be forty-six dollars and change. But if resources were mismanaged, the customer's bill would rise dramatically.

The problem became how to present these numbers in a way that would catch people's attention without resorting to having *Pac-Man* running around eating light bulbs. "That's when I turned to the Apple," James explains. "There was such a huge library of software available, including games. To be a successful communicator you have to pay attention to your audience. In the name of the TVA, I forced myself to play countless hours of Apple video games." (Tough job.)

The result of this effort is the Load Control Center exhibit, a principal attraction at The Valley Adventure. Entering the chrome and multicolored semicircle, the visitor is treated to an environment reminiscent of the bridge in *Star Trek*. What one might mistake for the viewscreen of the Enterprise is actually a large projection television that runs a two minute overview of the cost of energy sources and general instructions on how to play the Load Control game.

On either side of the projection television are two player stations. At each station, a color monitor is recessed in a slanted panel above a ledge where four knob-topped levers protrude. Each lever is labeled either Hydro, Nuclear, Coal, or Gas Turbine. An extensive cable network runs from the Load Control Center beneath deck to the hidden computer room where lines tie the levers to the game I/O ports and the monitors to the video-out lines of four Apple II Plus computers.

Poking the Peak Load. As the big-screen instructions are playing, the four stations present colorful graphics depicting each of the four power sources. Each player then gets a practice run on the system and the graphic pictures are replaced by a colorful bar-graph plot.

At the top of the display, a bar creeps left to right reaching peakload, then recedes representing customer demand. The combined output of each of the four levers is depicted by a horizontal bar representing supply which is displayed just below demand. Broad vertical bars climb up and down the screen as the player adjusts the power-supply levers. The use of hydroelectric power starts a blue vertical bar creeping downward; this represents the falling water level in the lakes as the dams are opened.

At the conclusion of the practice run, players are given advice on how to run the system better. The screen is cleared and replotted with a message to get ready for a scored run. A full day's demand curve is compressed into a run that takes a little over a minute. The player anxiously manipulates the levers in an attempt to produce the most effective mix of energy resources to meet demand.

The computer pauses while calculating at the end of the scored run. The player is then informed what the average customer's bill would be under his or her resource management. This can either be a treat or a horror, depending upon how close the bill is to forty-six dollars.

Left: Levers in hand, visitors to the TVA Load Control Center attempt to minimize customer utility bills by manipulating the various sources of energy to meet electric demand. Center: Testing her energy I.Q., a visitor to the America's Electric Energy Exhibit interacts with an overhead video projection monitor controlled by an Apple connected to a special keyboard mounted in the floor tube. Right: Sam DeLozier, manager of Eastern Computer, is the local retailer who services the Apples at the fair. Every exhibitor gave him high marks for keeping the hardware in top shape under such high-volume usage.

"I wrote the initial versions of the game in Applesoft," James recalls. "The simulation-model calculations worked but it was slow and, honestly, I'm not too good at handling graphics. So Sam DeLozier, our local Apple dealer at Eastern Computer, introduced me to Rob Scott, a Knoxville-area high school student. He's an Apple wunderkind. Scott helped polish the program, especially the graphics.

"Sometimes I look at the Load Control game and think it isn't that impressive. You look at what the arcade manufacturers, software houses, even the bigger budgeted pavilions here at the fair are doing and ours doesn't seem like a big deal. Then I look down on the floor and see long lines of folks waiting to get at the game, kids getting back in line. Ten thousand people a day running the Load Control Center!

"Then it hits me," James concludes. "This is the most powerful tool I have ever had to interact with people in all my time in exhibit work. And we're just scratching the surface." ■

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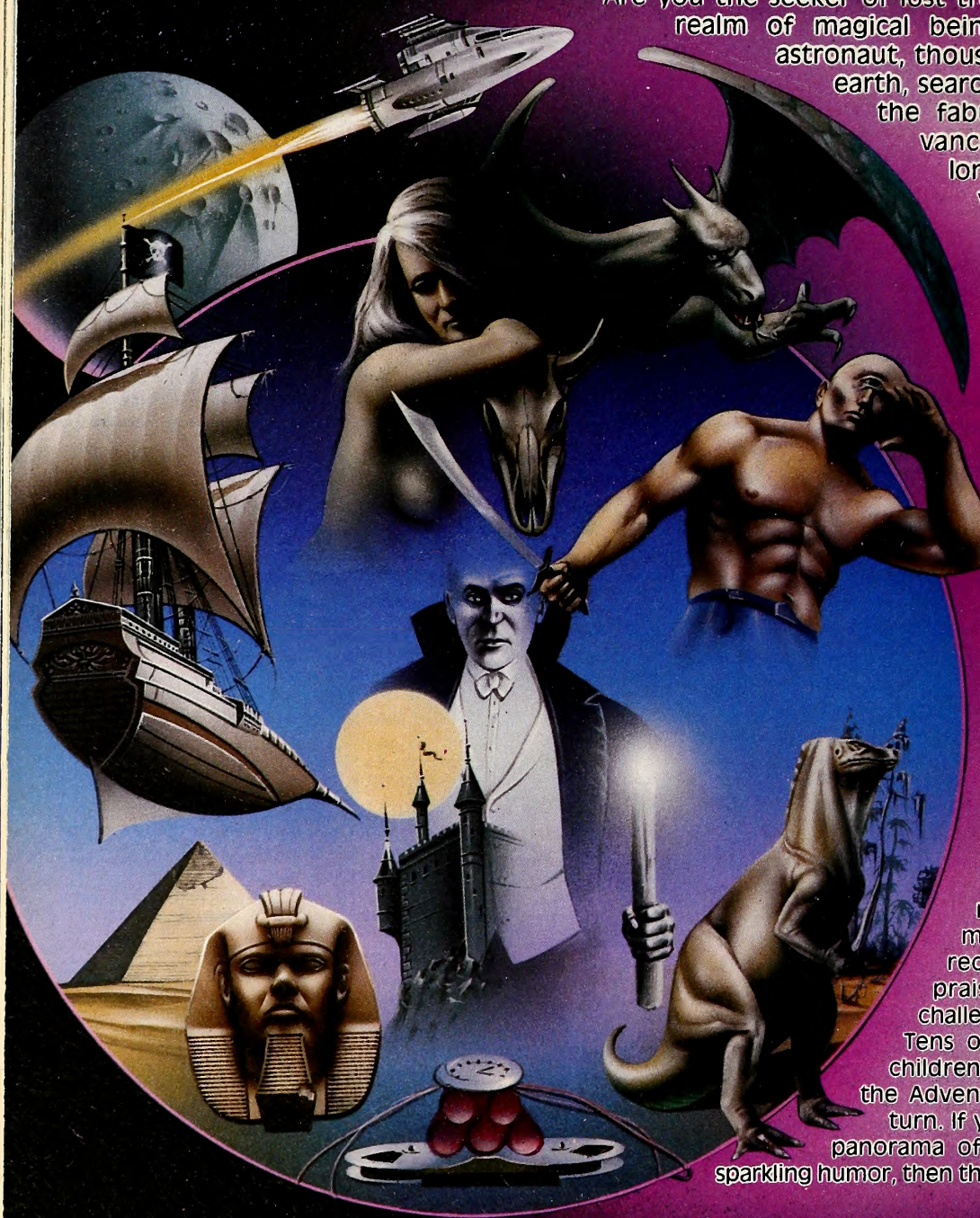

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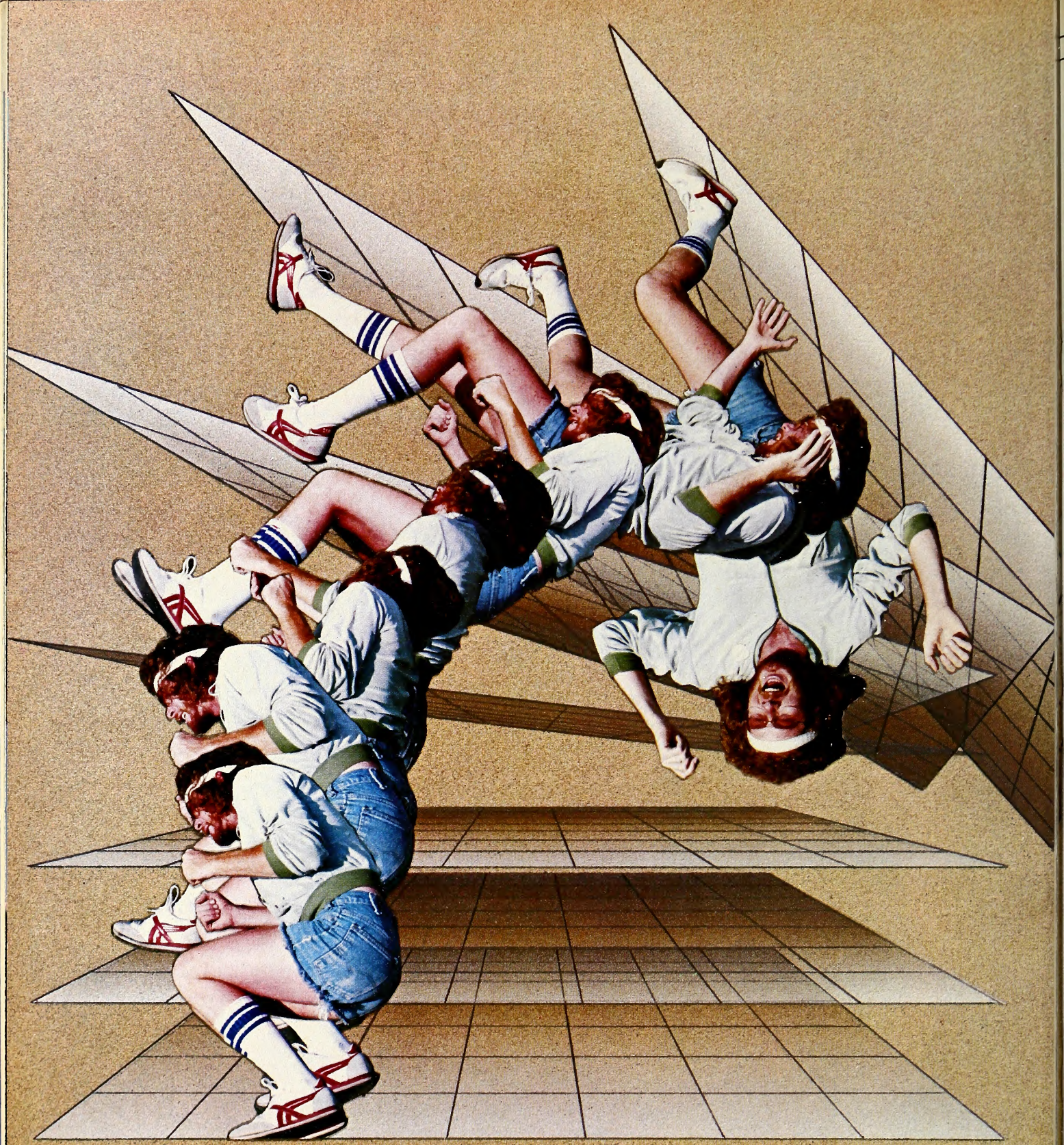

THE ANIMATED APPLE

With GraForth

BY PHIL THOMPSON AND PAUL LUTUS

With the Animated Apple, Softalk *introduces the limited series by a guest columnist outstanding in the subject field. The Animated Apple, an introduction to GraForth, is planned to have six parts. Selected because of the swift, widespread interest in the new language, the column is written by the author of GraForth, distinguished programmer and program designer Paul Lutus, and the person most closely involved with the technical implementation of the language, Phil Thompson.*

Please note that you cannot execute the instructions in this column without a GraForth package, just as you cannot follow the Pascal Path without Pascal, SoftCard Symposium without a SoftCard, or the Third Basic without an Apple III.

The promise of arcade-quality graphics is a powerful inducement to many to buy the Apple II. The high-speed shoot-'em-ups with color animation and realistic laser blast sounds may only be games to some folks, but to others they are the stuff of inspiration. What creative souls can see those games without imagining what they could do with Apple graphics, if only they knew the techniques?

The problem is that many have tried, but few have succeeded. At first, it was almost impossible to find the information necessary to create high-quality animation. Over the years of the Apple's existence, the open Apple allowed more and more discoveries. Soon, shape table utilities, hi-res character generators, and even 3-D graphics aids were available; but for most people, the initial stumbling blocks remain: machine language is too difficult to write and debug, and Basic is too slow. Now, however, there is an acceptable middle ground.

Enter GraForth. GraForth was created as a fast, structured programming language containing all the graphics tools needed to produce real-time animation in both two and three dimensions. It includes all the favorite graphics tools: line, plot, and fill commands; character graphics; turtle graphics; 3-D graphics; even a music synthesizer for producing notes in several voices and sound effects.

The language of GraForth is similar to Forth, which is known for its speed and flexibility and for its somewhat novel approach to programming. But, because GraForth is a language created specifically for graphics on the Apple, the Basic programmer won't have to start over; many commands are taken from Applesoft to make GraForth easy to learn. *Home* still clears the screen, *htab* and *vtab* still position the cursor, and *plot* and *line* are used in the elementary graphics modes.

GraForth operates under DOS 3.3 and your completed programs are compiled to machine language and stored as standard binary files. It is faster than Integer Basic, Applesoft (even compiled), and Pascal. For comparison, counting to 32,000 in Applesoft (*for I = 1 to 32000: next*) requires thirty-five seconds; Integer Basic (*for I = 1 to 32000: next I*) takes an amazing forty seconds, and Apple Pascal (*for I: = 1 to 32000 do;*) requires twenty seconds. GraForth (*32000 0 do loop*) takes only three seconds. This is not meant to be a complete benchmark for the languages, as it tests only the simple for-next (do loop) construct.

The graphics are as easy to use as the language is fast. Character shapes consisting of several redefined images may be drawn to the screen with one command. Three-dimensional graphics include color, perspective, and shapes of almost unlimited complexity. And turtle graphics works at speeds that are high enough for game programming.

In this series, we'll explore graphics on the Apple with emphasis on fast, smooth, 2-D and 3-D color animation. We'll give you examples, hints, and several sample programs to help you learn GraForth and eventually create your own impressive animations.

For background, the ability to program in some high-level language such as Applesoft or Integer Basic is helpful. You should be comfortable with the Apple hi-res screen and graphics in general. Knowledge of assembly language or a structured language such as Pascal won't hurt, but it isn't required. A color monitor is a plus, as much of what we'll be doing is in color.

Likes and Unlikes. GraForth is quite different from Basic or Pascal. Like Pascal it is a structured language, and also like Pascal it is compiled, not to a pseudo p-code but directly to machine language. Like Basic, GraForth is immediate; there is no separate compiler or linker to be invoked.

Where GraForth is different from Basic or Pascal is in its use of stacks. Pascal and Basic also use stacks internally, but they hide them from the user. This is done so you can type something like:

```
LET A = B + C
```

The Basic interpreter is smart enough to translate this line into the proper sequence of machine language routines to get the job done. This type of algebraic notation was used to make Basic easy to learn. The price you pay is speed. Generally, the more work a compiler must do to translate your program into the language of the machine, the more it will use very general-purpose routines. These routines are not particularly optimized for the task at hand, therefore your program slows down.

The tradeoff, then, has been simple. Use machine language when you want speed and a high-level language when you want understandable, easy-to-develop programs.

Fortunately, these are not the only alternatives. A high-level language can be built that operates in much more harmony with the machine for which it is generating instructions. This is the idea behind GraForth and Forthlike languages in general. By learning to use the stack, a data storage area that computers can use efficiently, you can keep all the features of high-level languages you like and still write programs that run ten times faster than they would written in Basic.

Understanding stacks is not difficult. In fact, if you have used a Hewlett-Packard calculator, you are already familiar with Reverse Polish Notation. This system is often used in mathematics because it eliminates the need for parentheses. RPN is implemented by using a stack in machines such as computers and calculators. With this system, all operands precede their associated operators. What this means is that if you want to add the numbers 3 and 4 together, you would write it as 3 4 + rather than 3 + 4. This is most easily demonstrated using turtle graphics.

Follow the Tail. Turtle graphics is a vector graphics system, similar in many ways to Applesoft's shape tables. What we mean by vector graphics is that the shape is drawn by a series of relative moves and draws. This allows us to design an image and draw it at any position or angle on the screen. Let's tie up some loose ends with examples of both RPN and turtle graphics.

GraForth's prompt is the word *Ready*. When you've booted up and gotten the prompt, get the turtle commands from your GraForth disk by typing:

```
READ " TURTLE "
```

Make sure to leave spaces on both sides of the quotation marks. The quotation mark is a GraForth command that says, "This is some literal text." Commands in GraForth are always separated by spaces. For this reason, they are often called *words*. *Turtle* is the name of the disk file containing the turtle graphics words.

When the prompt reappears, we're ready to start. Type:

```
TURTLE
```

Imagine that you now have a turtle with ink on its tail in the center of your screen. *Turtle* is a GraForth word that erases the screen and sets a text window along the bottom four lines. It also selects the color white and positions our imaginary turtle in the center of the screen, facing the top. We can tell it to *turn* and *move* (relative motion) or we can tell it to *turnto* or *moveto* an absolute position. We can also tell it to lift its tail so that no line will be drawn (*penup*) or put it down again (*pendown*).

Let's try this out. Type:

```
50 MOVE
```

Notice that the distance, 50, is specified before the command (*move*). Now let's command our turtle to turn to the right and walk another fifty units.

```
90 TURN 50 MOVE
```

Multiple commands can be placed on one line with spaces to separate them. Let's complete a square with the following:

```
90 TURN 50 MOVE
90 TURN 50 MOVE
```

You can see the advantage of turtle graphics over standard line drawing

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already. With standard line commands, we would have had to calculate the actual X,Y coordinates of each corner of the square. Using turtle graphics, we only have to know how to make a square to plot one.

In GraForth, every time you type a number, it is placed on the *data stack*. You can see this graphically by typing *stack* from the Ready prompt. Now type the following:

```
4 5 6
```

Don't forget the spaces between the numbers. When you press return, you'll see a list of these numbers inside square brackets. This is a picture of the data stack. The stack display can be turned off again simply by typing *stack*.

How do GraForth words use the stack? When we typed the number *50*, it was placed on the data stack. The turtle graphics word *move* then removed this number and used it as a distance to move the turtle. Most words in GraForth either use the stack for parameters or affect the stack in some way.

Let's Do It Again. No language would be complete without looping structures, and GraForth has a large variety of them. One of the easiest and most useful is the *do . . . loop* construct. Very similar to the Applesoft *for-next* loop, *do . . . loop*s can be used to repeat a group of words a predefined number of times. Here is a GraForth program that will draw a square using a *do . . . loop*.

```
TURTLE 4 0 DO 50 MOVE 90 TURN LOOP
```

Again, notice that the four and zero precede the *do*. This loop will simply count to four, each time executing the body of the loop that draws one side of the square. (Actually, it will count from zero to three, as the loop limit is not included in the loop; this is a Forth convention.)

If you typed this line into your Apple II, you immediately saw a square drawn on the screen. GraForth compiled and ran your short program, and then promptly forgot all about it. Like Applesoft, GraForth has both immediate and deferred execution modes.

In Applesoft, you write a program, and, while it's necessary to be within the language to run it, the language and your program are entirely separate entities. GraForth handles this differently. The distinction between your program and the language itself is much less clear. Your GraForth program actually extends the language. In other words, what you write is an addition to the language that specializes it for a given task. That task could be a 3-D space simulation, a maze game, or anything else you might like to write.

GraForth comes complete with a long list of words. These are the general-purpose commands that are useful in nearly any program. Some are also specific graphics commands for two and three dimensional graphics, others for music and sound effects. You can see this list at any time by typing *list*. Pressing control-C will stop the list; any other key will continue. If you have been staying with us so far, the list should look like this:

```
Ready LIST
TURTLE
TURN
TURNTO
MOVE
MOVETO
PENDOWN
PENUP
.
.
.
```

These are the commands that you can use to write your programs. Your programs actually extend this list; each word you create is appended to the top. In fact, we already extended it for turtle graphics when we typed:

```
READ " TURTLE "
```

The turtle graphics commands were read from the disk file called *Turtle* and added to our list of commands. This list is often called a *dictionary* or *word library*. Each word performs a certain task (like a subroutine in Basic or Pascal), and the entire list is your program.

Forget Me Not. Armed with this knowledge, let's create our own

word. Earlier, we wrote a simple GraForth program to draw a square. Unfortunately, it was immediately run and then forgotten. We can create programs that are added to the word library by defining a new word. Here is the new GraForth word *square*.

```
: SQUARE
  TURTLE
  4 0 DO
      50 MOVE
      90 TURN
  LOOP ;
```

Notice that, except for the first and last lines, it is identical to our earlier program. We indented this one for clarity since a GraForth word definition may extend over several lines. The first line is made up of two parts, a colon and the text *square*. The colon is a GraForth word that means "define a new word." The text *square* is the name of the new word being defined and is the name that will appear in the word library. Everything following the name *square* is the string of words that defines what the new word will do. Notice that it simply uses words that have already been defined to create the new word. The semicolon (;) at the end of the list says "end of definition." At this point the commands are compiled and the new word is added to the word library. We can see it now by typing *list*:

```
Ready LIST
SQUARE
TURTLE
TURN
TURNTO
.
.
.
```

and we can run it by typing *run*, which runs the top (last defined) word in the word library, or by typing the name of the word itself.

```
Ready RUN
Ready SQUARE
```

Both words cause our square word to be executed, and we are returned to the Ready prompt.

Some Homework. We've covered quite a bit this month. Before we leave, here is a new *Turtle* file you can type into the GraForth editor and save over the existing file (make sure you do this to a copy of your GraForth disk, not the original!). With this version, animation is much easier because you can use *penup* to move without drawing a line, *pendown* to draw, and *unpen* to remove an existing line. This allows you to erase entire shapes, similar to the use of *xdraw* with Applesoft shape tables.

```
VARIABLE TURTLE.X
VARIABLE TURTLE.Y
VARIABLE TURTLE.ANG
VARIABLE TURTLE.PEN
: TURTLE.WALK
  OVER OVER - >TURTLE.Y - >TURTLE.X
  128 / SWAP 128 / SWAP
  TURTLE.PEN DUP 1 =
  IF DROP LINE
  ELSE -1 =
       IF UNLINE
       ELSE POSN
       THEN
  THEN ;
: PENUP 0 - >TURTLE.PEN ;
: PENDOWN 1 - >TURTLE.PEN ;
: UNPEN -1 - > TURTLE.PEN ;
: MOVETO
  128 * 64 + SWAP
  128 * 64 + SWAP
  TURTLE.WALK ;
: MOVE
  TURTLE.ANG 16 * 45 / PUSH
  DUP I SIN * TURTLE.X + SWAP
  I 32 + SIN * TURTLE.Y SWAP -
  POP TURTLE.WALK ;
: TURNTO - > TURTLE.ANG ;
: TURN
```

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```
    TURTLE.ANG +
    360 + 360 MOD TURNTO ;
  : TURTLE
    GR ERASE
    0 40 20 24 WINDOW
    3 COLOR PENUP
    128 96 MOVETO
    0 TURNTO
    PENDOWN ;
```

New Turtle.

The Turtle Show is a GraForth program to show off your new turtle graphics words. You can either type it in directly or use the GraForth editor to enter, edit, and save it as a disk file. After it is entered, just type *run* to watch the show.

