SCIENCE ISSUE

FOR APPLE II USERS

II COMPUTING™

U.S.A. $2.95 CANADA $3.50 APRIL/MAY 1986

Shuttle Tracker

Robot Roundup

Scientists Who Use Apple IIs

Dice Simulator

Digital Gardener & Ortho's New Gardening Program

Reviews:
Catalyst
Science Toolkit
Instant Pascal
Let's Talk & more

5 Type-In Programs

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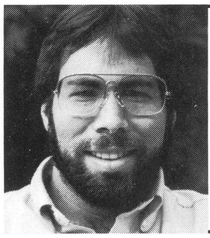
RamWorks II™ Up to 5,000,000 bytes to feed the biggest appetites.

Now expand your Apple IIe to an incredible 5 megabytes of usable RAM!

First came RamWorks. The IIe expansion card that became the unquestioned industry standard. Now Applied Engineering has done it one better ... with RamWorks II — a card so advanced, so powerful, we challenge you to find *anything* it doesn't offer.

RamWorks II makes a single Apple go a miraculously long way. With all the additional memory you'll need to feed even the hungriest of programs. And with the included RamDrive™ software, even older programs can use RamWorks II memory.



"I wanted a memory card for my Apple that was fast, easy to use, and very compatible; so I bought RamWorks."

Steve Wozniak
Inventor of Apple Computer

Now AppleWorks works even better.

You can choose versions of RamWorks II ranging in power from 64K all the way up to a whopping 5 megabytes. Even a 256K RamWorks II gives you over 200K of additional usable AppleWorks desktop.

With a 256K or larger card, AppleWorks will automatically load itself into RamWorks II, dramatically increasing AppleWorks' speed and power by eliminating the time required to access disk drive 1. So you can switch from word processing to spreadsheet to database management at the speed of light.

Only RamWorks II eliminates AppleWorks' internal memory limits, increasing the maximum number of records available from 1,350 to over 15,000. *Only* RamWorks II increases the number of lines permitted in the word processing mode. And *only* RamWorks II (256K or larger) offers a built-in printer buffer, so you won't have to wait for your printer to stop before returning to AppleWorks. RamWorks II even expands the clipboard. And auto segments large files so they can be saved on two or more disks.

The most compatible, most expandable card available.

RamWorks II is compatible with more off-the-shelf software than any other RAM card, as well as *all* software written for Apple cards, and software written for most other RAM cards too! It's also compatible with all hardware add-ons like Profile and Sider hard disks.

As your needs grow, so does RamWorks II. It's designed to accommodate future advances in 16 and 32 bit microprocessors. A connector allows coprocessor cards to access up to 5 MEG of memory. RamWorks II is expandable to 1 MEG on the main card (more than most will ever need) ... but if you do ever need more, a low-profile (no slot 1 interference) memory expansion connector allows you to add 512K, 2 MEG or 4 MEG of extra memory without wasting another slot.

And now, in living color ...

For only $129, you can add RGB color for unsurpassed, super high-resolution color graphics and sharp 80 column text. *Without* wasting another slot — because our RGB option plugs right into RamWorks II (or original RamWorks) without slot 1 interference, and attaches to any Apple compatible RGB monitor (RGB option not necessary with a composite monitor). Order it now — or add it later.

Even corrects mistakes.

If you bought some other RAM card that's not being recognized by your programs, and you want RamWorks II, you're in for a nice surprise. Because all you have to do is plug the memory chips on your current card into the expansion sockets on RamWorks II to recapture most of your investment!

RamWorks II Prices:
with 64K ($179), with 256K ($219), with 512K ($269), with 1 MEG ($369), with 1.5 MEG ($539), with 3 MEG (CALL), with 5 MEG (CALL), RGB option ($129) (can be added later), 16 bit option ($89) (can be added later).

It's time you let *your* Apple handle a lot of big appetites. Order RamWorks II today ... with 15-day money back guarantee *and* our "no hassle" five-year warranty. Call 9 a.m. to 11 p.m. 7 days, or send check or money order to Applied Engineering.

MasterCard, VISA and C.O.D. welcome. Texas residents add 5⅛% sales tax. Add $10.00 outside U.S.A.