```
: RESET
  PENUP
  128 96 MOVETO
  0 TURNTO ;
: SQUARE
  4 0 DO
      DUP MOVE
      90 TURN
  LOOP DROP ;
: SQUARE.CIRCLE
  36 1 DO
       DUP SQUARE
       10 TURN
  LOOP DROP ;
: SQUARE.SPIRAL
  65 1 DO
       I SQUARE
       10 TURN
  LOOP ;
: COLORS 3 , 6 , 2 , 1 , 5 , ;
: MANY.SPIRALS
  5 0 DO
      TURTLE
      I ' COLORS + PEEK COLOR
      SQUARE.SPIRAL
      RESET UNPEN
      SQUARE.SPIRAL
  LOOP ;
: MANY.CIRCLES
  5 0 DO
      TURTLE
      I ' COLORS + PEEK COLOR
      I 2 + 10 * DUP
      SQUARE.CIRCLE
      RESET UNPEN
      SQUARE.CIRCLE
  LOOP ;
: TURTLE.SHOW
  MANY.SPIRALS
  MANY.CIRCLES
  ABORT ;
```

The Turtle Show.

Next month, we'll talk some more about the language of GraForth and discuss different types of loops (if . . . else . . . then, begin . . . until, begin . . . while . . . repeat). For the main event, we'll introduce animation with GraForth's character graphics and also show you how to save your programs to disk.

In future columns, we'll expose the more advanced capabilities of GraForth. A space shuttle simulation program will demonstrate the use of 3-D graphics and the music section will include a library of general-purpose sound effects. We'll also discuss programming techniques for computer graphics and, above all, leave you with the knowledge you need to do it on your own.

If you have suggestions on what you would like to see covered, a particular problem or question with the language, or a helpful or interesting program, send it to Softalk Animation, Box 60, North Hollywood, CA 91603. We invite your input. ■

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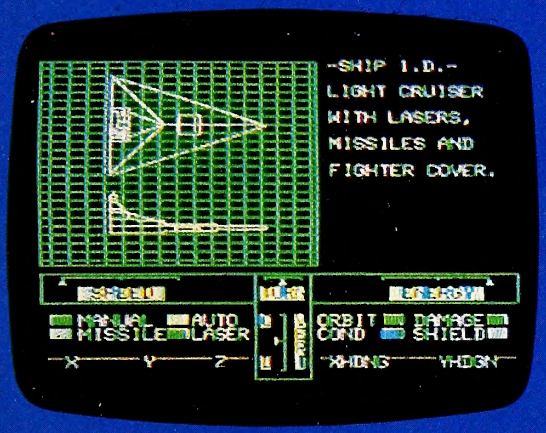

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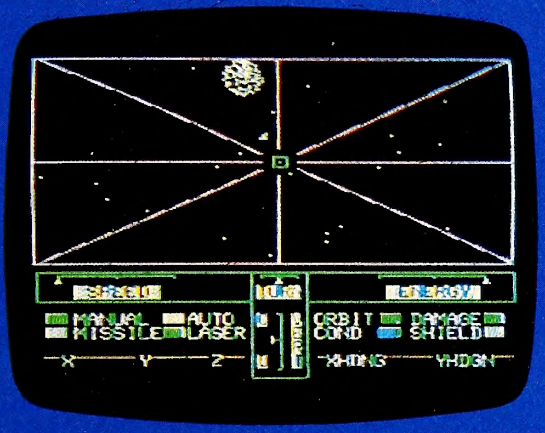

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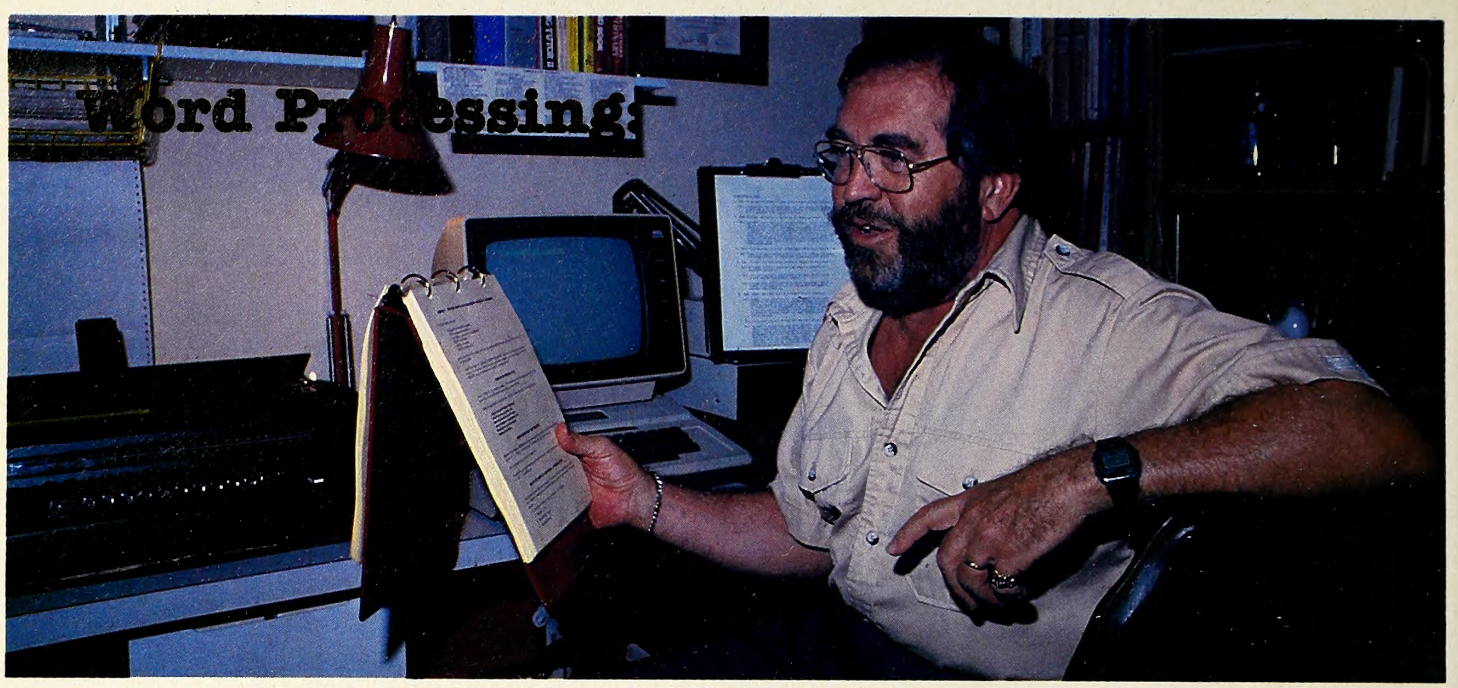

Special Psychology with Executive Secretary

BY JONATHAN MILLER

The moment sexologist Bill Terrell laid eyes on the man he sensed this would be no ordinary case. The middle-aged machine shop supervisor who stood before him didn't fit Terrell's general client profile—upper income, college-educated, white collar. This guy was a soulmate of Archie Bunker. A married grease monkey in overalls, he had one whale of a problem. He was hearing sexual voices.

"He had a fear that he was a latent homosexual," Terrell recalls. "He was hearing little voices in his head telling him that women were no good and his deduction was, 'If I think women are no good then I must like men.' "

The man wasn't impotent and there was nothing in his background or present activities to indicate that he had homosexual tendencies. Since it was possible that his client might be overlooking or repressing some clue, Terrell referred him to a clinical psychologist who put him under hypnosis. But nothing new emerged.

Telling Hands. Terrell was returning to square one when, during a subsequent visit, he noticed the man's hands. They were red and swollen. They got that way, the worker explained, because he occasionally had them in a powerful machine shop cleaning agent. Could there be a connection between the cleanser and the man's sexual problem, Terrell wondered? Terrell had played hunches other times that he was stumped. When the examination report came back from the toxicologist, he had his answer. The cleaning agent was highly toxic and accumulating in such quantities in his client's system that it was easily capable of producing the sexual hallucinations.

An unusual case, to be sure, but representative of the methods employed in sexual detective work by Bill Terrell—private sex counselor, sex educator, consultant, author, sauna store owner, and, out of organizing necessity, word processing Apple owner.

Ten years ago, Terrell took the considerable risk of abandoning the nine-to-five ranks. At age forty-eight, with his wife's blessing, he returned to school to enter what was then the highly suspect calling of sexology. He earned certification as a sex educator and counselor and picked up the master's degree in public health along the way.

Two years ago, buoyed by unexpected growth in his business interests, he took the plunge into computers. In addition to his private counseling, he was teaching a popular course in human sexuality to nurses, lawyers, social workers, and other helping professionals at the University of Minnesota. He and nurse/wife Kim were conducting weekend sexuality workshops for couples. By himself, Terrell was teaching another course at a local community college, doing consulting work for the Minneapolis Board of Education, working on two books, and handling bulk mailings for the sauna store. He was drowning in a sea of paperwork. So he leapt in head first, but it wasn't exactly a ten-point dive.

Heavy Thinker. "Before I got a computer I was the kind of guy who didn't put anything on paper until I had worked it out in my mind. I didn't like the idea of going through nineteen different drafts. Now I try to write three hours a day. I sit down and write. Later, if it's no good, I can throw it out, or, if there's something good there, which happens too, I can edit it. I find that's a very motivating tool."

It is July 1982. Terrell the Nontechnical is surrounded by his $7,500 investment in new-found tools. They dominate the study in his townhouse home in the Minneapolis suburb of Burnsville. The hardware: an Apple II Plus, two disk drives, a Hayes modem (microcoupler), a Bit Three eighty-column card, and a Missing Link board for his IBM Electronic 50 printer. The software: an *Executive Secretary* word processing package (word processor, mail sort, speller); *VisiCalc* spreadsheet; Apple *Dow Jones* access program; five or six word games; and a gin rummy program.

A man who plays the market and changes careers in mid life obviously doesn't shrink from taking chances, but every gamble has its risks. He got burnt on word processing, which constitutes 75 percent of his computer use. First there was the thrice-told tale of service in the Service Age—a salesclerk who didn't know all he should about his products. The same salesclerk at the recently opened store where Terrell bought his Apple also managed to sell him a DOS version of *WordStar*, a program, alas, that the clerk was unable to demonstrate. "I bought it blind," sighs a now wiser Terrell. "Then I found I didn't like it. I'm not a

computer-oriented person, and to sit down and decipher the documentation all by myself was a difficult job."

Matchmaker. When a friend suggested Minneapolis-based Personal Business Systems, makers of *Executive Secretary*, Terrell found the perfect mate. "One of the reasons I bought the program was because the demonstrator knew what he was doing, and the store offered an hour's free instruction with the package." The salesman spoke in plain English. His most complicated computer word was cursor. And Terrell, a computer pilgrim in search of a guru, was sold.

Before Apple and *Executive Secretary*, Terrell wrote by hand. He'd knock out a first draft in pen and ink, give it to a secretary at the university for typing, and then initiate his final edit. "Now I do all that on the Apple and print out finished copies. It has speeded up things considerably."

This has been particularly true in filing and retrieving the notes he works up on patient visits. "Quite often, I'll refer someone to a doctor—like I did in the case of the machine shop worker—and I'll send along a copy of the client's sexual history, if the client permits. It cuts down on the doctor's work and the patient doesn't have to go through the history a second time." Word processing has also been a tremendous timesaver in the preparation of lecture plans, curriculum redesigns, class handouts, and tests, which must be revised each term under university rules.

More from Less. Speed and ease have been the bread and butter issues for Terrell, but the benefits haven't been limited solely to word processing, thanks in large part to the versatility of the *Executive Secretary* program. "It has a lot of capability. I have mail merge, so I can do 498 mail labels, sorting them by ZIP code. I've never been a good speller, but with the *Executive Speller* program, which has twenty thousand check words built in and file space for twenty thousand more, I can put the medical terminology I use into its dictionary." There are, in addition, those little extras that make his creative life less taxing. He can transfer files and entire disks with relative ease to create backup copies, as is his habit. Using the program's abbreviation capability, he can punch in acronyms of munchable medical terms and leave the typing to his IBM.

"There's another thing," he says, continuing to count the ways. "You don't have to put in as many printer commands on *Executive Secretary* when it's on an eighty-column board as with other word processors. You just hit caret NR and it keeps everything from there on exactly as it's put on the screen. I can do all kinds of designs—center, justify, flush left, or flush right—and have it come out in type exactly the way it is on the screen."

Tiny Troubles. But surely this word processing marriage has hitches? In the beginning, yes. The documentation, now much improved, presumed more than it explained. An oversight in the labeling program documentation failed to mention the need to insert a period after a street name that followed a string of address numbers. An early version of the printer program capitalized everything after a colon, while the IBM printer indulged its own upper-case aberrations by capitalizing letters following an M or W. John Risken, programmer of *Executive Secretary*, took care of the first; IBM, confirming the wisdom of a yearly service contract, corrected the latter.

Those minor annoyances behind him, Terrell is at peace with his Apple and *Executive Secretary*. They comfort him in his creative hours of need. It had been his custom, Terrell explains, to keep a tape recorder by his bedside just in case the muse interrupted his slumbers.

Now, whenever the spirit moveth he shuffles into his word processing study to record his inspiration—secure in the knowledge he won't be disturbing his household. "Even if I accomplish nothing else," he says, "I at least can go back and get some sleep.

"I saw this system as a tool by which to increase my joy in the quality of my work and it has delivered."

Back in the 1950s, Terrell's professional joy was wrapped up in industrial photography. Taking advantage of the postwar boom in chemical plant construction, he'd built up his own freelance business and by the mid fifties was supporting four other families as well as his own. He was doing it his way and ulcerating all the way to the bank.

Too Perfect. "I was the classic Type A personality," he recalls. "I had an airplane, a nice ranch-style home, two cars, chain-smoked cigars,

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probably drank too much, and was making a helluva bundle of money—but my stomach couldn't stand it." His wife Kim couldn't either. It was his stomach and he'd have to do what he thought was right, she told him, but there was a caveat: "I don't want to be a rich young widow with four children; there's no demand for them."

So Terrell sold the business, joined the corporate ranks as a photographer for a subsidiary of Standard Oil of Indiana, gradually moved into public relations, and lived contentedly until the next crisis seventeen years later. The kids were gone.

"We looked at each other and said, 'Who are you?' We were no longer involved in being parents and we hadn't gotten much chance to know each other." The seed of a third career was planted when Bill and Kim Terrell sought counseling, but it would take another couple of years before it flowered. Terrell would flirt momentarily with a marketing job for an industrial film company in Minneapolis and take another fling at freelancing before realizing, in the midst of his gathering mid-life crisis, that what he wanted to do was get into something with more human orientation. "I was looking for something where I could work more closely with people. And I was just gutsy enough to give sexology a whirl."

Naked Dread. Terrell has never forgotten the incident. It happened about six years ago, soon after he started his private practice. He was puttering around his home office when he got a frantic call from one of his clients, a sobbing married woman, who, with her husband, had been in counseling several weeks. At the time, Terrell had a standing rule of only working with couples, but, under a fresh tempest of tears, he relented.

Soon after the woman arrived, Terrell was called from the room to take a long-distance phone call. "I couldn't have been gone more than three minutes," he says today, still amazed. "She'd taken off all her clothes and was lying down on the couch; my heart was in my throat and I sort of gulped. It must have been panic. I tried not to show it; I sat down in my chair and said, 'Mrs. So and So, before the phone call came, we were discussing such and such,' and she started talking. We went on for what seemed an hour; finally she sat up on the edge of the couch and began to dress. And nothing was ever said about the clothes."

Terrell, an Episcopal vestryman of long standing, did the right and professional thing, but such overtures can be a problem, and can even feed the public appetite for scandal. "A year rarely passes without a direct or pretty explicit offer from one of my students," says Terrell. "But I have a personal value system that says that's absolutely out."

Bad Amateurs. What burns Terrell and like-minded members of the five thousand strong American Association of Sex Educators, Counselors, and Therapists (AASECT) are unscrupulous practitioners—all too often, self-serving sex therapists who are abusing professional standards in attempting to alter sexual behavior. "There were and still are a number of people who see this as a method of satisfying their own voyeurism and unhealth as far as sex is concerned," he says bitterly. "I don't think there's a lot of this going on, but, unfortunately, we hear about the bad situations."

Terrell attributes much of this abuse to the growing pains of a young profession and the failure of the states to enact licensing legislation. (AASECT accreditation, which Terrell has, is voluntary.)

Although sex education has been around since the forties, it didn't catch on until the Me Generation seventies, when sex therapy hitched a ride on the self-improvement bandwagon.

Logic argued that the purveyors of the new sexual wisdom would emerge from the heavily degreed medical ranks; instead, the new faith was advanced by another seventies creation—the paraprofessional like Terrell.

Semi-Dark Ages. "Most of the physicians you'd normally go to back then were not well-trained in and not very comfortable with the area of human sexuality," Terrell contends. "It was only eleven years ago, a year after AASECT was formed, that a medical school first offered training in human sexuality to students."

Doctors weren't much interested in the subject, an attitude reflected today in a still common doctorly oversight. "This is a practice I get kind of hacked about from time to time," he says, getting hacked. "There's a high blood pressure medication doctors prescribe, but they don't mention to the patients that impotence is a possible side effect." And the rea-

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son they neglect to mention that little detail, Terrell adds helpfully, is because they presume it's of little moment.

The information Terrell dispenses—and that's principally what he does—seems very basic, yet it's surprising, he says, how little the word is getting around. He tells the story of a thirty-seven-year-old divorced woman with two kids who was deeply troubled by spending a weekend with a new suitor—but not because of sex. What disturbed her was naked bodies; despite eleven years of marriage, she'd never seen her husband in the nude. He'd go to the bathroom, don jammies and robe, hit the light, and crawl into bed.

"The only sex they ever had was under the covers and in the dark. She was scared to death. Once she blurted it out and we talked about it, she began to laugh and see how foolish it sounded. That was the extent of the therapy. She needed somebody to give her permission."

Opposites Attract. Terrell believes in a world where sex is natural and as gloriously varied as the people who engage in it. He also realizes that he lives in a world where guilt-ridden sexual pilgrims agonize over sin and performance. "There's this belief that you have to be superhuman in order to be normal," says Terrell of his democratically inclined and statistically minded brethren. "What's normal for you may not be for me. That's one of the messages we try to get across in these classes: for people to accept themselves and their sexuality as their own individual thing—as long as it's not harmful to them or their partners."

The people who come to see Terrell and other therapists haven't entered the sexual promised land—at least not yet. They're still hung up on the here, not the after, but sexology is blazing research trails to smooth their libidinous journey.

"Sex is a normal human function and you've got to learn to talk about it," he preaches. "If you don't get over that or find some way to accommodate it, you won't be able to talk to your own children without passing along the same sort of negative impressions."

Amen. ◨

Olivieri's Outline of Word Processors

by Peter Olivieri

Did you ever stop to think how dependent you are on words? Consider the impact that newspapers, magazines, paperback books, personal letters, textbooks, legal contracts, instruction manuals, dictionaries, encyclopedias, and family records have on your life.

Word processors were developed to help people manage the enormous quantity of information they encounter every day—to help them "process" the words. With the arrival of the microcomputer, it became possible to give word processing skills to more people.

Perhaps the first steps in acquainting yourself with word processing are to learn what a word processing system can do and to become comfortable with the terminology often used to describe the various features of a word processing system.

Over the course of a series of articles, we'll consider such things as: what a word processing system can do for you; what equipment makes up a good word processing system; what features are worth looking for in a word processing system; and what word processing packages are available for the Apple.

What can a word processing system do for you? In the end, only you can answer this question. But if you write reports, are an author (or a frustrated one), do a lot of typing, or prepare lots of form letters—or if you'd like to provide a service that makes such skills available to

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others—a word processor can simplify your life considerably. It's been demonstrated time and time again that once people have used a word processing system for their work, they seldom return to the "old ways."

Consider some of the applications. Have you ever gotten a form letter that looks very much like one that's been written especially to you? Here's your name, there's your address—yes, it certainly resembles a personal letter.

Such letters are a very common application of word processing. To create letters of this sort, you enter and then store on disk the names and addresses of the people to whom you want to send the letter. Once you have saved these, you can update the list as often as you wish.

Your next step is to type one copy of the original letter. In places where you'd like a person's name to appear, you type a code word (perhaps the word "name") and do the same for any other pieces of information you have about the person that might eventually find their way into your letter. The letter itself is then saved. You can then issue a command from your word processing machine that will merge the list of names with this original letter and print out a personal letter to each of the people on your list. The speed at which this can be done is much faster than you could achieve by typing each letter separately and, of course, each letter is error-free.

Let's Get Personal. A similar application can be found in the offices of many attorneys. Attorneys are often called upon to draw up a contract that consists 90 percent of standard material and only 10 percent of material that must be tailored to a particular client or situation. If the contract is resident on a word processing system, the attorney can quite easily recall it, enter the data that is relevant to the current client, and then have a personalized contract printed.

Authors are another group that can make good use of word processors. Mind you, a word processor does not make you a better author. But it certainly can increase your productivity and make you more efficient.

Goodbye, Pencils. Suppose you've just written a twenty-five page report only to discover that you have to add a lengthy paragraph in the middle of page 2. If you're working at a typewriter, your only alternative is to retype page 2, along with every page that follows. But if you had done the report on a word processor, you could easily make the insertion, have the computer "push down" all of the subsequent material, and then get a fresh printout of your document. Indeed, a word processing program can number your pages automatically, specify margins, indent paragraphs, print headings and footnotes, and so on. It may even check your spelling. And when you're done, the perfected version of your work still resides on disk, ready for further changes or to be stored in your permanent archives.

The advanced features of many word processing systems allow you to do the following kinds of things.

1. You can search through a document for every occurrence of a particular word or phrase (this feature is useful if you're creating an index of your document).
2. You can find every occurrence of a particular word or phrase and replace it with a different word or phrase.
3. You can have special control over a printer that is interfaced with your word processor. This allows you to print subscripts and superscripts, underscores, centered titles, and nicely aligned tables, and also enables you to make use of various other formatting features.
4. You can program a specific key on the keyboard to provide a special sequence of commands that you would normally have to enter one at a time.
5. Some word processors can be linked together to form a network in which documents and data can be shared.
6. Some typesetters are experimenting with linking word processors to their typesetting machines.

Perhaps this list of applications has begun to give you some idea of the kinds of services that a word processing system can provide. You can probably think of many others.

Next month we'll talk about equipment a particular system might consist of and how to use it. We'll also discuss some of the word processing features you may want to consider. ∎

MARKETALK

Reviews

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.

Zork III. By Marc Blank and Dave Liebling. A *Softalk* reviewer recently reported the ringing of the death knell for the text adventure. This review is out to prove that he was hearing things, and *Zork III* is the ideal example for making the point. *Zork III,* along with its Zorkian predecessors and the recent mystery hit *Deadline,* is very much alive and totally text.

When there are no more computerists who pleasure in intelligence and erudition, when there are no gamers with imagination, when there are no users who enjoy good prose, then those who are left may hear such a bell toll. For now, we can revel in *Zork III.*

The Infocom team improves with every outing—and they started at the top. *Zork III* is filled with well-written descriptions of imaginatively delightful and curious places. The grandeur of the ancient high-arched aqueduct system, shining in stolen sunlight; the damp, swirling mists of the Land of Shadow; the brilliance of the pit of fire, two hundred feet in diameter, its depths and heights lost in turbulent smoke and sunlike flame—all these are far more graphic than any depiction yet achieved by an adventure with graphics.

Realize that the Zorks are essentially a trilogy chronicling the history of a great lost empire that once flourished underground. It was a realm

that reached some level of achievement before its demise, having created entire aqueduct systems and hollowed-out mountains. It had great banks and businesses and a royal government, complete with crown jewels. It also had a Royal Puzzle.

Most of these achievements exist only in ruins now, and much has been lost completely. Grues menace the remains—gruesome predecessors of gruds and far more discreet in that they never show themselves. For many years the empire has been little more than a testing ground for adventurers and a home for a few seldom-glimpsed eremites.

And, of course, a prime mover. No? Yes, indeed. Someone had to give Blank and Liebling their inspiration, fill them in on the story. If you are clever enough, and good enough, and sensitive enough, you may meet this being in *Zork III.*

When you begin *Zork III,* you do not know your goal. That's one of the problems you must solve. Careful observation and constant relating of information will determine how well you'll solve this one.

What you will know is that the total score you are after is seven. That's all.

Two things are most unusual about the scoring system in *Zork III.* Each point is given for having behaved properly in a situation or toward a puzzle; it is not given for solving the puzzle or for knowing what you've done. You can earn all the points and not know how you did it. The true lover of logic and adventure will not be satisfied until those points are understood; all the evidence is there.

And, indeed, when you've gained all the points, you aren't through. You still have to prove yourself with one of the hardest, yet most clearly logical, puzzles in adventuredom.

Zork III, like all Infocom adventures, is not a word game. The vocabulary is extensive for an adventure, and if you use a word Zork doesn't know, it tells you which word is the problem. Niggling over words is not the point; logical problem solving is. And you need not be afraid to use erudite words; if the word fits the situation, Zork probably knows it.

Although plot is not its forte, *Zork III* has a theme, morals, and meaning. It's a masterpiece of logic that demands that you think. No adventurer—or game-enjoying thinker—should be without it. MCT

Zork III, by Marc Blank and Dave Liebling, Infocom (55 Wheeler Street, Cambridge, MA 02138; 617-492-1031). $39.95.

Transend. A unique feature of the *Transend* communication programs is that you can enter at any level and then upgrade to the more sophisticated packages by paying only the price difference and a $20 upgrade charge. Another nice feature is the inclusion of a backup copy.

Transend 1 turns the Apple into an intelligent terminal with file transfer capabilities and a limited editor. The entire system is based on numerous menus that guide you through setting up the system and executing the desired operations. The first task you are asked to perform when initially running the program is to set up the hardware configuration and system parameters. On the hardware side, *Transend* supports over twenty-five various communications, printer, modem, eighty-column video, and clock-calendar interface cards.

Transend has the capability to redefine any or all character codes. This can be done for either input data or output data. It will also support lower case on an unmodified Apple. The forty-column screen can be set up to display either upper case or lower case as inverse characters.

Finally, *Transend* also offers the unique capability of controlling the high-order bit of all data passed through it. This bit is normally not used with text transmission, but special functions such as binary transfers, graphics, and transmissions to certain systems may require control of this bit. It can be preserved as entered or forced either high or low. Furthermore, you can specify this action for both incoming and outgoing data as

well as to the printer—all separately.

Transend has many other advanced features, including data compression and decompression to reduce transmission time. The X-on/X-off protocol is also supported for compatibility with some remote systems, and makes it possible automatically to save the contents of the capture buffer to disk when it becomes full. Transfer-rate protocol is also fully supported by either full-duplex echo-back, nulls after carriage return, or delay between characters. With all of these options, it should be possible to communicate and send files to almost any remote computer system.

While *Transend 1* will only send text files, *Transend 2* allows transmission of any DOS 3.3 files, including those created by *VisiCalc*. When communicating with another *Transend*-equipped Apple, verified transmissions (using a CRC-16 error-checking code) are possible. This means that the receiving computer can check the validity of the data it gets and signal the sender if it spots an error. The transmission computer will then attempt to send that block of data again until it arrives correctly.

Transend 2 also lets you create a transmit list for multiple-file transmission at one time. A transmission-time estimator is included to inform you of the approximate connect time needed at the various baud rates. The main menu lets you select what type of operation to perform; each selection takes you to a different submenu with choices to further define the task. When making selections on these menus, the program will usually ask for confirmation on each command. However, an expert mode can be selected to disable this and speed up operation of the program.

Transend 3 will reportedly add further capabilities in the area of electronic mail. Unattended operation is supported by adding a clock-calendar card to the system, and scheduling the time for outgoing messages to be sent. Incoming mail is automatically logged and saved to the disk. Several other features of the electronic mail system are: automatic redialing at periodic intervals, password file protection, predefined text formats, and multiple addresses at one telephone number.

The program can maintain a mailing list with up to one hundred mailbox phone numbers and local mail stops. Mass mailing of a single document to multiple users should also be possible by the creation of an appropriate list. The scheduler will sort and schedule mail flow according to user-defined priorities. Incoming correspondence can be received automatically and sorted by recipient. With the appropriate password, recipients can display, modify, or print their mail.

Transend 3 will also add a full-featured text editor and a personal appointment scheduler. The Detached Mailbox option allows non-*Transend* users to send electronic mail to the system. This could significantly lower the overall cost of a complete system because some stations might not require the purchase of their own *Transend 3* package.

All in all, the *Transend* series appears to be very well-written and easy to use. The documentation is excellent, even though the program hardly needs it; in most cases, the numerous menus, displays, and prompts make the program self-documenting. The program also gets an A+ for error handling—improper keyboard entries are not allowed and the old reset key cannot disrupt the program.

Until October 1, SSM is offering free membership in the Source information utility with the purchase of any *Transend* package. That's almost like getting *Transend 1* for free. Now there's an offer that's hard to beat! JM

Transend 1, $89; *Transend 2*, $149; *Transend 3*, $275; SSM Microcomputer Products (2190 Paragon Drive, San Jose, CA 95131; 408-946-7400).

The Snapper. By Dave Sanders. This game from the folks who brought you *Word Handler* would have been better named "The Sleeper." One can play it for a while and be quite bored, but given half a chance it becomes a most engrossing diversion. The cover is somewhat misleading, asking, "Can You Survive the Snapper?" when, in fact, *you* are the Snapper. Your job is to eat blots, avoid the whirlers, and, for God's sake, stay away from the gamma-field!

The game is played on a somewhat haphazard grid, which contains a number of blots. There are two types of blots scattered about, red and blue, which increase in value every time you snap one up. However, you don't really get any points for consuming them until you reach a base, of which there are four on the grid. To prevent you from reaching the base, there are the whirlers and the gamma-field. The former whirl about the grid, consuming parts of it as they go, thus rendering it substantially more difficult to reach base. The gamma-field seems like nothing more

than a collection of pick-up sticks run amok—any contact with these moving refugees from a toothpick factory results in annihilation.

After you've wolfed down ten blots or so, a ring appears in the center of the screen. The ring increases a multiplier at the top of the screen by one, which in turn determines the value of the blots you have eaten once you return to base. Furthermore, getting the ring will cause the grid to be redrawn, undermining all the hard work performed by the relentless whirlers. After every five rings an extra life is awarded.

Got that? Simply put, one must avoid the bad guys while scarfing up blots and grabbing rings whenever possible. An occasional return to base helps rack up the points. There is a timer displayed at the top of the screen just to heighten the tension. At higher levels of play the interval is increased. And just to complicate things even further, the grid itself changes! At higher levels some of the grid lines switch from purple to blue, representing "slicks." Such pathways enable the Snapper to travel at a much higher speed, but preclude its turning off onto a side path until the end of the slick has been reached. Should you double back on the slick upon reaching the end, then you are able to turn onto another line. At the highest level of play, life in the fast lane takes over and the entire grid becomes slicks. However, mere mortals should not worry about ever facing this hazard.

In the interest of a slightly longer game, the folks at SVS have thoughtfully provided us with limited shields that enable you harmlessly to cross paths with the whirlers but not with the gamma-field. The shields only last for a couple of seconds, though, and are usually employed too late.

The *Snapper* is truly a game of strategy, despite first appearing to be simply a game of reflexes. In order to really get anywhere, you must figure out when to go for blots and when to head for base, as well as which blots to go after and in what sequence. Each time you return to base, the blots are redrawn (although the grid remains as the whirlers left it until a ring is captured) and the level of difficulty increases. Thus the longer you stay afield, the higher that round's score will be, and the more you get to play at the easier levels. Failure to get the rings at the low levels ensures a rapid demise at the higher levels, yet the longer you stay away from base, the more dilapidated the grid gets and the harder it is to get home. In short, you constantly have to make quick decisions, and all wrong decisions bring about even tougher dilemmas. Not many games play that way . . . only the good ones. DA

The Snapper, by Dave Sanders, Silicon Valley Systems (1625 El Camino Real, Suite 4, Belmont, CA 94002; 415-593-4344). $29.95.

Cytron Masters. By Dan Bunten. With much fanfare, Strategic Simulations has introduced the Rapid Fire line, four battle simulations designed to satisfy popular demand for fast-paced games without betraying their strategy roots and traditions. *Galactic Gladiators* is a somewhat traditional tactical (rather than strategic) game, but *Cytron Masters* is a new concept altogether.

The premise behind this game is like that behind *RobotWar* by Muse. That is, humanity has advanced to a stage where conventional war between human combatants is either threatening to race survival or considered abhorrent by a more enlightened society than our own. Either way, the culture has chosen to accept robot warfare and abide by its outcome as a substitute for the more destructive alternative. (Apparently, simply abolishing war leaves a void in diplomacy and also eliminates a lot of good games.)

Coming from the author of *Computer Quarterback*, it is interesting that *Cytron Masters* is comparable, albeit superficially, to football. Your role in the warfare is described as manager, but is similar to the position

of a coach. You are not represented by any particular character on the battlefield.

The actual combatants are Cytrons, of which there are four standard types. Each behaves in a simple, preprogrammed way. Mines explode on contact with any enemy unit. Bunkers are simply moving walls. They have the strongest defenses, but no offensive capabilities. They are used to draw fire from other units or to defend power centers or the command center, the enemy's principal objectives. Commanders don't attack either, nor do they defend very well. They are communication devices, relaying your orders to the units around them. Shooters have the most complex behavior. They shoot at the nearest enemy unit within a certain distance. All of them move about as ordered, in one of four directions, or halt.

The word Cytrons is short for cybernetic electronic devices. As the American Heritage Dictionary defines cybernetics as "the theoretical study of control processes in electronic, mechanical, and biological systems," this is a particularly apt name. Control processes are the essence of what makes *Cytron Masters* unique.

Your control over the proceedings (and your opponent's control, whether you compete with the computer or a friend) comes under the category of deployment. Like the Joint Chiefs of Staff, you needn't worry about the individual shots fired. You control the larger picture: what types of Cytrons to create, where to position them, when to defend, and how to attack. You give commands through the paddle controls, using a totally menu-driven format.

Despite your executive status, don't expect to be able to sit back in your armchair and occasionally issue an order. This is a real-time simulation, and speed is essential. Though the Cytrons act on their own, they do so in a thoroughly mindless way, without any thought of tactical necessities. You command them either individually or by relaying orders through the commanders. The manual strongly advises against using too much individual control. It is much faster to organize attack groups efficiently—perhaps a phalanx of mines, followed by a phalanx of bunkers, then some shooters and a commander—and relay orders. The manager who reacts to situations before they become crises will be victorious.

Because Cytrons are rather easy to destroy, they have to be replaced from time to time. The number of power centers you hold determines how fast you can build replacements, so it is a good idea to capture the enemy's power centers and to defend your own properly. You can place newly created units anywhere on your half of the field, so it is a good idea to position the locator once and place the Cytrons in groups. This is also a time saver compared to individual placement.

Your last option is to use missiles. These are nonstandard Cytrons that you guide with the paddle. When a missile is launched, all other activity on the field stops. The other player can launch antimissiles by way of defense. Whenever a missile explodes, the Cytrons immediately around it are automatically destroyed, whether friend or foe. These are powerful weapons, but must be used sparingly, as they take a lot of power.

Dan Bunten has made sure that *Cytron Masters* is easy to learn by providing a brief but complete manual. There is also a superb tutorial program that interactively explains how to play the game, providing practice with the menus as it explains each option and letting you practice with the missiles, which take arcadelike coordination to operate.

Cytron Masters gets a high rating in playability, intelligence, and excitement. DD

Cytron Masters, by Dan Bunten, Strategic Simulations (465 Fairchild Drive, Suite 108, Mountain View, CA 94034; 415-964-1353). $39.95.

Snooper Troops: The Granite Point Ghost. By Tom Snyder. When microcomputers began, the people who bought them were mostly programmers either by profession or by hobby. Naturally, many among them were science-fiction buffs, and certainly science followers. Early games tended to be set in space—or in medieval dungeons, the other fad of serious gamesters.

Now the microcomputer has spread to encompass all sorts of people; there is no one who cannot find good use for a computer. And the spread of the micro's popularity is testified to by a newcomer to the gaming field, the mark of popular appeal that spans all walks of life: the mystery.

The second major entry into the mystery field for micros comes from a brand-new company called Spinnaker, and—now, adult gamers, don't quit reading—it comes in the form of an educational game, *The Granite Point Ghost*. It is intended to be the first of a line of mystery games in which the solvers are called the Snooper Troops.

Although the Snooper Troops format is definitely educational and worthy of a place in every fourth-grade through eighth-grade classroom, it's also great fun. Guaranteed, parents who buy Snooper Troops for their kids will burn the midnight oil solving it after the kids are bedded down. And, unlike so many educational programs, the kids won't need encouraging to play it during the day.

Snooper Troops is a mystery in hi-res color. It takes place in the tiny town of Granite Point, Wherever, which you must map. As a member of the Snooper Troops, you get to drive around town in your Snoopmobile, getting statements from suspects, making phone calls (from booths) to informers or to the infamous Mr. X, and even snooping in—that is, searching—the suspects' homes when they're away.

The mystery is more structured than it would be for general adult use. Each suspect has three clues to give; each home yields three more clues when searched; and each phone contact (other than Mr. X) has three clues to give. In addition, there are special message clues you get at Snooper Troop headquarters through the computer Snoopnet; often you must hurry back to get them before they go off the air. And there are clues Mr. X will give you if you call him at the number he gives on the precise day he says. The clues are numbered, and you must keep track of each with its number.

Besides the general learning involved in deductive reasoning and organizing how to go about solving the mystery, several touches add to the educational value of Snooper Troops. To extract information from the phone contacts, you must suggest subjects to them; you're given three words for each suspect, but you may not use the exact word you've been given. You must give another word that hints to the informer what you're looking for. Only when you find the correct related word will you get the real clue. Other information and other clues help direct you to

the correct word if you have trouble.

Searching the houses is a whole game in itself. The houses are assumed to be dark when you search them, and you have a flashlight. But if someone is home or arrives home and you use the flashlight, you'll be caught. When you enter the house, the screen shows the layout of the house only in walls; the locations of clues are shown by question marks. You must move to a question mark and take a picture with your Snoopmatic camera, then get out without being caught. The only harm in being caught is having to start that search over again—which means waiting again for the day of the week that suspect is apt to be out.

There are many homes in Granite Point but only eight house suspects. It is fun that you can search the other homes as well, if you like. Instead of finding evidence such as ticket stubs or important papers, you catch photos of such things as "a box of corn flakes and a bunch of bananas."

When you believe you know who is making all the mischief—haunting an old mansion to scare the new owners away—you can make an accusation. Then you'll find that you have to eliminate every other suspect by identifying the clue that exonerates each. Then you must name the means and motive of the guilty party. No cinch, but educationally thorough and thoroughly fun.

Incidentally, drive carefully. If you don't, you and the Snoopmobile may end up spending time in the tow yard.

Snooper Troops is a breakthrough in educational programming: it is enjoyable, colorful, of trade quality, and an excellent educational tool. It's a good mystery, too. MCT

Snooper Troops: The Granite Point Ghost, by Tom Snyder, Computer Learning Connection, Spinnaker Software (215 First Street, Cambridge, MA 02142; 617-868-4700). $44.95.

VisiCalc Formatting Aids. As everyone knows, Apple II *VisiCalc* has become one of the best selling software products ever. But even with its wide acceptance, there are a number of things that *VisiCalc* doesn't do well. *VisiCalc Formatting Aids* is a product that can be of use to any *VisiCalc* user. A purchaser receives a disk, a ten-page manual, a two-page tutorial, and a registration card and order form. (You send the registration card and $7.50 to receive a backup copy of the program disk.)

When you first boot the disk you will see four program options, each a separate function that a *VisiCalc* user might need. The first option is Label Splitter. With this option you can take any label column in a *VisiCalc* file and convert it to any number of columns, giving them any column width larger than two. This can be a godsend for anyone who wants to set up a model with a lot of text and doesn't want to go through the hassle of entering the text into each individual cell. In *VisiCalc,* you enter your text into the cells in one column, entering each row of text into a single cell. Then you run the Label Splitter option and it automatically splits your text into individual cells. You even have the option of having the text split into noncontiguous cells (that is, putting it into columns A, C, F, and AA).

Formula Reader is the second option. It allows you to see any or all of the formulas, numbers, and labels in a specified *VisiCalc* file displayed on a monitor or printed on a printer. If you have ever tried to figure out what you were doing in a *VisiCalc* file and had problems because you could only see the formula or expression in one cell at a time, you have been waiting for this option. Print a hard copy, showing cell location with the formulas, values, and labels, and then go back to your *VisiCalc* model and you will find it much easier to untangle your model. Unhappily, this doesn't prevent you from tangling it in the first place!

Print File Reader does exactly what the name implies. It also permits you to look at or print any "print to disk" file. Some people might use this option fairly often, but most probably won't, because if you are printing a file to disk you will probably be loading it into another program anyway. If you have forgotten what files are on a disk, you can use this option to see what your files are. You could also use this option to examine any files you made with the Variable Width Reader option.

This may be the most useful option. You can selectively prepare a report format that allows you to specify which columns you desire printed, as well as individual column widths for those columns you print. Once you have developed a format, you can save it to disk and use it the next time you want to print the same report. This handles one of the most glaring limitations of *VisiCalc*—lack of individual column widths and the ability to print selected columns. You could, for example, print columns A, B, G, and R, each with an individual column width. Unhappily, it won't let you specify the order of the columns to be printed. It would be nice to print G before column A sometimes. As with the other options, you have the choice of printing your report on a printer or displaying it on the monitor. It will even give you the option of entering and changing a report heading.

One thing about the operation of this program is very inconvenient. If you are using more than one of the options in succession, you constantly have to change from the program disk to your data disk and back. It would be nice if it allowed you the option of putting the data disk in drive two and leaving the program disk in drive one.

VisiCalc Formatting Aids is a very useful product for those people who are trying to accomplish what this product does well: providing flexibility and added features to *VisiCalc.* IS

VisiCalc Formatting Aids, Data Security Concepts (Box 31044, Des Peres, MO 63131). $44.95.

Marauder. By Rorke Weigandt and Eric Hammond. Decades back, science fiction was about rocketing heroes shooting their way through the cosmos. Technology was seen as a triumphant solution to all man's ills and a great way to get around the galaxy.

A lot of those early science-fiction notions are dated now, even quaint. So how come everybody still wants to be rocketing heroes shooting their way through the cosmos?

Some things never change. And space shoot-'em-ups like *Marauder* continue to have that never-changing appeal.

There are two scenarios to *Marauder*; two completely different games that are thematically linked. The first scenario pits you against a city defending itself. You are the rocket invader trying to crack the city's defense shield and knock out their guns. They are hurling indestructible fireballs, magnetic air mines, and squiggling missiles at you. They also have two to four piercing lasers that cordon off your sky—sort of a booby-trapped Fourth of July.

The object of your mission is to poke enough holes in their shields to be able to knock out their defenses. Shut them down completely and you can dive right into the second scenario. Easy enough on the first level of

difficulty, but there are nine total and that ninth one is a doozy. Cracking the hide on that shield and dodging the fireworks at the same time is a real skill tester.

Your rocket drops you off at the maze entrance to the second scenario. You get an overhead view of yourself doing a fast clip through a labyrinth full of enemy aliens that only appear when you get too close. They'd just as soon kill you as look at you, and that's not so bad. Sometimes just their looks can kill. The corridors of the mazes are wide enough for you to dart around and avoid the tracks of their bullets.

The object is to get to the bottom maze where the power center is located. Score a direct hit on the glowing fireball and the roof caves in. The maze starts to fill up with tiny squares and you have just enough time to high-tail your way back out.

You have a choice of playing the two scenarios separately or sequentially on either keyboard or joystick.

And in the future, when you get called up to be a rocketing hero shooting your way through the cosmos, tell them you cut your teeth playing *Marauder.* Somebody will understand. MF

Marauder, by Rorke Weigandt and Eric Hammond, Sierra On-Line (36575 Mudge Ranch Road, Coarsegold, CA 93614; 209-683-6858). $34.95.

Personal Inventory. By Gaynor C. Benson. Database management systems have been the subject of a lot of discussion lately because of their ability to organize and relate many subjects. A full DBMS can be viewed as a higher-than-high-level language whose variables are entire collections of data and whose commands allow powerful associations to be made between different collections.

Unfortunately, to make use of most database management systems, some training in database concepts and organization is required. Many people probably fail to use this tool simply because they are unsure how it is used or how it can be used in their particular application.

Personal Inventory is not a DBMS; instead, it is a set of customized file managers for recording and relating information in seven specific subjects (magazines, technical subjects, books, computer programs, house items, jewelry, and tools). The advantage of this approach to managing data is that the work of setting up the database is already done. This is convenient and eliminates the need for previous database experience. However, this is not the program to use if the information to be stored and related is not included in the list of seven subjects or if anything other than simple searches on the subject is needed.

The list of subjects seems just right for the novice home user, someone trying to find uses for their new computer, and this is probably the market for which this product was designed.

To use *Personal Inventory,* you must select a subject and set up a disk for that specific subject. The program has a built-in routine to initialize new disks; the process is simple and self-explanatory. Once the disk is prepared, all operations are selected from a menu, which provides for entering or editing data and printing or displaying all or part of this data.

A nine-page manual covers all operations; it does a good job of leading the novice user through the steps necessary to begin a new subject disk and enter or retrieve data. A nice feature is that the program stores entered data immediately on disk, so power failures and other problems can't destroy your data. And if you make a mistake, it's simple to edit any data item.

Personal Inventory takes advantage of a second disk drive but doesn't require it. With a printer, you can make hard copy lists. JRH

Personal Inventory (Version 1.03), by Gaynor C. Benson, 8th Dimension Enterprises (Box 62366, Sunnyvale, CA 94088). Backup disk included. $59.95.

Phaser Fire. By Salt City Software. The latest in a slew of new offerings from Gebelli, *Phaser Fire* is a masterful graphics display in search of a gripping game.

The player controls a ship at the bottom of the screen. The mission is to defend the Star Portal and prevent any of the enemy from slipping past. The enemy comes in the form of waves of bombers that either drop bombs or launch rockets at you. While the rockets are indestructible and must be avoided at all costs, the bombs float gently downward and can be detonated with a blast from your phasers. The bombers, of course, are eminently mortal.

Once all the bombers in the initial wave have been obliterated, as indicated on a monitor in the upper left corner of the screen, you must then enter the Star Portal and try to pass through. This involves guiding your ship down a long, narrow tunnel which has broken lines every so often. You must pass through the gaps in the lines while avoiding a sentry that zips along these lines, trashing anything in its path. Successful navigation of the portal brings you to a new, faster, and larger wave of bombers bent on your destruction. Et cetera, ad nauseum. The only variation is that after the first wave, rocket-launching saucers appear and either dash across the screen or actually descend and pursue you. The pursuit involves landing and then scooting at you. There is a way to avoid destruction at the hands of an earthbound saucer, but Gebelli won't tell and neither will we.

Unfortunately, that's all there is to *Phaser Fire.* The 3-D effect of the graphics is wonderful, the animation smooth and flickerfree, and all is quite colorful. But we've seen this before; bits and pieces from a number of different games all appear here in a game that is all reflex and no strategy. A good show for the coin-op, hand-eye coordination crowd, but not much her for the thoughtful gamer. DA

Phaser Fire, by Salt City Software, Gebelli Software (1771 Tribute Road, Suite A, Sacramento, CA 95816; 916-925-1432). $29.95

Wordrace. By Paul Coletta. *Wordrace* is a demanding educational game that will tax your vocabulary to the limit. It can make use of a Votrax speech synthesizer.

A word and six possible definitions appear on the screen simultaneously as the countdown begins. You know the word! You scan the list frantically to find the corresponding definition. (Why is it you can always find the definition immediately when it's your opponent's turn?) F! It's definition F. You make a wild stab at the keyboard with your forefinger; to heck with touch-typing. You got 438 points out of 600. Where did all the time go?

Your opponent has bigger problems. She doesn't know the word. She's guessing, but if she guesses wrong, she loses points. F again. She lucks out: 500 points!

Wordrace offers three levels of play. There's a beginner's game: a fourth grade finalist in a spelling bee should know 50 percent of the words. There's a regular game: the average college student should know

about 50 percent of the vocabulary. And there's an advanced game. We're talking "brashy," "scruto," "sereno," "dotterel," and "tache." (A scruto, incidentally, is *not* a deep orange-red chalcedony.)

Wordrace offers a good come-from-behind feature. The score can never drop below zero. A player whose score is near zero can afford to guess and guess wildly. Meanwhile, the pressure is on the high-scoring player to be right consistently.

Wordrace has a vocabulary of more than two thousand words. You'll have built up quite a vocabulary yourself by the time the words and definitions start to repeat. A whole series of projected add-ons with additional words and entirely new specialized vocabularies will allow you to make use of *Wordrace* for a long, long time. SC

Wordrace, by Paul Coletta, Don't Ask Software (2265 Westwood Boulevard, Los Angeles, CA 90064; 213-475-4583). 32K. $19.95.

Real Estate Analyzer II. By James E. Howard. Designed to perform detailed cash flow and return-on-investment analysis, with an eye toward making the maximum profit possible consistent with the minimum exposure to loss, *Real Estate Analyzer II* attempts to point out those investments that will use the least cash possible while maximizing the use of appropriate legal and tax strategies. It does not do this in an automatic, push-button manner; rather, it is a powerful tool that helps you to arrange logically the large amounts of givens and variables present in any real-estate transaction into a manageable format. This lays the foundation upon which to perform the many "what if?" calculations necessary to determine what best fits your personal investment objectives.

The program not only points you toward a better path but also gives you a valuable education in the logic of real-estate investment. Quite a deal for the money, and some or all of the purchase price is tax-deductible, depending on your personal tax standing.

The program's two strongest features are its ability to compare two or more dissimilar properties and to forecast the net return on your investment. It can also target the point at which an investment changes from excellent to average.

With the documentation under your belt, the program is very easy to use, and the documentation is extremely helpful.

Howardsoft supports this program well. All registered owners are notified of any updates or upgrades. New versions, such as might occur because of a major change in the tax laws, are made available at a fraction of the purchase price with the return of your original disk.

This is a professionally written piece of software designed for professionals. But anyone interested in buying investment property today would benefit from a package such as this one. RJR

Real Estate Analyzer II, by James E. Howard, Howard Software (8008 Girard Avenue, Suite 310, La Jolla, CA 92037; 714-454-0121). $195.

Quadrant 6112. By Justin and Amanda Fisher. At the controls of a small scout ship equipped with lasers and three heat-seekers, you must defend your quadrant against a seemingly endless onslaught of aliens. Sound familiar?

Quadrant 6112 does, in fact, add a few twists to the traditional alien shoot-'em-up, and therein lies its saving grace. You must think as well as react in this game.

From Sensible Software, better known for their Apple utility programs, *Quadrant 6112* is an arcade game of deceptive simplicity. You patrol a quadrant surrounded by an impenetrable force field, on the lookout for invading aliens. The aliens sneak into the quadrant via two star gates, which are squares in the middle of the area you are patrolling. You cannot shoot into or enter the two star gates, yet you will see the aliens appear there before they enter normal space and try to demolish you. There are four distinct types of alien ships, along with the occasional appearance of an exceedingly lethal alien commander.

You must try to eliminate all the aliens by means of the two weapons at your disposal—lasers and heat-seekers. The lasers fire at the push of paddle button 0, and you are equipped with an unlimited supply of energy. The heat-seekers will destroy everything in normal space, which means on the screen but not within the two star gates, at the touch of the space bar. However, you have only three such devices and no means by which to replenish your supply.

The aliens come at you in waves. At first they merely try to collide with you, and you can take your time shooting them as long as you avoid their erratic movements. By the second wave, however, they begin shooting back, and each new type of alien is a better shot than its predecessors. Finally, the alien commander shows up, near the end of each wave, and he's out to dispatch you in very short order—unless, of course, you get him first using your heat-seekers or ridiculously fast reflexes. The commander rarely misses both shots and collision attempts.

Your mission involves more than just shooting aliens, though. You must also patrol the quadrant. This involves traveling the perimeter and completing laps, for which you receive bonus points that are tallied at the end of each wave of aliens, or posthumously. In order to earn any ships beyond your initial three, you must destroy all four waves of aliens and have completed at least one lap per wave.

Between completing laps, outmaneuvering the aliens, avoiding the commander, choosing when to use heat-seekers, and keeping your ship under control, *Quadrant 6112* keeps you on your toes. It is not an easy game in which to rack up points, and the action can be blindingly swift. Its only discernible weakness is ho-hum graphics. Due to the size of the various objects, however, it's a weakness that is understandable and easily forgiven. The speed and excitement of the game more than make up for the lack of graphic sophistication. Anyway, most of the time you're too busy to notice. DA

Quadrant 6112, by Justin and Amanda Fisher, Sensible Software (6619 Perham Drive, West Bloomfield, MI 48033; 313-399-8877). $34.95.

Prom-It EPROM Development System. The Prom-It EPROM Development System from MPC Peripherals Corporation includes a powerful programming board that doubles as a PROM expansion board. Personality modules allow the Prom-It to work with a large variety of devices. Completing the system is an easy-to-use, menu-driven program that controls all aspects of the EPROM programming process.

The Prom-It circuit card contains two dip switches and one lever switch. All are easy to reach when the board is installed in the computer. One dip switch is used to write-protect the EPROM and the other turns off compliance with the Apple's $CFFF expansion-disable protocol.

Three personality modules are included in the package: one for

2516/2716 (2K byte PROMs), and one each for 2532 and 2732 (4K byte PROMS). The Prom-It only programs single-supply (5 volt) EPROMs.

From the main menu you can initiate any of the operations by entering the number that appears in front of it. Selecting option 1 causes a complete check of the EPROM to see if it is blank. Option 2 causes the contents of the EPROM to be checked against the data present in the RAM buffer (the exact location and length of this buffer are set from option 8). Actual EPROM programming occurs within option 3. A running indicator shows during programming so you know the program is working.

The next four options deal with transferring data to and from the temporary RAM buffer. This is the area of RAM that must contain an exact image of the data to be burned into the EPROM.

Option 8 sets all the parameters necessary for the rest of the system. The buffer RAM starting and ending addresses are defined here. Also, the EPROM start address is determined; this can be specified by either an absolute address in the range $C800–$D7FF or by a relative offset from the start of the EPROM ($0000–$0FFF).

After performing any option, you're returned to the main menu. This simple command structure is easy to use and fairly bomb-proof.

In addition to being a powerful and versatile EPROM programmer, the Prom-It is a very useful software and hardware development tool due, in part, to a hardware decoding scheme that maps the first 256 bytes of the EPROM ($C800–$C8FF) into the $Cn00 peripheral I/O space. This is a common technique used on many boards to interface through the Apple's built-in Basic I/O commands. When designing firmware for your own peripheral card, you can use the Prom-It's mapping scheme to emulate the finished board. Of course, the necessary hardware mapping circuit must be duplicated on your board.

All in all, the Prom-It EPROM Development System is a fine product. The documentation consists of a thirty-page manual that's fairly complete and simple. Considering the nature of the product and its probable users, this is more than adequate. JM

Prom-It EPROM Development System, MPC Peripherals Corporation (9424 Chesapeake Drive, San Diego, CA 92123; 714-278-0630). $129.50.

Queen of Phobos. By Paul Berker and Bill Crawford. *Queen of Phobos* is a unique animal. It's a hi-res adventure, but the graphics—unusual, well-done line drawings, not color—are used for a scenario that would do fine as a text adventure, and not for their own sake. Indeed, if the graphics were the only draw for *Queen of Phobos*, you wouldn't be reading about it in these pages.

The Queen of Phobos is a space wreck: the hulk of a huge passenger transport abandoned in space. It's said that a very valuable enchanted mask was left on the wreck and your people have sent you after it.

Unfortunately, other people have similar ideas; you are not alone on the ship. The other pursuers of the mask, called looters (what, then, is our hero?), are apparently stymied and hang around just hoping someone like you will do the job so they can steal the mask. One of them blows up your transport ship soon after you come on board, which is intended to be a sufficient excuse for you to do them all in.

A whimsical touch is in the identities of the characters and the idiosyncratic susceptibility—or lack of it—they have to the weapons you find about the ship. In any case, you must find the ways to do them in before you can get away with the mask. Save often.

There is a giant maze of triangular staterooms that is enough to discourage the hardiest adventurer. The answer? Ignore them. Don't bother with the staterooms. Ain't no action there anyway. Investigate all the rest of the ship and solve the problems you're confronted with there. The staterooms will take care of themselves.

Occasionally, a sequence is animated—quite well and without disrupting the generally static humor of the graphics.

No object in *Queen of Phobos* is not useful, although some jobs can be done by any of two or three objects. The puzzles are generally logical although few are complex—which doesn't mean they're easy. There are a couple of places that seem like dead ends. Do something else for a while; when you return, the solution may just come to you.

Queen of Phobos offers several evenings of pleasurable, if frustrating, diversion for the adventurer. MCT

Queen of Phobos, by Paul Berker and Bill Crawford, Phoenix Software (64 Lake Zurich Drive, Lake Zurich, IL 60047; 312-438-4850). $34.95.

The Magic Keyboard. By Phil Wershba. Have you ever wondered why the keys on the Apple, as well as most typewriters, are laid out the way they are? This layout is commonly referred to as the QWERTY keyboard, after the beginning of the typewriter's top row of letters. Believe it or not, this configuration was actually designed to slow down the typist—thus reducing jamming of the keys on early typewriters. Despite at least forty years of technology rendering it unnecessary, the QWERTY design remains the standard.

Like many outdated standards, the QWERTY keyboard won't be replaced easily, if ever completely. Several more efficient designs are surfacing, however. Making a strong bid for popular acceptance is the Dvorak keyboard; it's been proven to increase typing speed dramatically. Touch-typing is much easier for beginners to learn on this keyboard because letters are placed more logically; the vowels, for example, are all in the home row of the left hand. With the possibility of such a layout someday becoming the new standard, it's fun to find that you can have it on your Apple today—with the ability to toggle back to QWERTY in an instant.

There are several devices available for the Apple that allow you to redefine the keyboard, but only the Magic Keyboard gives three different layouts at the flick of a switch.

The Magic Keyboard comes with a selection of seven standard keyboards and eight possible numeric keypad configurations. (Only two of each set are available at a time.) This selection is accomplished by setting six dip switches on the main board.

Some of the alternate arrangements available with the Magic Keyboard include the Dvorak and the American Simplified keyboard. Another set puts the keys in alphabetical order across the keyboard. There are even two layouts optimized for one-handed operation, and there are three sets of colored key cap decals to indicate the keys' new functions.

Among the keypad arrangements available, there is one especially designed for hex. Sixteen keys in rows of four allow numbers 0 through F. Installation of the Magic Keyboard requires some disassembly of the computer, but this is adequately outlined in an eight-page manual. Several photographs help illustrate how this piggyback module is inserted between the keyboard connector and its corresponding socket on the motherboard. Another flat cable connects the module to a special switch unit. This unit is affixed on the computer just to the right of the reset and return keys with double-stick foam. The switch unit contains one slide switch, a momentary push button, and a small LED indicator. The slide switch selects between the normal Apple QWERTY keyboard and one alternate layout. Momentarily pressing the other button causes the keyboard to take on one of the numeric keypad arrangements. The red LED also lights to indicate this function.

The keyboard mapping is accomplished in an EPROM so you can design your own layout if you have access to an EPROM programmer. The company will also provide this service for $20 per keyboard. The standard unit does not provide control characters with the alternate keyboard; this can be accomplished, however, by making a small modification to the Magic Keyboard. Two wires are added which must be connected to the Apple keyboard. This also makes it possible to have true upper and lower case entry using the shift key. The only trade-off for this function is that it reduces the number of alternate keyboards that can be contained in PROM down to three.

The Magic Keyboard is a handy device for anyone who needs to redefine the layout of the Apple keyboard. The numeric keypad function is not as smooth as an external unit, but it costs less and remains attached to the computer. Since many people will only require one alternate set, the full keyboard modification may give an added bonus of true shift key operation.

The sixteen-key hex keypad arrangement is a joy for machine language programmers. JM

The Magic Keyboard, by Phil Wershba, Southern California Research Group (Box 2231, Goleta, CA 93118; 805-685-1931). $89.95.

Pig Pen. By TMQ Software.

Our porcine heritage.

Who was it who remained unafraid of the big, bad wolf? And what

about the one who went to market, the second who stayed home, the third who had roast beef, and so on?

And certainly no one can forget those immortal stars, Miss Piggy, Porky Pig, and Arnold Ziffle (the last two retired and living off their residuals). These are the glamour pigs: they've shed their mud packs to find fame and fortune; raised themselves out of the mire; no longer driven to the stockyards, but to and from the studios.

Pigs don't live in styes, nor do they appreciate the fact that twisted American entrepreneurial minds turned their bathing habits into the commercialized sport of mud wrestling. Those squealing little hocks o' ham are furious! They're out to get anyone trespassing on their turf. So pull up your suspenders and get ready for a real run around the *Pig Pen.*

The game's author has equipped the program to be played with either a joystick or keyboard. In the keyboard mode, you select the keys for directional movement prior to the start of each game.

Play begins with a skinny little man running around a maze inside a pigpen, leaving behind him a trail of white dots, accumulating points as he tries to lure the little fatties in the vicinity of those ever-menacing "power dots." With the little man in full power, the roles reverse, however. The sows become elusive ghostly pig-heads, scampering off in different directions while the little man gives chase.

Take heed. These piqued porkers are not to be outdone! Frequently, they ride piggyback on one another hoping to confuse the player. And both opponents have the advantage of escapeways as each maze changes. More often than not, these swine use the escapeways as a strategic distraction.

After playing *Pig Pen* several times, you devise your own strategies against those chubby little mucksters, one of whom can incorporate the trail of dots left behind as you make your way through the maze. Running back over the established trail allows you to escape more rapidly. Therefore, it may be advantageous to secure a trail all the way around the maze to ensure a quick exit from the pursuing piglets.

The most excitement in these maze games comes from being able to outmaneuver opponents and still maintain the calm determination required to move from one screen to the next. *Pig Pen* provides the challenges; you provide the spirited competition.

Oh yes, don't forget the ear of corn that pops up during the game. It's worth a thousand points on your score. You can't miss it. It looks like an old-fashioned broadcast microphone. SMP

Pig Pen, by TMQ Software, DataMost (9748 Cozycroft Avenue, Chatsworth, CA 91311; 213-709-1202). $29.95.

Performer Printer Format Board. If you have an Epson printer connected to your Apple II, then you may be interested in a new board called the Performer. This board is like a "plug-in program," and it enhances text and graphics capabilities. Though similar to software products, the key to this program is that it is contained in EPROM. This means that it does not have to be loaded into memory from disk. Instead, the program can be instantly run with just a few keystrokes. Once initialized, the driver routines remain "connected" and can be activated at any time.

As soon as you call your Performer, you'll see a menu from which you can set seventeen parameters that will affect the printed output. For example, you can select normal, italic, expanded, compressed, or enhanced printing—and various combinations. The number of lines per inch, columns per line, lines per page, and total page length can also be changed. Page numbering, titling, and dating are options as are video on-off, primary-secondary page select, and normal-inverse graphics.

When you escape back to the operating system, the firmware is still connected through the output hook, although the system will appear to operate normally. You can then toggle the printer or dump the text screen or graphics screen immediately. Another toggle takes you back to the menu. Unfortunately, all commands must be entered while in the immediate mode. No information is given on how to change parameters from within a program, although this should certainly be possible.

The Performer is designed to work with the TYMAC PPC-100 parallel printer card, which Micro-Ware also distributes. It should also function, to varying degrees, with other interface cards. Probably the most outstanding feature is its low cost, which is not much more than similar programs that require loading from disk.

The Performer should make a welcome addition to any Apple-Epson system that still has at least one empty slot. While not as elegant as some of the newer, full-featured printer interface cards, the Performer represents a reasonable alternative for people who already have a printer card. Versions are also available for other graphics printers. JM

The Performer, Micro-Ware Distributing (1342B Route 23, Butler, NJ 07405; 201-838-9027). $49.

Mouskattack. By John Harris and Ken Williams. Remember thos three blind mice that got their tails cut off with a carving knife? Well, they've returned to get their revenge in this enjoyably frustrating new game from the author of *Jawbreaker.* And a ravenous rodent called Super Rat keeps helping them out.

Mouskattack is a maze game in which you lay pipe through the corridors as you travel. Sometimes you have to go back over a section you've completed to make a connection you missed. Two cats and one rat trap at a time are available to you. Picking up a kitty and placing it where you don't want the rodents to come keeps them away. You can also pick up the traps and set them where you want. If you run over a trap with a mouse in it, he's a goner; otherwise he's eventually able to wriggle free.

Sometimes the mice have too much freedom. When you exit the maze at any of four points, the mice can chase you off the screen and nip you in the wrenches before you get back. These are also fast mice. Each time they bop you, it's back to square one, next round (there are three per game), and it's excruciating if you've almost got all your pipe laid down. That's why it's called the rat race.

You'll want to get plenty of sleep before you play *Mouskattack.* If you stop at any point in the maze—hoping you can nap with a kitty for a while—the magnetically inclined mice will box you in until kitty goes kaput and you'll be a goner too.

As to that big cheese, Super Rat, he's definitely a rodent to run from. The traps can hold him but cats are his culinary meow.

A third play option available in the game (besides keyboard or joystick) allows two players to compete in laying pipe. In this ratty battle, cats become weapons and traps can be raided for bonus point rats.

Walt Disney built his kingdom on a cute little mouse. If he had played a few games of *Mouskattack,* with its cute little mouse that kicks up its heels when you lose, the world would be minus one M-O-U-S-E. MF

Mouskattack, by John Harris and Ken Williams, Sierra On-Line (36575 Mudge Ranch Road, Coarsegold, CA 93614; 209-683-6858). $34.95.

Peachy Writer. By Carl Rutledge. Have you ever looked at your Apple and thought, "I don't need a fancy word processor, but it would be nice if I could use this system as a typewriter once in a while"? If so (and if your system already includes a disk drive and a printer), this may be just the program you're looking for.

It's a word processor reduced to the absolute minimum, with the emphasis on ease of learning. The manual calls it a "text editor," but it's more than that. It includes a text editor, all right; but it also has disk management routines (store, retrieve, delete, and catalog), a printer formatting menu, and a useful help file. Not bad for less than thirty dollars!

Needless to say, it has some weaknesses—it's awkward to work with, it looks funny on the screen, and it prints very slowly; but "weakness" is relative. Compared to several systems that cost ten times as much, *Peachy Writer* is weak. But considered as an answer to the question, "What is the least that an intelligent, careful person could get by with, if he didn't have to use it very often?" *Peachy Writer* is a well-chosen set of compromises.

The system's main problems derive from limitations of the Apple display—the lack of lower-case characters, and the forty-character line length. Dr. Rutledge has provided some neat tricks for working around these limitations, but he couldn't get rid of them entirely.

The lower-case problem is taken care of by having everything print in lower case, unless preceded by a slash mark (/). The solution to the forty-character line problem is similar—simple and effective, but somewhat odd-looking on the screen. If you set the system up for a line length of more than forty characters, each line will be folded in such a way that it ends on the right margin: thus if you set for a sixty-five character line, each typed line would begin fifteen characters in from the left margin and extend for two lines on the screen, ending the second line at or before the right margin. Three different tab commands are available.

The editing commands are the familiar Apple left and right arrows and escape-IJKM (or escape-ABCD), plus commands to examine, delete, insert, or modify selected lines.

Finally, one quite sophisticated feature: the system supports a wide variety of printer control characters, embedded in the text. This includes both true control characters (which display as inverse, for editing) and escape sequences.

In short, *Peachy Writer* is a simple but effective "text management system": a set of routines that manipulate the existing capabilities of your Apple in order to produce text, either on disk or on paper. It's not quite a "word processor," from the professional writer's point of view, but it's a handy tool for the nonspecialist who only occasionally wants to produce text with his Apple. JR

Peachy Writer, by Carl Rutledge, Cross Educational Software (Box 1536, Ruston, LA 71270; 318-255-8921). $24.95.

Keno Master. By Ed Magnin. *Keno Master* comprises one and two player versions of the venerable game of keno, based on the rules of the game as it is played in the casinos of Las Vegas, Nevada.

For those who might be unfamiliar with the game, keno is a bingo-type game in which eighty numbered balls are tumbled in a wire cage; twenty are then removed at random. Meanwhile, you choose up to fifteen numbers on a playing card or, in this case, your display screen. The object is to preselect as many of the drawn numbers as possible. Victory results when you are correct in a qualifying percentage of your chosen numbers. For this you are paid according to a schedule that the computer displays for you on command. If you bet one dollar and chose ten numbers, you would be paid $180 if seven of your numbers appeared among the selected twenty. However, if only five of your picks are correct, you receive only two dollars.

This version of the game is clear and straightforward with on-disk, easy-to-follow instructions. In fact, it addresses its mathematical points so well that it could serve as an appealing method of introducing younger household members to some harder-to-teach mathematical concepts painlessly. For its price, this could be the educational software investment of the year.

The game keeps track of the amounts you have won and lost. It also has a provision to repeat your previous bet, for those who like to play a pattern of favorite numbers over and over without having to reenter the information each game.

An inexpensive, fun game that clues you in on why the world has played keno in one version or another since 1530. RJR

Keno Master, by Ed Magnin, Telephone Software Connection (Box 6548, Torrance, CA 90504; 213-516-9430). $25.

Wine Cellar. By Bryan Ehlers. Apples have been from outer space to underwater, so it only seems natural that sooner or later they would appear underground—or at least as far below as your wine cellar.

That's what this simple, easy-to-use database is for: organizing the vintages and varietals of your wine collection. It can handle up to 372 varieties of wine, each of which may be associated with as many as 32,767 bottles of the stuff, or 2,730 cases. That's a lot of grape juice!

More than just a dry listing, this inventory program uses symbols to designate availability, drinkability, and rating of your stock. It has a wild card capability that lets you list Zin for Zinfandel and still come up with all the information you need. You can also print out a copy of your cellar's contents on any eighty-column printer.

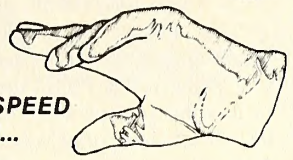
Information can be entered for each particular wine under winery, varietal, vintage, region, number of bottles, month, year, price of purchase, and current value. There is also room for a personal comment on each one.

One-key commands let you *look* at the scrolling contents of your cellar, *drink* those contents (actually, delete any bottles you have consumed), *add* or *edit* any information as the wines age, and gather overall *statistics* — like how many bottles of Pinot Noir you have left after that last soiree.

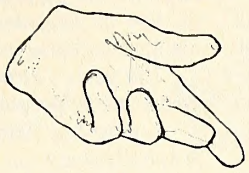
Wine Cellar is a custom-tailored inventory program that can be used

&Amper~Magic T.M.

by Bob Nacon



MACHINE LANGUAGE SPEED WHERE IT COUNTS...



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Find substring	Multiple poke hex	Speed restore
Get 2-byte values	Print hex $	Store 2-byte values
Gosub to variable	Print string	Swap variables
Goto to variable	Print w/o word break	

These routines and more can be attached and accessed easily. For example, to allow typing of commas and colons in a response (not normally allowed in Applesoft), you simply attach the Input Anything routine and put this line in your program:

```
xxx PRINT "PLEASE ENTER THE DATE. ";: & INPUT,DATE$
```

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The documentation is well-organized and complete and gets you up and running in a hurry. High Technology offers a telephone software hotline to help with any technical questions that may arise.

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PACE, by Robert Stoldt, High Technology Software (2201 N.E. 63rd Street, Oklahoma City, OK 73113; 405-478-2105). $395.

The Flockland Island Crisis. By Kevin Bagley. And now, one of those golden classics from last June that will live in our hearts forever, and the winner of the Association for the Advancement of Questionable Taste in Computer Game Hype Creativity Award for 1982. O nostalgia.

The recent emergence of the television docudrama caused a stir in some circles, with the charge made that the hybrid form provided neither reliable fact nor edifying fiction. Such is the case here. As a game, *Flockland Island* is pretty limited; so is its value as a socio-historical curiosity—the game has little to do with actual events. (The historical reference for *Choplifter* is readily guessed from just looking at the screen; with *Flockland,* you'd never know.)

This is the only game in recent memory that *requires* two players; the one-player mode is a thoroughly losing proposition, though the documentation doesn't address the subject either way.

Enemy ships approach from either side of a long, skinny land mass and attempt to remove chunks of it while you attempt to manipulate your two mobile shore defense batteries to prevent them from doing so. The animation is of the can't-move-and-shoot-at-the-same-time variety, and with two players the frustration this situation evokes is heightened as the two of you attempt to execute five separate move-and-shoot commands simultaneously.

The game's strongest points are its swift capitalization on current events and its propulsion of microcomputer games into some headlines.

A must-buy item as a souvenir of the summer of '82. AC

Flockland Island Crisis, by Kevin Bagley, Vital Information (7899 Mastin Drive, Overland Park, KS 66204; 913-381-1818). $34.95.

Chuckles' Laf Pak. By Chuck Beuche. By the law of the land of computer software, this disk should cost $119.80 or more. A lot to pay for a game, you say. Quite right. *Chuckles' Laf Pak* isn't a game: it's four games on one disk—for the price of one disk.

Of course you're asking why they weren't released on four disks. Aren't they good enough? The answer is yes, yes, yes, and maybe. Perhaps On-Line was just feeling generous when they put together this package. These are fast, tight little games, presenting a lot of action in limited space.

First and best: *Creepy Corridors.* A maze is dug out on the screen. You control an army of little men trying to sweep up the diamonds in the corners of the maze. They dodge and shoot through ten levels, keeping herds of munching meanies at bay. This one is worth the price of the disk. If you can get past level six, you are very, very good. Joystick or keyboard.

Second entry from *Chuckles'* game machine is *Apple Zap,* featuring

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THE BASIC Solution

By Wm. V. R. Smith

Sequential text files are a very useful method of data storage if you can get around the idiosyncrasies of the input statement.

We deal with text files through the DOS commands *open, write, read, close,* and a few others we won't discuss here, as well as through the Basic commands *input, print,* and *get.* The last three are familiar to most Basic programmers but will be used differently in this application.

Enter program A.

Lines 60 and 70 create and write to a text file called Test on your disk. Note when you run the program that none of the data in A$(X) prints out on your screen. That is because when *write* is in effect, *print* sends things to the disk instead.

Program B uses the input statement to retrieve data from file Test.

Now run this program. There is a problem, no? Only part of the expected text file was printed out, along with some really unattractive "extra ignored" messages. This is the fault of the input statement, which uses commas as separators for data. The same thing would have happened had this been a normal input statement, that is, one requesting data from the keyboard. If it only asks for one string and you include a comma, it takes your input as two strings and tells you "extra ignored."

This is a problem in text-file input. The type of material you are likely to want in a text file will tend to contain commas (and colons, which will also cause an error). To get around this, we can use the get command to take data from the file instead. Get is able to take any ASCII character as input— even commas, escapes, returns, and control characters (but not reset)—without problems. So add program C to program B.

To explain briefly, line 120 accepts characters from the file, one at a time. Line 140 builds the string and echoes it to the screen. Line 150 checks for the ASCII value 13, which is given by the return key. This indicates the end of the line of data.

Now change line 40 in program B to *gosub 100.* When you run this program, you'll find that it goes slower, but it returns all the data you put into the file. This is a preferable situation, but we can do better still.

Shorter and Faster. There is a way to get the input statement to accept commas and colons. You simply have to enclose the whole string in quotation marks. In normal input statements this solution is often ignored to avoid requiring the user to enter the extra punctuation. The computer, however, can put the quotation marks in easily.

```
10  A$(1) = "FOUR SCORE AND SEVEN"
20  A$(2) = "YEARS AGO, OUR FOREFATHERS"
30  A$(3) = "BROUGHT FORTH ON THIS"
40  A$(4) = "CONTINENT, A NEW NATION. . ."
50  A$(5) = "              —ABRAHAM LINCOLN"
60  PRINT CHR$(4); "OPEN TEST"
70  PRINT CHR$(4); "WRITE TEST"
80  FOR X = 1 TO 5
90  PRINT A$(X)
100 NEXT X
110 PRINT CHR$(4); "CLOSE TEST"
```

Program A. A simple text file writer.

```
10 PRINT CHR$(4); "OPEN TEST"
20 PRINT CHR$(4); "READ TEST"
30 FOR X = 1 TO 5
40 INPUT A$: PRINT A$
50 NEXT X
60 PRINT CHR$(4); "CLOSE TEST"
70 END
```

Program B. A reader of text files.

```
100 REM INPUT ROUTINE
110 A$ = ""
120 GET I$
130 I = ASC(I$)
140 A$ = A$ + I$: HTAB 1: PRINT A$;
150 IF I = 13 THEN 170
160 GOTO 120
170 RETURN
```

Program C. Input routine using get.

Go back to program A and change line 90 to *print CHR$(34); A$; CHR$(34).* The use of CHR$(34) is, of course, the only way to get the computer to print out the quotation mark. Run the program to re-create the file Test. Now, change line 40 in program B back to the way it was. You won't be using the input routine again, but you might want to keep it to experiment with. It won't harm the program, in any case. Now, when you run the newly restored program B, you will see that our data was retrieved from the disk at a greatly augmented rate.

This application has its uses for those who typed in *BasiCalc* from our July issue. That version of the program used a variation on the slow-moving get-type input routine for loading files from the disk. Changing the following two lines of the program should speed up your data reading a lot.

```
5200 PRINT CHR$(34); A$(Y,X); CHR$(34)
5630 INPUT A$(Y,X)
```

But That's Not All. Unfortunately, if you have already saved any spreadsheets the old way, these modifications will make the files incompatible. Not an insurmountable problem: you can use *BasiCalc* to convert the file by the following method.

1. Load the old *BasiCalc* program.
2. Type in the new line 5200. At this point leave 5630 as is.
3. Run.
4. Use the slash key to get the menu. Select the load option and type in your spreadsheet's file name. *BasiCalc* will load the file in the old method. Confirm that the file loaded as you expected it to, with everything intact.
5. Now select the save option. As an extra precaution, use a different file name, so the old file won't be overwritten. *BasiCalc* will save the file using the new save routine, and your file will be compatible with the faster loading method.

You can convert any number of old files in this way, When you are finished, break out of *BasiCalc* and change line 5630. To be safe, save your new version of *BasiCalc* under a new file name too.

And we have more good news for people who typed-in *BasiCalc.* Some of our readers have discovered bugs in the ampersand and at-sign options. As you recall, the ampersand key was supposed to do row or column summation. Unfortunately, it didn't work in summing rows. The at-sign key, which was supposed to clear an answer cell, didn't work at all. And finally, any entry or equation that resulted in the display of a negative noninteger (like −5.2) produced some very interesting results. Try it! Then correct it. Changing the following lines will fix problems.

```
640 SF$ = "": IF A1 < 0 THEN SF$ = "-"
641 WA = ABS (A1):A3 =  INT (WA):A1 = (WA - A3) +
    1.001:H$ = SF$ + STR$ (A3) + "." + MID$ ( STR$ (A1),3,2)
660 FL$ =  STR$ (A1):A1 =  VAL ( LEFT$ (FL$,CW(X))): RETURN
805  P=1
2104 IF A=64 THEN 2256
2109 IF A > 43 THEN 2255
2256 AA$="                              ":IF A$ = CHR$(64) THEN
     A$(Y,X) = LEFT$(AA$,CW(X)): GOTO 2260
```

Note that the string in 2256 is a number of spaces. This should be at least equal to the largest column width you might want to set. The default width is eight, so you want at least eight spaces there. Many thanks to the readers who pointed out and corrected these errors.

There is also good news for early *BasiCalc* disk purchasers. We have a new version that contains all the changes we just talked about. It also has a twelve-screen tutorial on how to use *BasiCalc.* So if you sent for our disk early, and your version doesn't have the tutorial, you can exchange it for one that does. Send no money, but you must return the old disk so that we know you paid for it in the first place. ■

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The Shape of Things

BY DAVID DURKEE

An Army helicopter lifts from the parking lot of an extremely rural U.S. Post Office and flies into hostile territory on a mission of mercy. On the ground below, enemy tanks fire futile volleys at the chopper as it moves toward its goal. Soon, it spots the captives, who signal it in desperation. It lands, inadvertently crushing one of the erstwhile victims, and the survivors madly scramble aboard. A few must remain behind. Another tank arrives to harass the rescue operation, but the copter lifts in time, sprays the tank with explosive shells, and returns to friendly territory, where the first batch of grateful beneficiaries disembark. A few turn back to wave to the hero, who is already off to give further succor to the remaining hostages.

The Hi-Res Challenge. And all this action occurs on a computer screen. Who would have believed it in 1976? The minis and mainframes that were prevalent then—and the ones still used today by universities and corporate giants—while unquestionably faster and more powerful than today's ubiquitous micros, just don't lend themselves to this sort of use. Indeed, the easy access to high-resolution graphics was a major factor in securing Apple's supremacy in the home computer market. It put the personal in personal computer and set standards that Atari and IBM are only beginning to challenge years after Apple's inception.

Don't misunderstand: the graphics in this popular game were not easily achieved. The current standard for arcade games requires of the next crown prince of programming a complex understanding of assembly language, the hi-res memory layout, and bit-mapped graphics.

However, this arcane knowledge is necessary only for the speed of animation an arcade game requires. The hi-res images—the colors and the detail—are within the grasp of any moderately competent Applesoft programmer who knows where to look. The uses of such visuals are as numerous as the individuals who would use them. If you have ever wanted to put more on the monitor than the few scant letters, numbers, and punctuation marks allowed by ASCII, read on!

Unfortunately, Apple only went halfway in giving you these marvelous graphics techniques. They provided a means for reading hi-res shapes from a table and drawing them on the screen in various sizes, colors, and angles. Great! Only problem is, they barely provided any means at all for creating these shape tables. Nor did they provide any shapes with the machine, or even with the DOS System Master, which wouldn't have been difficult. The procedure for creating shape tables described in the Applesoft manual is, in its complexity of execution, not unlike writing Basic programs by entering the hexadecimal tokens for the keywords directly into the Monitor. Possibly worse. If you have already learned the method from the manual, forget it; there are better uses for your unique genius. If you haven't, don't bother; there are now several utilities available for this purpose.

Inner Workings. By way of circumlocution, before we continue, here's a clear, but not very complete, description of how a shape table works. The table acts as a series of instructions, though it is actually closer to being a data table. Nevertheless, there are eight possible instructions shape tables are allowed to contain. They are:

Plot a point and	move up
	move right
	move left
	move down
Don't plot and	move up
	move right
	move left
	move down

This assumes that the scale is one and the rotation is zero. At higher scales, plotting a point becomes drawing a line, but that is something you can discover on your own. Note you can only go in one of four directions with a single instruction. To do a diagonal line or a curve, you have to mix directions.

We're going to look at three of the available packages—*Accu-Shapes,* by Accent Software; *Higher Graphics II,* by Synergistic Software; and *Apple Mechanic,* by Beagle Bros—and discuss what makes a good shape utility as well. Consider what kinds of capabilities a really good shape utility should have. Pay attention, aspiring geniuses, because no program on the market is perfect. There may be room for one more shape utility if it's good enough (though that isn't a promise).

You the Artist; Apple the Brush. A shape maker's primary function is to allow you to design shapes and use them in your programs. All of these programs do this, of course, but the different ways they do it are important. The easiest to write (but the hardest to use) will have you entering the shape point by point in the same sequence it will go into the table. This makes it hard to get the shape right in the first place, and even harder to correct one that's wrong. You will have to design any shape more complicated than a rectangle on graph paper first. *Higher Graphics* handles the shape generation phase in this way.

Accu-Shapes has the best method of shape generation. You design the shape in low resolution and the program compiles the table semiautomatically. This means that you can guide it through the construction process without having to tell it every step, if you like. Creating the shape in lo-res introduces a unique problem: because the lo-res pixel is wider than it is tall, the shape looks taller than you expected when you draw it in hi-res. *Accu-Shapes* allows you to correct this distortion easily with its powerful—and unequaled—shape-editing option. With a few quick keystrokes you can make the shape longer or shorter along any horizontal or vertical axis.

Apple Mechanic handles shape design somewhat differently. You design the shape in hi-res, but you have a simultaneous display of the shape as it will look in normal scale and the shape in a triple scale, which makes it easy to keep track of the cursor and pay attention to detail. This also means no distortion problem. Unfortunately, while you can design the shape on the screen before telling the program the exact steps to use to draw it, the tracing procedure is entirely manual and so a little slower than with *Accu-Shapes.*

To varying extents, all three programs allow you to look at old shapes while creating new ones. *Higher Graphics* allows you to see as many shapes as you want. The others only allow one other shape to be displayed at a time, but they also allow you to trace over all or part of that shape, an option that you may find more valuable. If, for instance, you wanted to create a hi-res chess set, you could trace over the base of the rook shape you already designed to save effort when designing the knight and bishop shapes.

Diamonds Are a User's Best Friend. The keys used for cursor control should ideally be placed in a usable diamond formation on the keyboard. *Accu-Shapes* uses W, A, D, and X to move the cursor. These keys form a convenient pattern around the S key, which is used for scrolling the picture. In contrast, *Higher Graphics* uses U, D, L, and R, which by their scattered keyboard positions can slow down the design process a lot. *Apple Mechanic* uses the arrows and the A and Z keys, which may be the easiest configuration.

Next, because a table can have more than one shape, there ought to be a way to rearrange the shapes in the table. Ideally, the first shape in the table should be the shape you use most often. If the most-used shape changes as you develop your program, you should be able to rearrange the table with as little fuss as possible. Flexibility is the key; a good shape maker won't punish you for changing your mind.

Accu-Shapes allows you to do this by a complicated process of retrieving a shape into a hold area, inserting it in the table where you want it, and deleting it from its original location. *Higher Graphics,* in this respect the best of the three, comes with a shape-shuffler program that allows you to set up tables by taking shapes from any number of other tables and putting them in any order you like. The only way that *Apple Mechanic* allows resequencing is through retracing a shape in a new loca-

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tion. This is tedious and is an unfortunate deficiency in the program.

You the Programmer. Furthermore, if we are to consider the program a utility at all, you have to be able to load your shapes easily from Basic. You don't want to have to jump back into the shape maker whenever you want to use the shape. All of these programs save the table into a binary file and let you bload them and poke the table address into the pointers. On the surface, that would seem to make all of them equal. The fact is, loading a binary file is not a simple process for the beginner, so the explanation that the manual provides at this point should be clear and complete.

In this respect, *Higher Graphics* strongly favors Integer Basic programmers. Integer is a faster language than Applesoft, so with the hi-res routines that *Higher Graphics* provides, this package is probably better suited to animation if you have Integer. But more people use Applesoft, for good or ill, and the *Higher Graphics* manual fails to explain how to set the pointers to the shape table from Applesoft.

The other two programs both ignore Integer Basic. *Accu-Shapes* explains how to set the table pointers from the Monitor but refers you to the Applesoft manual for doing it from within a program. *Apple Mechanic* explains it all very well. In fact, though Bert Kersey's manual modestly claims, "Heck, I can't teach you *everything*," his manual without question comes the closest to doing so. It has by far the best documentation of the three, explaining how to use shape tables in every conceivable detail. It is the easiest manual for a beginner to use, yet it contains information that an expert can benefit from.

Each of the packages has other features and limitations that ought to be considered. *Accu-Shapes* has no other function but to create shapes, although it is definitely the best at that. It has an excellent shape-display method, showing up to fifteen shapes at a time with no overlap. By contrast, *Higher Graphics* shows shapes either one at a time, with scale and rotation options, or fifty at a time, with no considerations to prevent large shapes from running over each other or off the screen. *Apple Mechanic* neatly displays the whole table of twelve shapes (the maximum it allows) on one screen with no overlap.

All of the packages have a set of demonstration shapes.

Higher Graphics has a screen-creator program, which allows you to use shapes and an Etch-a-Sketch–type drawing routine using paddles or joystick. You can then save the screen to disk for use in your programs—as a title page, for instance.

Apple Mechanic comes with a plethora of other utilities, some related to shapes and graphics and some not. One of these is a full-character font editor with a few example fonts for your use. These fonts contain much larger characters than those available with the *DOS Tool Kit*. There are also two programs provided that use these fonts. One is for creating hi-res pictures to store on disk, and the other is for merging with your programs to give them the same ability. There is also a facility for analyzing shape tables: viewing them at different scales, colors, and rotations and looking at disassemblies of tables.

Apple Mechanic also contains the utility Byte Zap, which allows you to examine and alter any disk byte by byte. Although this is unrelated to shape tables, it has its uses. With it, you have access to parts of the disk that were previously closed to you. You can look at the catalog sectors, and even examine and change DOS commands and error messages.

Parting Words to the Wise. None of these programs is perfect. All of them lacked two features that would be extremely useful. One is the capacity to manipulate and edit shape tables generated by other programs. This wouldn't be too difficult a feature to incorporate, as a shape table can remain in memory even after the program that loaded it is gone.

The other feature we looked for but didn't find was a facility for creating Applesoft subroutines to poke the table into memory rather than load it from disk. Aspiring shape maker programmers should try to include features like these. ■

Accu-Shapes, by Jason Marks, Accent Software (3750 Wright Place, Palo Alto, CA 94306; 416-856-6505). $49.95. *Higher Graphics II*, by Robert C. Clardy, Synergistic Software (830 North Riverside Drive, Suite 201, Renton, WA 98055; 206-226-3216). $35. *Apple Mechanic*, by Bert Kersey, Beagle Bros (4315 Sierra Vista, San Diego, CA 92103; 714-296-6400). $29.50.

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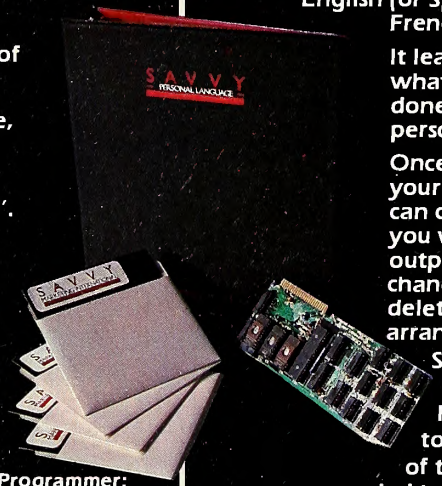

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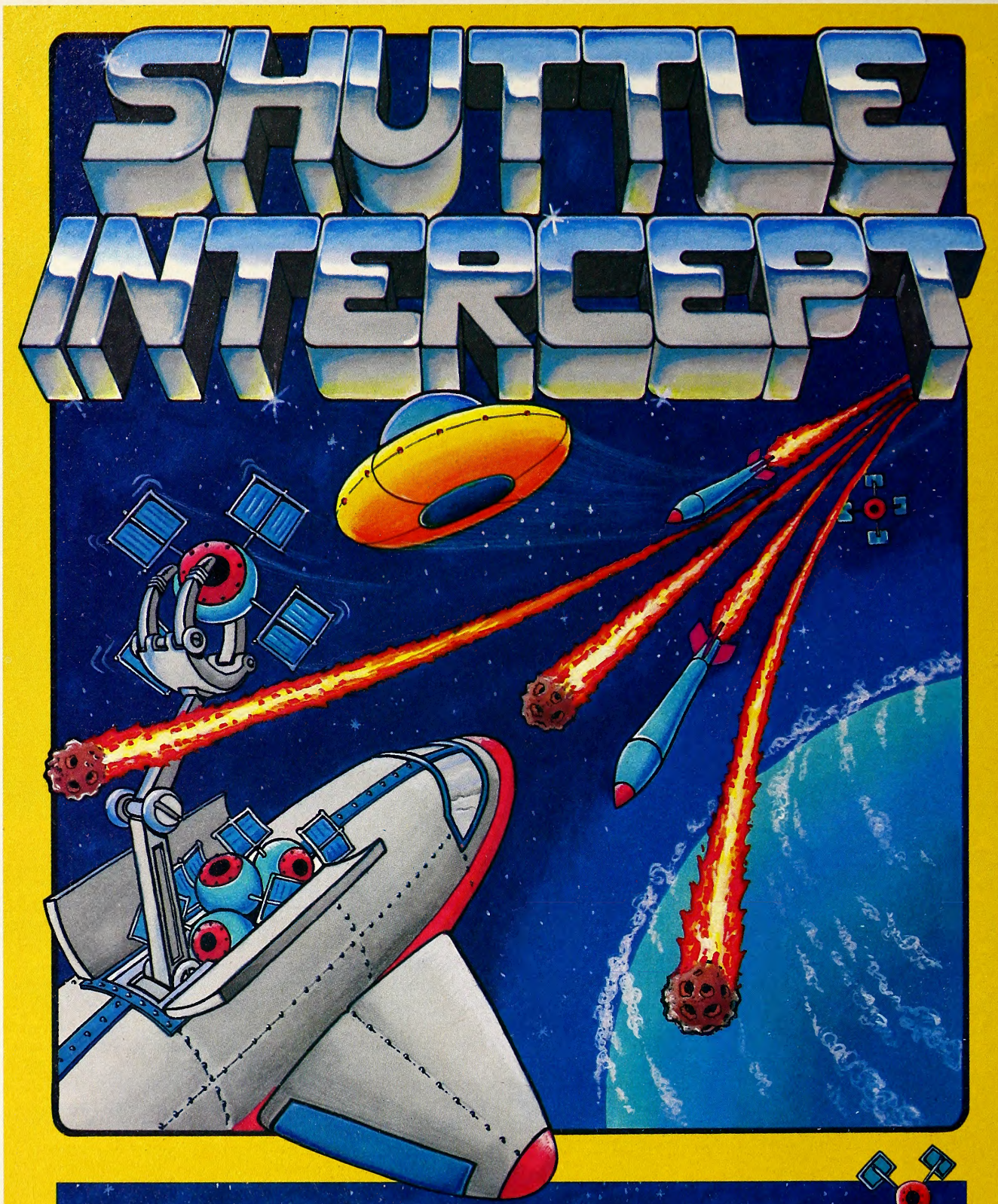

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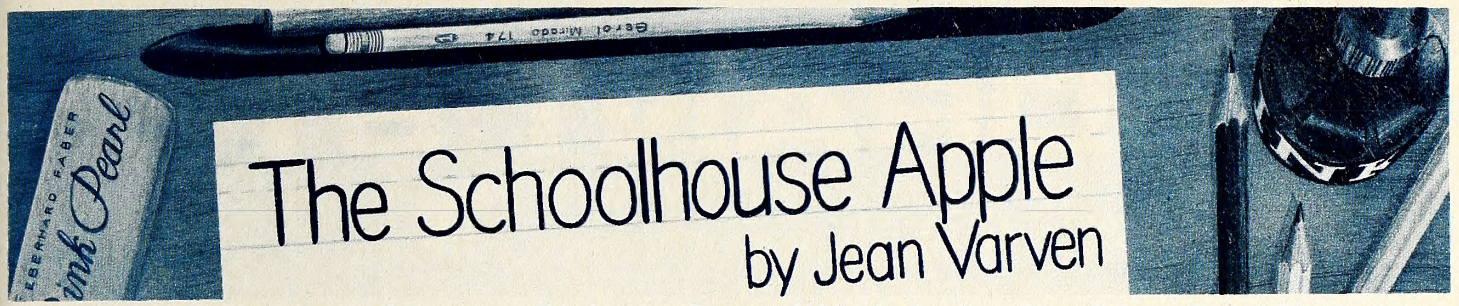

The Schoolhouse Apple

by Jean Varven

It's September—the beginning of a new school year. Fittingly, the September installment of Schoolhouse Apple marks the debut of an exciting new feature—James H. Muller's series of tutorials on the Logo programming language.

This month's column also features news about a development that will have real impact on computer science education in the years ahead and more company capsules.

So let's get started.

Jumping the Gun. What will high school seniors be doing in May of 1984? If everything moves along as scheduled, twelfth-graders who have done the appropriate course work will be attempting to pass an advanced placement examination in computer science. Those who succeed will receive college credit for their work.

Advanced placement examinations are not a new development. The College Board, the New York City–based organization that develops the tests, has offered AP exams in English, math, history, biology, chemistry, physics, and foreign languages for the past twenty-five years—and in art and music for the past ten. But an AP exam for computer science is real news. Coming at a time when educators are concerned with establishing standards for computer science instruction, it's bound to affect what high school students learn about computers.

Students who take AP examinations have usually prepared themselves by taking one or more special high school courses. These courses are designed to cover material outlined in a detailed course description issued by the College Board.

Once the College Board decides to offer an AP test in a particular subject area, a committee of educators begins the difficult task of determining what knowledge and skills the examination should test—and what a course for teaching this material to high school students might look like. An important aspect of this process is determining what first-year courses at representative "target colleges" are like so that high schoolers really will be doing equivalent work.

Harlan Hanson is the College Board's director of advanced placement tests. After discussing the notion of a new mathematical sciences option with some colleagues, Hanson assembled a group of "curriculum coordinators" to assess the possibilities.

The group was to consider whether to design an AP course in linear algebra, probability/statistics, or computer science. The committee strongly recommended computer science and gave reasons not to offer courses in the other two subjects.

Bringing a small group of high school and college educators together under the chairmanship of Professor Stephen Garland of Dartmouth College, Hanson asked the educators to act as if they were a development committee and see how far they could get in developing a serious first-year college course.

The formal course description is now nearly ready and will be issued this fall. This means that courses to prepare students for the AP exam are likely to begin in the fall of 1983. Why the delay? Well, before the high school courses are taught, many teachers will be going back to school.

The committee devising the AP course decided that students must know Pascal in order to pass the advanced placement test. The committee's feeling is that Pascal is the only structured language commonly available for testing students' programming methodology. This means that instructors who have been teaching their students Basic, Fortran, or some other programming language have busy times ahead.

The College Board will be helping member schools set up Pascal institutes next summer. A mock course has already taken place at Carleton College in Northfield, Minnesota.

Two possible approaches have been considered. The first is to offer teachers an accelerated AP course of the type they will need to teach in order for their own students to pass the AP test. The second is to have an experienced advanced placement teacher come in and talk about what he or she teaches and why. Although the second approach would seem to be a valuable one, there may not be enough experienced advanced placement teachers who know Pascal to meet the demand.

Harlan Hanson stresses that the advanced placement course and exam are not cast in stone. This is just meant to be a beginning, "an opening up of the machinery of the AP program to computer science." Although Pascal is the language of choice right now, it's possible that additional languages may be acceptable later on.

The next step in the process is for mock examinations to be administered at cooperating test-site colleges. This will enable the College Board to assess whether the kinds of test questions being asked are useful, representative, fair, and appropriate when measured against what colleges are actually covering in a first-year course. In addition, there will be annual revisions to the exam based on feedback from colleagues.

In a future column, we'll tell you about the computer science course description and about educators' reactions to it.

More Software Sources. Now here's some background information on half a dozen companies that create educational materials for the Apple market.

The Learning Company, 4370 Alpine Road, Portola Valley, CA 94025; (415) 851-3160.

Founded earlier this year, the Learning Company develops educational software for use by children of ages three through thirteen. Rather than seeing the computer as a teaching tool that's best used for drill and practice, the Learning Company emphasizes the computer's potential as a tool to help children learn conceptual thinking. Suitable for use in home and school, the programs are interactive and use graphics and music to help retain learners' interest.

According to Jack B. Smyth, president of the Learning Company, programs are designed to "expand a child's potential for creativity through logical thinking." Before release, programs are tested in a variety of settings, including elementary and nursery schools, learning centers, museums, and homes.

The company's products include *Moptown*

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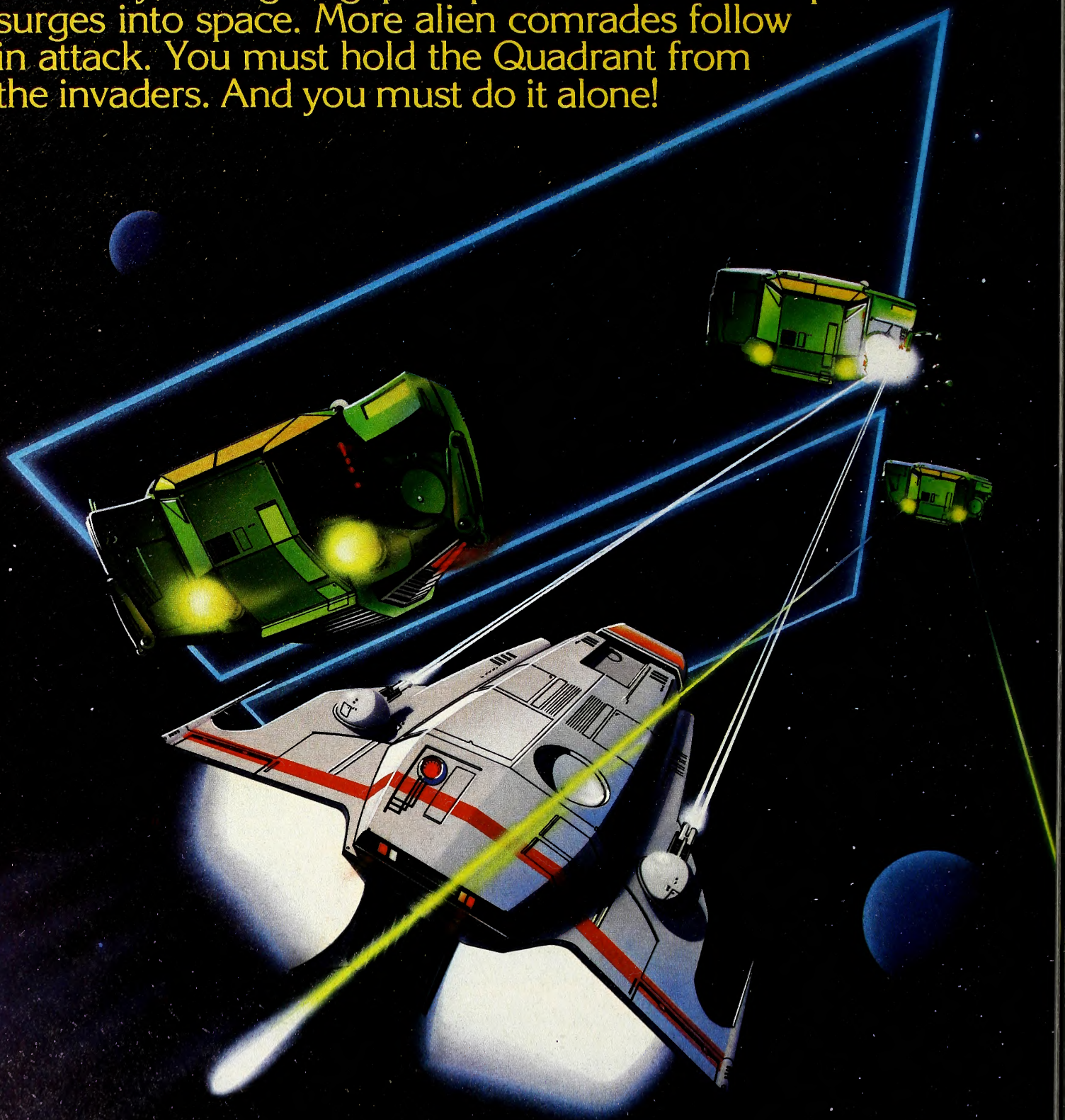

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and *Magic Spells*, two programs from Advanced Learning Technology and available through Apple's Special Delivery Software. These programs draw on the earlier work of Ann Piestrup, the educational psychologist who founded Advanced Learning Technology in 1979. Piestrup is the Learning Company's founder and chairman of the board.

Juggles' Rainbow, *Bumble Games*, and *Bumble Plot* are three programs of more recent vintage that relate to one another and are intended to be "building blocks" of learning that guide youngsters through progressively more difficult material as they are ready for it. *Juggles' Rainbow* teaches children ages three through six the concepts left, right, up, and down, as well as introducing them to using the computer. In *Bumble Games*, children ages four through ten learn such things as how to understand charts and graphs, how to describe locations on a map, and how to do basic computer graphics. *Bumble Plot*, designed for learners ages eight to thirteen, brings in positive and negative numbers and encourages learners to build on the information they acquired through playing *Bumble Games*.

Mathware, 919 14th Street, Hermosa Beach, CA 90254; (213) 379-1570.

This company gets its name from the *Mathware Basic Math System* (reviewed in *Softalk*, May 1981), a five-disk system for teaching math skills to children in grades three through eight. Formerly a part of Math City, a math tutoring service based in Palos Verdes, California, Mathware became a separate software development company in April of this year.

Written by mathematician Bob Essertier, the *Mathware* system comes in both classroom and home versions. It can be set to varying levels of difficulty. In addition, the difficulty level changes within the lesson as learners demonstrate the ability to handle more challenging problems or the need for simpler ones. Topics include addition/subtraction, multiplication/division, fractions, decimals, and ratios/percentages.

Essertier especially enjoys developing CAI materials, but for the last year and a half, he and partner Tom Brock, a former secondary school principal, have been working on a comprehensive administration package for schools. The system, now going through extensive testing at three school sites, requires a hard disk and can accept information from individual computer stations hooked up through the Ominet system or from a central computer.

The three modules that have been created so far—*Basic Data, Attendance*, and *Current Scheduling*—all share the same data files, as will a fourth module, *Future Scheduling*. The system has been set up so that schools will be able to establish their own data fields. And, according to Essertier, they've paid special attention to the complicated legal requirements with regard to attendance.

Reader's Digest Services, Pleasantville, NY 10570; (914) 769-7000.

Reader's Digest Services is the personal computer publishing division of the Reader's Digest Association. According to corporate and public affairs associate Bruce Trachtenberg, "Programs carrying the Reader's Digest logo will be as easy to use as possible," structured so that users don't have to spend a great deal of time learning to use them. The company's plan calls for documentation to be brief and clearly and simply written.

Programs in the company's educational software series are known as Edu-Disks. The first one, released by the company earlier this year, is a mathematics assessment and reinforcement package developed under contract by Cybertronics International (Morristown, New Jersey) for children in grades one through seven. It features pretesting and posttesting and specific exercises designed to improve learners' math skills.

Two new Edu-Disks are scheduled for release in late fall of this year. The first is *Problem-Solving Strategies*, a program for learners ages ten and up that teaches logical thinking and decision making through programmed exercises in graphing, diagramming, and creative number lines. The second package is the *Vocabulary/Language Arts* series being developed by Prentice Associates (Boston, Massachusetts). The three animated word-game programs included here are designed to increase learners' vocabulary skills.

Recently, Reader's Digest Services announced the finalization of a two-year agreement with Apple Computer by which the Digest Company will develop and market Apple-compatible educational software. Apple will provide technical information, computer training for Reader's Digest personnel, access to computers, and marketing support.

SouthWest EdPsych Services, Box 1870, Phoenix, AZ 85001; (602) 253-6528.

The programs created by this eighteen-month-old company draw on the expertise of an educational psychologist, a programmer, and content experts in various subject areas. SouthWest EdPsych Services president Marley Watkins is the educational psychologist, Larry Johnson is the chief programmer, and practicing teachers are the program consultants.

Watkins bought his Apple about three and a half years ago, intending to write statistical programs that would help him in his research. Following through, Watkins did write some statistics programs and, along the way, discovered some of the other things the computer made possible. The result was the formation of SouthWest EdPsych Services.

The company's education programs include *The Math Machine* and *The Spelling Machine*, both designed primarily for elementary school children. Intended as supplements to classroom instruction, the programs feature individualized lessons to help students learn at their own pace, color graphics and sound as learning reinforcement, and immediate feedback. Both programs come with manuals that can be used by teachers and parents and a record keeping system to track learners' progress.

The Reading Machine, a program that teaches the reading skills typically taught in kindergar-

ten through third grade, is scheduled for release this fall.

In addition to two educational games, *Spelling Sorcery* and *Math Wars*, the company offers *Cactus Grade Book*, a menu-driven gradebook system designed with the novice computer user in mind.

Spinnaker Software Corporation, 26 Brighton Street, Bemont, MA 02178; (617) 484-8444.

This brand-new company intends to market learning games that are especially intended for use in the home. The company principals, Bill Bowman and David Seuss, believe there is far too little software for the home that successfully combines educational value and entertainment.

Several programs are scheduled for release by Spinnaker this fall. *Face Maker* is a "software toy" for first-time computer users ages five through eight. This program introduces children to menus and symbols, and gives them the opportunity to communicate with the computer via the joystick. *Face Maker* teaches how the computer can be used to create and manipulate graphic images and enables children to write very simple programs to animate the faces they create.

Story Machine, a learning game for children ages five through nine, teaches children to communicate with the computer via the keyboard and helps them develop the ability to write sentences and paragraphs using words taken from a supplied list. The computer animates the sentence or paragraph that has been created and the animated sequence is accompanied by appropriate sound effects.

The Granite Point Ghost, the first scenario in the Snooper Troops interactive mystery series (created by Thomas Snyder, author of the *Search Series* for McGraw-Hill), should be available now. Computer users who attempt to solve the mystery of what happened to the old Cable mansion on Thursday, April 6, will acquire note-taking and mapping skills. They'll also be called upon to devise information-gathering strategies, to screen, classify, and relate information, and to develop and test out their hypotheses.

Terrapin Update. The Terrapin Logo package (reviewed in the July issue) contains two disks, not one. The second disk is a Logo utilities disk.

Hal Abelson's *Logo for the Apple II* is now part of the package in book form. Registered owners of the original Terrapin Logo package will receive the book and a new tutorial automatically. ◨

A Schoolhouse Apple Tutorial

LOGO The Voice of THE TURTLE

BY JIM MULLER

Most adults grew up with the idea that math is a computational system of adding, subtracting, multiplying, and dividing numbers. In school, math was a series of tables and formulas, memorized along with other subjects such as spelling, states and capitals, foreign language vocabularies, and historical dates. While teachers may have had good intentions, little was done to teach students how to think.

Maybe this is why the language Logo has been misunderstood by so many adults. They see it only as a series of graphics commands that allow young children to draw geometric shapes on the computer. Just as they don't perceive mathematics to be a universal problem-solving language, they don't perceive or appreciate the flexibility and lack of inhibiting constraints in Logo.

Logo has a deceptively simple premise. If you want the computer to do something for you, you simply teach it how. Preschoolers use Logo to teach the computer to scribble while college students use it to gain a better insight into Einstein's theory of general relativity. Logo users can dabble in anything from circles, squares, rectangles, and triangles to vector analysis, solid geometry, curved space, and Newtonian dynamics.

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Logo can be likened to the game of chess. Players can learn and use the basic moves at a very young age. But a number of lifetimes can be spent learning the virtually infinite variety of combinations of moves that make up opening, middle, and end-game strategies.

The primitive commands of Logo can also be learned very quickly. But exploring the variety of combinations—not only of the Logo primitives, but of user-defined Logo procedures—can take another variety of lifetimes.

Let's take a short look at the game of chess—and at Logo.

The pawn in chess is the foot soldier, capable mostly of moving forward one step at a time. On its first move, however, the pawn may move two spaces. And to capture another piece, it can only move diagonally.

In Logo, this can be represented by a simple procedure.