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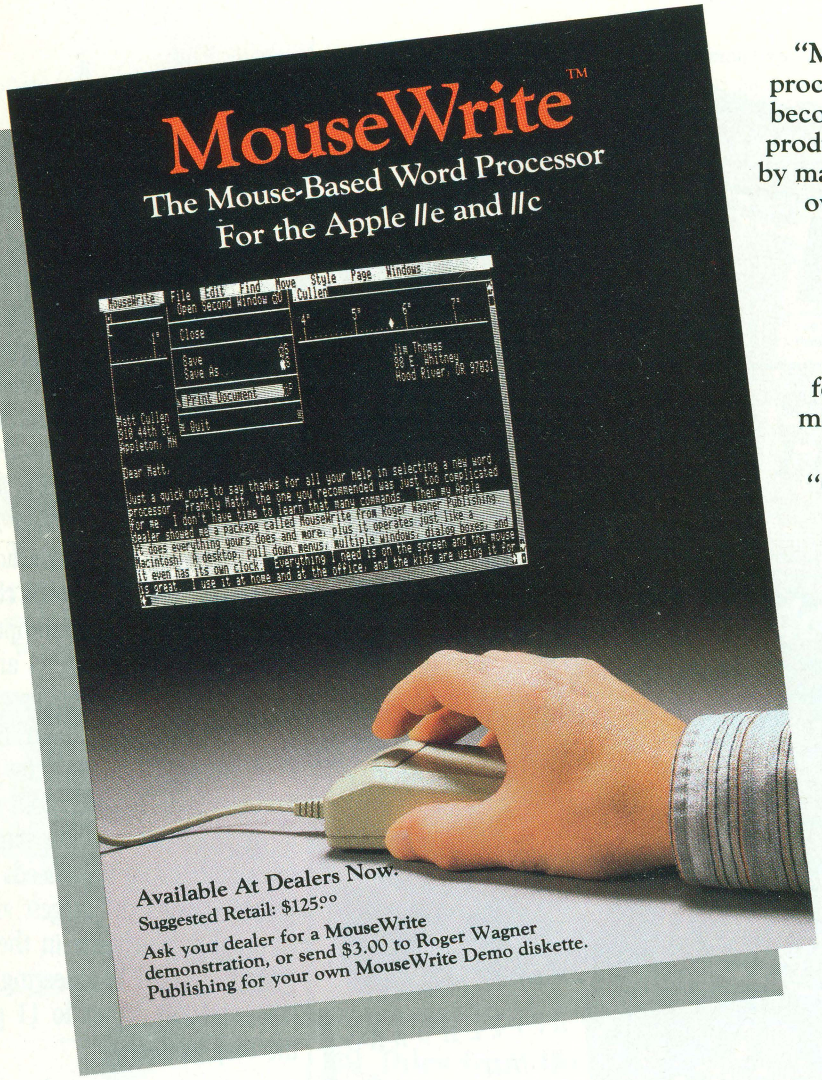
"MouseWrite takes word processing another step forward."

- Paul Freiberger, author of "Fire in the Valley"



"**MouseWrite**, the Macintosh-like word processor for the Apple //e* and //c is fast becoming recognized as a significant new product. Already well received in reviews by many leading computer magazines, you owe it to yourself to discover what the **MouseWrite** excitement is all about. Here are the highlights of some of those reviews:

"...just about the easiest to use full-featured word processor on the Apple market." **InCider Magazine, July, 1985**

"One thing that really impresses me is the speed at which the windows and menus work."
A+ Magazine, Sept. 1985

"...I would recommend **MouseWrite** without reservation to anyone searching for a full featured word processor..."
Creative Computing, Sept. 1985

MouseWrite is in computer stores now! To find out more about **MouseWrite**, stop by your local computer store and ask for a demonstration.

***MouseWrite** runs under ProDOS (hard disk compatible), and requires an Apple //c or enhanced //e with extended 80 column card. Mouse is optional, but recommended.

Roger Wagner™ PUBLISHING, INC.

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What the Experts are Saying About RamWorks II!®

"In an informal competition called '640K vs. 640K' AppleWorks running on a RamWorks equipped Apple IIe outperformed Symphony running on an IBM PC."
—*InfoWorld*

"AppleWorks wiped out Symphony... The competition was set up partly to show off another of Wozniak's favorite things, the RamWorks II memory expansion board from Applied Engineering . . ."
—*San Jose Business Journal*

"There are huge differences among the AppleWorks modifying programs sold with the cards. Without doubt, RamWorks II is the most powerful."
—*inCider*

"Applied Engineering's RamWorks is a boon to those who must use large files with AppleWorks... I like the product so much that I am buying one for my own system."
—*A+ Magazine*

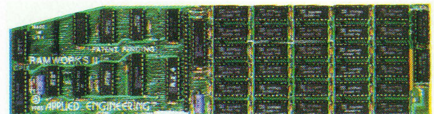
"RamWorks II is the most powerful auxiliary slot memory card available for your IIe, and I rate it four stars... For my money, Applied Engineering's RamWorks II is king of the hill."
—*inCider*

As you can see, it's easy to tell who sets the pace in Apple memory expansion. In fact, if you read the competition's ads, you'll notice that many even claim to be as good as RamWorks. Some say they're "RamWorks compatible". At least they agree on one thing. RamWorks is the one they have to measure up to. But the truth is there aren't any substitutes for RamWorks.

Because RamWorks and Z-RAM have a mesmerizing list of characteristics that, as you use them, will change your perceptions of an Apple computer forever. Achieving a level of speed and performance most critics claim is the best they've ever seen. But we want to do more than impress the experts, we want to impress you!

Applied Engineering stands ready to solve your expansion needs today and tomorrow with the largest and best supported product line in the industry.

Call Applied Engineering at 214-241-6060, 9 am to 11 pm. To get the very best.



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The recognized industry standard for memory expansion in the Apple IIe.

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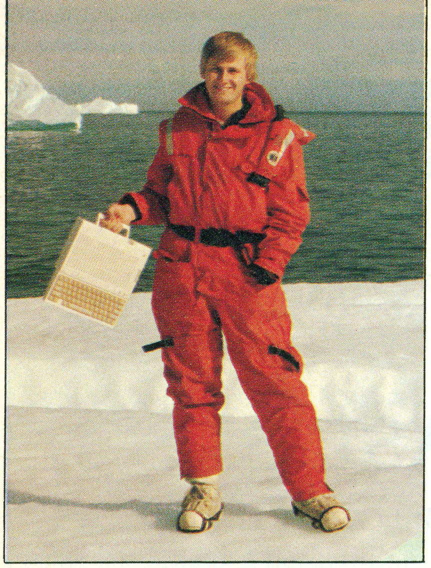