```
TO PAWN
MAKE "KEY RC
IF :KEY = "1[FORWARD 2]
IF :KEY = "F [FORWARD 1]
IF :KEY = "L [LEFT 45 FORWARD 1]
IF :KEY = "R [RIGHT 45 FORWARD 1]
IF YCOR = 8 [QUEEN]
SETH 0
PAWN
END
```

This procedure and the one that follows tell a pawn how to move. If you enter a one, the turtle moves forward two steps, in that this is the first move. Thereafter, moves are made with the F key. To capture, you can move the pawn diagonally forward left or right. After each move, the heading of the pawn is turned back to 0, to keep it moving up the screen.

Should the pawn reach the other side of the board, at square 8, the player can exchange the pawn for any other piece. In this case, we have selected a queen. Of course, all of the conditional procedures could be written to select any piece. However, for the sake of an example, the queen was selected.

```
TO QUEEN
MAKE "KEY RC
IF :KEY = "F [UP]
IF :KEY = "B [DOWN]
IF :KEY = "R [SIDERIGHT]
IF :KEY = "L [SIDELEFT]
IF :KEY = "N [DIAGUPLEFT]
IF :KEY = "M [DIAGURIGHT]
IF :KEY = "X [DIAGDNLEFT]
IF :KEY = "Z [DIAGDNRIGHT]
SETH 0
QUEEN
END
```

The queen poses another problem in that it can move more than one space at a time. The first lines of both procedures—PAWN and QUEEN—tell the computer to make the variable KEY equal to the input from the keyboard. Where the pawn can only move one space at a time, writing the procedure to accomplish that type of move requires a definition for that single key input.

With the queen, however, inputs for both direction and the number of spaces are required. Thus, the input from the keyboard needs to call another procedure to define the distance. For example:

```
TO DIAGUPLEFT
MAKE "DISTANCE RC
LEFT 45
FORWARD :DISTANCE
SETHEADING 0
QUEEN
END
```

Similar procedures can be written for all of the directions by simply changing the second line to face the turtle in the proper direction.

An interesting element of this series of procedures is the use of procedures to call themselves and other procedures. Logo offers this global type of capability wherein a defined procedure can be used to communicate with another procedure or itself through input and output functions.

Another interesting aspect demonstrated here is the interactive nature of Logo. Any of the defined procedures can be run independently by simply entering the name of the procedure. PAWN, QUEEN, DIAGUPLEFT, and all of the other direction procedures become new Logo commands that can be used within the hypothetical chess game or to provide a scribbling procedure for preschool children. To do this, however, might require creating some additional procedures to draw curves.

Apple Logo has arc and circle procedures written into a STARTUP file on the disk supplied. Of course, it is possible to write your own procedures that will allow a youngster to draw curved lines and circles. Here's one example of such a procedure.

```
TO C
MAKE "KEY RC
REPEAT 360/:KEY [FORWARD 1
  RIGHT :KEY]
```

In this case, the youngster enters a C and a number—the higher the number, the smaller the circle.

One of the other interesting features of Logo not demonstrated here is the capability of using not only numbers and character strings but also lists and procedures as variables. This gives you far more control over how the computer will interpret and use the language.

At the Young Peoples' Logo Association learning center in Richardson, Texas, youngsters have developed some increasingly complex procedures that draw people, that use two and three dimensional drawings, and that play complex word and graphic games. Most importantly, working with Logo has taught them to think, to use the computer for what it can do best—compute—and to allow them to do what they can do best—imagine.

As Einstein said, "Imagination is more powerful than knowledge." If you want to find out just how powerful, try your hand at Logo.

James H. Muller is president of the Young Peoples' Logo Association, 1208 Hillsdale Drive, Richardson, TX 75081; (214) 783-7548.

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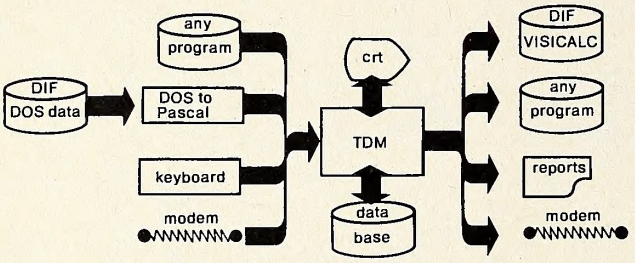

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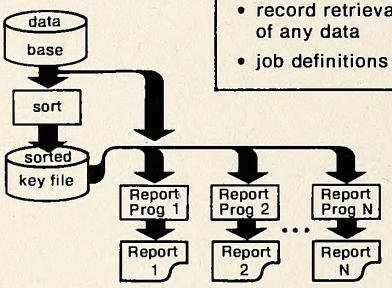

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PASCAL SYSTEMS

THE PASCAL PATH

By Jim Merritt

Tools of the Craft, Part 15

Heartiest congratulations go out to anyone who answered last month's challenge: to design and build the procedure IntegerOutput, which generates the character representation of an Integer value and deposits that character sequence into a specified output file. This *data conversion* procedure complements IntegerInput, presented last month as an example of the mechanisms that underlie the predeclared standard procedure Read. IntegerOutput, of course, represents the type of process that goes on in the bowels of Write. Here's a version of IntegerOutput that uses only the Pascal language features and programming techniques that we've studied so far:

```
PROGRAM
 TestIntOut;
 VAR
  I
   :Integer;
 PROCEDURE
  IntegerOutput(VAR
              OutFile
                :Interactive;
            Source
              :Integer);
  (* DESCRIPTION: Copies the character
     representation of Source to the Specified
     OutFile . . . character representation begins
     with hyphen if Source is negative, and is
     unsigned if Source is 0 or positive. *)
  CONST
   (* The following constant (HighPlace) must
      equal 10 raised to the power
      Trunc(Log10(MaxInt)). This guarantees that
      this routine can handle AT LEAST all
      Integers from the range -MaxInt .. +MaxInt.
      Do you see why? *)
   HighPlace = 10000;
   Base=       10;       (* Base 10 arithmetic *)
  VAR
   PlaceValue,
   Digit
    :Integer;
   FoundNumStart
    :Boolean;
 BEGIN (* IntegerOutput *)
  IF (Source < 0) (* is negative *)
   THEN (* emit leading hyphen *)
    Write(OutFile, '-');
  (* Now, display the magnitude of Source, one
     digit at a time. Always display the leftmost
     digit, then discard it, until all digits have been
     displayed. *)
  Source := Abs(Source); (* Get magnitude *)
  PlaceValue := High Place; (* Ready to look at
                               highest position*)
  FoundNumStart := False;
  REPEAT
   (* Get the leftmost digit *)
    Digit := (Source DIV PlaceValue);
   IF (FoundNumStart (* already *)
     OR (Digit <> 0)
     OR (PlaceValue = 1) (* guarantees that 0
                            will be handled
                            properly *))
    THEN
     BEGIN (* Display valid digit *)
      (* We've begun to display the number *)
       FoundNumStart := True;
      Write(OutFile, Chr(Digit + Ord('0')));
     END
    (* ELSE, the digit is a "leading zero" that
       should be ignored. *);
    (* Remove the leftmost digit *)
     Source := Source MOD PlaceValue;
    (* Now, have PlaceValue reflect that of the
       NEW leftmost digit; get ready to look at that
       position. *)
     PlaceValue := PlaceValue DIV Base;
   UNTIL (PlaceValue < 1);
     (* We only need go as low as the "ones'
        place." *)
  END   (* IntegerOutput *);
BEGIN (TestIntOut)
  WriteLn;
  FOR I := MaxInt DOWNTO -MaxInt DO
    BEGIN
      IntegerOutput(Output, I);
      WriteLn(Output);
    END;
  WriteLn;
END   (TestIntOut).
```

How It Works. First, IntegerOutput emits the minus sign, if necessary. Once this is done, Source's possible negativity is irrelevant, and so the parameter is transformed into its own absolute value (magnitude) in order to simplify succeeding calculations. Remember that modifying the value of a regular parameter within a procedure or function is permissible and does not affect the value that is stored in the corresponding actual parameter (in this case, the global variable I). Regular parameters are, as we've learned, true local variables that are initialized by Pascal with the values of their associated actual parameters at the time of the procedure or function call.

The strategy for displaying the character representation of Source is a simple one: we know that no Integer in Apple Pascal consists of more than five digits, so we arrange to scan through each possible digit position, moving from leftmost (most significant) to rightmost (least significant). Displaying the entire number is simply a matter of extracting and displaying the character that corresponds to the digit value in each position.

It turns out that, rather than "extracting" each digit as we need it, it's easier to keep "slicing" the leftmost digit from Source and discarding it when it is no longer required. To make this possible, we declare and use the variables Digit, which will hold each digit value in turn, and PlaceValue, which arithmetically identifies the leftmost remaining digit position in the ever-shrinking Source. Initially, PlaceValue is set to HighPlace, or the leftmost possible digit position.

To "slice off" the leftmost remaining digit in Source, we assign to Digit the value (Source DIV PlaceValue). Suppose Source is greater than or equal to PlaceValue. Then Digit would be left holding a nonzero value. If Source is smaller than PlaceValue, Digit would contain zero.

To discard the leftmost digit and prepare to "slice away" its neighbor to the right, we compute (Source MOD PlaceValue) and assign that value back to Source. Then, we compute (PlaceValue DIV Base) and make that the new PlaceValue. The process is repeated until PlaceValue is less than one. Note that the rightmost possible digit position is being examined when PlaceValue contains one, so the display loop should certainly terminate after that iteration. As a matter of fact, both PlaceValue and Source will contain zeroes at the termination of the display loop.

Incidentally, what do you think would happen if the loop continued for one more iteration, past that in which PlaceValue contains one? If you're curious, rewrite the REPEAT-UNTIL loop's terminal condition to be "(PlaceValue < 0)", then recompile and execute. If anything bizarre happens (and it should), follow any directions that the Pascal system writes on your video screen.

And a Zero Shall Lead Them. The display strategy described above doesn't mirror IntegerOutput perfectly; indeed, it includes a subtle quirk that IntegerOutput does not. Simply, unless special measures are taken, all values of Source will be displayed with the same number of digits (five, in keeping with the declared value of HighPlace). Thus, 32767 would be displayed correctly, as

```
32767,
```

but 23 would be displayed in a more awkward form, as

```
00023,
```

and so on. To prevent IntegerOutput from displaying these unnecessary "leading zeroes," we use the variable FoundNumStart, which is set True during the rightward digit scan whenever a nonzero digit is encountered. (Its initial value is False, and it is left untouched if a digit position contains a zero.) By examining the IF-condition that guards the writing of a digit to OutFile, you can see that all nonzero values are dis-

played, while zeroes are generally displayed only once FoundNumStart becomes True. Note that the IF-condition also ensures that the least significant digit will always be displayed, whether or not it is zero and regardless of the value of FoundNumStart. This guarantees that at least one digit will be displayed for any Integer, including zero itself.

Trouble in Paradise. There is a potentially serious limitation built into IntegerOutput as presented above. Certainly, the procedure will compile and execute in the Apple Pascal system. In fact, it will function properly for all valid Source values and OutFile destinations. But, theoretically, it works only for those Integer values in the range −99,999 to 99,999, due to the declared value of the constant HighPlace. This restriction doesn't limit the Apple Pascal programmer, of course, since the largest valid Integer magnitude is 32767. Thus, IntegerOutput is more than a match for any possible Integer value in Apple Pascal. However, it's just like Apple to keep improving the Pascal system, so some future release of Apple Pascal may permit you to work with a substantially expanded range of Integer values. The method of data conversion discussed, which works for Apple Pascal 1.0 and 1.1, may not necessarily work for the "enhanced numerics" of this hypothetical future Pascal system. To take advantage of the new system feature, you would have to modify the constant HighPlace such that its new value would be the power of 10 that is less than or equal to (but not greater than) the new largest Integer magnitude (as 10000 is to the current largest magnitude, 32767).

Write your programs and routines in as general a form as possible so that you will find it easy to modify them, when necessary, to accommodate data values that you did not (or could not) foresee in the original design. To respond to a change in the range of Integers available on any given Pascal system, you need change only one constant in IntegerOutput. That's not bad! But recall the complementary procedure, IntegerInput, which we studied in a previous issue. In its original form, IntegerInput is capable of converting *any* stream of input digits into an Integer. It does not have to be modified at all if the system's capabilities change.

Can we write a version of IntegerOutput that, like IntegerInput, is immune to reasonable evolution of the Pascal system? Yes, if we're willing to put up with some redundant "scanning" of the parameter Source. The trick is to initialize PlaceValue to reflect not the maximum, but rather the *actual* number of digits in Source before control passes to the display loop. To do this, you must insert another loop into IntegerOutput prior to the display loop, one that "prescans" Source and sets PlaceValue accordingly, as in the following version of the procedure:

```
PROGRAM
 TestIntOut;
 VAR
  I
   :Integer;
 PROCEDURE
  IntegerOutput(VAR
              OutFile
               :Interactive;
             Source
              :Integer);
 (* DESCRIPTION: Copies the character
   representation of Source to the specified
   OutFile . . . character representation begins
   with hyphen if Source is negative and is
   unsigned if Source is 0 or positive. Works for
   all possible Integer values. *)
  CONST
   Base=      10;      (* Base 10 artithmetic *)
  VAR
   PlaceValue,
   Digit
    :Integer;
 BEGIN (* IntegerOutput *)
  IF (Source < 0) (* is negative *)
   THEN (* emit leading hyphen *)
    Write(OutFile, '−');
  (* Now, display the magnitude of Source, one
    digit at a time. Always display the leftmost
    digit, then discard it, until all digits have been
    displayed. *)
  Source := Abs(Source);   (* Get magnitude *)
  (* Build up PlaceValue to reflect actual number
    of digits in Source. *)
  PlaceValue := 1;
  WHILE ((Source DIV PlaceValue) > = Base)
  DO
   PlaceValue := PlaceValue * Base;
  (* We start by looking at highest position *)
  REPEAT
   (* Get the leftmost digit *)
    Digit := (Source DIV PlaceValue);
   (* Display it *)
    Write(OutFile, Chr(Digit + Ord('0')));
   (* Remove the leftmost digit *)
    Source := Source MOD PlaceValue;
   (* Now, have PlaceValue reflect that of the
     NEW leftmost digit; get ready to look at that
     position. *)
    PlaceValue := PlaceValue DIV Base;
  UNTIL (PlaceValue < 1);
  (* We only need go as low as the "ones'
    place." *)
 END   (* IntegerOutput *);
BEGIN (TestIntOut)
 WriteLn;
 FOR I := MaxInt DOWNTO −MaxInt DO
  BEGIN
   IntegerOutput(Output, I);
   WriteLn(Output);
  END;
 WriteLn;
END   (TestIntOut).
```

As you can see, by modifying IntegerOutput into a more general form we are able to simplify it as well. The new version of the procedure eliminates not only the constant HighPlace and the Boolean variable FoundNumStart, but also all the expressions that were concerned with the suppression of "leading zeroes." In the original IntegerOutput, HighPlace was used as an arbitrary guess as to the number of digits in Source. FoundNumStart, and the expressions that used it, were means by which the procedure could recover from a high first guess and avoid displaying zeroes for unfilled digit positions. The new method guarantees that the display will always commence with Source's true leftmost digit, because the position of that digit is determined prior to the display process, not during it.

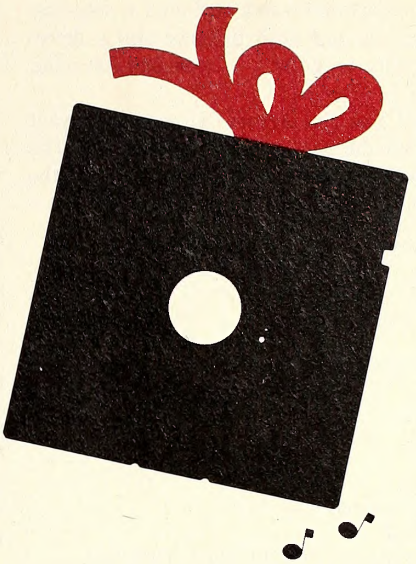
There are those who might look at the "double scan" of Source in the second version of IntegerOutput and decry the procedure's "lack of efficiency," believing that performing so many extra arithmetic operations just to determine the actual size of an Integer is very wasteful of the computer's resources. On the other hand, you should realize that input and output operations (such as Read and Write) are perhaps the slowest in any computer's repertoire. Generally speaking, both the Apple's 6502 cpu chip and the p-machine simulator perform arithmetic much more quickly than an I/O device can accept or deliver data. Thus, the "cost" of a few extra arithmetic operations in IntegerOutput is negligible when compared to that of putting out a single character using Write. In other words, nobody waiting for output should even be aware of the extra, preliminary scan, so it doesn't hurt to use it.

Even though the addition of the preliminary scanning loop does not noticeably degrade the performance of IntegerOutput, you may still wonder if it is possible to display the character representation of an Integer after scanning the number only once. In fact, we can do this by employing arrays, strings, or recursion. Arrays and strings are data structures that we will begin to study this month. Recursion is a programming method in which a procedure or function tackles a large problem by dividing it up into two or more similar, more easily managed parts, then calling "clones" of itself to handle each subsidiary part. We won't study recursion for some time; you'll learn how to program IntegerOutput recursively when the time comes. Alternative versions of IntegerOutput that use strings and arrays will be presented shortly.

The Case of the Phantom Procedures. Before we finally conclude our initial discussion of input and output, let's reflect upon the perhaps startling fact that Read, Write, and the "parameterized" versions of ReadLn and WriteLn do not actually exist (at least, not in the way that your own procedures and functions do). While processing your program, the compiler translates calls to these "anomalous" procedures into one or more calls to appropriate (and "invisible") data conversion procedures, similar in design and function to IntegerInput and IntegerOutput. For example, the call "Write(IntVal1, IntVal2)" (where IntVal1 and IntVal2 are Integer expressions) might be translated into the two successive calls, "IntegerOutput(Output, IntVal1); IntegerOutput(Output, IntVal2)". Similarly, "Read(Keyboard, RealVar, IntVar, CharVar)" might expand to "RealInput(Keyboard, RealVar); IntegerInput(Keyboard, IntVar); CharInput(Keyboard, CharVar)".

You are not permitted to call the actual procedures and functions that underlie Read and Write; indeed, you are not even supposed to know that they exist. They, and their similarity to procedures that we have developed here, are raised only to give you a feel for how the Pascal system actually functions and to assure you that the system, while complicated, is something that

Pssssstt...



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can be understood—and exploited wisely—by someone who has both patience and a determined desire to know . . . someone like you, perhaps?

Could You Use Arrays? Suppose you want to compute the sum of five input numbers. The program below shows one way of attacking the problem, using only three variables.

```
PROGRAM
 AddInp;
 CONST
  InputQuantity=
              5;
  FieldWidth= 6;
 VAR
  ValNum,
  NewInt,
  Sum
   :Integer;
BEGIN (* AddInp *)
 Sum := 0;
 FOR ValNum := 1 TO InputQuantity DO
  BEGIN
   Write('Please type value #',
   ValNum:FieldWidth, ': ');
   ReadLn(Input, NewInt);
   Sum := Sum + NewInt;
  END;
 WriteLn('The sum of ',
      InputQuantity:FieldWidth,
      ' input values= ',
      Sum:FieldWidth);
END  (* AddInp *).
```

Here is a typical session with AddInp; note that the numbers to the right of the colons are supplied by the user, and the symbol < CR > signifies a press of the return key:

```
Please type value #   1: 2<CR>
Please type value #   2: 4<CR>
Please type value #   3: 1<CR>
Please type value #   4: 5<CR>
Please type value #   5: 3<CR>
The sum of          5 input values=      15
```

If you change the value of the constant InputQuantity, you change the number of values that AddInp will accept and sum. Note that, given this program's structure, only three variables are ever needed to sum any number of input values. Now, let's change the rules of the game. Let's require the program to display not only the sum of the input data, but also the input values themselves. Immediately, the problem grows thorns. In order to display all the input values, the program must remember each one! For five Integers, the easiest way out (so far) is to declare five separate Integer variables, one to store each input datum.

```
PROGRAM
 AddInp2;
 CONST
  InputQuantity=
              5;
  FieldWidth= 6;
 VAR
  ValNum,
  NewInt1,
  NewInt2,
  NewInt3,
  NewInt4,
  NewInt5
   :Integer;
BEGIN (* AddInp2 *)
 FOR ValNum := 1 TO InputQuantity DO
  BEGIN
   Write('Please type value #',
   ValNum:FieldWidth, ': ');
   CASE ValNum OF
    1:
     ReadLn(Input, NewInt1);
    2:
     ReadLn(Input, NewInt2);
    3:
     ReadLn(Input, NewInt3);
    4:
     ReadLn(Input, NewInt4);
    5:
     ReadLn(Input, NewInt5);
   END (* CASE ValNum *);
  END;
 (* Generate a single line thus:
   The sum nn+nn+nn+nn+nn= nn *)
  WriteLn('The sum ',
       NewInt1:FieldWidth,
       '+',
       NewInt2:FieldWidth,
       '+',
       NewInt3:FieldWidth,
       '+',
       NewInt4:FieldWidth,
       '+',
       NewInt5:FieldWidth,
       '= ',
       (NewInt1+NewInt2+NewInt3+NewInt4+
        NewInt5)
         :FieldWidth
           );
END  (* AddInp2 *).
```

What would be necessary if we wanted to modify this second version of AddInp to handle even larger amounts of input—say one hundred Integers, or one thousand? You are absolutely correct! The programmer would spend an insufferable amount of time entering repetitious instructions. Are you thinking: "But loops are supposed to save us from drudgery! We know how many input values we need, and ValNum indicates the particular one that we're getting at any given instant. Can't Pascal use ValNum to find, automatically, the right NewInt for each datum?" No, the declarations of NewInt1 through NewInt5 do not permit this. On the other hand, if you express these five variables as an *array*, you can do exactly what you have in mind.

Birds of a Feather. An array is a collection of variables, all of which share not only the same type, but also the same name. Each individual variable in the array is an *element* of the array. Because one identifier refers to all the elements in an array, you must append extra identification to the array name in order to specify an individual element, just as you must include more information than merely a street name in order to identify a particular building. This extra "addressing" information is called an *index* (also, a *subscript*). An index is nothing more than an expression that evaluates to an Integer or enumerated value. This value is taken as the "address" of a single element within the array.

When referring to an array element, you place the index between square brackets immediately after the array name. Thus, if the index for a particular element of the array X is 47, then X[47] refers to that single element (and to no other). If an Integer variable InxBase con-

tains the value 3, then X[3*InxBase+2] names the same array element as X[11]. Note that every time an array element is accessed, an index must be computed.

It may not be immediately obvious, but Apple II keyboards generate both the left and right bracket, albeit with some difficulty. To type the left bracket, you must hold down the control key and the K key simultaneously. For the right bracket, press both shift and M, together. The proper strategy is to press the control or shift key first, hold it down while you tap the appropriate letter key, then release it. You've probably been doing this all along; still, even those who are experienced with keyboard work will sometimes let their fingers get ahead of their thoughts.

While indices are most usually Integer numbers, they need not be. In fact, values taken from any enumerated type, whether built into the Pascal language or defined by the programmer, may be used as array indices. Thus, Integer, Boolean, and Char values are all eligible, as are values from types Color and WeekDay, which we invented for our own purposes in past issues. Only real numbers are forbidden to act as indices, and this has never bothered any programmer of my acquaintance—to the best of my knowledge, nobody has ever been able to make use of, say, the 3.1415th element of an array.

How To Ask for Arrays. Of course, arrays must be declared, just like all other variables. If you want an identifier to name an array, the type you give it must specify an array structure. Figure 1 gives the syntax diagrams for an array type descriptor. Such a definition may be used directly, in a VAR declaration, or associated with a type identifier of your choice in a TYPE declaration. (The type identifier alone may then be used to stand for the entire array specification in subsequent TYPE and VAR declarations.)

The key elements in an array type descriptor are the *index descriptor* and the *element type descriptor.* The index descriptor specifies the values that may be used to index the array and, by implication, the number of elements in the array. For instance, the declaration "Test: ARRAY [Boolean] OF Real" describes an array containing two Real-number elements, Test[False] and Test[True], while "Test2: ARRAY [1024..3071] OF Char" creates an array of 2,048 single characters. According to the definition of Test2, the array contains no such elements as Test2[10], Test2[1023], Test2[3072], or Test2[4000]. The only legal index values for Test2 lie in the range 1024..3071.

As you can see from looking at the railroad diagrams in figure 1, the index descriptor may be a single identifier that encompasses an entire enumerated type of subrange type, an explicit subrange specification, or an explicit enumeration. Notice that this forces the upper and lower bounds on array indices to be defined, directly or indirectly, as constant values. In other words, the size of an array is fixed in its declaration; an array may not "grow" or "shrink" during program execution (although we will learn techniques for simulating such behavior in months to come).

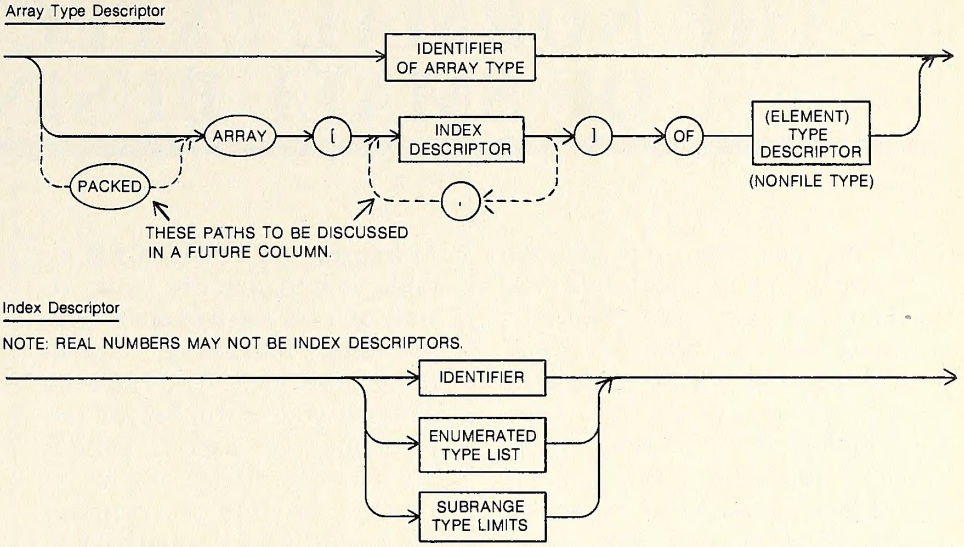

Figure 1.

The element type descriptor designates the data type that is shared by all the elements in the array. An "ARRAY [1..10] OF Char" contains ten single-character elements, while an "ARRAY ['A'..'Z'] OF Boolean" contains twenty-six separate True or False values.

Only files are not permitted to be array elements in Apple Pascal. (This is an arbitrary restriction that doesn't apply in all versions of the Pascal language.) Variables of all other data types are suitable as array elements. In particular, a single element of an array may itself be an array, which in turn includes arrays as elements, and so on. Such an array is said to be multidimensional because two or more indices are required to specify a single, indivisible datum. Although detailed coverage of multidimensional arrays must wait until next time, note

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that the syntax diagram in figure 1 includes explicit provision for specifying more than one index in an array declaration.

Examine the following array type and variable declarations and work through the syntax diagrams to convince yourself that each, in fact, obeys the rules of Apple Pascal. (Several declarations specify multidimensional arrays. Which ones, and how many dimensions do they have?)

```
TYPE
 Color= (* enumerated type *)
  (Red, Yellow, Blue);
 CharArray=
  ARRAY [1..10] OF Char;
 IntArray=
  ARRAY [Color] (= that is, Red .. Blue *) OF
  Integer;
 ColorArray=
  ARRAY ['A'..'Z'] OF Color;
 AType2Dim=
  ARRAY [1..5] OF ARRAY [1..5] OF Integer;
 BType2Dim=
  ARRAY [1..5, 1..5] OF Integer;
VAR
 NewInt,
 OldInt
  :IntArray;
 C
  :ColorArray;
 Expl
  :ARRAY [(Low, Med, High)] OF IntArray;
 Flags
  :ARRAY [1..32] OF Boolean;
 D2A
  :AType2Dim;
 D2B
  :BType2Dim;
```

Even though it contains constituent variables that may be accessed separately, an array is a complete, individual entity in its own right, and may be treated as a whole. Thus, using a single assignment statement, you can assign values to individual array elements (for example, "NewInt[1] := 5"), or you can assign the entire contents of one array to another (for example, "NewInt := OldInt"). Of course, two arrays must be identical in size and type of element or the Pascal compiler will prevent wholesale assignment of one array to the other. As we amble down the Path, you will have plenty of opportunity to become familiar, and comfortable, with the dual nature of arrays.

To supplement our discussion with an executable example, here is AddInp3, which uses an array to bring simplicity back to the summation problem:

```
PROGRAM
 AddInp3; (* Uses arrays *)
 CONST
  InputQuantity=
              5;
  FieldWidth= 6;
 VAR
  ValNum,
  Sum
   :Integer;
  NewInt
   :ARRAY[1..InputQuantity] OF Integer;
BEGIN (* AddInp3 *)
 Sum := 0;
 FOR ValNum := 1 TO InputQuantity DO
  BEGIN (* Get a new Integer *)
   Write(Output,
       'Please type value #',
       ValNum:FieldWidth, ': ');
   ReadLn(Input, NewInt[ValNum]);
   Sum := Sum + NewInt[ValNum];
  END;
 (* Display the input values and summation *)
  Write(Output, 'The sum of ');
  FOR ValNum := 1 TO InputQuantity DO
   BEGIN
    Write(Output, NewInt[ValNum]:FieldWidth);
    IF (ValNum < InputQuantity)
     THEN
      Write(Output, '+')
     ELSE
      Write(Output, '= ');
   END;
  WriteLn(Sum:FieldWidth);
END   (* AddInp3 *).
```

Remember that, for every access to NewInt, an index must be computed. This implies that, for every loop iteration, the index to NewInt is recomputed to conform to the current contents of ValNum. As ValNum changes, NewInt's index values change, and so a different element of NewInt is affected for each iteration.

Once more, we have programmed our way into a comfortable situation where, in order to change the number of input values to be summed, we need only modify the value of a single constant, InputQuantity.

"There are dimensions other than the one we know." While that may or may not be a true metaphysical description of the universe, it certainly applies to arrays in Pascal. Next time, in keeping with the spooky holiday season, we'll discuss these extra dimensions and much more as we proceed further into the realm of arrays, records, and strings. ◻■

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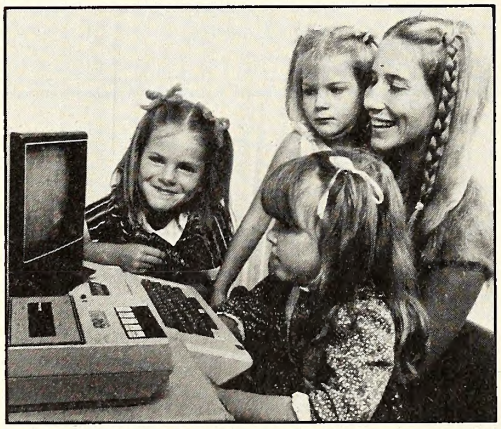

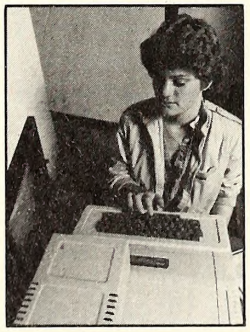

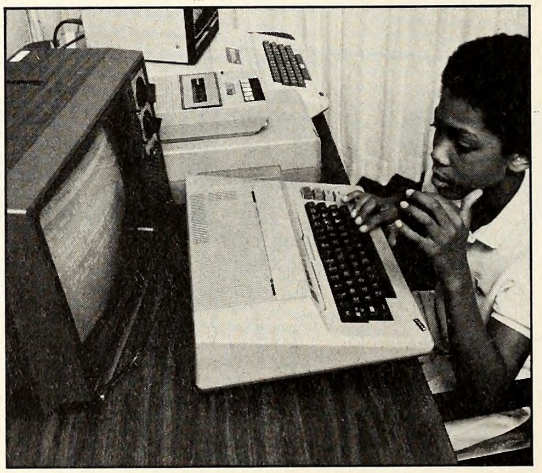

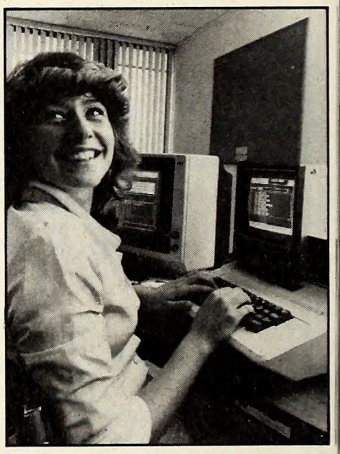

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*From a review in the "Instructional Computing Newsletter"; MECC, May 1982.

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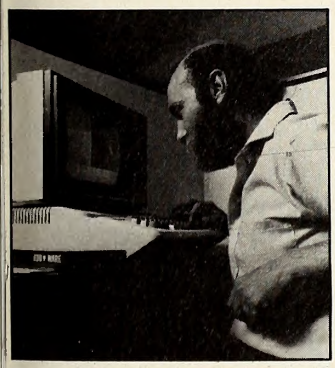

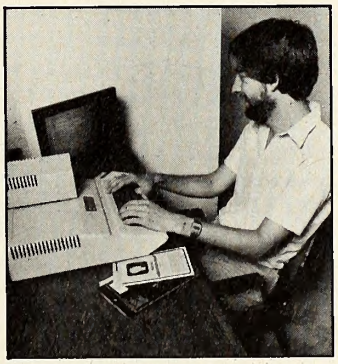

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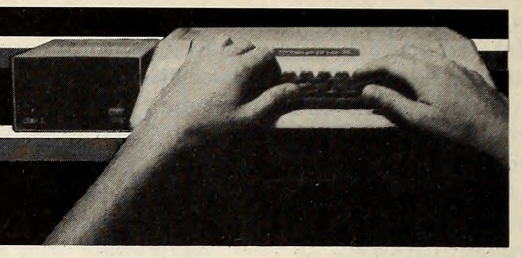

from page 140

fast, four-way shooting action. You're a space station in the middle of the screen, with alien ships blasting at you from north, south, east, and west. Keyboard controlled.

Third out of the chute is *Space Race.* You control rocketships trying to get from the cones of two volcanos at the bottom of the screen to an escape hatch at the top. Hundreds of anxious, radar-crossed bats mess up your right of way. This doesn't have the necessary primal charge of the others. Paddles only.

Finally, in *Mine Sweep* you control a nozzle blasting through a screenful of mesh, trying to clear it all away. Every time you think you've almost done it, a little weaving bug knits up a new batch of strands. The time keeps ticking away. Engrossing and impossible; a frustrator. Keyboard, joystick, or paddle controlled.

Four different games, most with reconfigurable keyboard controls, and each with its own challenges. What to do with all the money you save? Invest in a set of paddles or a joystick if you don't already have one. MF

Chuckles' Laf Pak, by Chuck Beuche, Sierra On-Line (36575 Mudge Ranch Road, Coarsegold, CA 93614; 209-683-6858). $34.94.

Client Management System II. By David J. Kalmick. The *Client Management System II* is a new and very complete law office billing and management control package that offers ease of use and great flexibility both in billing and in the number, type, and format of the many useful reports it is capable of generating.

The program has three major functions. First, it prepares prebills and monthly statements. The statements may be printed on your company letterhead, on preprinted accounting forms, or on plain paper for extra uses such as audit or file copies. The system has separate functions for regular hourly billing, the billing of cases taken under contingency, and the billing of trust accounts. The billings are normally done on a regular month-end cycle but it is very easy to issue interim statements or to set up your own billing cycle.

Second, the program prepares more than a dozen management reports, including Aged Accounts Receivables, Alphabetical Case Recap, Case Control Reporting, Case Histories (for single or multiple cases), Total Fees Billed by month, quarter, and entire year, showing fees billed, costs advanced, standard, contingency, and trust account income and unearned income, Total Fees Billed by each attorney, paralegal, and secretary, Financial Case Recaps, and several reports containing general ledger information showing current and cumulative totals for fees, cost advanced, and payments received, as well as hours spent this month, average hourly rate charged, and total balances due.

The last function is a unique and comprehensive docket schedule and critical-dates calendar. One of the unusual features is that the program can keep track of dates many years into the future, avoiding the year-end scramble to transfer dates from one calendar to another. In practice, daily ledger sheets are prepared by the computer showing what appear to be three-by-five-inch ledger cards. If the critical date is less than one week away, it will be printed one per sheet. If less than two weeks away, they are printed two per sheet; those further in the future are printed three per sheet. This system makes it possible to determine at a glance the urgency of each date. Each of these "cards" lists the day's date and the critical future date with the client's name, the names of the senior attorney and the responsible attorney, the matter to be taken care of, and the location and time at which all is to take place. Finally, at the bottom of the card in letters five times normal size are printed the number of days and weeks until the critical event will take place. These cards are printed on the sheets three weeks before the critical date. On the actual date, the word *Today* is printed in these giant letters!

Compu-Law has fully licensed the Apple Pascal System programs so that you need only have a RAM card to have full Pascal capabilities. This includes the ability to format and initialize the many disks needed for the operation of this program from within the program itself—a very convenient feature typical of the practical thought that went into the system during its two and a half years of development and testing.

Once the operation of the system is mastered, it is normally possible for a firm with up to ten people with billable time to enter all the necessary information in about four hours, depending on the total number of transactions and expenses. The system is set up so that it is a simple matter to enter all the necessary information.

The documentation is quite lengthy and detailed, but it is badly planned and organized. Despite the more than two hundred pages allotted to documentation, there is no hands-on tutorial.

Some of the terminology is disturbing. In a two-drive system, drive one is referred to as the program drive and drive two is referred to as data drive one. This could cause problems: the system, when configured as suggested in the manual, uses about thirty disks; in a large, busy office the disk storage could easily require more than a hundred disks and frequent disk swapping. After you become familiar with the system, these problems lessen.

With the original purchase of the program, Compu-Law or your dealer will have one of their experts spend up to a full day with you to help install the system and train an operator in its basics. After this, they make themselves available for telephone support as necessary.

But the critical program disks cannot be copied and no backup disks are available. Worn-out or damaged disks will be replaced by mail within twenty-four hours for $35 or by Express Mail for $45.

In short, while the system is very well conceived and executed, it is too complex and storage-intensive to be easily used on the suggested floppy disk system, except by smaller firms and storefront offices. For larger practices, the system should only be considered in conjunction with a high capacity hard disk storage system.

The program is written in Apple Pascal. Its compiler-generated UCSD Pascal code makes the program very fast, with little or no time wasted waiting for processing. The program is entirely menu-driven and self-prompting, which makes operator training relatively easy despite the flawed manual discussed earlier. RJR

Client Management System II, by David J. Kalmick, Compu-Law (5500 Lindley Avenue, Suite 223, Encino, CA 91316; 213-996-1810). $2,500.

The Curse of Crowley Manor. By Jyym Pearson. As part of Scott Adams's decision to add hi-res graphics to all of his adventures, Penguin's graphics have been added to this "Other-Venture" production.

The Curse of Crowley Manor, an intermediate-level adventure, stars you as Inspector Black of Scotland Yard. The scene is set in London, 1913. It starts with a telephone call telling you there has been a gruesome murder at the Crowley estate. Your job is to uncover the hideous secret of the manor and to bring the killer to justice. Drawing heavily on the occult and demonology, this adventure has several challenging sections.

One's powers of deduction and observation are constantly tested. Overlooking any one minor clue will cost you your soul in the end game, where one battles the forces of Hell itself! Dead bodies and signs of demonic influence abound. If you are lucky, a friendly wizard will provide aid and guidance in your quest. One last warning: Be careful or you may be eaten alive! RRA

The Curse of Crowley Manor, by Jyym Pearson, Adventure International (Box 3435, Longwood, FL 32750; 305-862-6917). $29.95.

Disk Directory Dater. By Leighton Paul. This is another straightforward, economical utility program from the Telephone Software Con-

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nection people, who seem to have a penchant for simple programs that perform a needed task in a simple manner.

The operation of the program is transparent to the user. The *Disk Directory Dater* modifies DOS to automatically date stamp a file name in the catalog listing whenever a file is saved or rewritten to the disk. Today's date is also displayed in place of the words "disk volume" at the top of the catalog screen.

The program is so well-designed as to be near-unbombable. The date that is placed in the program name is not significant to the running of that program. For example, Hello may be run by just typing *run hello* without the date. If you add the date to the run command it will still work. If your program name is more than twenty-one characters long, it will be truncated to twenty-one characters—but you can choose to type the whole name, the first twenty-one characters, the first twenty-one characters and the date, or the whole name and the date—and the program will run like a piece of cake. If a file is saved with the same name, the date will be changed to the current date.

If you have a clock card that uses the standard Mountain Computer Apple Clock format, this program will save a program named *Clock* that will automatically read your clock upon boot-up, reset the date for you, and then run the Hello program of your choice. If you want to manually set the date in either case, you need only type *in#b* and you will be asked to type in the desired date. The program will then update itself without further input from you.

All this is very nicely done without removing any DOS commands to make room for the *Dater* routines.

In these days of increasing paranoia concerning piracy and other sub-legal distribution schemes, the Telephone Software Connection has a refreshing attitude.

All *TSC* software, when ordered by mail, comes on high-quality Verbatim disks and is completely unprotected and listable. Most of the programs are self-documented in a clear and concise manner.

The only constraint in the use of *Disk Dater* is the requirement that the system be booted with a DOS master disk before merging the *Dater* with your disk's DOS. For obvious reasons, you should not attempt to use this program on disks that have any kind of copy protection or alterations to DOS.

If you do any amount of programming, and like to keep track of when a particular version of a program was saved without resorting to changing the name of each version, this routine would be a timely investment. RJR

Disk Directory Dater, by Leighton Paul, Telephone Software Connection (Box 6548, Torrance, CA 90504; 213-516-9430). $25.

Bez-Off. By John Besnard. *Bez-Off* is another entry in the burgeoning genre of game anthologies, an innovation of these economically worrisome times whereby you get several games for the price of one—some of which may even be pretty good.

The basic idea in *Bez-Off* is that you get one try at three different games rather than the usual three tries at one game.

All three scenarios continue the ongoing affair between Apple gamers and the insect world. The segment that lends the name to the game is similar to *Fly Killer*, a freebie of a few years back from the Tokyo Baked Apple user group, in which you manipulate your floating bug bomb against an increasing moth population, with killer dragonflies appearing at about level ten; here, the pests are bees. The stomp-'n'-squish contingent is represented by a stream of ants, a sugar cube, and a floating hiking boot. Avoid the scorpion. A spiderweb game with a floating pair of scissors appears to be unique unto itself.

Aside from their thematic unity, the three are not closely related, but the score is cumulative. After you finish one, you have your choice of going to one of the remaining games. They are all of the no-win type, with the denouement of each an inevitable capitulation before superior numbers of inferior life forms; a sound ecological lesson.

The graphics are straightforward, neatly avoiding all opportunities for gross sensationalistic effects.

Joystick only. AC

Bez-Off, by John Besnard, Bez (4790 Irvine Boulevard, Box 19633, Irvine, CA 92714). $32.95.

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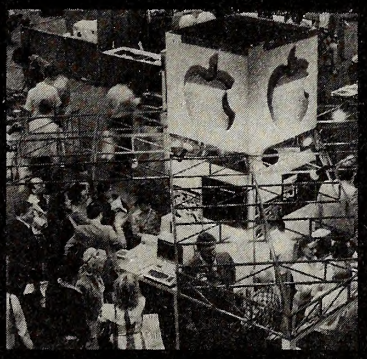

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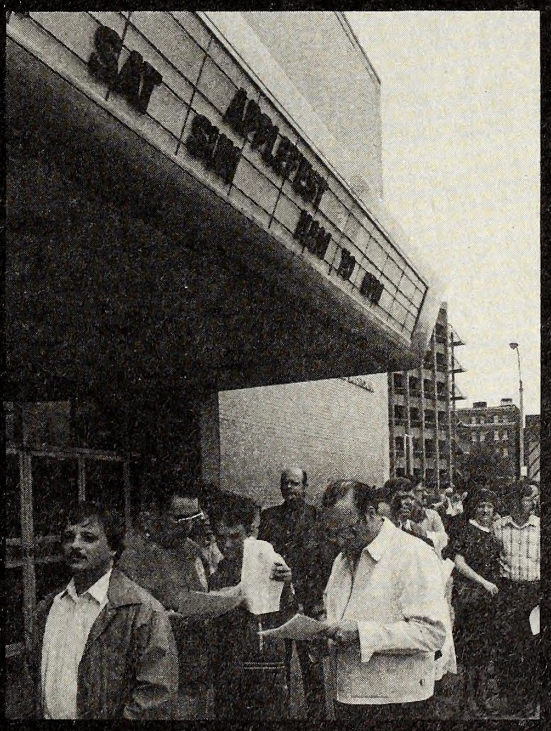

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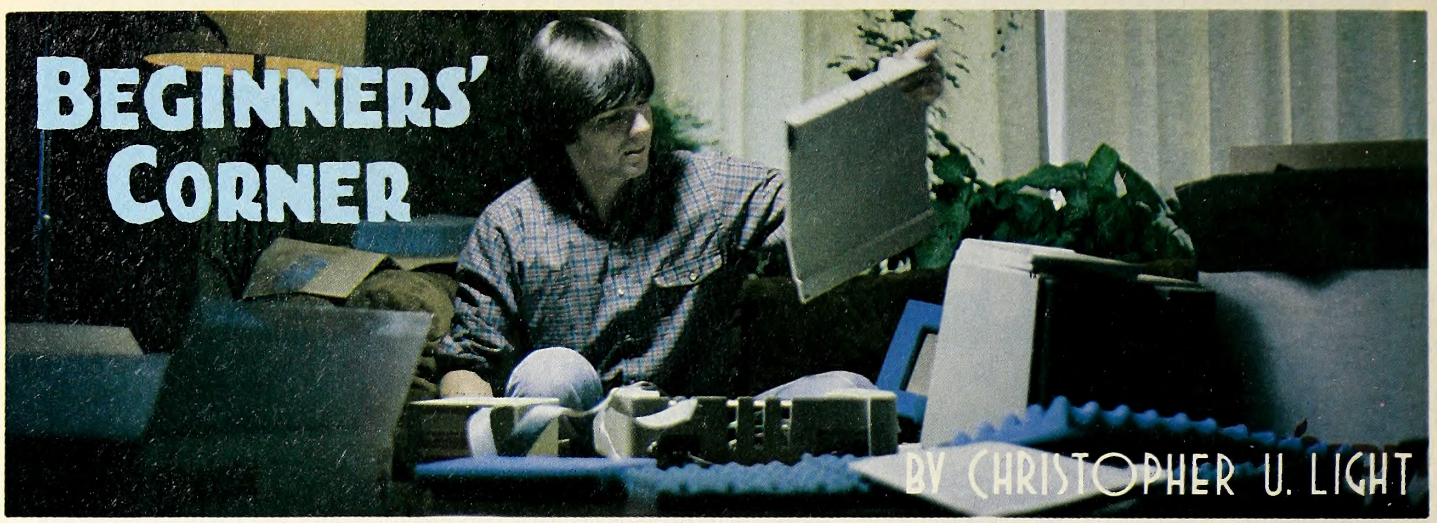

Dear Appley: My teen-age boy recently modified Clonesmith *to make it copy anything . . . and I mean anything—his Beatles records, his dog, his friends' homework, his worst enemy's worst enemy, and his Cheryl Tiegs poster. Now I'm afraid he's used it on himself. When I looked in his room, all of a sudden he had a twin brother, and they were fighting over who would get to use the Apple. What do I do?*

Unexpected Mother of Twins

Dear Unexpected: A child can grow to reach his full potential only if he has certain possessions that he can call his very own and need not share with siblings. Buy another computer for the second child. If you can't afford it, see if *Clonesmith* will copy the one you have.

Dear Appley: Since my husband has retired, he's never gotten out of his chair in front of his computer except to go to the kitchen for another beer. All day long he sits there staring at the screen muttering to himself, "For . . . next . . . goto . . . branch to sub 200." Because he's using our only television set for his monitor, I can't even watch "General Hospital." Please help.

At Witts End

Dear Witts: What you need is another man. When your husband leaves to get a beer, go to the computer and dial the Sauce. When you're connected, call up Spouse.Net, and you'll see a dozen or so names and resumes. If a temporary arrangement will be sufficient, call for Swap.Net. That one has thousands and thousands of names, and I'm sure you'll find at least one who's compatible.

Dear Appley: Me and my friends are into Wizardry. *Last night, Tommy—he's a level six gnome—snuck into where the computer is and created maybe a hundred new characters, gave all their money to his character, and then deleted them. Now he has twenty thousand more gold pieces than we have. Is that fair?*

Greech the Hobbit (Level 11)

Dear Greech: You ask about fairness? I call it murder one! Call your local district attorney's office immediately. He should get at least the death penalty for this—if not much more.

Dear Appley: My boot disk drive is making an awful lot of clacking and grinding noises. Is there something wrong with it?

Concerned

Dear Concerned: I think it's okay. My hair dryer does that, too.

Dear Appley: Here's an Applied Advice I think your readers should know about. As you know, the Apple's game paddles are both exactly alike. They're both right-handed, so you can't have one in each hand. However, if you turn the left one around so the cord is facing you, then you can have one in your left hand as well as in your right and still push the buttons with your thumbs.

Ms. J. Nybble

Thanks to you, Ms. Nybble, and to all the rest of you for keeping those letters rolling in. Here are a dozen more of Dear Appley's Applied Advices:

1. Always have an initialized disk in your boot drive when you turn on your system. If you don't, someday you'll want to save a program you've written and find you can't because DOS was never loaded.

2. For the same reason, always have at least one blank initialized disk on hand to save files onto. And label it so you know that it is initialized. A good idea is to have one with the label "Working Disk" to use for temporary storage of anything you're working on. Because disks don't last forever, every so often reinitialize it to erase it completely, transfer to it some permanent files that you rarely refer to, store it, and break out a new one for the working disk (and initialize it immediately).

3. If you know you're going to be printing the output of your program, put the command PR#1 in the program itself rather than hoping you remember to do it from the keyboard. This saves an awful lot of control-Cs or resets and also a lot of swear words. For the same reason, put PR#0 at the end of the program to turn off the printer so you don't mess

up your output with keyboard commands or syntax error.

4. You probably have found out already that game paddles are good for only about one trip around the sun, but don't throw your old ones away. You can get replacement buttons at your neighborhood Radio Shack, but the 150K ohm variable potentiometer turned by the knob is almost impossible to find (except maybe in Silicon Valley). If one of yours goes, cannibalize the good one out of an old set and solder it in place of the bum one in the new set. If you've already clipped the wires to get the old one out, don't worry. Both paddles are wired exactly the same way, so you can open up the other one and copy its wiring.

5. If your Apple hangs when someone turns on the washing machine, a surge protector may solve the problem. If it hangs on hot summer days, it may be overheating. Try one of the fans that clip on the side vent holes. They are reasonably priced and are available at most dealers. At least one of the auxiliary fans comes without a switch. When the manufacturer was asked why, he said, "Just buy a terminal strip, put it on the floor, and plug everything into it—computer, monitor, fan, printer. Then you can turn everything on all at once with your foot." It's not a bad idea. They are convenient if you're not also using your monitor to watch "M*A*S*H."

6. Before writing a program, even a little Hello program for initializing a disk, always type *new* to erase whatever is already in memory. If you don't, you may be surprised months later. For instance, suppose the residual program creates or writes data to a text file named Printer. Later you save on this disk another file also named Printer. When you boot the disk, you may find that what you thought was an innocent Hello program has destroyed your efforts.

7. Always check a disk's catalog before using the rename command. Although you can't save two different programs on the same disk with the same name (the second would replace the first), you can end up with both if you rename one of them.

8. No matter what you see people in computer stores do, never, never, never (well, hardly ever) open or close a disk drive's door if the light is on and the disk is spinning. Not only could this destroy all the information on the disk, but you may clamp the spindle on the doughnut instead of in the hole.

9. Always put a write-protection tab on your original disk before you copy it. If you have one drive, you may get mixed up as you swap disks back and forth twenty-seven times to copy twenty-seven files. If you have two, you may hit the wrong slot or drive numbers. If you're going from your only copy of your just-written adventure-game-to-end-all-adventure-games to a backup disk with nothing but a Hello program on it and accidentally go the wrong way, you'll have two initialized working disks. Got a write-protection tab on the working copy of your System Master? No? How many times have you initialized it and had to recopy it?

10. You know that when you're writing a program you should always number your lines by tens to leave room for additional lines if you need them later (*when* you need them later). What numbers should you pick for those additional lines? If you add only one line, choose the one ending in five—five, fifteen, twenty-five, and so on. This leaves four unused numbers both above and below for still more lines. If you need two lines, using numbers ending in three and seven will leave you with two above and below and three in between.

11. Speaking of line numbers, when you're writing a program, you'll probably want to use one line number for every statement so that you can branch to that statement later if you need to. When you're done, you may want to pack your program using colons to put several statements that won't cause branching problems on the same line. Example: 10 X = 100, 20 Y = 25 converted to 10 X = 100:Y = 25. You can do this without retyping by using escape (once) to gain control of the cursor, copying the first line with the arrow key, adding a colon (:) at the end, continuing your copying to include all the blanks between the first line and the second line to indicate that it's all one line, deleting the second line's numbers with the space bar, and then copying the rest of the second line with the arrow. You'll then have to delete the old second line by typing its number.

12. When you clean your disk drive heads don't scrub the pressure pads by mistake. Remember that the Apple drives have their heads on the bottom side of the disk, not the top.

Next month: Mistakes . . . mistakes . . . mistakes. ❑■

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Buttonwood Apples

BY KEN LANDIS

Buttonwood Apples first appeared in *Softalk* in the September 1981 issue. Although only a year has passed, both the software industry and the availability of investment applications programs have expanded at a rate that belies time.

One year ago, the major investment software packages for the Apple could be counted on one hand. Today, there are at least twenty packages available. Some software houses are nearly matching the breakneck pace at which arcade games materialize for the Apple.

As investors, we stand both to benefit and to lose from this rapid growth. If publishers sacrifice the quality and support of their products in an attempt to get products to market too quickly, investors will become wary of new offerings and will not purchase as many. Since this will shrink the potential of the market, fewer new products will be created. If, however, the new software packages are given the attention to detail they require, investors will have a greater variety of reliable tools to choose from.

Apples first found their way into investment management as electronic filing cabinets. Used with available databases, they helped to organize information for individual investors and for some forward-thinking investment professionals.

Charted Waters. The first investment programs took the form of technical charting or portfolio management. Charting is a time-consuming, exacting task that requires not only market knowledge but artistic ability, while portfolio management and accounting demand accounting skill. These programs have enabled the Apple to serve these needs.

Newer programs for the Apple perform sophisticated options analysis, momentum studies, and other complex analyses. In the past, these techniques were the province of larger computers. As such, these tools were not readily available to individual investors unless investors subscribed to service bureaus or patronized full-service brokerage firms that provided these calculations. The costs to the investor for these services were high.

The off-the-shelf software now available for the Apple can perform a majority of the calculations required by even the most sophisticated investor.

Data retrieval via telephone lines from large databases ensures that accurate and timely information is available to the investor for input into these sophisticated analytical tools. For those investors who cannot justify the expense or the equipment needed for electronic data retrieval, almost all packages allow entry directly from the Apple's keyboard using resources such as the daily newspaper and *Barron's Market Laboratory*.

What Goes Up? As the cost of hardware continues to fall, computer power will be within the reach of more investors. Software prices will be influenced by public demand and by authors' expectations as to the prices their products can command.

As in any new industry, the marketplace is searching for an equilibrium point. What prices, levels of service, support, and quality will consumers demand for software products?

As investors and users, we will be the ones who will shape the marketplace for these products. Our needs, and our desire to get our money's worth, will define and mold future investment packages.

Focus on Software. This month Buttonwood Apples features the *Computing Investor Software Series* from the Computing Investor (29-A Estancia Drive, Marana, AZ 85238; 602-683-4444).

Hardware required: 48K Apple II with 16K RAM card or Applesoft card; 48K Apple II Plus. Printer is optional.

Data Entry: Manual only, no modem facilities.

Backup policy: Copiable.

The *Computing Investor Software Series* was created by Rod Packer, the author of the recently released *Investor's Computer Handbook* from Hayden Book Company. The series consists of eight programs.

Quickfolio is a sample portfolio evaluator (available to anyone who sends in a blank 5¼-inch disk). The program will yield the portfolio's total worth, dollar gain and loss, and percentage gain and loss.

Fotofolio produces a picture of your portfolio's status. Several measurements are analyzed and plotted in color or black and white.

Each chart has a status display that shows the results of each measurement. The presentations available are portfolio gain or loss; relative worths for each security; annualized gain or loss; tax-holding times for capital gains treatment; percentage attainment of your price goals for each security; and a portfolio summary report.

Quotepro is a quote base manager, similar to a rudimentary database system. You enter weekly quotes in eighths or in decimal. *Quotepro* then builds a full-year quote disk to display any stock's quote stream as a quarterly-oriented "quote calendar" and point and figure charts are scaled in week-of-the-year form.

Chartpro is the technical charting module of the series. Data is entered manually. *Chartpro* utilizes high, low, close, and volume information. The charting routines generate a price-volume chart on the hi-res screen. Trend line, trailing average, and other technical calculations may be performed. The package allows you to obtain specifics of the securities being viewed, such as exact price and volume, by using one of the twenty keystroke commands available (explained in the help screen).

Gaining Momentum. *Momentum-M* is an equity momentum monitor. Using weekly price information and buy-sell points that you specify, *Momentum-M* calculates weekly price changes relative to each stock's prior movements. The program calculates support and resistance lines and is used as a buy-sell decision aid.

Transactor provides the investor with a stock account status report. You enter the specifics of a buy or sell order and the module then determines your portfolio's inventory status, calculates a running cash balance, and builds lists for tax records.

Stocksheets is a database manager that creates a "stocksheet" or report on each security you enter. The program is self-prompting for data such as price-earnings ratio, net income each quarter, and so on. You may store your notes and opinions of each company by ticker symbol.

Vector-S computes support and resistance lines based on the movement of each security. The program may be used as a predictive trading model. Color animation is used to show momentum of the securities being examined.

All the programs in the series may be purchased as one package or as various sets. The complete series costs $299. Each collection of programs has a special name that indicates the type of investor for whom it is considered appropriate.

The *Technical Investor* includes *Quotepro, Chartpro,* and *Stocksheets* and retails for $149. The *Weekend Investor* is comprised of *Fotofolio, Quotepro,* and *Momentum-M,* and is $99. The *Investor's Aide,* which consists of *Transactor* and *Stocksheets,* is also $99. The *Small Investor's Sampler* is *Quickfolio* and *Fotofolio* and sells for $49.

Sylvia Porter They're Not. The intent of the author of the programs was to provide tools that would help small investors do a better job of managing their money and portfolios. The series was not designed to help you pick stocks from the entire market, but to aid you in selecting stocks from your "known" list.

Dr. Packer warns investors not to rely on the buy-sell recommendations of *Vector-S* or *Momentum-M*. He envisions these programs as an aid to the investor, not as a substitute for individual judgment. It's a good idea to heed this advice whenever dealing with investment software.

The programs were designed with the nonprofessional investor in mind and will be reviewed in that light.

Each module has help screens that contain the majority of the documentation for each program. Technical sheets are provided that clarify the specifics of a program and highlight some of its features. The combination of the on-screen documentation and the technical sheets provides only a minimal explanation of the modules and a guide to their operation.

For the sake of simplicity, we'll review each module separately. Since investors can obtain the *Quickfolio* module by sending a blank disk to the author, we won't review *Quickfolio* here.

Fotofolio is designed to be used by the small investor as a visual reinforcement aid. The statistics mentioned earlier are projected first as bar graphs and then in tabular form. The author's intent is to help you "visualize" your portfolio's performance. The bar graph technique does indeed highlight stock performance.

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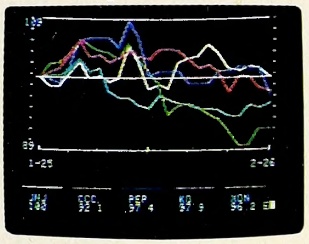

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Mix and Match. The bar graphs are not scaled on the vertical axis; this makes absolute comparisons between securities difficult, although relative comparisons clearly stand out. For those investors who find charts more pleasing than numbers or visual displays easier to understand than tables, *Fotofolio* is a valuable tool.

Quotepro can be difficult to use. The technical notes that accompany this program consist of a script that walks you through step by step. The procedure is not complicated but is difficult to understand nonetheless.

The program is designed to provide you with a database of quotes on your securities. After this information has been stored, you may retrieve it either as a quarterly oriented "quote calendar" or as point and figure reversal bar graphs. The point and figure reversal bar graphs indicate breakouts in a stock's movement. To interpret these graphs, you must be well versed in the underlying analytical theory. Without a solid background, these charts can very easily be misused.

The *Chartpro* module produces high-low-close-volume charts on the Apple's hi-res screen. The charts are nicely drawn and easy to read. When you're unsure about which command to use, press the H key (for help, as in the other modules) and a screen listing all the available commands will appear.

The program is easy to use. Stock quotes are easy to enter, and the charting routines are fairly rapid.

Momentum-M retrieves its information from the *Quotepro* module. The program quantifies relative movements of your securities. How this is done is not made clear. Scores are displayed for each security, but their actual importance or interpretation is not fully explained. This program apparently has been used successfully by the author, but neither the technical sheet nor the on-line documentation is explicit enough about the program's computations.

Transactor provides an excellent system with which to organize and file information on the status of your trading account. The program does not have the facility to recognize short sales or interest on a credit balance, but this will not affect the majority of investors in any appreciable way. The program has good error trapping. The left and right arrow keys are used to drive the program's menu, which is simple to read and understand. It is a straightforward, well-executed program for portfolio information management and cash balance reporting.

Stocksheets is basically a tailored database for stock information. You are prompted for various characteristics about the stock in question. *Stocksheets* saves the information and also has areas for your personal comments. The data entry is structured but not difficult. When you're entering new data, the program does not clear the screen; this makes reading and checking of data entries difficult.

If you don't have a database program, *Stocksheets* can be of value as a diary of a company's activities.

Sound Foundations. *Vector-S* is a price-momentum indicator that uses animated graphs to show support, resistance, and breakouts of equities. The technical foundations of the program are sound, but some people may find the program difficult to use. The menu structure is confusing, and after a few commands have been executed the screen is littered with information from previous commands or operations.

The graphics are interesting, although a high-low-close chart using color for emphasis, coupled with data in tabular form, would be even more useful to the investor.

Dr. Packer has devoted considerable energy to the creation of the microcomputing investor series. The programs reflect his investment style and strategy. Unfortunately, the documentation that accompanies the series does not fully explain the operation or use of the programs. A good technician is likely to find some of the modules useful and interesting but must be willing to expend significant time and effort to gain an understanding of the program's operation and results.

The people at the Computing Investor are more than willing to provide information or advice on their programs by telephone or by mail. The buyer should be prepared to take advantage of these channels considering the programs' present documentation.

In summary, the *Computing Investor Software Series* fulfills its intent of providing an integrated series of programs that give the small investor a useful analytical tool. ∎

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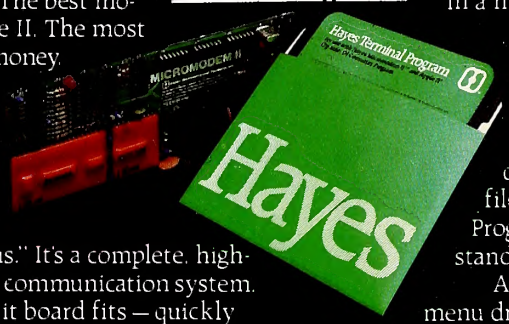

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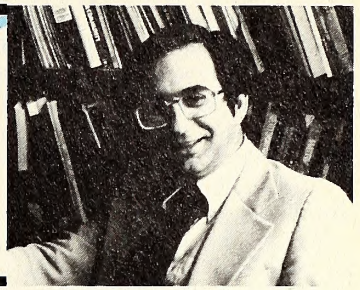
Mind Your Business

BY PETER OLIVIERI



Welcome to the fall season and to our September installment of Mind Your Business. There is much to talk about this month, so let's get right to it.

Business User Group. The mail from readers who are interested in being part of our business user group is quite heavy. It's particularly nice to note how willing members are to share with one another their positive and negative experiences.

Some of you may recall a plea from a regular reader, Gary Griffis, about interfacing the NEC Spinwriter with the Apple Serial Interface card. Dr. Helge Gunther of Webster, New York, who once faced a similar problem, sent along a solution.

Gunther reveals that the secret to interfacing the Apple II Plus with the NEC Spinwriter is the replacement of the P8A PROM chip (as recommended in the addendum to the Apple Serial Interface card booklet). With the P8A PROM installed, the NEC printer works very well. It has an ETX/ACK protocol, mark parity, full duplex, and fast printing speed.

If you wish to interface the Apple III with the NEC Spinwriter, the process is a bit more complicated. The printer does not operate with the cables and modem eliminator that are supplied with the Apple III. (It will work with XON-XOFF protocol, but Dr. Gunther wanted to use the same one as with the Apple II.) It was therefore necessary to have a special cable prepared. The following diagram for the cable was provided by Tom Landry at NEC Information Systems.

	To Printer (female)		Apple III (male)
	1	---------- >	1
	2	---------- >	3
	3	---------- >	2
	7	---------- >	7
Pin Number	5		5
	6		6
	8	---------- >	8
	20		20

Note that pins 5, 6, 8, and 20 are bunched on both ends before connecting.

The printer should be set to 7 bit, odd parity, 1,200 baud, full duplex; and the protocol for using the RS-232 driver should be configured to ETX/ACK protocol as listed in the Apple III *Standard Device Drivers Manual* for the Qume Sprint 5 printer.

One nice feature with this configuration is that if you've forgotten to turn on the printer, or if the printer is in local mode when printing instructions have been sent to it, you can correct the setting on the printer and a control-F will get you going without losing a single character. This particular setup allows you to use the printer with either the Apple II Plus or the Apple III. All that's needed is a rocker switch to transfer back and forth from mark parity to odd parity.

While this explanation may be a bit technical for some readers, it just fills the bill for those who are having problems with interfacing. Sometimes the only way to get information about how to solve a problem is to get the answer from another user. Contacting vendors and dealers is not always the most successful way to go. Your hints, peeves, rages, and other experiences using the computer are well worth sharing; they may provide some much needed information to another user.

Find Your Business. Jeff Lambert, president of Photronics Corporation in Pennsylvania, writes to underscore how vital it is for users to be able to locate immediately data on compatibility of hardware and software. Of course, the strengths of certain hardware and software need to be documented also.

Ideally, a telephone-accessible database containing legitimate complaints and reviews of products should be established. Dealers, vendors, and magazines cannot convey the same information about a product as can someone who has "walked into the desert" with it! Lambert hopes that other readers share his feelings and can either suggest a forum for the exchange of information or will actively support any such forum that might be developed. As one step toward addressing this problem, Mind Your Business will devote space to the business user group and will share information users send in.

Several thousand of you responded to the Olivieri's Inquisition a few months back. What a great resource. To get the ball rolling now, we'd like to ask those of you who have had experience using a word processor or printer to answer the following questions.

If you are using a word processing program:

1. Which word processing program are you using?
2. How much did it cost?
3. What hardware is needed?
4. What are its strengths?
5. What are its weaknesses?
6. What general comments do you have about word processing (hardware or software oriented)?
7. Do you have any questions for other readers about word processors?

If you have a printer:

1. Which printer do you own?
2. How much did you pay for it?
3. What interface card do you have?
4. What are the printer's strengths?
5. What are its weaknesses?
6. What general comments do you have about it?
7. Do you have any questions for other readers about printers?

When you finish, send your response to Softalk B.U.G. (Business User Group), Box 60, North Hollywood, CA 91603. For a mere twenty cents you can be an active member of the group. Your replies to these questions will provide valuable information to other users; besides, it's quite likely that sometime in the future someone else will reply to questions that are of particular interest to you.

Financial Modeling. One of the most important aspects of any business is managing the financial side of things. Even if you have a strong background in finance, this can be a complex and difficult task.

In the course of running a business, it's often necessary to consider a variety of financial options and then to select the one that best suits the company's goals and objectives. This process can call for a good deal of quantitative analysis and the building of models that represent the financial aspects of any organization. If these models are well constructed, you can use them often and ask various "what if?" questions that will help you evaluate different financial strategies.

Most managers who have to make these kinds of decisions greatly value any support they are given. Software systems that provide this kind of help are sometimes called decision support systems. Such systems aid judgment instead of simply trying to computerize it. This approach evolved at about the same time as the concept of time sharing on large computers and gave users the opportunity to develop and use financial models interactively.

With the arrival of microcomputers, similar power is becoming available to interested users at a significantly lower cost. One such system, available from Addison-Wesley Publishing Company, is called *Micro-DSS/Finance.* (Note that the letters DSS, for Decision Support Software, appear in the title.) *Micro-DSS/Finance* represents a sophisticated financial modeling package for the microcomputer. Addison-Wesley plans to develop a *Micro-DSS* series for managers and professionals.

Perhaps the best way to illustrate what this type of package will do is with an example. If you are somewhat familiar with financial modeling, you'll immediately recognize the power of this system. If you're new to the concept, then what follows will be an excellent tutorial on some of the characteristics of such models. We'll consider some of the more advanced features of the package later on.

Let's look at an example from the *DSS/Finance* package of the analysis of alternative investments.

Financial Modeling Example. Joan Perkins, owner of Perkins Real Estate, plans to retire next month at the age of seventy. She intends to keep the house she owns (debt free) and to convert all her other assets, valued at $320,000, to cash.

To supplement her guaranteed pension of $14,000 per year, Perkins is thinking about purchasing a ten-year annuity with an 11 percent yield. She is also considering investing $150,000 in a money market fund. The current yield on the fund is 13.7 percent, but she feels that interest rates will drop to 12 percent next year and that they will stabilize at 11 percent.

Perkins would like to know both her dollar income and her real income over a ten-year period, assuming that inflation is around 9 percent per year. Her question is whether she'd be better off putting all her cash assets into the money market fund or into the annuity.

Many of us, provided we had a little help (and luck and time), could solve this problem using pencil and paper. Let's look instead at how a program might be written within the *DSS/Finance* package to come up with some answers more easily. The program will be explained in more detail after the listing. Refer now to figure 1.

The first number at the beginning of each line is a line number. We'll use these numbers to reference different lines as we explain their meanings.

Lines with a C at the beginning represent comments that can be inserted into a program. When a number appears at the start of a line (after the actual line number), it refers to a row.

Look at line 5. This line says that row 2 of the model will be labeled "cash" and will contain cash amounts. This same principle applies to lines 6, 9, and 10, which are labeled "pension," "investment in money market fund," and "interest rate," respectively. Since no values have been given yet, they will have to be input to the model later.

Line 11 contains a calculation. It says that row 6 will be labeled

```
 1: C
 2: C
 3: C INVESTMENT MODEL FOR JOAN PERKINS
 4: C
 5: 2'CASH'
 6: 3'PENSION'
 7: C
 8: C
 9: 4'INVESTMENT IN MONEY MARKET FUND'
10: 5'INT RATE-MMF'
11: 6'INT INCOME-MMF'=4*5/100.0
12: C
13: C
14: 7'INVESTMENT IN ANNUITY'=2-4 for 1
15: 8'ANNUITY PARAMETERS'
16: 9'ANNUITY'=7 PAYMENT 8
17: C
18: C
19: 10'GROSS INCOME'=3+6+9
20: 10'GROSS INCOME'=10+4 FOR 10
21: 11'INFLATION FACTOR'
22: 12'REAL INCOME'=10/11
23: C
24: C
25: 13'NPV RATES'
26: 14'NET PRESENT VALUES'=12 MULTINPV 13
```

Figure 1. Listing of commands for alternative investment analysis.