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FOR APPLE II USERS

II COMPUTING™

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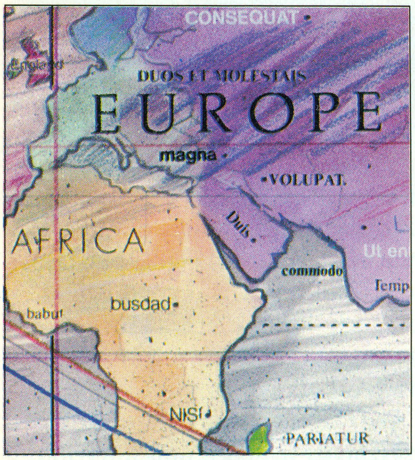

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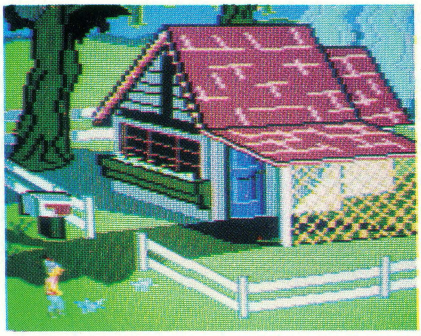

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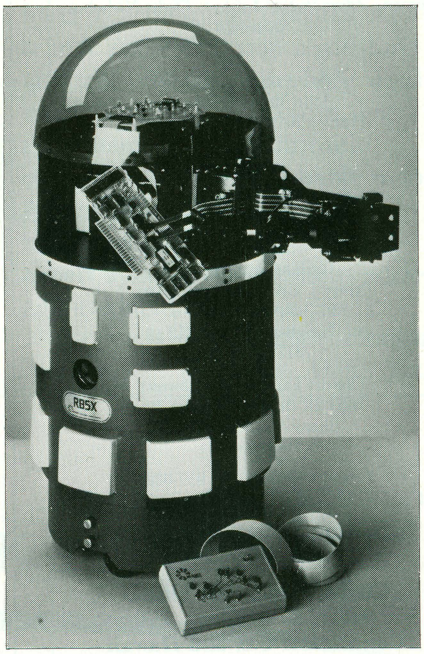
SOFTWARE LIBRARY



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EDITORIAL

Ad Astra

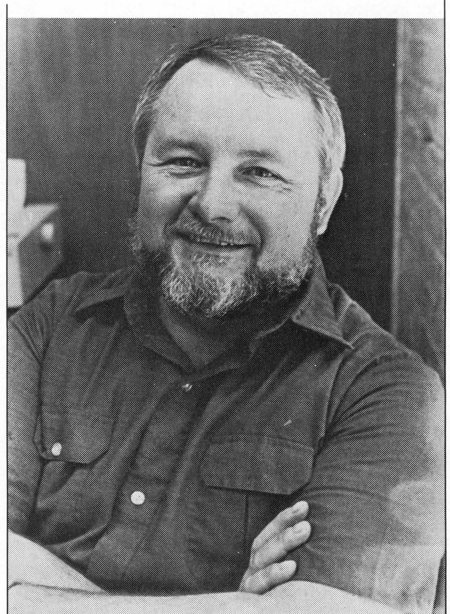
by DeWITT ROBBELOTH, Editor

By the time you read this, the shock we all experienced at the explosion of the Space Shuttle Challenger will have ebbed to sorrow over the loss of our astronaut crew. By now, NASA probably will have identified the cause of the accident and may even have resumed shuttle launchings. Tragic as it was, the accident will surely be only a temporary setback for our space program.

The event affects us directly because we have been planning for some months to feature in this issue a shuttle tracking program. The accident occurred just three days before our deadline. The article and listing were edited and ready to go, but certain details had to be changed because Challenger contained monitoring equipment and experiments we assumed would be in place by now. The program will still be accurate for Canaveral launches, but the TDRS West satellite will not be in place until redeployed.

Maybe we forgot how dangerous space exploration really is, became complacent after such a long string of successes. The professionals know the risk and accept it; our advances rest on their courage and desire. But we haven't forgotten how important space is. It is our real physical frontier, and a deep psychological destiny. It will be met.

I believe the space program is one of the truly great and inspiring efforts our nation has ever undertaken, and I salute not only the heroism of the men and women who take great risks on our behalf, but also the skill and dedication of the thousands who work diligently to make the program as effective and safe as possible.


PHOTOGRAPHY BY LORRAINE CAPPARELL

The loss of Christa McAuliffe, the first teacher in space, was a terrible blow to the millions of students and other teachers who watched her mission with high hopes, but she is no less heroic in death than if she had lived. American youngsters could hardly have better models than the seven we lost aboard Challenger. To the memory of all of them we dedicate this issue.//

READER FORUM

51 YEARS YOUNG

I have had my Apple IIc since January of 1985. I am 51 years young, mother of three children. My daughter is studying computer programming and CAD and I could see where I was being left behind. I bought the *Applesoft BASIC Programmer's Reference Manual* and now I can look at the programs in your magazine and follow the flow. I look forward to a long association with your magazine and I'm happy to learn Margot Comstock and Neil Shapiro are writing for you. Best wishes to you, your staff and your magazine.

Marie Lewis
Douglas, ND

INTO THE CRYPT

I just finished reading the December/January issue of your magazine and found it delightful. The Typo II program worked nicely. I hope "Tales from the Crypt" will be a regular part of your magazine. Thank you.

J. Allen Beaird
Loma Linda, CA

SHAPIRO LIVE!

I picked up a copy of your new magazine here in Tallahassee at Waldenbooks. I must say it was educational to see Neil Shapiro in the flesh! Thanks!

Frank Brown
Tallahassee, FL

A LONG SHELF LIFE

My favorite computer magazines become a permanent part of my computer library and never get thrown away. ***II Computing*** will become one of them. Thank you.

Robert Albanese
Worthington, OH

DOING BUSINESS

I read with interest and some dismay your article, "Doing Business with the Apple IIc," in your December/January issue. I realize it is impossible to cover all business products in an article such as this, but we feel our products, BusinessWorks, The Business Accountant and The Advanced Business Accountant, deserve mention. They're easy to learn and use and all three contain modules for System Manager, General Ledger, Accounts Payable and Receivable, Inventory Control and Payroll. All modules are integrated and with BusinessWorks and The Advanced Business Accountant you can convert data to AppleWorks files. I hope you agree that our products deserve mention in ***II Computing***.

Joan L. Levers, Director
Corporate Communications
Manzanita Software Systems
Roseville, CA

(See "New Products," page 98—***II Computing*** Editors.)

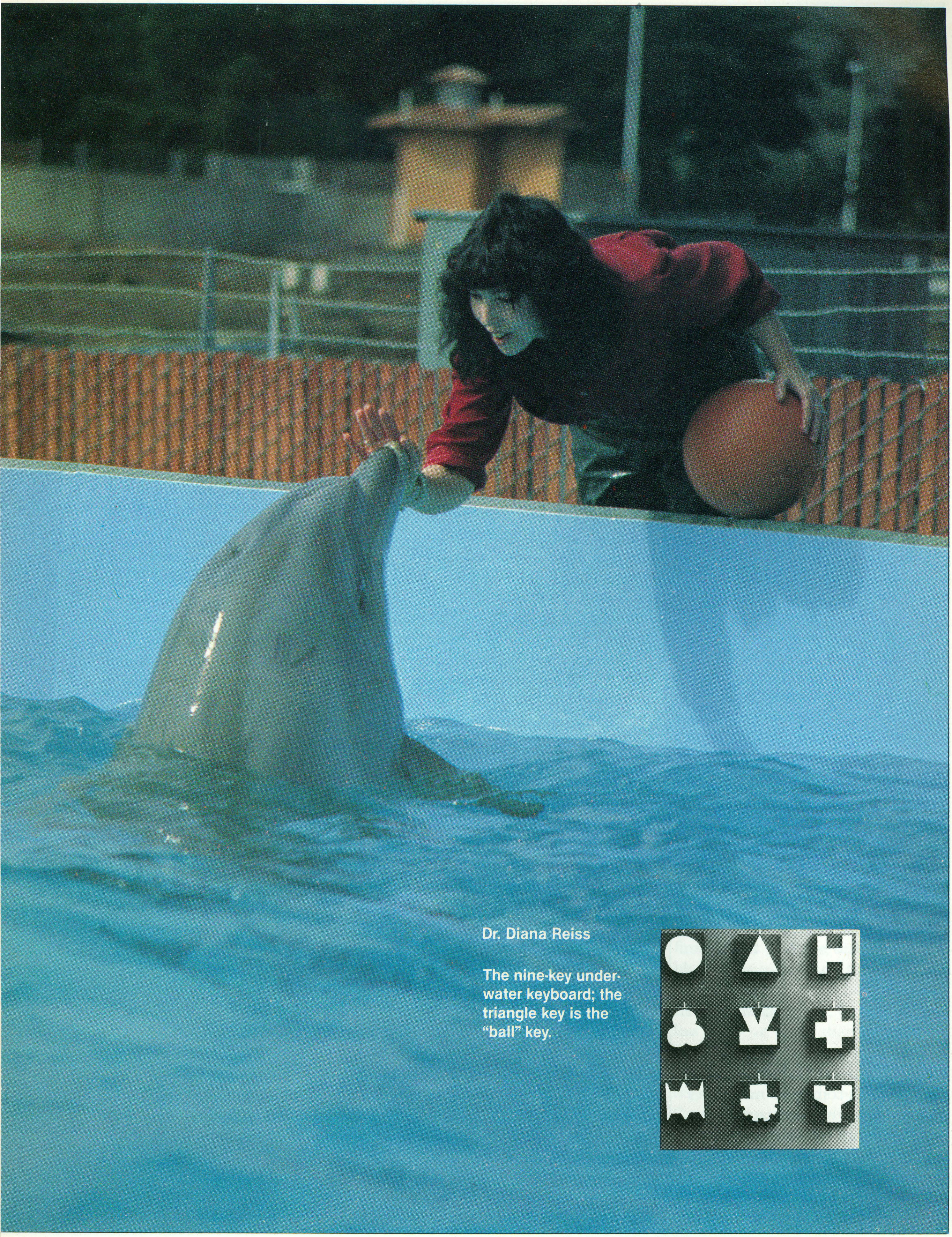
NOW HEAR THIS

Thanks for the high-quality review of our product Advisor in the December issue. We'd like to clarify a few points. Advisor can have up to 255 rules and 127 logical variables. Each variable can have one of four states: true, false, don't know and untested. We think Advisor's inference engine is unique in being able to use logical negation ("not. . ."), something even bigger and much more expensive expert systems can't. Advisor is being used in several commercial situations. We were told many times that it wasn't possible to do an expert system at all with small microcomputers. We worked hard to achieve the essential AI search and conclusion algorithms and still retain a reasonably sized knowledge base. Of course, big AI systems running on minicomputers are more capable than Advisor, but we believe Advisor is the first and only rule-based expert systems development package available for the Apple II.

William Moulton, President
Ultimate Media, Inc.