```
1: 2=320000
2: 3=10*14000
3: 4=*150000
4: 5=13.7,12,*11
5: 8=11,120,1,12
6: 11=1, 9%
7: 13=10,15,20,25
```

Figure 2. Data file for alternative investment analysis.

"INT INCOME-MMF". The values in that row are to be calculated as follows:

Row 4 times row 5 divided by 100.

Look at the formula and see how this is typed. Remember that the calculation is to be done for all columns in the table (ten years, in this case).

Line 14 also has a calculation in it. It says that the "investment in annuity" will be the result of row 2 minus row 4 for the first column only.

Lines 15 and 16 deal with a special built-in function in *DSS/Finance.* This function requires two lines. The first line gives the appropriate parameters for the annuity. Thus, line 16 says to use the parameters in row 8 against the values in row 7. The function requires that four parameters be placed in row 8. These are the interest rate as a percentage, the number of payments, the starting month, and the number of payments per column (year). You'll see how this looks when the data is listed and the final reports are shown.

Line 16 uses another built-in function that allows you to compute the net present value of the numbers in row 12 at each discount rate contained in row 13.

Preparing the Data. The data can be entered into the model interactively or as a data file. Figure 2 contains the data for our alternative investment analysis model.

The information in the data file relates directly to the original problem statement.

Line 1 says that the value in row 2, column 1 is 320,000.

Line 2 says that row 3 has ten values of 14,000 (the pension).

Line 3 says that all columns get a value of 150,000.

Line 4 gives the interest rates for the money market fund. The first value is 13.7 percent, the next is 12 percent, and the rest of the values are 11 percent.

Line 5 gives the four annuity parameters described earlier: a rate of 11 percent for 120 months, beginning in month 1, with twelve payments per year.

Line 6 gives the inflation rates. They start at 1 percent and then increase at the rate of 9 percent per year.

Line 7 gives the different discount rates required by the present value formula. They are 10 percent, 15 percent, 20 percent, and 25 percent.

One very nice feature of the *DSS/Finance* model is a special command called *worksheet.* This command causes the system to print out a worksheet that contains a listing of all the values that must be input to the model to make it work. The values are clearly labeled and are followed by blanks. This allows you to send the worksheet (the request for input data) to someone who has little knowledge of or experience with computers. After this person has completed the worksheet, it can be returned to whoever is running the actual model.

Getting Some Answers. A few simple print commands now allow you to print out a variety of reports. Figure 3 shows three such reports much as they would look when printed.

It's not often that such a detailed and lengthy example finds its way into this column. But in this case an example seemed the best way to illustrate what kinds of things this particular package can do. If you're interested in the subject of financial modeling, invest some time in trying to see how most of this model works. It may give you some insight into how you might put it to use in your own setting.

Micro-DSS/Finance requires an Apple II with 48K, the Language System, two disk drives, a monitor, and a printer (preferably one with 132 columns).

Bag of Tricks. Now for some specifics about *DSS/Finance.*

The program is designed to build and run models and to generate reports and graphics.

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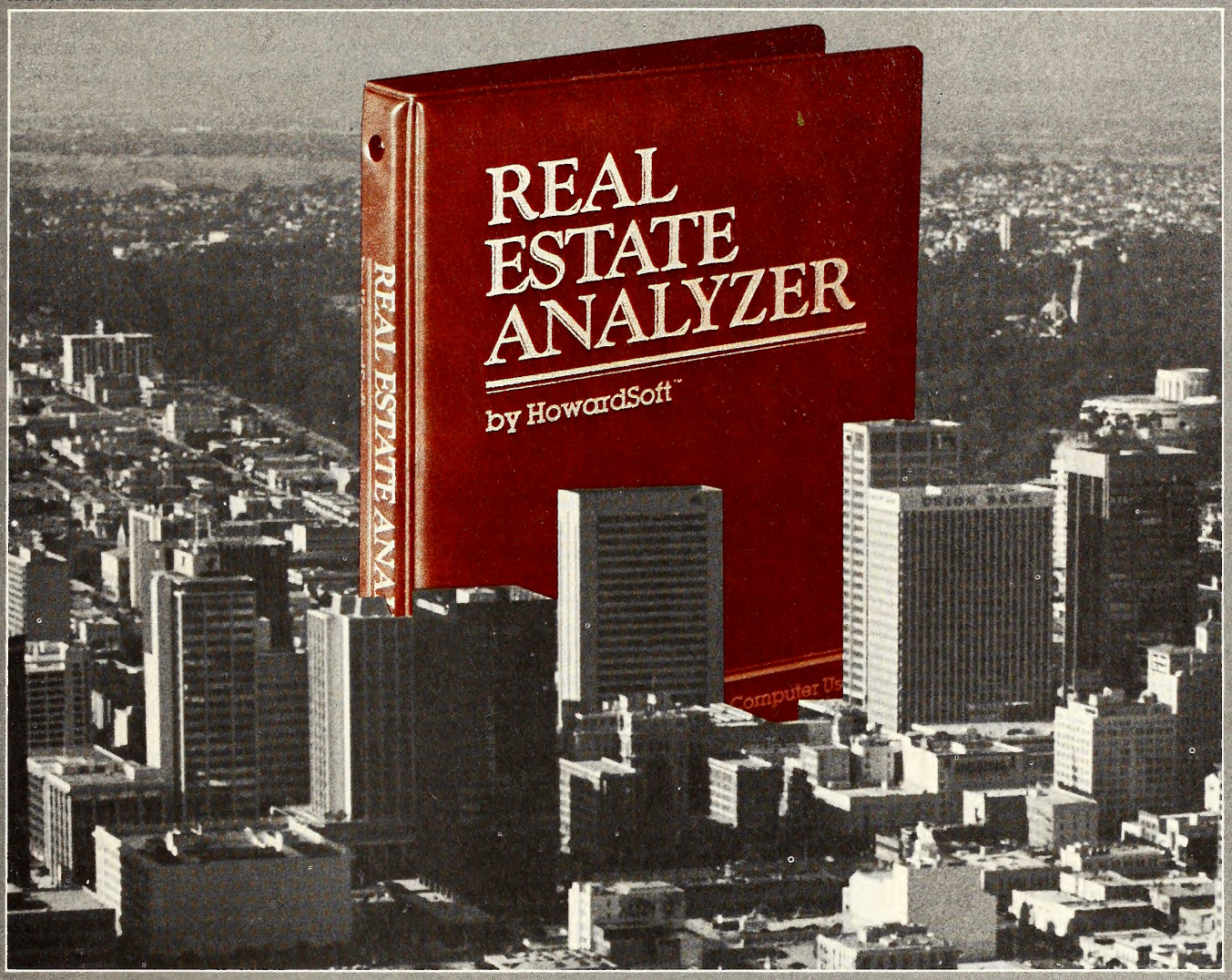

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INVESTMENT MODELS FOR JOAN PERKINS
(FIRST 5 OF 10 YEARS ARE DISPLAYED)

CASE: DIVIDED BETWEEN ANNUITY & MONEY MARKET FUND

	1982	1983	1984	1985	1986
CASH TO INVEST	320,000	–	–	–	–
PENSION	14,000	14,000	14,000	14,000	14,000
MONEY MARKET FUND:					
INVESTMENT	150,000	150,000	150,000	150,000	150,000
INTEREST RATE	13.70%	12.00%	11.00%	11.00%	11.00%
INTEREST INCOME	20,550	18,000	16,500	16,500	16,500
ANNUITY:					
INVESTMENT	170,000	–	–	–	–
ANNUITY	28,101	28,101	28,101	28,101	28,101
SUMMARY OF INCOME:					
GROSS INCOME	62,651	60,101	58,601	58,601	58,601
INFLATION FACTOR	1.00	1.09	1.19	1.30	1.41
REAL INCOME	62,651	55,138	49,323	45,251	41,514
	10%	15%	20%	25%	–
NET PRESENT VALUE	332,855	228,115	251,593	225,438	–

CASE: ALL MONEY INVESTED IN ANNUITY

	1982	1983	1984	1985	1986
CASH TO INVEST	320,000	–	–	–	–
PENSION	14,000	14,000	14,000	14,000	14,000
MONEY MARKET FUND:					
INVESTMENT	–	–	–	–	–
INTEREST RATE	13.70%	12.00%	11.00%	11.00%	11.00%
INTEREST INCOME	–	–	–	–	–
ANNUITY:					
INVESTMENT	320,000	–	–	–	–
ANNUITY	52,896	52,896	52,896	52,896	52,896
SUMMARY OF INCOME:					
GROSS INCOME	66,896	66,896	66,896	66,896	66,896
INFLATION FACTOR	1.00	1.09	1.19	1.30	1.41
REAL INCOME	66,896	61,372	56,305	51,656	47,391
	10%	15%	20%	25%	–
NET PRESENT VALUE	337,416	296,247	264,709	240,032	–

CASE: ALL MONEY INVESTED IN MONEY MARKET FUND

	1982	1983	1984	1985	1986
CASH TO INVEST	320,000	–	–	–	–
PENSION	14,000	14,000	14,000	14,000	14,000
MONEY MARKET FUND:					
INVESTMENT	320,000	320,000	320,000	320,000	320,000
INTEREST RATE	13.70%	12.00%	11.00%	11.00%	11.00%
INTEREST INCOME	43,840	38,400	35,200	35,200	35,200
ANNUITY:					
INVESTMENT	–	–	–	–	–
ANNUITY	–	–	–	–	–
SUMMARY OF INCOME:					
GROSS INCOME	57,840	52,400	49,200	49,200	49,200
INFLATION FACTOR	1.00	1.09	1.19	1.30	1.41
REAL INCOME	57,840	48,073	41,411	37,991	34,855
	10%	15%	20%	25%	–
NET PRESENT VALUE	327,686	274,631	236,729	208,897	–

Figure 3. Three sample reports.

back, net present value, interest expense, and tax loss carry-forward.

Functions for lag, spreading, and cumulative value are built in.

Simultaneous equations and matrix manipulation can be done easily.

The program can handle tables of up to 13,000 cells.

The program facilitates the design of extensive, customized reports, as well as the speedy generation of "quick and dirty" reports.

Reports can be "turned sideways" so that rows are columns and vice versa.

Files of results can be saved and used as input to other models.

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Tax calculations include computation of the amount of a loss carried forward and the appropriate tax rates.

Loan amortization includes functions for interest, principal paid, remaining balance on a loan, and total payments.

Graphic displays of reports include pie charts, bar charts, and line graphs. A special plug-in device allows you to conduct a "slide show" of your graphics. This device plugs into the game port and is also used as a copy-protection feature.

The *DSS/Finance* documentation is outstanding. It is professionally done and easy to use. At times it does read like a sales promotion piece, but it is nonetheless very thorough and complete. In addition, a user hot line is provided to assist users.

Ouch. Now for the bad news. The cost of *Micro-DSS/Finance* is $1,500! For those of us who are used to considering packages that range in price from $29.95 to $250, this is very steep.

While many users will feel this is too high a price, the model is extremely powerful. If you are at all involved in financial modeling, you must seriously consider *DSS/Finance*. It is indeed less expensive than it would be to use a larger mainframe package. In any case, if you are interested, consider purchasing either the *User Reference Manual for Micro-DSS/Finance* ($35) or *Introducing Micro-DSS/Finance* ($10) first and giving it a thorough look.

If the *DSS/Finance* package seems to be right for you, it may be one of the better investments you make. It is not as fast and powerful as its mainframe predecessors, but it is very impressive.

Continuing Support. Once we've bought a product—in particular, a software product—all of us like to know how to use the package to its fullest. A variety of newsletters and user groups formed around particular programs have surfaced to offer this kind of information and continuing support.

Intercalc is one such user group. Intercalc is the largest independent user group specializing in the uses of *VisiCalc*-type programs. The group also publishes *SpreadSheet*, a bimonthly newsletter, Intercalc members receive many valuable tips, applications, product reviews, and complete templates developed by the organization's founders. In addition, members contribute their ideas, tips, concepts, and programs. Members also receive special discounts on related products.

The majority of Intercalc's membership is from the business community and includes Fortune 500 companies, Big Eight accounting firms, advertising agencies, brokerage houses, computer manufacturers, small businesses, colleges, doctors, and lawyers. Membership dues are $25 per year and represent a good investment.

Whether you're a novice or an expert at using *VisiCalc*, you really should have *SpreadSheet*. Each issue contains great tips and actual applications. You can even share some of your own uses (and be paid for your contribution).

A Yearling. About a year ago, Software Arts, the creators of *VisiCalc*, introduced a publication of their own called *SATN* (Software Arts Technical Notes). The objective of this bimonthly publication is to show all *VisiCalc* users how to use the program more effectively and extensively. Articles cover such things as detailed applications, tutorials, points of clarification, and information on the use of specific *VisiCalc* commands.

Upcoming issues of *SATN* are scheduled to include articles about exchanging data between *VisiCalc* and other programs using the DIF format, political forecasting models, interfacing with word processing programs, and more. If you're interested in subscribing to *SATN*, send $30 to Software Arts.

In both of the above instances, you might ask to see a sample issue before deciding whether to subscribe. But, based on the issues we've seen, the total investment of $55 is a wise one for any regular user of *VisiCalc*. Continuing professional and technical support is absolutely essential to the success of any business product—and that means success from the viewpoints of both user and vendor.

Finale. Well, that brings us to the end of another month. Thanks for reading along; we hope something discussed here was helpful to you. The Inquisitions are nearly done, the word processing series is progressing, and the Apple III review will be coming up soon. Take care and have a good month. ∎

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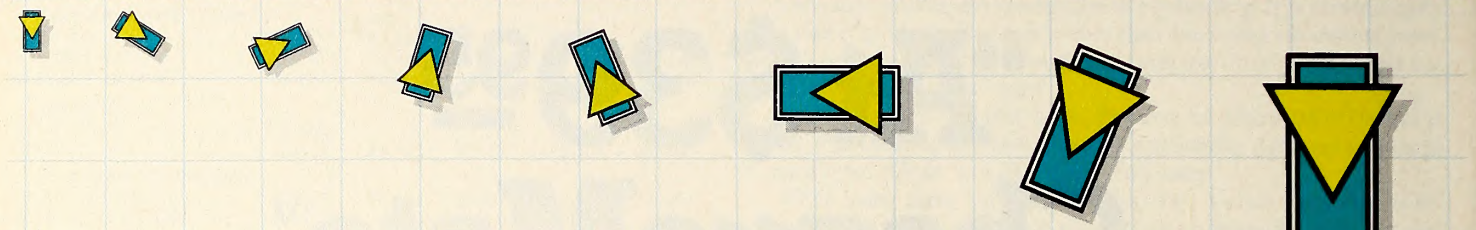


by Mark Pelczarski

Mark Pelczarski credits David Durkee as coauthor of this month's Graphically Speaking.

Although most graphics are done in machine language for speed, there are some interesting effects that can be created easily and quickly in Applesoft Basic.

Explosions. Using Applesoft shape tables, you can do a fast, good-looking explosion. First, use the shape maker from two issues ago to create a somewhat random shape like the one shown in figure 1. Make it somewhat small, as we will be scaling it larger. Also, be sure that your starting point is somewhere in the middle of the shape so that it stays centered when we increase the scale. Name this file, Shape.

Now use the routine in listing 1 to create an explosion at location X,Y. The routine first draws the shape you created in scale 1, erases it, draws it in scale 2, erases it, and so on until it reaches scale 7. Along the way, it varies the hcolor from one to seven, adding color to the effect. If you use this routine on a background you want to keep, use xdraws instead of draws, and skip the hcolor commands—draw will clobber whatever was there.

Lasers. The hplot command can be used to create a quick laser effect between any two points. It helps to have a set source for the beam. The two bottom corners are favorites in many games because they give the impression that the user is really in a spaceship. That is what we will use here. Unfortunately, there is no hplot command with the features of xdraw, so any fancy background will be hurt by this effect.

Now, of course, these two effects are just dying to be used together, which is why we used the odd line numbers. Listing 3 is a routine that incorporates both into a laser blast followed by an explosion sequence.

```
1   REM EXPLOSION
10   PRINT CHR$ (4);"BLOAD SHAPE,A 16384"
20   POKE 232,0: POKE 233,64
30   HGR : POKE - 16302,0
40   REM X,Y IS THE LOCATION OF THE EXPLOSION
50   X = 140:Y = 96
320   FOR I = 1 TO 7
330   SCALE= I: HCOLOR= I
340   DRAW 1 AT X,Y
350   HCOLOR= 0
360   DRAW 1 AT X,Y
370   NEXT I
```

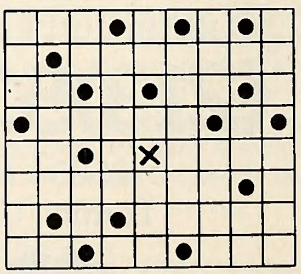
Listing 1.

```
1   REM LASER FIRE
10   HGR : POKE - 16302,0
20   X = 140:Y = 96: REM TARGET LOCATION
300   HCOLOR= 5: HPLOT 278,190 TO X,Y: HPLOT 1,190 TO X,Y:
      REM DRAW
310   HCOLOR= 0: HPLOT 278,190 TO X,Y: HPLOT 1,190 TO X,Y:
      REM ERASE
```

Listing 2.

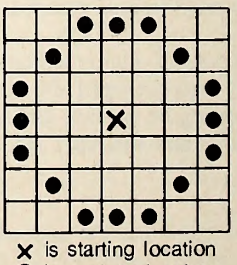
```
1   REM LASER FOLLOWED BY EXPLOSION
10   PRINT CHR$ (4);"BLOAD SHAPE,A 16384"
20   POKE 232,0: POKE 233,64
30   HGR : POKE - 16302,0
40   X = 140:Y = 96: REM WHERE IT ALL HAPPENS
300   HCOLOR= 5: HPLOT 278,190 TO X,Y: HPLOT 1,190 TO X,Y
310   HCOLOR= 0: HPLOT 278,190 TO X,Y: HPLOT 1,190 TO X,Y
320   FOR I = 1 TO 7
330   SCALE= I: HCOLOR= I
340   DRAW 1 AT X,Y
350   HCOLOR= 0
360   DRAW 1 AT X,Y
370   NEXT I
```

Listing 3.



× is starting location
● is a plotted point

Figure 1. Random Explosion Shape.



× is starting location
● is a plotted point

Figure 2. Bouncing Ball Shape.

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Last month we provided a primer on animation using random paths, preset paths, and joystick and keyboard control. As an addition to those methods, listing 4 is a program that actually simulates the natural movement of a common object: a bouncing ball. You'll need a new shape for this program, as illustrated in figure 2. Name your new shape file, Ball.

Lines 10 through 70 set things up. The main loop, lines 100 through 190, follows this sequence:

```
1   REM XF,YF ARE BOUNCE FACTORS
2   REM XM,YM ARE MOMENTUM
3   REM GF IS THE GRAVITY FACTOR
4   REM X,Y IS STARTING LOCATION
10   PRINT CHR$ (4);"BLOAD BALL,A 16384"
20   POKE 232,0: POKE 233,64
30   HGR : POKE - 16302,0
40   SCALE= 1: ROT= 0: HCOLOR= 3
50   HPLOT 0,0 TO 279,0 TO 279,191 TO 0,191 TO 0,0
60   X = 30:Y = 30:XM = 5:YM = - 1
70   XF = 12:YF = 20:GF = .4
100   REM MAIN LOOP
110   XDRAW 1 AT X,Y:XO = X:YO = Y
120   X = X + XM:Y = Y + YM
130   IF X <  3 THEN X = 3: GOTO 200
140   IF X > 276 THEN X = 276: GOTO 200
150   IF Y < 3 THEN Y = 3: GOTO 250
160   IF Y > 188 THEN Y = 188: GOTO 250
170   YM = YM + GF
180   XDRAW 1 AT XO,YO
190   GOTO 110
200   REM LEFT OR RIGHT
210   XM = - XM
220   XM = SGN (XM) * ( ABS (XM) - ABS (XM) / XF)
230   GOTO 150
250   REM TOP OR BOTTOM
260   YM = - YM
270   YM = SGN (YM) * ( ABS (YM) - ABS (YM) / YF)
280   GOTO 170
```

Listing 4.

Line 110 draws the shape at X,Y.

Line 120 updates the shape's location by adding the momentum factors, XM and YM. These are preset in line 60 and updated in various places throughout to account for gravity and bouncing.

Lines 130 through 160 check to see if the ball has hit a wall. If it has, the routines from lines 200 through 280 reverse the direction of movement and simulate the loss of energy that occurs when a ball bounces.

Line 170 is the gravity factor.

Line 180 erases the shape. Note that the more instructions you put between drawing and erasing a shape, and the less you put before the next draw, the less your shape will flicker. Using smaller shapes also helps minimize this problem.

Line 190 goes to the beginning of the loop.

The Effects of Entropy. Take a look at line 220. This is where the object loses some of its momentum in bouncing. ABS (XM) / XF is the fraction of the energy that is lost. If you make XF smaller, the object will lose more energy with each collision. However, if you make it a negative number, it will gain energy!

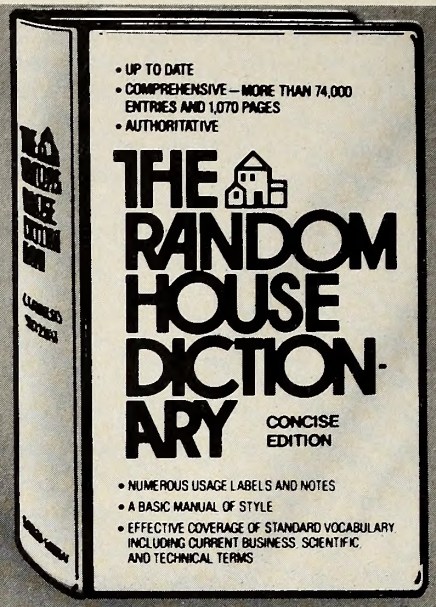
The preset values for this variable and others are located in lines 60 and 70. Try changing them and seeing how each affects the physical laws in the little world on the hi-res screen. The remarks in lines 1 through 4 explain what each controls.

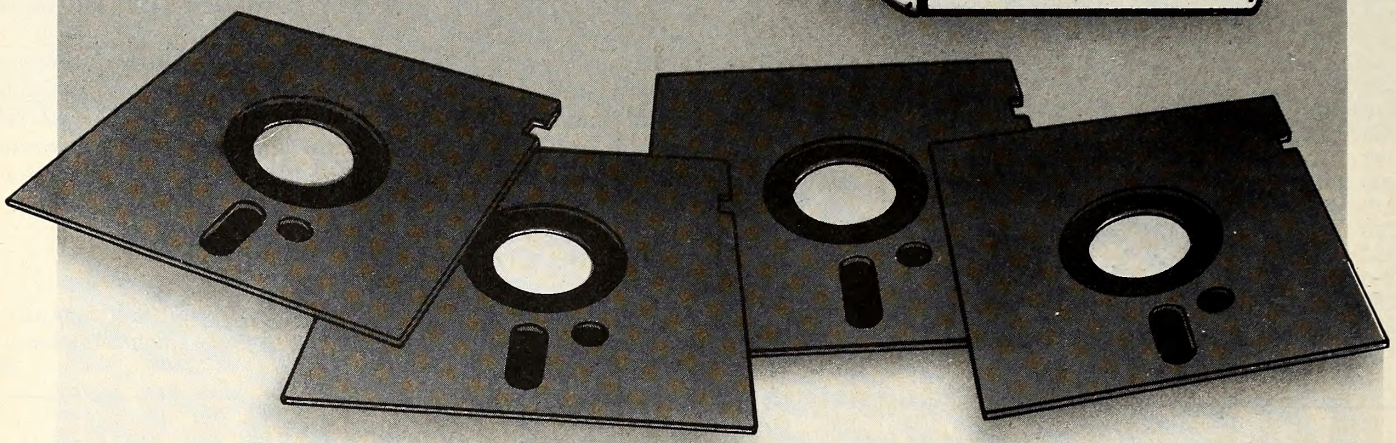
Now, the only trouble with this is that it goes on forever unless you use control-C to get out of it. This is the reason that we numbered the important parts of the laser and explosion routine starting at 300. If you just add those lines 300 through 370 onto the listing 4 program, and then add these two lines, you get a neat way out that demonstrates aptly how to use such a subroutine in a larger program.

```
185   KB = PEEK( - 16384): POKE - 16368,0:IF
        KB > 127 THEN 300
380   FOR DL = 1 TO 500: NEXT DL: HOME : TEXT : END
```

That's all for now. In the next few installments we'll be offering a Basic hi-res character generator and machine language graphics routines to use from Basic programs. ◨

WE'VE CHANGED MORE ON THE APPLE SPELLER THAN JUST THE NAME





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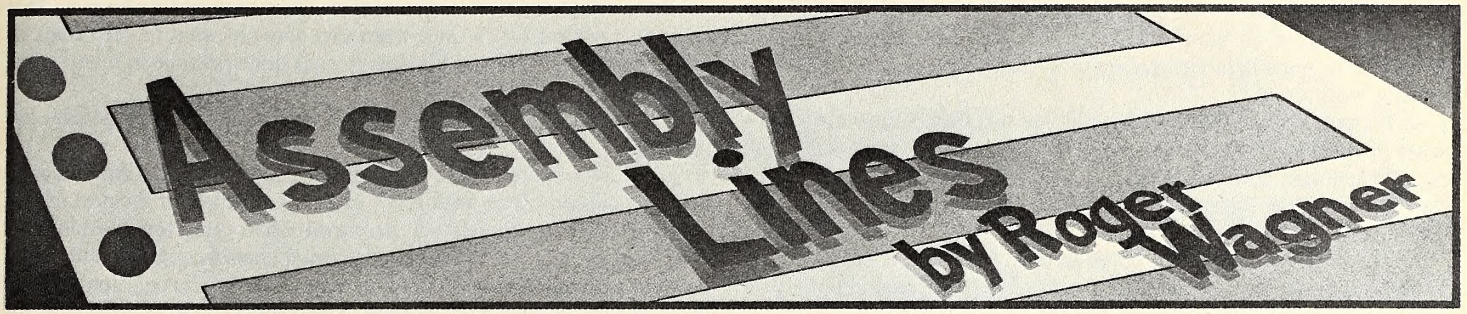

Everyone's Guide to Assembly Language, Part 24

Last month we looked at a routine to simulate the SCRN(X,Y) function of Integer Basic. The notion of inquiring about points on the screen is closely related to this month's topic, the *collision counter.*

The collision counter is a one-byte memory location on page 0 of the Apple's memory. Its value is a function of the Applesoft hi-res graphics routines specifically related to shape tables. The purpose of the collision counter is to keep track of any "collisions" between a shape being drawn on the screen and any previously drawn screen images. The collision counter is located at $EA (decimal 234) and is affected only by the commands draw and xdraw.

Some Experiments. To illustrate the behavior of the collision counter, we'll first need a shape table to experiment with. The one given here is probably the simplest one possible—a single dot.

To enter it into memory, go into the Apple's Monitor by typing in *call −151*, and then type in:

```
300: 01 00 04 00 04 00
 E8: 00 03
```

This will place the table in memory at location $300 and set the pointer at $E8,E9 to point to the table.

The first two bytes of the table (01 00) indicate the number of shapes in the table, which in our case is just one. The next two bytes (04 00) give the offset from the beginning of the table ($300) to the start of the actual shape data ($304). The next two bytes (04 00) are the actual bytes of data for the shape itself. In this example the shape table is a single move of one position up the screen.

You may wish to review the information on shape tables in your Applesoft manual (1978), pages 92 to 96, for more details on shape tables.

The first experiment is to verify that we have in fact installed a usable shape table. This is most easily tested by putting your Apple into Applesoft Basic and typing in:

```
HGR : HCOLOR=3 : ROT=0 : SCALE=1
```

The screen should clear. You can now type in:

```
DRAW 1 AT 100,100
```

A single dot should appear on the screen. You can change the scale to three by typing in:

```
SCALE=3
```

Test this by typing in:

```
DRAW 1 AT 100,100
```

A vertical line of three pixels should appear. If all has gone well so far, you can now try a third experiment. The purpose of the experiment will be to see how the collision counter reacts with various combinations of drawing colors, background colors, shape drawing commands, and the previous condition of the collision counter.

Clear the screen with hgr again, and try this sequence of commands, noting for each one what the conditions of the screen and collision counter are before and after the command. (Note that references to "color" in this article will be in terms of "white" and "black" as would be seen on a black-and-white monitor. If you have a color set, the dots will appear as single color dots—as explained in previous issues.)

```
HCOLOR=3 : POKE 234,0 : DRAW 1 AT 100,100 : PRINT PEEK(234)
```

('0' should be printed along with a white dot on the screen)

```
DRAW 1 AT 100,100 : PRINT PEEK(234)
```

('1', white dot)

```
DRAW 1 AT 100,100 : PRINT PEEK(234)
```

('1', white dot)

```
HCOLOR=0 : DRAW 1 AT 100,100 : PRINT PEEK(234)
```

('0', dot erased)

```
DRAW 1 AT 100,100 : PRINT PEEK(234)
```

('1', no dot)

If you try all the various combinations, you should be able to replicate a chart something like this:

HCOLOR	Command	Background	C=0	C=1	Result
White	DRAW	Black	0	0	White
White	DRAW	White	1	1	White
Black	DRAW	Black	1	1	Black
Black	DRAW	White	0	0	Black
White	XDRAW	Black	1	1	Black
White	XDRAW	White	0	0	Black
Black	XDRAW	Black	1	1	White
Black	XDRAW	White	0	0	Black

With the scale at one, we did a series of draw and xdraw commands.

The first column shows the value of hcolor for the draw or xdraw command. The second column shows which command we used. The third column shows what background color was present when the shape table was drawn.

The headings C=0 and C=1 refer to the status of the collision counter before the draw or xdraw. The entries in each column show the value after the command is executed. The last column shows whether the resulting dot is white ("on") or black ("off").

The conclusions to be "drawn" from this chart are:

1. If a draw is done, the resulting dot will be consistent with the hcolor used. The collision counter will increment one unit for each dot on the screen that is already at the same "color" as the dot being drawn. That is, if white is your hcolor, the collision counter will count the num-

ber of white dots the shape hits. If your hcolor is black, the collision counter will return the number of black dots the shape draws over. This allows you to use a light background and dark shapes and still have everything work!

2. If xdraw is used, the current hcolor has no effect. Xdraw always reverses the background dots. For a black background, xdraw will increment the collision counter for only those dots turned "on." If the background is white, the collision counter will be set to zero only if all dots are turned "off."

3. The previous state of the collision counter has no effect on the final value after the draw or xdraw. This means that no preconditioning or initializing is necessary in a given routine.

Draw versus Xdraw. Before proceeding further with the collision counter, it is important to take a moment to clarify the distinction between the two shape table commands draw and xdraw.

Draw is very direct in that it basically does an hplot in whatever the current hcolor is, using the specified shape. As mentioned earlier, the collision counter simply adds up the total number of collisions with existing dots in the same "on" or "off" state as the hcolor being used.

Moving shapes using draw is done by first drawing the figure, and then either reversing the color by setting hcolor to black and then doing another draw, or using xdraw to accomplish approximately the same thing.

Xdraw, on the other hand, uses the EOR (exclusive or) function to actually reverse the bits on the screen where the shape is to be drawn. What this means is that a fixed color as such is not used. Rather, each bit on the screen in the desired shape pattern is reversed from its current status. By following this with another xdraw, the screen is restored and background figures are not erased.

Principles of Animation and Collision. Any hi-res game or simulation is basically just a simulation of reality in which a screen image successfully mimics the behavior of an object in the real world. The primary things to be simulated are generally motion and collisions. Both aspects have been discussed in earlier issues, particularly with regard to the idea of simulating convincing motions.

In the past programs, the positions of the objects were used to determine whether it was time to bounce the object off a wall or off another object. In this sense, we can say that collisions were *predicted* rather than *detected*. The collision counter gives us a way of detecting collisions with objects on the screen whose current position may not be known. This takes on practical significance when you may not want to keep track of all the things flying about the screen, as is quite possible in many game scenarios.

Putting all this together, we come up with the following general approaches:

1. Draw a figure. Check the collision counter for nonzero values to detect a collision. Draw with black or xdraw to erase for the next movement. Background figures will be erased when using this technique.

2. Xdraw a figure. The collision counter should equal the number of dots in the figure (that is, a constant value) if there is no collision with existing images. Xdraw again to erase. The collision counter should return to zero if no previous collision was made. This will leave background images intact, but figures drawn will have a "harlequin" appearance as they pass over background images. See the demonstration program for an example of this.

The Scanner. The following two demonstration programs are called *The Scanner* because they are reminiscent of the classic radar screen sweep pattern.

The first program uses the xdraw,xdraw system of redrawing the image, and as such, is nondestructive to other images on the screen.

```
1  * ********************************* *
2  *   SCANNER — XDRAW/XDRAW     *
3  * ********************************* *
4  *
5            ORG  $7000
6            OBJ  $7000
7  *
8  FLAG      EQU  $06
9  RT        EQU  $07
10 SCL       EQU  $08
11 *
12 *
13 PREAD     EQU  $FB1E
14 WAIT      EQU  $FCA8
15 HCOLOR    EQU  $F6F0
16 HGR       EQU  $F3E2
17 HPLOT     EQU  $F457
18 HPOSN     EQU  $F411
19 SPKR      EQU  $C030
20 *
```

```
                        21 ROT      EQU  $F9
                        22 SCALE    EQU  $E7
                        23 PTR      EQU  $E8
                        24 SHNUM    EQU  $F730
                        25 DRAW     EQU  $F605
                        26 XDRAW    EQU  $F661
                        27 CTR      EQU  $EA
                        28 *
7000: 4C 09 03          29 ENTRY    JMP  E2
                        30 *
7003: 01 00 04          31 TBL      HEX  010004
7006: 00 04 00          32          HEX  000400
                        33 *
7009: A2 03             34 E2       LDX  #$03       ; WHITE
700B: 20 F0 F6          35          JSR  HCOLOR
700E: A2 00             36          LDX  #$00
7010: 86 07             37          STX  RT
7012: A2 03             38          LDX  #$03
7014: 86 E8             39          STX  PTR
7016: A2 70             40          LDX  #$70
7018: 86 E9             41          STX  PTR+1
                        42 *
701A: A9 01             43 SET      LDA  #$01
701C: 85 06             44          STA  FLAG
                        45 *
701E: A2 8C             46 POSN     LDX  #$8C
7020: A0 00             47          LDY  #$00       ; X = 140
7022: A9 50             48          LDA  #$50       ; Y = 80
7024: 20 11 F4          49          JSR  HPOSN      ; SET CURSOR @ X,Y
                        50 *
7027: E6 07             51 CALC     INC  RT
7029: A2 00             52          LDX  #$00
702B: 20 1E FB          53          JSR  PREAD
702E: 98                54          TYA
702F: D0 01             55          BNE  STORE
7031: C8                56          INY             ; SCALE=1
7032: 84 08             57 STORE    STY  SCL
                        58 *
7034: A5 06             59 CHKFLG   LDA  FLAG
7036: F0 04             60          BEQ  ERASE
7038: C6 06             61          DEC  FLAG
703A: F0 14             62          BEQ  PLOT       ; ONLY ONCE
                        63 *
703C: A2 01             64 ERASE    LDX  #$01
703E: 20 30 F7          65          JSR  SHNUM
7041: A5 F9             66          LDA  ROT
7043: 20 61 F6          67          JSR  XDRAW
                        68 *
7046: A6 EA             69 SOUND    LDX  CTR
7048: F0 06             70          BEQ  PLOT
704A: AD 30 C0          71 CLK      LDA  SPKR
704D: CA                72          DEX
704E: D0 FA             73          BNE  CLK
                        74 *
7050: A2 8C             75 PLOT     LDX  #$8C
7052: A0 00             76          LDY  #$00
7054: A9 50             77          LDA  #$50
7056: 20 11 F4          78          JSR  HPOSN
7059: A2 01             79          LDX  #$01
705B: 20 30 F7          80          JSR  SHNUM
705E: A5 08             81          LDA  SCL
7060: 85 E7             82          STA  SCALE
7062: A5 07             83          LDA  RT
7064: 85 F9             84          STA  ROT
7066: 20 61 F6          85          JSR  XDRAW
                        86 *
7069: A2 01             87 DELAY    LDX  #$01       ; PDL1
706B: 20 1E FB          88          JSR  PREAD
706E: 98                89          TYA
706F: 20 A8 FC          90          JSR  WAIT
                        91 *
7072: 4C 1E 70          92 GOBACK   JMP  POSN
                        93 *
```

After assembling the code at $7000, enter the following from Applesoft:

```
HGR: HCOLOR=3: HPLOT 100,0 TO 100,160
```

Preset paddle zero to the minimum (zero = far left) and paddle one

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to the maximum (255 = far right).

Now activate the routine by typing in:

```
CALL 28672
```

Experiment with different paddle values, slowly increasing the radius with paddle zero until the scanner intersects the vertical line. You should at that point hear a number of clicks from the speaker as the lines cross each other.

Let's see how the program actually works. Line 27 starts the actual code by jumping over the data for the shape table. This is the same one-dot shape table you entered earlier in this column. Lines 32 and 33 initialize the HCOLOR to 3 (white), although for this program that is actually not necessary. Lines 34 through 39 set our value for rotation to zero (to be used later), and set the pointer $E8,E9 to point at our table at $7003.

Now here's the tricky part. In general we want to store two positions for the line we'll draw. The first is the old position (where it was last drawn) and the second is the new position where the new line will be drawn. You'll recall we developed this technique in earlier articles on the moving dots as a way of minimizing the screen flicker.

For the simple dots, it didn't really matter if on the first pass through the program we erased a dot that wasn't really there. In this case, though, it does matter since using XDRAW will cause an image to appear if one wasn't there already to erase.

This is solved by using a one-pass flag that will tell the program to skip over the ERASE routine on the first time through. Lines 41 and 42 initialize this flag to '1'.

Lines 44 through 47 use HPOSN to prepare for the later use of the shape tables. Line 49 increments the value for rotation on each pass through the loop. This causes the revolving of the line. Wrap-around when RT reaches 255 happens automatically, so no checking for *out of range* errors is required.

Lines 50 through 55 get the value for scale from paddle zero, which corresponds to the eventual length of the plotted line. Note that a special check is done to avoid scale being set to #$00, since Applesoft treats this the same way it treats 255. This makes the paddles a little more friendly to the user.

On the first pass through, FLAG will be equal to 1, so the test on line 58 will fail. It will then be decremented to 0 to clear the flag, and the forced branch to PLOT will be executed.

The routine for drawing the shape is very similar to routines in programs presented in earlier articles. The main difference in this routine is our use of the routine XDRAW ($F661), which is used the same way the DRAW routine was used before.

Once the PLOT section is completed, a wait is done at lines 85 through 88 by using the WAIT ($FCA8) routine as a function of paddle one.

Notice that on successive passes through the loop, FLAG will equal zero, and so ERASE will always erase the old position before PLOT creates the new one. RT ($07) and SCL ($08) are used to hold the new values for rotation and scale, respectively.

As for the actual collision detection, because we are using the Xdraw,Xdraw method, we will use method 2, which says that the collision counter should return to zero after the figure is erased. We use this fact to check on lines 67 and 68 for a zero value collision counter. If the counter is not zero, the speaker is clicked that number of times before the program does the next plot.

In practice the speaker is a little undependable since the frequency of the clicks is so high. You may wish to experiment with different delays in the CLK loop, as is done in the sound routines. You may prefer the current method for this demo because of the intuitive nature of the clicks, but musical sounds can also provide some interesting insights into the process.

The usual hgr equivalent from this routine has purposely been left out to allow you to alter the screen with hplot and other Applesoft commands before running the scanner. Another interesting variation is to type in:

```
HGR: HCOLOR = 3:HPLOT 0,0: CALL 62454
```

The screen should clear to all white. Now activate the scanner by typing in:

```
CALL 28672
```

Now the clicking will depend more directly on the length of the line, although some interesting variation can be observed depending on the angle of the line as well. While you're reading along you might ponder why that would be, considering the screen would seem to be clearly uniform in the number of dots the line is intersecting.

Once you've entered yourself sufficiently with the first program, try this second variation, one that uses the Draw,Xdraw method. Here the point of interest is that the scanning line erases anything it touches, and so leaves a visible trail of where it has been when activated against a solid white background.