THANK YOU

The editors of **II Computing** *thank those first one hundred subscribers who completed and returned our questionnaire. Your good words encourage us and we have plans to include many of the features you request, such as more tips and tricks on widely-used programs, more practical type-in programs, info on upgrades for II+, IIe, material for beginners, maintenance of your system, Logo, profiles ---more, more, more!* **Thank you.**



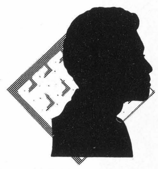
Dr. Diana Reiss

The nine-key underwater keyboard; the triangle key is the "ball" key.

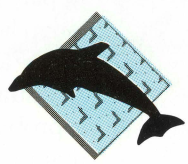
PHOTOGRAPHY BY THOMAS HARDY, MARINE WORLD

Scientists USING APPLE IIs

by ROBERT STAYTON



Diana Reiss COMMUNICATING WITH DOLPHINS



Diana Reiss talks to dolphins with her Apple II. To her surprise, they talk back. Reiss is director of Project CIRCE at Marine World/ Africa USA in Vallejo, California. She is studying how dolphins think.

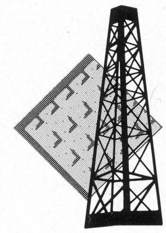
To communicate with the dolphins, Reiss submerges a large nine-button keyboard, hooked up through fiber optics to her Apple II computer. A dolphin can ask for a ball by pressing a key with a triangle symbol on it. A Mountain Computer music board in the Apple then generates a special dolphinlike whistle unique to that key. At the same time, a voice-generator board in the Apple feeds the word *ball* to headphones worn by Reiss, who then throws a ball into the pool. The dolphin quickly associates the "ball" sound with an actual ball.

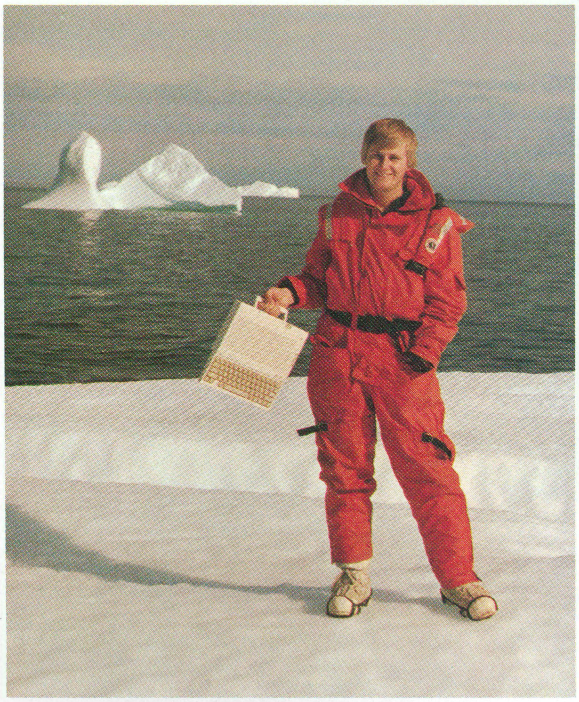
To Reiss's amazement, the dolphins spontaneously began mimicking the "ball" sound *before* pressing the "ball" key. "They even started using the "ball" whistle when playing with a ball among themselves with no keyboard or humans around," Reiss says.

Since the dolphins began mimicking her synthetic whistles, Reiss has made plans to attach a real-time sound analyzer to the Apple to immediately judge the animal's response. By matching it to previously digitized sound patterns, the computer may be able to translate the dolphin whistles into English. Reiss can't wait to hear what they have to say.

Robert Stayton, a free-lance writer living in Santa Cruz, California, specializes in science.

John Miller
OBSERVING ICEBERGS





Imagine yourself aboard an oil-drilling rig in the freezing waters off the east coast of Canada. A giant iceberg lumbers slowly toward you. What do you do? Will it miss the rig? Do you abandon ship? Can you lasso the iceberg and tow it to the side in time?

Although this scenario would make a thrilling game on an Apple computer, it's no game for Petro-Canada Resources of Calgary, Alberta. The company has invested millions in offshore oil exploration equipment and needs to know how a particular iceberg will behave.

"The problem is that icebergs *don't* behave," explains John Miller, environmental specialist for the company. His group has developed models of iceberg migration on an Apple IIe computer not to play games, but to prevent disasters. The limitation lies in obtaining adequate data on ocean currents, and waves and iceberg size.

Usually, scientists can only predict the risk as a probability and take action accordingly. "The mainframe computer group in the company estimated it would take three months to set up a model. We did it on the Apple in four days," Miller says.

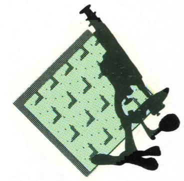
To learn more, his group recently placed accelerometers on an iceberg to access its up and down "heaving" motion. A VHF transmitter beamed the data to an Apple computer aboard a nearby ship for analysis. "The Apple is versatile enough to receive the data, crunch the numbers, and word-process a report, all before the ship docks," Miller says.

Lynda Goff
DOCUMENTING PARASITIC ALGAE

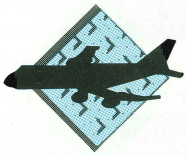
It won't scare you as much as *Invasion of the Body Snatchers*, but pity the poor algae whose bodies get taken over. Biologist Lynda Goff at the University of California at Santa Cruz has discovered that certain parasitic red algae can inject a compact copy of their cell nucleus into a cell of a different red algae species. The invader then takes control of the internal machinery of the host cell, forcing it to produce food for the parasite.

Most parasites just attach to a host without violating their genetic makeup. "Injecting one nucleus into a totally different cell and having it function there is a whole new mechanism," Goff explains.

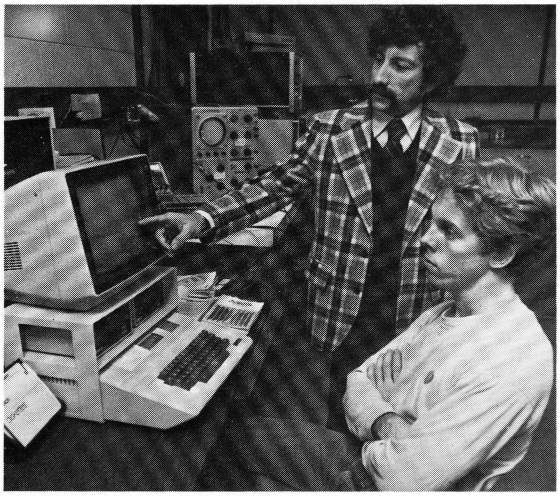
Goff was able to document the unusual parasitism with a new technique, *microspectrofluorometry*, which includes the use of an Apple IIe. She stains the cells with a fluorescent dye, then illuminates them with ultraviolet light. A TV camera attached to the microscope sends an image of the glowing cells to the Apple computer, which digitizes and displays the image. The software overlays the image with rulers and instructions. Measurements of perimeters of cells as they start to distort are quickly taken off the screen with a Houston Hi-Pad. "The Apple makes things possible that are absolutely impossible without it," Goff says.



Mark Darlow
TAMING JET-TURBINE VIBRATION



The next time you fly, you might thank Mark Darlow and his Apple II for making the flight so smooth. Darlow, an assistant professor of mechanical engineering at Renssalaer Polytechnic Institute in Troy, New York, studies the vibrations of rotating turbines in jet engines.



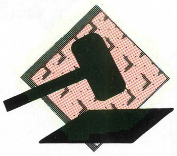
Excessive vibration quickly wears out bearings, leading to higher maintenance costs and possible unsafe operation. "Vibration can be controlled by spin-balancing the turbine, much like balancing the tires on your car," Darlow says. But jet turbines are more complex and spin at much higher speeds than auto tires. When several turbines are attached to one shaft, correcting one can "uncorrect" another. Darlow recognized five years ago that a computer could sort out all the modes of vibration, so he bought one that was readily available: an Apple II.

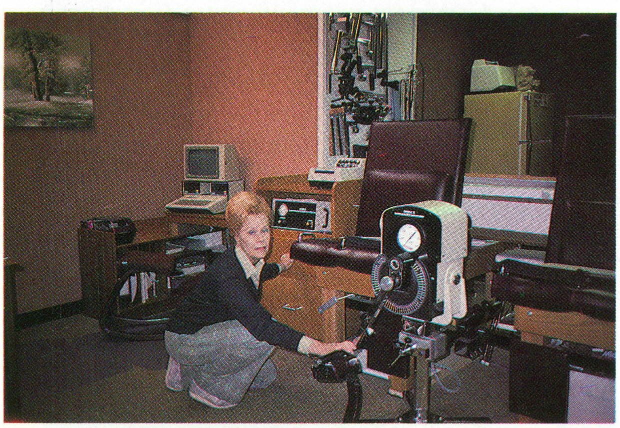
In his lab, he attaches a tachometer and several displacement probes to a turbine rotor, and then spins it. The output from these sensors goes to a mix of commercial and self-built hardware cards in the Apple. The cards digitize the signals and feed them to the software Darlow wrote in BASIC and assembly language.

The software performs a spectrum analysis, which means it sorts out the different rates of vibration, their magnitudes, and whether they are in or out of synch with each other. That type of analysis is not particularly new, but Darlow has gone one step further. His software can prescribe *corrections* for the vibrations by specifying where to place balancing weights.

Since the software does everything but install the weights, the system is very easy to use. "Companies can use this relatively cheap system during initial assembly and each subsequent maintenance check to make sure their turbines are safe and reliable," Darlow says.

Peggy Bodine-Reese
SETTLING PERSONAL INJURY CASES





Is this person really injured? Thousands or even millions of dollars balance on that question in personal-injury court cases. Peggy Bodine-Reese, of Gaithersberg, Maryland, uses her Apple IIe to answer such questions with a finality that usually leads to an out-of-court settlement.

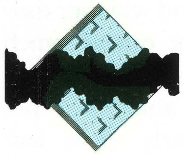
Bodine-Reese is a physical therapist with a Ph.D. in exercise physiology. Attorneys call her in as expert witness to document the presence or absence of injuries that doctors have a hard time diagnosing.

She connects her Apple computer to a Cybex exercise machine that measures the range of motion of joints and the strength of muscles. An analog-to-digital board and her custom software convert the output of a patient's motion into tables and graphs. The system is scientific enough to convince most attorneys and juries, so now only about one percent of her cases actually go to trial. Formerly 25 percent did.

The key to this reliability lies in her calibration scheme. She uses a separate device to calibrate the Cybex, which then calibrates the Apple. "This gives the measurements a solid basis in reality, and the attorneys are not in a position to argue with the results," Bodine-Reese says.

The system was initially set up by Mark Ferris, a recent high school graduate working for the summer in her office. The makers of the Cybex have since purchased the software. Bodine-Reese also does all her word processing and billing on her Apple.