```
                        1  ********************************** *
                        2  *    SCANNER — DRAW/XDRAW        *
                        3  ********************************** *
                        4  *
                        5          ORG  $7000
                        6          OBJ  $7000
                        7  *
                        8  FLAG    EQU  $06
                        9  RT      EQU  $07
                        10 SCL     EQU  $08
                        11 PREAD   EQU  $FB1E
                        12 WAIT    EQU  $FCA8
                        13 HCOLOR  EQU  $F6F0
                        14 HGR     EQU  $F3E2
                        15 HPLOT   EQU  $F457
                        16 HPOSN   EQU  $F411
                        17 SPKR    EQU  $C030
                        18 *
                        19 ROT     EQU  $F9
                        20 SCALE   EQU  $E7
                        21 PTR     EQU  $E8
                        22 SHNUM   EQU  $F730
                        23 DRAW    EQU  $F605
                        24 XDRAW   EQU  $F661
                        25 CTR     EQU  $EA
                        26 *
7000: 4C 09 70          27 ENTRY   JMP  E2
                        28 *
7003: 01 00 04          29 TBL     HEX  010004
7006: 00 04 00          30         HEX  000400
                        31 *
7009: A2 03             32 E2      LDX  #$03      ; WHITE
700B: 20 F0 F6          33         JSR  HCOLOR
700E: A2 00             34         LDX  #$00
7010: 86 07             35         STX  RT
7012: A2 03             36         LDX  #$03
7014: 86 E8             37         STX  PTR
7016: A2 70             38         LDX  #$70
7018: 86 E9             39         STX  PTR+1
                        40 *
701A: A9 01             41 SET     LDA  #$01
701C: 85 06             42         STA  FLAG
                        43 *
701E: A2 8C             44 POSN    LDX  #$8C
7020: A0 00             45         LDY  #$00      ; X = 140
7022: A9 50             46         LDA  #$50      ; Y = 80
7024: 20 11 F4          47         JSR  HPOSN     ; SET CURSOR @ X,Y
                        48 *
7027: E6 07             49 CALC    INC  RT
7029: A2 00             50         LDX  #$00
702B: 20 1E FB          51         JSR  PREAD
702E: 98                52         TYA
702F: D0 01             53         BNE  STORE
7031: C8                54         INY            ; SCALE=1
7032: 84 08             55 STORE   STY  SCL
                        56 *
7034: A5 06             57 CHKFLG  LDA  FLAG
7036: F0 04             58         BEQ  ERASE
7038: C6 06             59         DEC  FLAG
703A: F0 0A             60         BEQ  PLOT      ; ONLY ONCE
                        61 *
703C: A2 01             62 ERASE   LDX  #$01
703E: 20 30 F7          63         JSR  SHNUM
```

```
7041: A5 F9     64          LDA  ROT
7043: 20 61 F6  65          JSR  XDRAW
                66 *
7046: A2 8C     67 PLOT     LDX  #$8C
7048: A0 00     68          LDY  #$00
704A: A9 50     69          LDA  #$50
704C: 20 11 F4  70          JSR  HPOSN
704F: A2 01     71          LDX  #$01
7051: 20 30 F7  72          JSR  SHNUM
7054: A5 08     73          LDA  SCL
7056: 85 E7     74          STA  SCALE
7058: A5 07     75          LDA  RT
705A: 85 F9     76          STA  ROT
705C: 20 05 F6  77          JSR  DRAW
                78 *
705F: A6 EA     79 SOUND    LDX  CTR
7061: F0 06     80          BEQ  DELAY
7063: AD 30 C0  81 CLK      LDA  SPKR
7066: CA        82          DEX
7067: D0 FA     83          BNE  CLK
                84 *
7069: A2 01     85 DELAY    LDX  #$01       ; PDL1
706B: 20 1E FB  86          JSR  PREAD
706E: 98        87          TYA
706F: 20 A8 FC  88          JSR  WAIT
                89 *
7072: 4C 1E 70  90 GOBACK   JMP  POSN
                91 *
```

In this routine, the first variation is in the use of DRAW (versus XDRAW) on line 77. In addition, because we are now using the Draw,Xdraw method, the collision counter detection now goes after the initial creation of the image as is done by PLOT. In terms of programming then, the changes are minor. It is interesting to note, though, how differently the screen behaves.

It is most instructive to start by typing in:

```
HGR: HCOLOR = 3: HPLOT 0,0: CALL 62454
```

The call 62454 is the routine that clears the hi-res screen to the last hcolor plotted, so we'll take advantage of it to fill the screen with dots for our Draw,Xdraw scanner to detect. Make sure the paddles are set to zero for paddle zero and 255 for paddle one. Then activate the routine by typing in:

```
CALL 28672
```

As you eventually sweep out all possible angles and radii, you'll notice that not all screen locations can be reached from a fixed point. This is because of a limited number of rotation positions (as opposed to a continuous 360-degree motion) and also the line nature of the screen display.

By looking carefully you can see that there are more point interceptions, and thus collisions and clicks, at the near vertical, horizontal, and forty-five-degree positions than angles in between. This tends to give a modulated sound to the clicks as the "beam" scans when running the first program against a white background.

The Possibilities. Once you understand the idea behind the collision counter, it can be very useful in both arcade game–type software and other simulations. You'll probably be able to imagine all sorts of novel ways of applying this technique in your own programs.

Next month, we plan to give nongraphics enthusiasts a break and look a little more into some areas of machine language programming that we haven't covered yet.

See you then!

A Note from Roger: Our discussion of hi-res graphics from assembly language will wrap up with the old year. We'd like your input on where to go next. What would you like Assembly Lines to cover?

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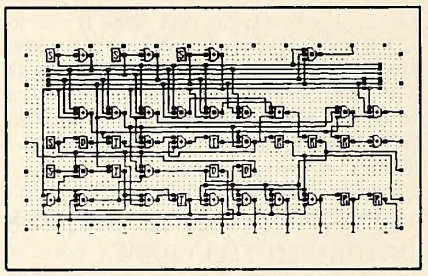

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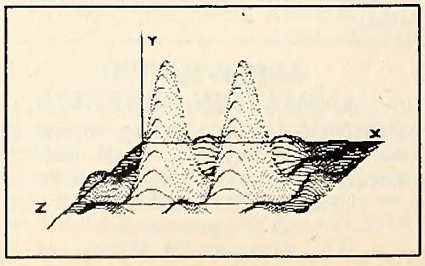

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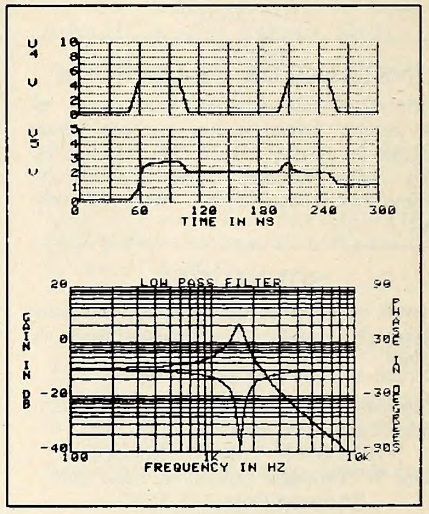

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VENTURES WITH VISICALC

BY JOE SHELTON

This month we are going to discuss an important feature of VisiCorp's newly introduced *VisiCalc Advanced Version* and learn how to build templates that can accomplish the same thing with a regular version of *VisiCalc*.

VisiCalc Advanced Version. VisiCorp announced *VisiCalc Advanced Version* for the Apple III at the National Computer Conference in June. The *Advanced Version* is the most powerful version of *VisiCalc* available.

One new command, providing powerful and useful new capabilities, stands out in the *Advanced Version*. It is the *Keystroke Memory* command. This command can execute a series of *VisiCalc* commands with a single keystroke (all right, three keystrokes if you count /K). The potential uses for Keystroke Memory are varied, and, as people begin to understand and use it, its range of uses will probably increase dramatically.

One of the main advantages of Keystroke Memory is that it allows you to consolidate data from different templates into a single template. The *Advanced Version* doesn't magically consolidate information, however. Instead, it uses the Data Interchange Format (DIF) as the vehicle for consolidations. Other modeling tools, such as Apple's *Senior Analyst* and Microsoft's *MultiPlan*, use *tags* to specify which data is to be consolidated. The use of tags for consolidations is very flexible because data can be pulled from a file without requiring that the models have a specific format. But the problem with employing tags is that users still have to be very familiar with the operation of the software.

VisiCorp has chosen to do consolidations in such a way that users don't have to be familiar with the more complicated aspects of *VisiCalc*. The idea is that data will automatically be interchanged through DIF files using Keystroke Memory. DIF can be even more useful, because it enables you to transfer data to different Visi-series products as they become available on the Apple III. *VisiSchedule* for the Apple III, for example, also announced at the June conference, uses DIF.

Now Comes the Hard Part. The problem (and it is either a simple or a complex one depending on your knowledge of *VisiCalc*) is that the original template designer must design the template to be able to handle data transfer through DIF. After all the templates have been completed (and the templates *don't* have to be in the same format), the Keystroke Memory command allows consolidations to be accomplished by almost anyone. The user simply boots *VisiCalc Advanced Version*, presses /K and a specified key, and the consolidation begins. The user is prompted to insert the correct disks and the rest of the consolidation is automatic.

While DIF has been available for a couple of years, this is the first time it will be easy for users to take advantage of its capability. As *VisiCalc Advanced Version* gains in popularity, no doubt many templates will be created that use this method of consolidation. Apparently anticipating preparation for this, VisiCorp announced *Business Forecasting Model*, a series of templates for the DOS 3.3 Apple II version of *VisiCalc*. These templates are designed to enable consolidations of information into income statements, balance sheets, and financial-ratio analysis templates using DIF. If you own *VisiCalc III*, you can convert these templates to your version of *VisiCalc* using the information contained in last month's column.

Consolidations don't require the *Advanced Version*. So even if you don't have an Apple III you can use DIF files to consolidate information. The only stipulation is that you must have a version of *VisiCalc* that contains DIF capability. If you want to check your version, pressing /S will show a # in the list of options. The # symbol is the DIF save-load command.

If your version doesn't have DIF, there is still a simple method for doing consolidations. Those of you with thirteen-sector Apple II *VisiCalcs* or the original *VisiCalc III Version 1.0* can use the normal *VisiCalc* file consolidation method. Note: If you have a DOS 3.3 Apple II version of *VisiCalc* and plan to use DIF, make sure that you have a version other than 193B. Version 193B will have problems with DIF transfers. If you do have version 193B, contact your dealer to see about obtaining an upgrade.

Which Method Should You Use? There are advantages and disadvantages to each method of consolidation. DIF consolidation permits smaller files to be sent for consolidation. Effectively, the DIF file is nothing more than the information displayed on the screen. That means that if the input model uses any formulas to generate the data (for example, 10 percent growth per month), the data (numbers) and not the formulas will end up in the consolidation template. For most consolidations, that is desirable. But if you want to take the information presented and do

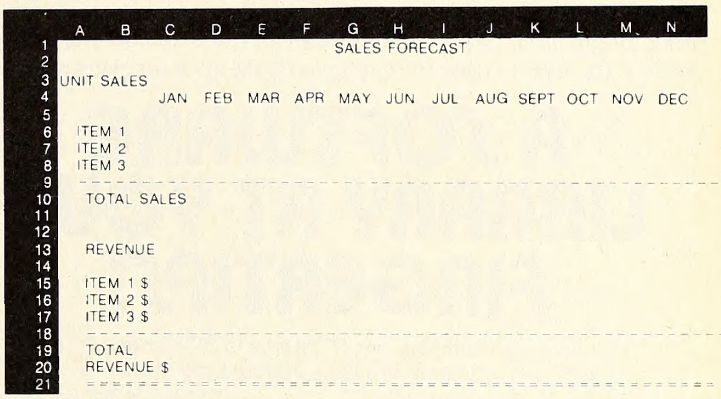
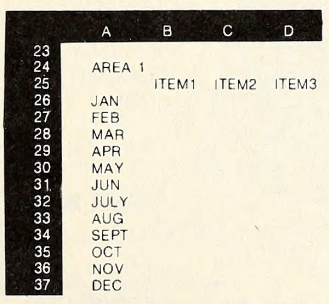


Figure 1.



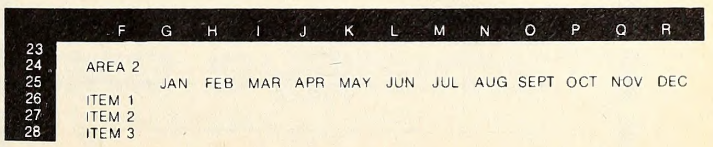


Figure 2.

"what if?" calculations (after all, what's *VisiCalc* for?), you won't, for example, be able to change the growth percentage rate and see the effect without rebuilding each input model to include formulas. If you need to "what if?" clearly the normal *VisiCalc* file method is necessary.

The normal *VisiCalc* file method requires that each input model be in exactly the same cell coordinates as it is in the consolidation template. That has a major implication. If the input model is below the consolidation template, it will be a larger file than the consolidation template and will consist mostly of blank space. This is because the file size is partly determined by the number of rows and columns that exist to the left and above the bottom right of the model. The DIF method allows the input model to require only the space necessary for the actual model.

Choose a Method and Try It! If you aren't going to use the DIF transfer capability, complete the DIF consolidation model until you have tested and saved the consolidation template and then go to the section in this article on building a model using normal *VisiCalc* files. If you are going to use DIF, start in this next section. As always, it will be easier and more fun if you boot *VisiCalc* and try things out as we go along. You'll also need a formatted or initialized disk on which to save files.

Building a DIF Consolidation Model. In order to consolidate information, we are going to build two types of templates. The first type of template is comprised of the models that have the information to be consolidated. We will refer to these as *input models.* A company's area sales forecasts from the sales managers of different regions are an example of an input model.

The second type of template is the consolidation template. This is the template that a company's sales office would use to consolidate area forecasts into a single sales forecast. In this article, we'll build two input models. But first we'll build the consolidation template.

Our consolidation template will include a sales forecast and a revenue forecast. The sales forecast will be a consolidation of the separate input model forecasts for unit sales. The revenue forecast will be based on the total unit sales multiplied by a specified retail price. Our forecast will be for one year (January through December) and will include three items (or products). Set up the forecast and revenue sections as shown in figure 1. (In order to make the directions for the input templates easier to understand, start the Item 1 row in C6 for the Unit Sales chart, and in C15 for the Revenue chart.)

Next, enter the two regional (Area) forecasts input models shown in figure 2.

The Area forecasts in figure 2 are the locations to which the DIF files will be transferred. After we have completed and saved the consolidation template, we will delete the consolidation forecasts (figure 1) and use the Area forecasts as the input models. For simplicity, we will save both input models in one file; but normally each Area template would be used independently. If that sounds confusing, remember that the Area forecasts are the input models that contain the data we are trying to consolidate and would probably come from different people. It is also important to note that we could have as many input templates as memory and space permit.

Presto, Chango. The two input models shown in figure 2 point out another interesting thing about using *VisiCalc* for consolidations. The input models don't have to be in the same format as the consolidation template; they don't even have to be in the same format as each other. Having them in different formats does complicate the initial model building, as you will see. Once the model is completed, the format of the individual input models makes no difference.

The ideal format for the input models is to design each to have the same format as the consolidation template. That way, any rows or columns (Items or months in our example) added to the input models can easily be added to the consolidation template. The formulas in the consolidation template can easily be added through replication.

Furthermore, the labels applied to each row and column can be different in the individual templates. In an input model, a cell can be labeled the intersection of a month and a product name, while in the consolidation template the consolidated data can be labeled anything appropriate.

For simplicity's sake, format all the data cells in the unit and the revenue forecasts for integers. That's easily accomplished by entering /FI in an individual cell and then replicating it through the remaining cells in the templates.

Now comes the difficult part. As we said earlier, having two different layouts for the input models will cause the formula entry to be a bit more complicated. Move to cell C6, the intersection of Jan and Item 1 in the unit forecast section. We want to add the data in the equivalent cell coordinates for Jan and Item 1 from Area 1 and Area 2 input models.

In our example, the formula in the first cell is +B26 +G26. Cell B26 is the January forecast for Item 1 in the Area 1 forecast and G26 is the equivalent cell in Area 2. To continue the example, Item 1 Feb is +B27+H26. If the input models had been the same format as the consolidation model, you would have had only to enter the first formula and then to replicate it (using relative reference) into the remaining cells. If you'd like to make the remainder of our example easier, change the Area 1 model to the same format as the Area 2 model before proceeding. Then finish entering the remaining formulas in the sales forecast section.

Next, the Total Sales cells will sum the values in each column. Enter the @SUM formula (that is, @SUM(C6...C8)) and replicate it (with relative reference) across the Total Sales row.

Next, in the Revenue section, we want to take the unit sales figure for each month for each Item and multiply it by a retail price. In our example, the Jan Item 1 Revenue cell has the formula 12*C6. Jan Item 2 is 15*C7 and Jan Item 3 is 13*C8. Complete the Revenue section following the examples above. You can use the replicate command (with relative reference) again to speed up the process. If you want the prices to be variables, you can have a section in your model where you enter the individual costs. Then, instead of having the formulas be a value multiplied by a cell coordinate, the formulas will be the cell coordinates that you already have in the formulas multiplied by the cell coordinate containing the prices. Remember, if you replicate these formulas, you will use relative reference and No Change (for the costs).

We need a Total Revenue row next. Replicate the formula in Jan Total Sales across the Total Revenue row (need we say using relative reference again?), All of the cells should display 0 until we enter values in the input models.

The next step is to test the template to ensure that our formulas are

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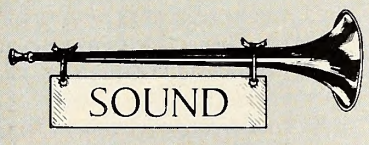

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accurate. First, save this template under a file name like CONS.TEMP (Apple III format), or CONSOLIDATION TEMPLATE (Apple II).

Next, enter the *same* value (for example, 10) into each cell in the Area 1 model only. Press *!* to recalculate the template and to check that all the values in the Unit Sales portion are the same and that the Total Sales values are all equal. Then, check that the rows containing Item 1, Item 2, and Item 3 monthly revenues as well as the Total Revenues are all the same. Repeat this test for the Area 2 model. If you get unexpected results, double-check the formulas in the suspect cells. (Don't forget to save the file again if you make any changes.)

If you're going to do consolidations using normal *VisiCalc* files, now is the time to go to the section entitled, "Building a Consolidation Model Using Normal Files."

For DIF users, it's now time to prepare the input models. This part is going to be easy! For this example, we will keep these two input models in the same file. Once you understand how to break them out of the consolidation template, you can easily separate them into different files if you want to.

Delete rows (/DR) until the label Area 1 is in cell A3. Save the file. This is all it takes to make our sample input template. If you want to save individual input templates, delete the columns containing the Area 2 model and save the Area 1 model. Reload the original input template containing both Area 1 and Area 2 and delete the columns containing the Area 1 model. Save the Area 2 model and you're ready to do a consolidation using individual input models.

Consolidating the DIF Model. The first step in consolidation is to enter information into the individual Area models. You can enter either random information or growth formulas in the cells. For example, you can enter a value in the Jan cell, enter 1.1 * (the Jan cell coordinate) in the Feb cell, and then replicate the value in the Feb cell (using relative reference) into the Mar through Dec cells.

Next, move the cursor to the cell containing the label Area 1. Press */S#S AREA1*(return). Move the cursor to the lower right cell of the Area 1 model (Dec Item 3) and press return twice. Do the same thing for the Area 2 model, using a different file name than you used before, and you are ready to do a consolidation.

Reload the consolidation template (CONS.TEMP or CONSOLIDATION TEMPLATE) and move once more to the cell with the label Area 1. Press */S#L AREA1* (return return). You have now consolidated the Area 1 model. Press *!* and see the result in the consolidation area of the template. Remember that you must start with the cursor on the correct Area label whenever you load your DIF files. Load the Area 2 model (using /S#) and see the completed results. You now have a consolidated template. If you want to learn how to consolidate using normal *VisiCalc* files, read the next section.

Building a Consolidation Model Using Normal Files. If you have completed, tested, and saved the consolidation template (including the Area models), you are ready to prepare it for consolidation. The first thing we must do is separate the Area models. These are the input models. This is done in a slightly different way than in the DIF method. Rather than deleting rows or columns to remove the consolidation part of the template, blank out (/B) all the cells in the consolidation part of the template. You can do this easily by replicating a blank cell throughout the cells you want to be blanked. *Do not* delete any rows or columns. It is important that the input models remain in their exact cell locations. Otherwise, the consolidation won't work.

After blanking out all of the consolidation part of the template, save the Area model template. If you desire individual Area models, you can then blank the Area 2 part, save it, load the combination Area model, blank out Area 1, and save the Area 2 model. You now have two individual Area models.

This method of consolidation is simpler than using DIF. Load, enter sales data, and save the separate Area models. You might want to use growth formulas in the forecast cells (see the section, "Consolidating the DIF Model") so you can see that the consolidation doesn't affect the formulas.

Load the consolidation template (again, CONS.TEMP or CONSOLIDATION TEMPLATE) and then, without clearing the consolidation model, load (in the normal /SS fashion) the remaining Area models. You now have a consolidated model.

Designing Templates for Growth. The two or three files you have are all you need to do many different consolidations. You can change the titles in the models for different applications. If you decide that you need more Items or more months, the easiest way of getting them is to take the consolidation template, add the new rows or columns, test the model, and break out the individual input models.

In some instances, the data to be consolidated is really only a part of the consolidation template. The consolidation template may do many different computations, in the range of which the input model is only a small factor. That relationship really doesn't affect the process of designing the template. The input model should be designed as a physical part of the consolidation template and should be tested; only then should it be separated from the template. You can, of course, try to develop the individual templates in separate files, but then the only way to test them is actually to consolidate. If they don't work, then make your changes, save the files, and try another consolidation.

Also, the input model might be a part of a larger template. In this case, as you probably know by now, the input model should fit the format (cell locations) for both the original and consolidation templates.

Once you understand how to build consolidation templates, you will begin to find many instances in which information from certain templates can be used in other templates. Consolidations are often the quickest and easiest way to accomplish that. If your consolidations are complicated because they require too many steps, look closer at *VisiCalc Advanced Version*. Once you know how to consolidate your information, the *Advanced Version* will do most of the work for you!

Templates Revisited. Last month we discussed how to convert *VisiCalc* templates that were designed for use on different Apples. Purchasing *VisiCalc* templates is one of the fastest ways to begin to realize value from *VisiCalc*. A future column might be the perfect forum in which to discuss some of the templates available today. If you know of any company selling (or giving away) *VisiCalc* templates for any Apple Computer version of *VisiCalc*, please write to *Softalk* and let us know. If response is sufficient, you'll see an article or review on templates in a future column. ■

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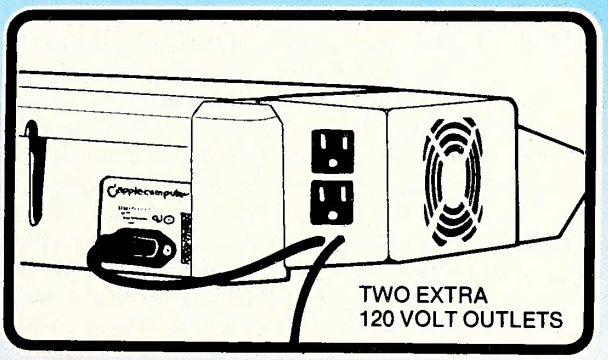

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HARD TALK

BY JEFFREY MAZUR

Without question, the most important peripheral for most computer owners is the floppy disk storage system. When you consider the alternative, the tape recorder, it becomes clear why the vast majority of Apple owners have at least one Disk II.

Because of the high demand for these units, many outside manufacturers are now offering Apple-compatible disk drives. In fact, many of these drives are superior to the Disk II in storage capacity, speed, and reliability. Even the Apple disk controller card has been improved by several companies.

Disk Basics. When it was introduced, the Disk II floppy disk system, like the Apple itself, represented a radical departure from the design of the time. Gone were the usual LSI controller IC, the sector hole detector, and the constant disk rotation when the drive was not in use. Even the head-load solenoid was eventually removed, lowering drive cost as well as the noise generated during operation.

If all of this is Greek to you, maybe reviewing a few basic principles of how the floppy disk works will help. This month's column focuses mainly on a hardware description. For a further understanding and a complete overview of the disk operating system software, refer to a treatise such as *Beneath Apple DOS* from Quality Software.

The Disk Medium. As you may already know, a floppy disk is something of a cross between recording tape and a phonograph record. As with the recorder, information is stored magnetically on a thin piece of Mylar film. Rather than using a long, narrow strip of "tape," the standard floppy is an eight-inch diameter disk that can be rotated like a record. The Disk II and other drives we will be discussing are technically classified as minifloppies because they use the smaller 5¼-inch format.

Information is stored on this film base by spinning it past a writing head so that data is laid out on a circular track. The head moves in and out to write on many different tracks. Tracks are somewhat like the grooves on a record, only each track is concentric; that is, the tracks do not continually spiral inward. A better analogy may be to an eight-track tape player, in which the head moves up and down to play back the different tracks.

How does the head actually read and write data on the disk? The secret lies in a thin coating of magnetic particles that are spread onto the surface of the Mylar. These particles are suspended in a substance that allows them limited movement, yet keeps them from falling off the disk. The coating is referred to as the *oxide.*

Each particle is like a tiny magnet; therefore, it will act like a compass under the influence of a magnetic field. That is, if the field is strong enough, these particles will turn themselves so that they are aligned with the field.

On a blank or erased disk, each particle will be pointing in a completely random direction (figure 1a). After passing over the head while it is writing, however, the particles in that track will be aligned in one of two directions, depending upon the flow of the electric current through the head (figure 1b). The direction of current flow determines the direction in which the particles line up. By changing the current's direction, we can write our desired information as a series of magnetic fields. After the particles have passed by the head and are no longer influenced by its field, they remain locked into their last orientation until acted upon by another magnetic field. Therefore, we have achieved our goal: the permanent storage of data. This is the basis for all magnetic recordings, whether of music, digital data, or television pictures.

Reading data back from the magnetic media is also quite simple. As the aligned particles move past the head (which is now being used as a pickup device), they set up their own magnetic fields, which extend into the gap of the head. Whenever there is a change in the particles' orientation, or *flux reversal,* a small voltage is induced into the head (figure 2). This voltage can be amplified and conditioned to resemble exactly the data signal originally recorded. Figure 3 shows how this is accomplished.

Packing It In. With binary digital data, an important consideration is how much data can be stored on a given disk. In this discussion, we're going to make numerical claims about the performance of disk drives in several areas.

These numbers by no means represent the actual expected limita-

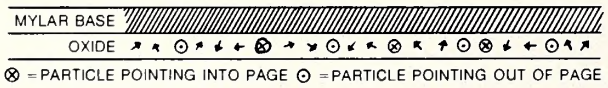


Figure 1a. Erased disk.

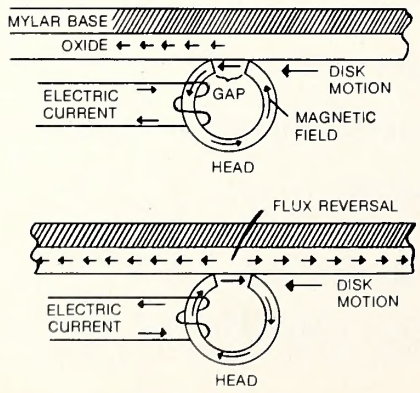


Figure 1b. Recording a bit.

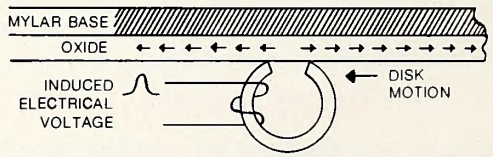


Figure 2. Reading a bit. Induced voltage pulse caused by flux reversal passing over gap.

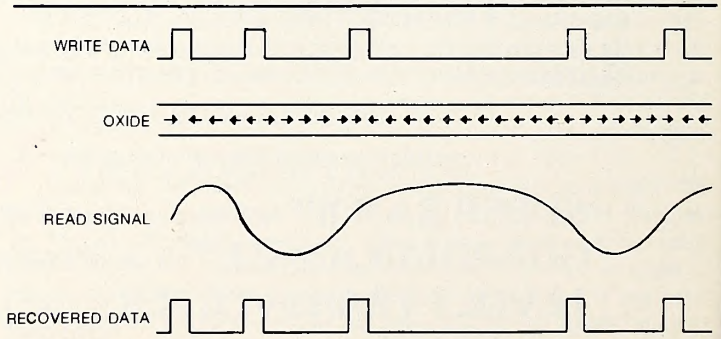
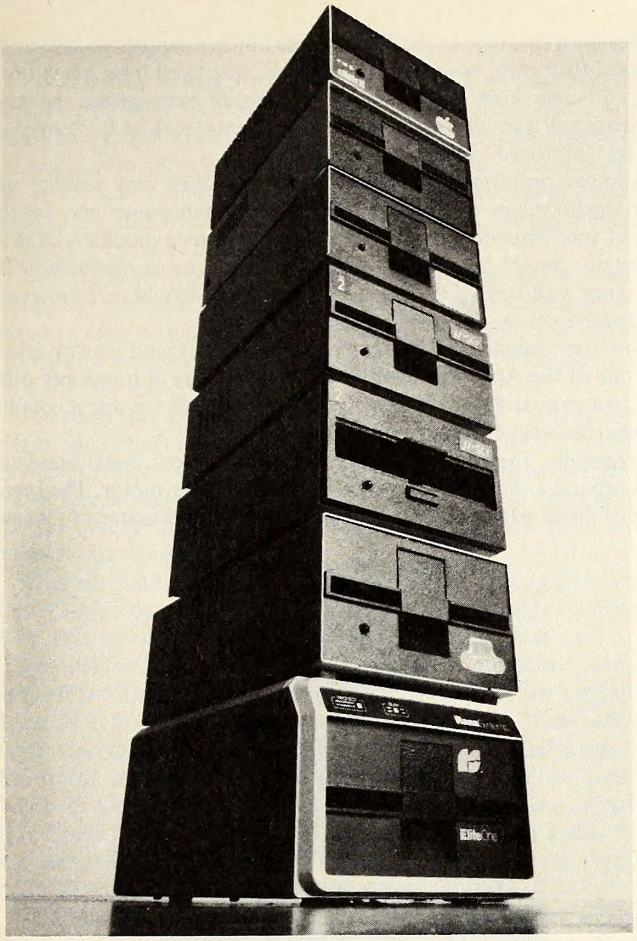


Figure 3. Data is recovered by producing a pulse for every polarity change of the read signal.



Above, our first collection of Apple-compatible drives. Starting from the penthouse on down: the Disk II made by Apple Computer; the Model 3101 by Lobo Drives; the Super Drive by Fourth Dimension; the A2 and the A40 drives, both by Micro-Sci; the Apple-Mate by Quentin Research; and the Elite One by Rana Systems.

tions at any given time. Instead, they are relatively standard figures that give a considerable margin of safety to ensure reliable operation. Thus, for example, when we say that a disk can hold 25,000 bits per track, it may be true that we could store as many as 50,000 bits in some instances. But after allowing for disk and drive variations, environmental factors such as temperature, humidity and dust, and wear and tear, it may be that the lower number is the limit we can approach and still have a reasonable chance of recovering our data without error.

The total amount of data that can be stored on one disk depends upon two factors: the number of tracks and the number of bytes per track. The number of tracks used is determined by the accuracy of the positioner and the track recording width. The Disk II and its equivalents all use thirty-five tracks. While most drives for the Apple are physically capable of reaching one or more extra tracks (moving closer to the disk's center), many manufacturers are now using the popular forty-track drives. Of course, changes must be made to the DOS in order to use the extra tracks.

Both thirty-five and forty track drives use a standard track density of 48 TPI (tracks per inch). This means that the head only moves about ¾ of an inch from track 0 to track 34. Seventy and eighty track drives achieve their greater density by packing the tracks closer together, at ninety-six TPI. Obviously, this requires a very accurate positioner and a head with a narrower field.

The number of bytes that can be recorded per track also depends upon a number of factors. First, a certain constraint is imposed by the disk material itself. This has to do with the density of the magnetic particles, or how many there are on a given area of the disk. It takes many particles in alignment to represent either of the magnetic states; therefore, the density of particles really sets a limitation on the density of flux changes. At the same time, the read-write head has a limiting factor of its own. This relates to the size of the field it creates when writing and responds to when reading. The drives we will be discussing are typically rated at about 5,500 FCI (flux changes per inch).

Keeping in Sync. Given this limitation on the number of flux changes per inch, the number of bits per track depends upon the track length and the number of flux changes required per bit. The first figure is easy to calculate. Since we must assume the "worst case" conditions, we use the innermost track dimension, which turns out to be a circle of about 1.54-inch radius. Using two-pi-R, the circumference formula, this translates to 9.68 inches.

The number of flux changes per bit is determined by the type of recording format used. Since the data is stored serially, that is, one bit at a time, by a mechanical device whose motion is not extremely precise, it must be sent asynchronously. This means that some extra *clock pulses* are added to the data so that when reading, the playback circuits can later synchronize with the data stream coming from the head. Several different techniques have been developed for this function.

Recording Format. Before trying to understand the recording technique used by Apple DOS, it is helpful to examine the standard format that was used by most other manufacturers when the Disk II came out. A typical 5¼-inch floppy disk system might have consisted of a Shugart SA400 drive, a controller interface designed around an LSI controller IC, and a disk operating system such as CP/M. The system might have used *hard sectoring,* in which the beginning of each block of data was indicated by the presence of a sector hole in the disk. This hole was detected by a simple lamp-photocell arrangement located on either side of the disk. Another sectoring scheme, called *soft sectoring,* might also have been employed. This technique signifies the beginning of each sector by writing a special series of bits, sort of a road sign, to the disk to mark the address of each location.

The actual recording technique used is known as double frequency (FM) NRZI modulation and is characterized in figure 4. A *bit cell* is defined as the space between two clock bits. The absence or presence of a pulse within each cell determines whether it represents a zero or a one. With this technique a "zero" is written by one flux reversal and a "one" is written by two reversals within each bit cell.

Given the previous restraints on flux density, the standard single density recording was set at 25,000 bits per track. This works out to 2,581 bits per inch on the inner track. Since each bit takes a maximum of two flux reversals to record, this translates to 5,126 flux changes per inch, which is well within any disk's capabilities. After accounting for the sectoring information and safety gaps, this allows about 80K of storage per disk.

However, using one clock pulse per bit is quite inefficient. All that is required for read synchronization is that a pulse be received every so often. If the data *ones* recorded on the disk could provide this pulse, we could eliminate the clock pulses. Without clock pulses, however, there must be some guarantee that there will not be a long string of zero bits. Such a string would be read back as a long space without any pulses. If long enough, it could cause the read circuits, or *data separator,* to become unsynchronized.

Thus, the data to be stored must first be translated into a series of legal codes that can be written to the disk. This is the function of a routine in DOS. There is a similar function to restore the data when it is read back from the disk. With DOS 3.3, eight-bit data is first transformed into one of thirty-two different codes. This allows six bits of the original data to be represented by the eight-bit code. With this technique, known

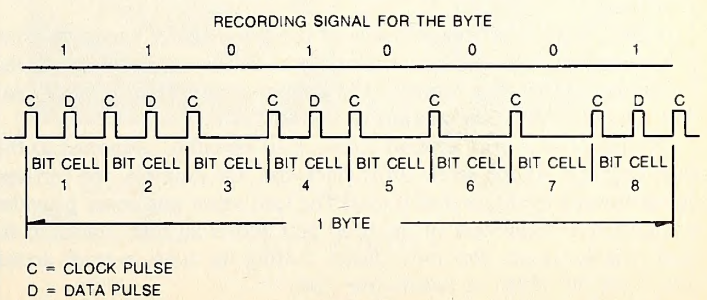


Figure 4. FM recording

as group code recording (GCR), six bits of data can be represented by only eight flux changes instead of the twelve previously required. That's a 50 percent improvement!

Apple Innovations. By stretching things a little farther, DOS 3.3 is able to place more than one hundred forty-three thousand bytes of data per disk. This is accomplished with a flux density of approximately 5,460 FCI. The only penalty for this increased storage capacity is a similar increase in the complexity of the storage system.

Whereas the previous single density format lends itself to a simple hardware interface (usually contained within one chip), the GCR format requires extensive software overhead to perform disk operations. Apple felt that the computer would be tied up anyway during disk operations, so they placed many of the typically hardware functions in software.

Another example of this is in the control circuits for the head positioner. By using software, Apple was able to design a faster positioning mechanism. Instead of moving the head at a constant rate like its predecessors, the Disk II accelerates the head as fast as possible until it is halfway to where it needs to go. Then the head is decelerated at the same rate until it finally comes to a stop at the desired location. Since several different positioners are used by the drives under consideration, we will now look at these mechanisms.

Head Positioning Mechanisms. The function of any head positioning mechanism is to move the head to a precise location under the disk. This selects which track the head will access. Almost all disk drives use a stepper motor to perform the actual movement. Unlike a normal motor that spins freely when a voltage is applied, a stepper motor only turns in small increments, or steps, according to changes in the voltages applied to its coil.

Each possible position of the motor's shaft corresponds to one track on the disk. The Apple Disk II and all "fully compatible" drives use a ninety-six TPI, or seventy-track, stepper motor. This means that the stepper motor can position the head to within 1/96 of an inch. The standard head, however, makes a recording whose track width is greater than this. Thus Apple's disk operating system only uses every other position, or *phase,* yielding a forty-eight TPI or thirty-five-track drive. Many software protection schemes make use of these in-between positions, or *half-tracks;* therefore, to be completely "Apple compatible," a drive must have this ninety-six TPI compatibility.

The magnetic head within a drive sits in a small carriage that rides along a metal rail. This keeps the head tangential to the disk recording (just like those straight-line tracking phonograph turntables). Linking the carriage to the stepper motor is usually accomplished in one of three ways: by means of a plastic cam, a lead screw, or a metal band.

The least expensive approach is to attach a small plastic disk, or *cam,* to the stepper motor. Molded into the top of this disk is a spiral groove. A small ball bearing attached to the carriage rides in this groove. Thus, as the cam rotates, the head moves in and out. With this type of coupling, there is a significant amount of sloppiness, or *play,* and this limits the accuracy of the head positioning. By the way, it is this plastic cam that causes most of the noise (especially those squeaks) when the head is changing tracks.

Another limitation of cam drive is the time it takes to step from track to track or over multiple tracks. For reliable operation, the carriage should have at least thirty-five milliseconds to move one track. Because of this, Apple DOS has a built-in delay routine that waits forty msec. for track-to-track stepping. Even with DOS's clever accelerate/decelerate positioning software, this yields an average access time of about two hundred msec.

Other Head Positioners. Many of the newer drives have now gone to a lead screw–type positioner. This works on the same principle as the bench vise and monkey wrench. The stepper motor drives a worm gear that runs parallel to the motion of the head.

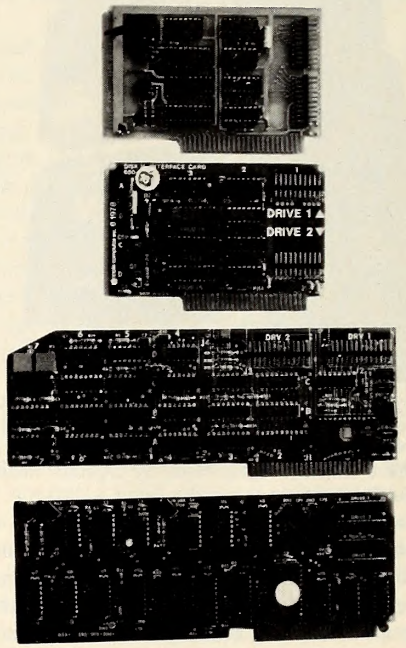
Riding on this gear, or lead screw, is an assembly connected to the head carriage. As the screw turns clockwise, for example, the carriage moves toward the inner disk tracks. The lead screw positioner provides more accurate alignment of the head and allows all forty tracks to be used reliably. It can also move faster, cutting the track-to-track access time down to fifteen to twenty-five msec.

Of course, to take advantage of the extra tracks and faster seek rate, patches must be made to the DOS. These patches can stir up some difficulties of their own, however. For example, when you have a mixture of standard Apple drives and enhanced drives on the same system, the standard drives will undoubtedly experience problems (such as I/O error) under the "improved" DOS.

Another problem with the patches is that they may conflict with other modifications to the DOS. The biggest annoyance may be that most of your favorite programs, which use their own modified DOS for protection, cannot take advantage of the drive's extra capabilities. But even under standard DOS, these improved drives should perform as well as standard drives, if not better.

Another mechanism, the *band* positioner, has found its way into at least one of the Apple-compatible drives. This type of positioner offers even greater accuracy and speed by providing an almost direct coupling between the stepper motor and the carriage.

Essentially, the carriage supports a long, narrow metal band that loops around a drive pulley exiting from the stepper motor. The special shape of the band allows a small screw to fix the band securely to the pulley to prevent slippage. With virtually no mechanical constraints to slow it down, the band positioner can achieve track stepping in less than five msec.



Controller cards for Apple-compatible drives (from the top): controllers from Lobo Drives; Apple Computer; the four-drive controller from Rana Systems; and Micro-Sci's controller.

Beyond the three types of positioners already described, there are more exotic techniques such as the voice coil positioner, which provides motion in the same manner as the cone of a loudspeaker. This can overcome even the shortcomings of a stepper motor, but only at a much higher cost. The advantages of these techniques are questionable for the 5¼-inch floppy format.

The Contenders. For purposes of this overview, we evaluated several of the disk drives currently available for the Apple. A Dymek alignment disk and disk speed program were used to check quality control on the subject drives. Current measurements were taken and overall drive noise was evaluated. Finally, we looked at the length of the connecting cable and whether it was shielded or not. This may prove important in multidrive systems, especially where you have an interference problem. All the drives we evaluated are styled to match the Apple and include beige cabinets.

Apple Disk II. The Disk II, a thirty-five-track cam-positioned drive, is essentially a stripped-down version of a Shugart SA400 or equivalent. All Disk IIs now come with a shielded cable about twenty inches long. Current retail price of a drive, without controller, is $525; with control-

ler the tag is $645.

Lobo Drives Model 3101. The Lobo drive is an exact replacement for the Disk II. It uses the same type of drive mechanism, a similar analog board, and works equally well with an Apple disk controller card or Lobo's own 3.2 to 3.3 switchable boot controller. An interesting feature of the Lobo products is that one pin of the disk cable connector is keyed to a cutoff pin on the controller connectors, making it impossible to plug the cable in backward.

Unfortunately, you can still connect the cable missing an entire row of contacts; powering up the computer under this circumstance is guaranteed to blow a chip on the analog board. The Lobo drive comes with a thirty-inch unshielded cable and is priced at $385. With the 13/16 sector controller the price is $455.

Interface Inc. Drive. An Apple-compatible drive available from Interface Inc. uses an upgraded forty-track version of the SA400, the SA390. For those with an appetite for variety, this drive comes with a case in one of eight different colors. The price is also quite attractive: $325 for a single drive (with a thirty-six-inch unshielded cable). It uses a standard Apple controller card.

Micro-Sci A2 and A40. The A2 drive from Micro-Sci is another Disk II replacement. It rated very well in our alignment test and sells for $479. This includes a twenty-eight-inch unshielded cable.

The A40 is a forty-track, band positioned drive that is *not* Apple compatible without a special controller card (used by the seventy-track Model A70) that comes with various utilities on disk. These utilities are mainly used to modify DOS, Pascal, and CP/M to take advantage of the extra tracks and faster seek rate (five msec). The A40 is the fastest drive we tested. Other utilities are provided to modify FID, CopyA, and other Apple utilities to perform correctly with the extra tracks. A complete user manual is included that details all operations with both standard DOS and modified DOS.

The Micro-Sci controller card can handle two drives and includes a jumper to select either thirteen-sector or sixteen-sector boot code. The prices for the A40 (with twenty-six-inch unshielded cable) and controller card are $449 and $100 respectively.

Quentin Apple-Mate and Fourth Dimension Super Drive. These two drives are almost identical. Both use the Siemens FDD100-5 forty-track drive with a lead screw positioner. Although these drives offer greater capacity and faster operation, neither manufacturer includes the DOS patches necessary to take advantage of these features. Some other features of the Apple-Mate and Super Drive are disk-protection systems that prevent the drive doors from closing unless the disk is fully inserted and motor stall sensors that can prevent a burnout if the disk jams.

Track zero switches silence the drives during recalibration, adding to their overall smooth and quiet operation. Of course, some people may miss all that racket that the other drives make; at least you know when they're working, especially when they run across an I/O error.

The Apple-Mate is a very fine drive at a reasonable price of $379. It uses a twenty-two-inch shielded cable that will plug into any Apple standard controller card. The Super Drive retails for $329. The Apple-Mate and Super Drive both carry one-year warranties. Either would be a good choice for an add-on drive.

Rana Systems Elite One. The Elite One is the first in a series of floppy disk drives from Rana Systems. Looking a bit different from the rest because of its larger size, it is still stylishly designed to match the Apple. The only disadvantage in its greater height will be for those who use an Apple stand to hold their drives and monitor. The Rana drives will not fit into the small shelf.

The extra size gives the drive a place to put two small LEDs that indicate disk activity and write-protect status. A small touch switch next to the write-protect indicator also allows you to protect the disk manually without having to remove it and place a tab over the notch. A small jumper inside the disk can be set to have the drive come up unprotected (like a regular drive) or protected when the computer is first turned on.

Inside the Elite One there may be either a Siemens, MPI, or Tandon drive assembly. No matter which is used, the drive offers fast and accurate head positioning, forty-track operation, and automatic power-down of the analog circuits when the drive is not being accessed. Another real plus is the small loose-leaf user manual that comes with the Elite One. This manual is quite comprehensive and includes sections on the hardware and software.

Although the Elite One can be connected to any Apple controller, Rana also makes its own controller card. This, too, is a rather unique device. It can control up to four drives (with simple patches to the DOS); it automatically selects the booting code for either thirteen or sixteen sector disks; it offers improved data separation; and it incorporates power reduction features. This last claim was confirmed by our current measurements: despite its overwhelming increase in circuitry, it drew only 190 milliamperes from the +5 volt supply, as compared to 270 milliamperes for the Apple controller.

The *Elite Enhancer* disk contains several utilities to modify DOS for the Elite drives. Rana has solved the problem of mixed drive types by including a drive table within the DOS itself. This table is configured according to the type of drive(s) in each slot. When the modified DOS tries to access any disk, it first checks this table and then uses the proper seek delays for the type of drive. Of course, if you change any drives around, you must reconfigure the DOS to match. While this special DOS still has some limitations, it presents a most reasonable solution to the maximum use of mixed drives. The Elite One is priced at $449; the four-drive controller is $135. Extended warranties can also be purchased on either item.

In Conclusion. The disk drive market for the Apple II is just beginning to heat up. Apple Computer has always been in a good position to supply the first drive to most users. Now, however, the improved features and lower prices of outside vendors are attracting the first-time buyer as well as the add-on shopper. ■

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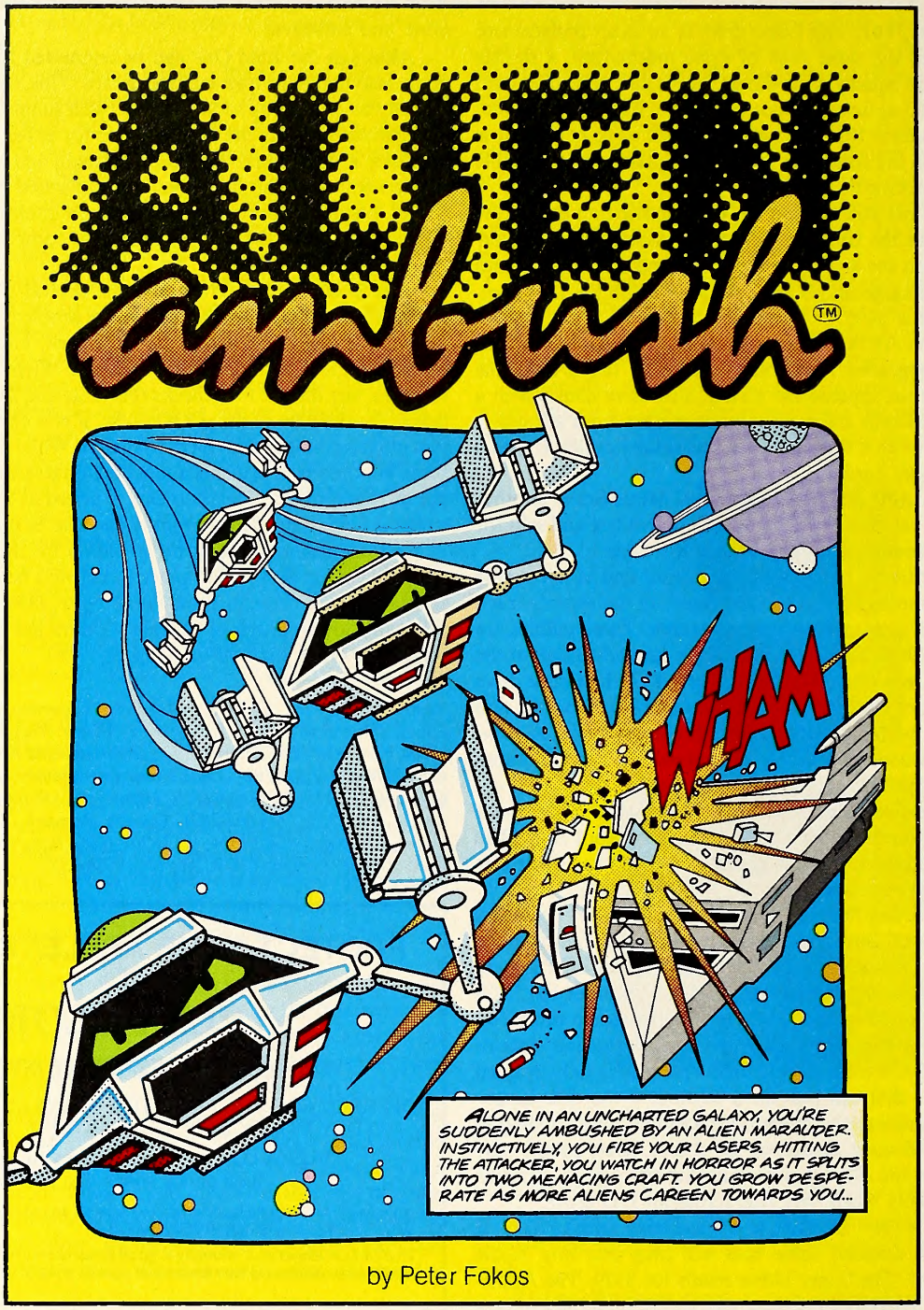

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Softalk Presents The Bestsellers

The following letter was received from Ernie Brock, product manager at Sirius Software, and speaks for itself:

"Your May Top Thirty list is in serious error. For that month, Bandits *outsold* Kabul Spy *(number 25 on your list) 24 to 1 but does not appear on the list. Through the end of May, total sales of* Bandits *were 1.4 times the total sales of* Kabul Spy, *which is pretty amazing considering* Kabul Spy *came out two months before* Bandits. Minotaur *and* Kabul Spy *were both released the same month and have sold equal numbers of copies every month since then, but* Minotaur *never appeared on the list. In the month of May,* Flywars, Cyclod, Lemmings, Gorgon, and Jellyfish *all outsold* Kabul Spy *by factors from 2 to 1 up to 4 to 1, but did not appear on your list. I have sales receipts to verify the quantities. If you continue publishing the Top Thirty list as it is, you should bill it as* Softalk's *favorite thirty, not as the top thirty sales leaders. It is irresponsible journalism to represent this list as being based on actual sales figures.*

"As you are probably aware, the Top Thirty list is being quoted by publishers in pitches to lure new authors, by distributors and retail owners to determine what products to order, by venture-capital groups to decide what companies are good investment risks, and by end users to determine what products to buy. Ultimately a product will sell on its merits, but with the vast number of new products currently available in the Apple market, your list is leading many to support products that are inferior or outdated.

"I suggest that if you are serious about reporting on the best selling software, that you hire an independent accounting firm to audit actual sales.

Apple III

This Month	Last Month	
1.	1.	**VisiCalc,** Software Arts/Dan Bricklin and Robert Frankston, VisiCorp
2.	2.	**Apple Writer III,** Paul Lutus, Apple Computer
3.	3.	**Personal Filing System,** John Page, Software Publishing Corporation
4.	4.	**PFS: Report,** John Page, Software Publishing Corporation
5.	6.	**Apple III Business Basic,** Apple Computer
6.	5.	**Apple III Business Graphics,** Apple Computer
7.	6.	**Word Juggler,** Tim Gill, Quark Engineering
8.	—	**Great Plains Hardisk Accounting Series,** Great Plains Software
9.	9.	**Apple Pascal,** Apple Computer
10.	8.	**Access III,** Apple Computer

The record industry has Billboard, *the TV industry has the Nielsens, and radio has the Arbitron report. All these are provided by independent, reputable accounting firms. Since* Softalk *is one of the major voices of the software industry, I believe it is your responsibility to provide a more accurate reporting of software sales."*

The letter raises questions ranging from definition to methodology.

The primary question is: At what point in an individual unit's life does it become a sale? To a software publisher like Sirius, it's a sale when the product is shipped to a retail store or a distributor. To a distributor like Softsel, it's a sale when it's shipped to the retail outlet. To the retail outlet, it's a sale when the unit passes into the hands of the end user. *Softalk* adopts this latter definition.

Any other method leaves open room for obvious misinterpretations. In the case of Sirius itself, distributors have standing orders for *x* amount of each new entertainment product the company releases. Should we then assume that every product put out by Sirius Software finds equal favor in the marketplace? Clearly not, nor would anyone be justified in drawing that inference.

In the case of distributor sales, those sales represent the expectation by the retailer that they can sell a given product at a certain level. Should we then draw the inference that they did? Empirical evidence tells us that such an inference would be false.

Two cases in point are relative to the controversy. First consider *Dragon Fire* from Level-10. They claimed to have shipped nine thousand pieces in their initial release, and we have no reason to doubt them any more than we have reason to doubt the ratios cited in the letter above. Should *Softalk* then have reported *Dragon Fire* as the number-one seller? It was not, nor did *Softalk* so report. Parent company Dakin-5 was forced into bankruptcy by just such overshipping.

DB Master from Stoneware is another case in point. When Stoneware first started delivering *DB Master* in quantity, they would ecstatically relay to *Softalk* the huge numbers being shipped. As the weeks, and then months, went by without the *Softalk* poll reflecting those numbers, it became a matter of speculation as to whether Stoneware was inflating their shipping figures or the poll was not properly capturing the sales. Neither was the case. In the third month after Stoneware started shipping, the end users started buying. In effect, the pipeline was three months long. Incidentally, *Softalk*'s poll results reflected Stoneware's claims almost unit for unit after taking into account that three-month lag.

Word Processors 10

This Month	Last Month	
1.	1.	**Screen Writer II,** David Kidwell, Sierra On-Line
2.	2.	**Apple Writer II,** Paul Lutus, Apple Computer
3.	3.	**WordStar,** MicroPro
4.	8.	**Word Handler,** Elekman, Silicon Valley Systems
5.	6.	**PIE Writer,** Softwest, Hayden
6.	9.	**Executive Secretary,** John Risken, Sof/Sys
7.	5.	**Sensible Speller,** Sensible Software
8.	4.	**Magic Window,** Gary Shannon and Bill Depew, Artsci
9.	7.	**SuperText II,** Ed Zaron, Muse
10.	10.	**Zardax,** Ian P. Phillips, Computer Solutions/Action-Research Northwest

The marketplace can best be viewed as a pipeline, with publishers pouring product into the supply end, distributors providing the energy to move the product through the pipe, the retailer controlling the spigot at the consumer end, and the end user being the ultimate object of all that expended effort. The length of the pipeline is measured in units of time as opposed to units of distance.

In the best of all possible worlds, the pipeline would be instantaneous; that is, a product moved from a publisher's warehouse would be a product in an end user's hands. Not only is that not true, it is not true that a product in a distributor's hands is a product in the dealer's hands. During the very poll in question, a Chicago retailer was questioned about why he wasn't moving a certain product that was heading the lists of West Coast retailers who used the same distributor. His response? "We haven't received that yet." The lag time for the distributor to serve his midwestern accounts with this product was three weeks. In this case, the time differential meant that some stores were reporting sales of the item in May while other stores were not.

A very realistic scenario would be that the publisher finished the product in April, shipped to the distributor in May, but some of his peak sales were not reflected in the marketplace until June. Such a product may show up as fifteenth on the chart for two months, whereas had all the sales been in one or the other of the months, it would be number two or three. A weaker product might not show either month, although the sales lumped in one month might have rated a bottom rung on the Top Thirty.

Another variable is shelf life. Once moved to the dealer, how long does the product sit before being purchased? Shelf life is both a positive

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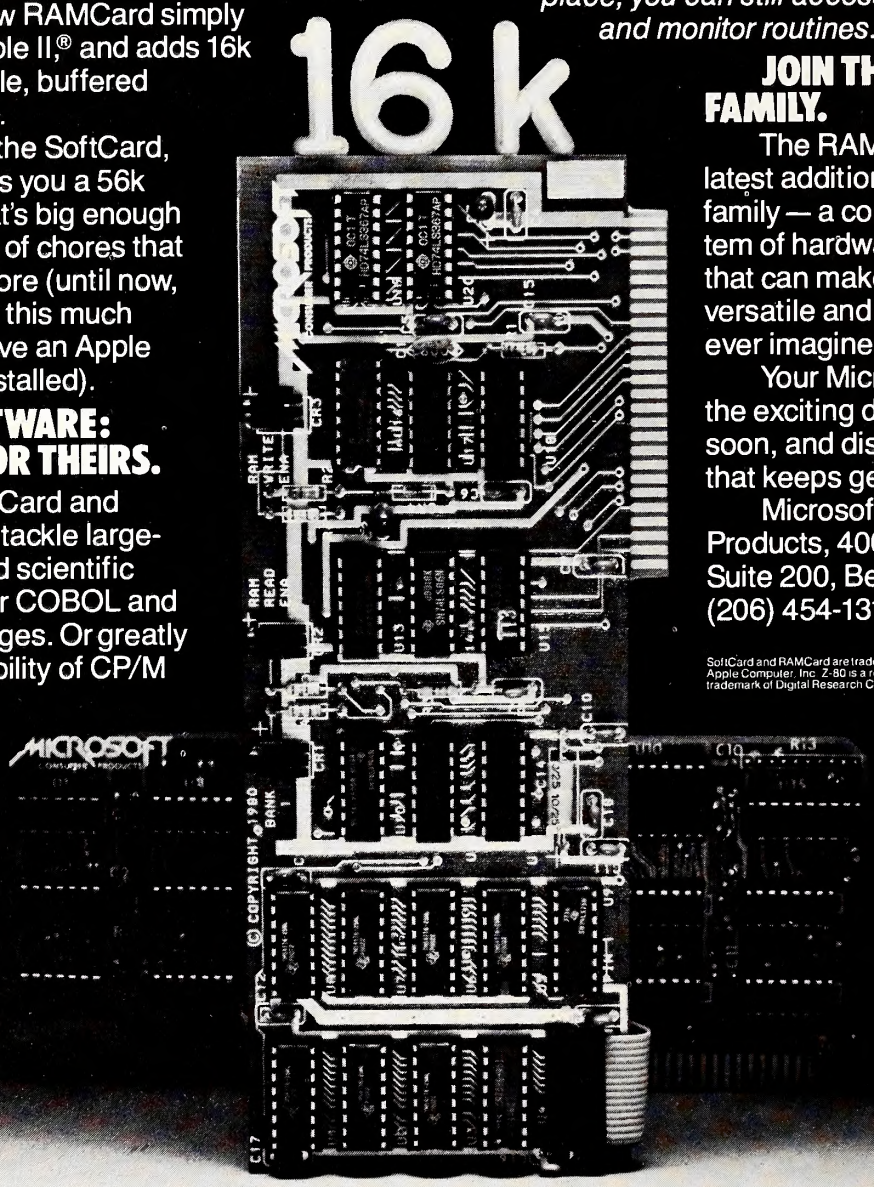

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and a negative measurement. If the product never sells, such as *Dragon Fire*, shelf life is the kiss of death. But if the product, or the product line, is so reliable that the dealer is willing to order more than a couple of test units, then shelf life is a positive measurement of the market's view of that product or product line. Companies that benefit from their reputation are Sirius and Strategic Simulations, among others. Dealers know products from these companies will sell, and therefore buy in larger quantities, in essence stockpiling against future sales.

Companies without that kind of reputation sell in smaller quantities to the dealer. But there is no inference there that the end user is more enamored of one product than the other. The fact that the dealer has ten copies of *Kabul Spy* and three of *Queen of Phobos* is not an indication of popularity. If, at the end of the month, the dealer has eight copies of *Kabul Spy* and no copies of *Queen of Phobos, Queen of Phobos* did better. Sirius did better than Phoenix even though *Queen of Phobos* did better than *Kabul Spy*. Is that confusing enough?

In the case of *Bandits,* very few of the more than one hundred retailers polled mentioned the program for May, although many more commented on how well it was doing in June. Sirius's pipeline is apparently longer than they realize.

The letter writer is in error in assuming that independent accounting firms have any relationship to any of the measuring devices he cites. *Billboard* clearly states that they generate their own data. Interestingly enough, they do not consider only sales, but also radio play. Nielsen and Arbitron are independent companies, but neither is an accounting firm.

Business 10

This Month	Last Month	
1.	1.	**VisiCalc,** Software Arts/Dan Bricklin and Robert Frankston, VisiCorp
2.	2.	**Personal Filing System,** John Page, Software Publishing Corporation
3.	3.	**DB Master,** Alpine Software/Stanley Crane and Jerry Macon; and Barney Stone, Stoneware
4.	4.	**PFS: Report,** John Page, Software Publishing Corporation
5.	5.	**VisiTrend/VisiPlot,** Micro Finance Systems/Mitch Kapor, VisiCorp
6.	7.	**BPI General Ledger,** John Moss and Ken Debower, Apple Computer
7.	6.	**VisiFile,** Creative Computer Applications/Colin Jameson and Ben Herman, VisiCorp
8.	9.	**PFS: Graph,** Bessie Chin, Software Publishing Corporation
9.	—	**VisiDex,** Peter Jennings, VisiCorp
10.	—	**General Manager,** Brillig Systems/Paul Malachowski and Kevin Cooper, Sierra On-Line

In the music industry, the authentic measuring stick is the Recording Industry Association of America. The RIAA certifies records platinum or gold, depending on their sales. The RIAA depends on the sales data of the various distributing companies for its data; as a result, its certifications became a laughingstock, represented by the phrase, "He shipped platinum and returned gold." In record parlance, this means the distributor cajoled retail outlets to accept a million units, but had to take back five hundred thousand.

In an effort to reestablish the credibility of their certification, RIAA now waits six months to conduct a sales audit on any title to ensure that the returns have been properly logged in.

There are two lessons to be learned from the RIAA experience: First, that moving product is not the same as making sales. Second, that music business executives were not above using misleading data for their own purposes. Why should we grant software publishers higher human attributes?

The question of Nielsen and Arbitron is even more interesting. Both measure television audiences, and it is a little-known fact that there was a fairly wide discrepancy between what they reported for local Channel 7 news and Channel 4 news in Los Angeles. Depending on which service you subscribed to, you'd find Channel 7 way ahead or Channel 4 winning a neck-and-neck contest. At stake were millions of dollars of advertising revenue. One of the channels even threatened a lawsuit to prevent what they considered erroneous information from being disseminated. It never came to that, and the disparity in reported results has

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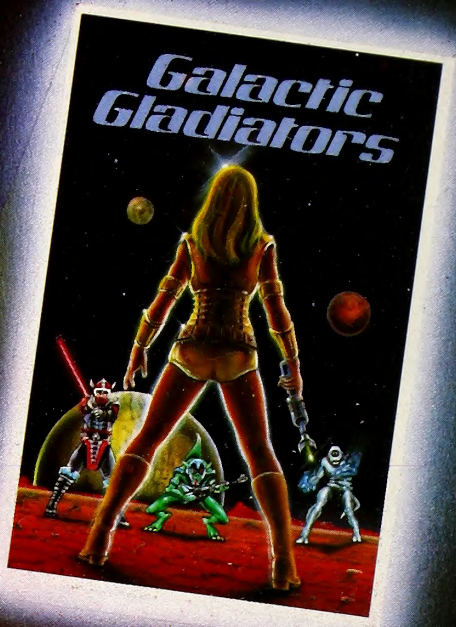

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since narrowed, but to hold either of these companies up as a paragon of polling techniques is not perhaps as realistic as one might believe.

The *Softalk* poll is conducted with similar methodology to the music polls conducted by *Variety*. A statistically representative sampling of dealers—large, medium, and small—from all geographical sections of the country are polled. Whereas none of the information sources cited above admit to error or document their methodology, *Softalk* each month documents what percentage of sales is represented by the results and what probable margin of error may exist in the calculations.

What use any person might make of the poll results is for that person to decide. We would venture to state that any person who made business decisions solely on what was printed in the Top Thirty would be dangerously oversimplifying the market and inviting disaster. The *Softalk* poll does not predict what will be; it only states what was.

Softalk believes its poll to be well-grounded fundamentally and as accurate as any methodology extant. It takes into account a far larger proportion of actual results than any other poll of its kind in any other industry. It is not perfect; any results reported from partial sampling will be flawed. But to ignore such marketplace realities as shelf life and length of pipeline ignores fundamentals.

The results for the month of July were pretty much status quo. *Choplifter* widened its lead over *VisiCalc* for the first place and there was other minor shuffling in the first ten places.

PFS rose to third, *Wizardry* went up a notch to fourth, *Screen Writer II* dropped two spots to fifth, *Snack Attack* jumped to sixth, *Home Accountant* dipped a peg to seventh, *Apple Writer II* slipped into eighth as the only newcomer to the first ten, *Knight of Diamonds* dropped to ninth, and *DB Master* was tenth.

The strength of the *Wizardry* concept is shown by the basic game's strength vis a vis its own scenario. Now that the initial buying splurge on *Knight of Diamonds* has been spent, *Wizardry* has reclaimed the title as the most popular fantasy game in the Apple market.

Strategy 5

This Month	Last Month	
1.	1.	**Castle Wolfenstein,** Silas Warner, Muse
2.	2.	**Flight Simulator,** Bruce Artwick, SubLogic
3.	—	**Rendezvous,** Wes Huntress, Edu-Ware Services
4.	3.	**Sargon II,** Dan and Kathe Spracklen, Hayden
5.	4.	**RobotWar,** Silas Warner, Muse
	4.	**AirSim-1,** Ted Kurtz, Mind Systems

Adventure 5

This Month	Last Month	
1.	5.	**Zork II,** Infocom
2.	2.	**Kabul Spy,** Tim Wilson, Sirius Software
3.	1.	**Deadline,** Infocom
4.	—	**Escape from Rungistan,** Bob Blauschild, Sirius Software
5.	—	**Zork I,** Infocom

Fantasy 5

This Month	Last Month	
1.	2.	**Wizardry,** Andrew Greenberg and Robert Woodhead, Sir-tech
2.	1.	**Knight of Diamonds,** Andrew Greenberg and Robert Woodhead, Sir-tech
3.	3.	**Ultima,** Lord British, California Pacific
4.	4.	**Apventure to Atlantis,** Bob Clardy, Synergistic Software
5.	5.	**Curse of Ra,** Tim Bird, Mark Madrid, and Andrew Martin, Automated Simulations

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The other salient feature of the top ten is the presence of *Apple Writer II*. Apple Computer has been running a promotion in which *Apple Writer II* is bundled with the system at a cost saving to buyers. If the bundled software units were to be counted, *Apple Writer* would have been far and away the leader in July. As it was, the promotion also served to fuel sales of separate units of the program, although some retailers reported requests that *Apple Writer* be replaced by other word processors.

The infusion of *Apple Writer*s had a generally depressing effect on the rest of the word processing market, as evidenced by *Screen Writer*'s dip. One exception was *Word Handler*, which actually climbed into the Top Thirty for the first time. *Word Handler* benefitted when *Screen Writer* was off the market for refurbishing and it's clear that Silicon Valley Systems won't relinquish that momentum without a fight.

Joining *Word Handler* as first-time entries to the Top Thirty were *Transcend* from SSM and *PFS: Graph* from Software Publishing Corporation. Reentering the Top Thirty was *Data Capture 4.0*.

SSM's marketing strategy brought *Transcend* into the market more rapidly than would normally be expected of a communications package; the company is bundling the software with a Source membership. That bundling enabled the program to edge out *Data Capture 4.0* as the leading communications package. Southeastern Software's package had previously had a stranglehold on this segment of the market.

In general, there was a slight resurgence in the marketplace in July, although entertainment software sales were still not too perky. This poll, the twenty-fourth conducted by *Softalk*, marks the first time that there were not at least ten arcade games in the Top Thirty. Part of the reason may be the lack of discretionary income of families during an economic downturn, and part of the reason may be the increasing use of Apples in dedicated business environments; but most retailers are blaming a glut of product so great that buyers are having great difficulty distinguishing between the packages. In many cases, retailers report that this has resulted in the buyer postponing a decision or buying a different type of entertainment software.

Unfortunately for the adventure programmers, theirs has not been

Home 10

This Month	Last Month	
1.	1.	**Home Accountant,** Bob Schoenburg, Larry Grodin, and Steve Pollack, Continental Software
2.	2.	**MasterType,** Bruce Zweig, Lightning Software
3.	—	**Transcend,** SSM
4.	3.	**Data Capture 4.0,** David Hughes and George McClelland, Southeastern Software
5.	5.	**Personal Finance Manager,** Jeffrey Gold, Apple Computer
6.	4.	**Typing Tutor,** Image Producers, Microsoft
7.	—	**Electric Duet,** Paul Lutus, Insoft
8.	7.	**ASCII Express,** Bill Blue, Southwestern Data Systems
9.	8.	**Apple Logo,** Apple Computer
10.	7.	**VisiTerm,** Tom Keith, VisiCorp

Hobby 10

This Month	Last Month	
1.	1.	**Bag of Tricks,** Don Worth and Pieter Lechner, Quality Software
2.	3.	**Utility City,** Bert Kersey, Beagle Bros
3.	2.	**DOS Boss,** Bert Kersey and Jack Cassidy, Beagle Bros
4.	7.	**The Complete Graphics System,** Mark Pelczarski, Penguin Software
5.	5.	**Graphics Magician,** Chris Jochumson, David Lubar, and Mark Pelczarski, Penguin Software
6.	6.	**Zoom Grafix,** Dav Holle, Phoenix Software
7.	9.	**Apple Mechanic,** Bert Kersey, Beagle Bros
8.	—	**Special Effects,** Mark Pelczarski, Penguin Software
9.	—	**Lisa 2.5,** Randy Hyde, Sierra On-Line
10.	—	**Global Program Line Editor,** Neil Konzen, Synergistic Software

Softalk Presents The Bestsellers

the alternate selected. For the second straight month, no adventure game ranked in the Top Thirty. The evolution of that genre at present is indicated by the absence of Sierra On-Line's (On-Line Systems) product from any position on the Adventure 5 list. Infocom, with their three text adventures, and Sirius, with their first two hi-res adventures, have displaced the once seemingly invincible line up from On-Line.

The Coarsegold crowd didn't even rate runner-up position. Quality Software's *Ali Baba* tracked sixth in July. On-Line's in no danger of going south, however. *Cannonball Blitz* and *Marauder* joined *Screen Writer* on the Top Thirty, *General Manager* gained the Business 10 list, and *Lisa 2.5* attained the Hobby 10 list.

As with the Top Thirty, the specialty lists saw little change. The *Great Plains Hardisk Accounting Series* supplanted Denver's *Executive Accounting System* in the Apple III list. The Fantasy 5 list saw *Wizardry* and *Knight of Diamonds* change places with the other three programs holding their own. The same five programs remained in order on the Strategy 5 list, but they were joined by *Rendezvous,* which slipped into third place.

In the Business 10, *VisiDex* joined *General Manager* as a new entry and the *BPI General Ledger* package edged out *VisiFile* for sixth. The rest of that list remained the same. The composition of the Word Processor 10 list was the same, but the order was significantly different. *Word Handler* jumped to fourth, *PIE Writer* rose a notch to fifth, and *Executive Secretary* rose to sixth. Dropping down were *Sensible Speller* to seventh, *Magic Window* to eighth, and *SuperText* to ninth.

Transcend vaulted into third in the Home 10 list. The surprise entry was *Electric Duet,* Paul Lutus's two-voice musical program from Insoft, which gained seventh. There were no new programs gaining the Hobby 10 list, although three programs that had previously been listed regained the charts. They were Penguin's *Special Effects,* Sierra On-Line's *Lisa 2.5,* and Synergistic's *Global Program Line Editor.*

If the market continues to fight off the summer doldrums and builds to a big holiday selling season, the amount of product available will ultimately be a blessing. Otherwise, it'll be tight belts for some software publishers come winter. ■

Apple-franchised retail stores representing approximately 6.2 percent of the sales of Apples and Apple-related products volunteered to participate in the poll.

Respondents were contacted early in August to ascertain their sales leaders for the month of July.

The only criterion for inclusion on the list was number of sales made—such other criteria as quality of product, profitability to the computer retailer, and personal preference of the individual respondents were not considered.

Respondents in August 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 for 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 5.3 percent, which translates roughly into the theoretical possibility of a change of 4.03 points, plus or minus, in any index number.

The Top Thirty

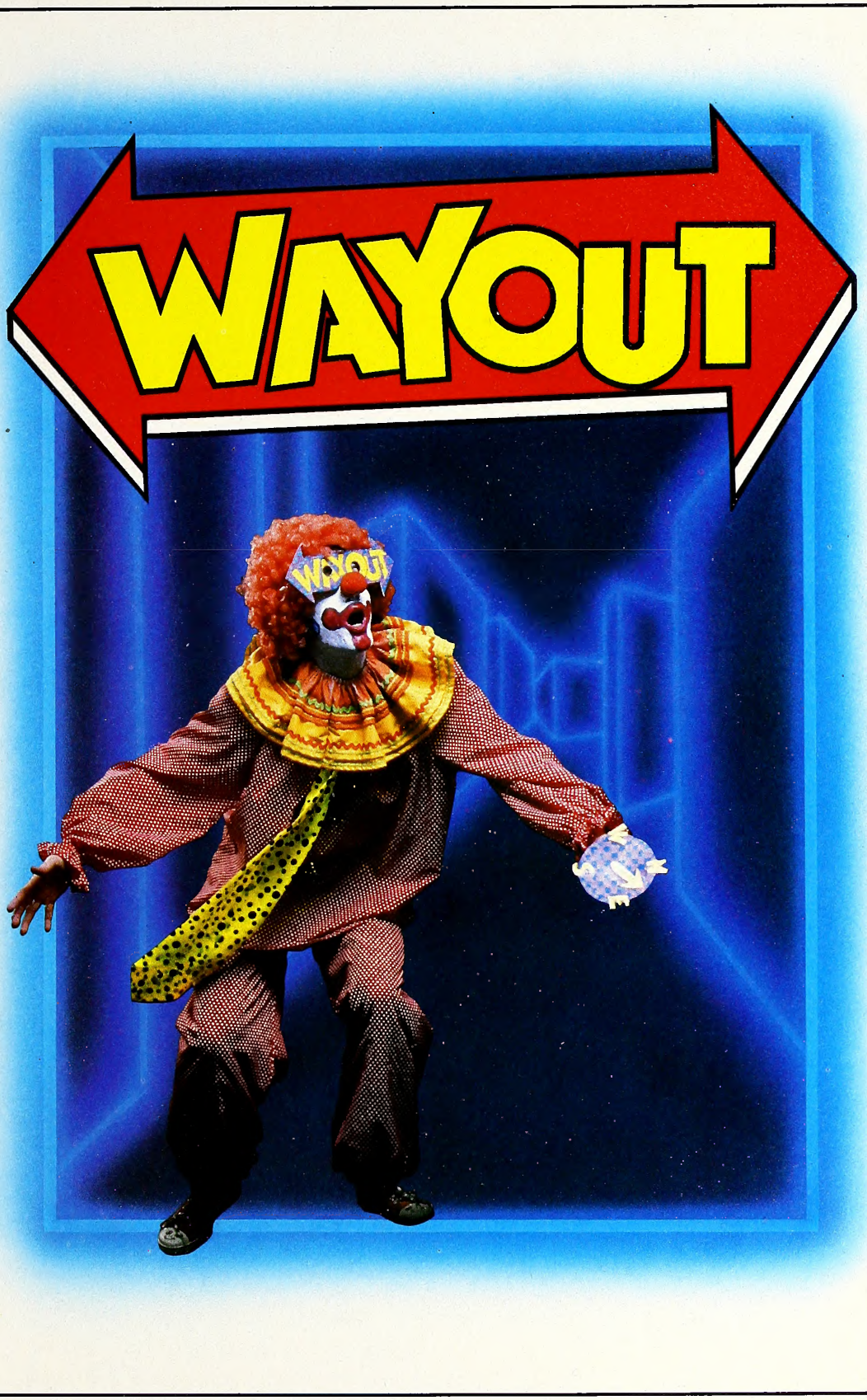
This Month	Last Month	Index	
1.	1.	202.90	**Choplifter,** Dan Gorlin, Broderbund Software
2.	2.	150.43	**VisiCalc,** Software Arts/Dan Bricklin and Robert Frankston, VisiCorp
3.	7.	98.73	**Personal Filing System,** John Page, Software Publishing Corporation
4.	5.	94.07	**Wizardry,** Andrew Greenberg and Robert Woodhead, Sir-tech
5.	3.	90.18	**Screen Writer II,** David Kidwell, Sierra On-Line
6.	8.	70.35	**Snack Attack,** Dan Illowsky, DataMost
7.	6.	68.80	**Home Accountant,** Bob Schoenburg, Larry Grodin, and Steve Pollack, Continental Software
8.	15.	64.15	**Apple Writer II,** Paul Lutus, Apple Computer
9.	4.	62.19	**Knight of Diamonds,** Andrew Greenberg and Robert Woodhead, Sir-tech
10.	9.	50.14	**DB Master,** Alpine Software/Stanley Crane and Jerry Macon; and Barney Stone, Stoneware
11.	14.	38.48	**Star Blazer,** Tony Suzuki, Broderbund Software
12.	13.	38.09	**A2-PB1 Pinball: Night Mission,** Bruce Artwick, SubLogic
	17.	38.09	**Cannonball Blitz,** Olaf Lubeck, Sierra On-Line
14.	16.	36.15	**Castle Wolfenstein,** Silas Warner, Muse
15.	19.	30.71	**PFS: Report,** John Page, Software Publishing Corporation
16.	20.	29.93	**VisiTrend/VisiPlot,** Micro Finance Systems/Mitch Kapor, VisiCorp
17.	21.	29.15	**Taxman,** Brian FitzGerald, H.A.L. Labs
18.	29.	28.76	**BPI General Ledger,** John Moss and Ken Debower, Apple Computer
19.	23.	27.99	**VisiFile,** Creative Computer Applications/Colin Jameson, and Ben Herman, VisiCorp
20.	11.	25.65	**Bandits,** Benny Ngo and Tony Ngo, Sirius Software
21.	10.	24.10	**Bag of Tricks,** Don Worth and Pieter Lechner, Quality Software
	22.	24.10	**MasterType,** Bruce Zweig, Lightning Software
23.	18.	23.71	**WordStar,** MicroPro
24.	—	21.77	**Transcend,** SSM
25.	—	20.99	**Data Capture 4.0,** David Hughes and George McClelland, Southeastern Software
26.	—	20.60	**Word Handler,** Elekman, Silicon Valley Systems
27.	29.	20.21	**Utility City,** Bert Kersey, Beagle Bros
28.	—	19.82	**PFS: Graph,** Bessie Chin, Software Publishing Corporation
29.	25.	19.05	**Swashbuckler,** Paul Stephenson, DataMost
30.	12.	18.66	**Marauder,** Rorke Weigandt and Eric Hammond, Sierra On-Line

Step right up! It's new, it's fun, it's aMAZing! It's WAYOUT, a game so exciting it can make a blind man talk, a deaf man see! Step right up and put on these wayout protective goggles. Good! Now take this compass and mapmaker and step inside this hallway. Excellent! OK now, I'm gonna lock you inside and see if you can find your WAYOUT!

See those fireflies? They'll show ya which way the wind is comin' from — if you don't get blown over first. Oh, and beware the Cleptangle. He loves to sneak off with your mapmaker and compass. Whadya think? Pretty WAYOUT, eh?

Yes, people everywhere are going out of their way to play WAYOUT from Sirius. The first 3-dimensional maze game of its kind with 26 different adventures to lose yourself in. WAYOUT requires an Apple II or II+ Computer with 48K and one Apple disk drive and is playable with keyboard, Apple-compatible paddles or joystick or with an Atari-type joystick attached to a Sirius Joyport.

Sirius™
Sacramento, California



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