Glenn Andrews
DESIGNING CUSTOM GENES



Apple computers are now designing custom genes. That's *genes,* not *jeans,* and the subject is biology, not fashion.

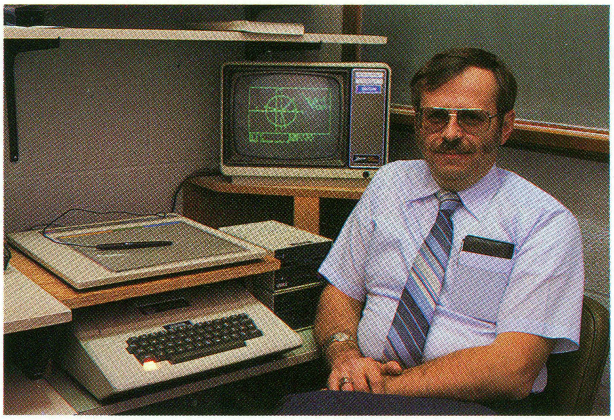
Genetic engineering promises potent medicines to combat diseases like cancer or AIDS, but the research is difficult because of the chemical complexity. To speed up research, the tedium of chemically synthesizing a particular strand of DNA had to be reduced. Glenn Andrews, senior research investigator at Pfizer, Inc. of Groton, Connecticut, thought that the chemical steps could be automated with precisely controlled valves, pumps, timers and sensors. He worked with Genetic Design of Watertown, Massachusetts, to develop the AutoGen 6500, a programmable "gene machine" with an Apple IIe for a brain.

"You can type in the configuration of DNA that you want, and the Apple uses its library of chemical routines to design the gene and then make it," Andrews explains.

The plumbing delivers chemicals in the right amounts at the proper time to produce the correct sequence of chemical reactions. The Apple receives feedback at each step to detect a clogged line or stuck valve that would mess up the reaction. "It's two-way communication, like the brain-to-body connection," says Andrews.

Since most of the machine's functions are controlled in the software, they can be completely reconfigured as new developments arise. This "software plumbing" makes the machine much more versatile than others of its type, according to Andrews.

George Piotrowski
ANALYZING HOW JOINTS WORK



George Piotrowski wires up a cadaver to study how a hip joint works. His field is orthopedic biomechanics: the study of bones, muscles and joints. The Veterans Administration Hospital in Gainesville, Florida, provides him space and bodies to work with.

Piotrowski attaches 15 strain gauges to a cadaver's hip, then pushes on the leg to simulate walking. The outputs of the strain gauges flow to an Apple II+ with a 16-channel A/D converter board. The Pascal software Piotrowski wrote converts the measurements into a "strain field," which shows where the joint is being strained the most and least.

"The conversion is tedious and used to take three weeks by hand. Now the data is there immediately when the test is completed," Piotrowski says. The data is improving the design and attachment of artifical hips, which are needed by some patients at the hospital.

At the University of Florida, where Piotrowski is associate professor of mechanical engineering, he is also setting up a similar study on the fetlock joint in the foot of a living horse. "That joint is totally accessible because it is directly under the skin," he explains. When the instrumented horse walks around, Piotrowski will be the first person to simultaneously measure the force, motion and pressure in a living joint. This basic research will increase the knowledge of joint lubrication, thereby helping to sort out the causes and symptoms of degenerative joint diseases.

Patricia Redden
FINDING HIDDEN CHEMICALS IN FOOD

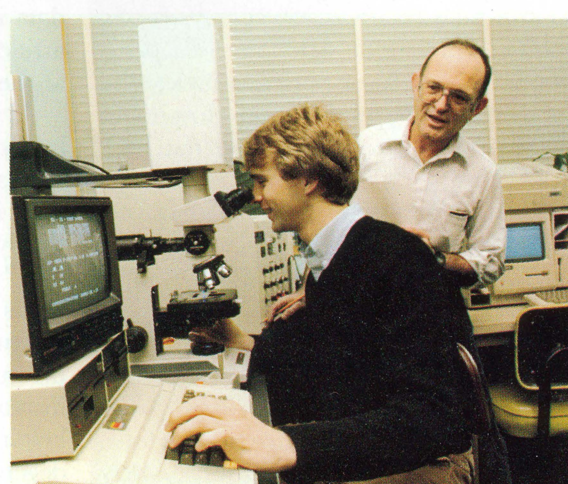
Patricia Redden looks for additives in food, both deliberate and otherwise. Deliberate additives show up on food labels, and wary consumers can choose to avoid them. The "otherwise" additives are not on the labels, because they sneak into food without anyone knowing.

"For example, instant coffee granules can absorb organic chemical compounds floating in the air, both at the plant and at home," says Redden, an analytical chemist at St. Peter's College in Jersey City, New Jersey. "We want to find out what gets absorbed and if it is hazardous," she explains. She uses sophisticated chemical instruments such as mass spectrometers and infrared spectrophotometers to identify and measure the hidden chemicals.

The Chemistry Department at St. Peter's is just now beginning to hook up some of these instruments to the six Apple II computers purchased over the last five years. But that will be just one more task added to the long list the computers already handle. Redden uses speadsheets and word processing for lab reports, and modems to access bibliographic references online. The department just got a grant from a state agency to write educational software on the Apple for introductory courses in chemistry and biology.

The chemists repeatedly find new applications for their Apples, despite the Computer Science Department's insistence that they should be using IBM computers. "It seems as though the natural sciences have latched onto Apples and are not letting go," remarks Redden.

John Sieburth
COUNTING PLANKTON



Counting plankton is not anyone's idea of a good time. Marine biologists who research floating microorganisms traditionally spend hours counting tiny specks under a microscope and tallying the counts with paper and pencil.

PHOTOGRAPHY BY PAUL A. ROSELLI

John Sieburth, professor of oceanography at the University of Rhode Island at Naragansett, says that technique is tedious, error-prone and inefficient. He knew there must be a better way. And, as he states, two of his students found that way. In a paper and accompanying program originally published in *Bioscience* (November, 1985), Frank G. Cynar and Michael F. Sieracki devised software that converts an Apple II computer into a counting assistant.

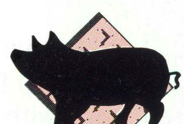
"You still have to peer through the microscope, but your hands on the keyboard do the counting," Sieburth says. The software displays ongoing counts on the screen, beeps when a wrong key is pressed, and instantly calculates species statistics for video display or hard copy.

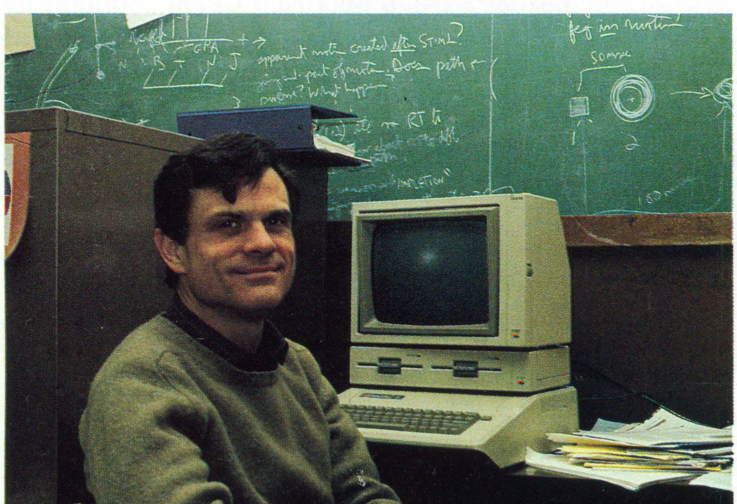
"We use the system to study the ecology of floating bacteria, algae and protzoa, the very bottom of the food chain that keeps the planet working," he explains. "I started using Apple computers several years ago to ease the burden of doing science. I also didn't want to be outdone by third-graders."

Copies of the Applesoft program are available free by sending a blank disk and self-addressed, stamped envelope to John Sieburth, Graduate School of Oceanography, University of Rhode Island, Narragansett, RI 02882.

William Banks

SIZING UP WITH AN APPLE





The words flash on the monitor: "Which is bigger, a cow or a dog?" Easy. You respond quickly with "cow." Then it asks, "Which is bigger, a dog or a pig?" After a moment's thought, you respond "pig."

That moment of thought reveals something about how people store everyday information, says psychology professor William Banks of Pomona College in Claremont, California. "Size is an abstract concept, so why does one comparision take longer than the other?" he asks.

He uses an Apple computer to present his subjects with pairs of words, then lets the Apple measure their response time. The software, written in Pascal by undergraduates, tabulates the results quickly for comparison to other trials.

"People have argued that the answers come from calling up a mental image of a dog, a mental image of a pig, and then comparing the images. That's hogwash. If you know how big to make the mental images, then you knew the right answer before making the images," he remarks.

His goal is to describe the underlying mental processes. Banks got his first Apple, a II+, in 1979 and has used Apple IIs ever since. His work is currently supported by grants from the National Institutes of Health and the National Science Foundation.//

THE DIGITAL GARDENER

by CHARLES BARTISH
program adapted for the Apple by SCOTT ANTHONY

This spring, introduce your computer to your garden and bring high-tech efficiency to your planting. **Digital Gardener** optimally determines the layout of your vegetable garden. Simply tell the computer which vegetables you want to plant (among 30 given varieties, from asparagus to watermelon), and the size of your plot of land. Your Apple will determine row spacings, planting distances and number of plants of each variety. It will tell you which vegetables are most compatible when planted next to each other, and will print a map of your garden with all rows labeled for you to carry to the backyard. The program also maintains a record of your plantings from year to year, very useful for rotating crops as well as for comparing your methods.

YOUR PLANTING PLAN

Type in Listing 1, Garden Layout, check it with TYPO II and SAVE a copy before you RUN it—or boot it from the Action Disk. From the main menu, simply follow the prompts.

To plan a new garden choose the MAKE option. Give the garden a name and type in the desired number of feet for length and width. The program will recommend a length, but you need to specify the width, or just go ahead with the suggested garden size of 15×30 feet.

The program contains data for 30

continued on page 19

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II Computing—For Apple II Users. You really did pick up the right magazine.

"Bring high-tech efficiency to your planting."

different vegetables. The information comes from *Grow Your Own Vegetables* by Robert Fletcher, Reference Circular 559 from Pennsylvania State University Publications, 1974. You can change these values when you run the program, or put your own values in the DATA statements.

The program places the tallest plants closest to the north border. (You may want to adjust the location of your plot according to the sunlight exposure so that lower vegetables, such as lettuce, are not shaded by the corn.) You may set up combinations of vegetables if you know you will use space in the same row for different members of the same family. For example, my CB1 (combination one) is a mixed row of brussels sprouts, broccoli and cauliflower.

PLOTTING THE PLOT

Onscreen you'll find each vegetable's name and the following information: DISP, the distance between plants in inches; ROWS, the number of rows of the particular vegetable; DISR, the distance between rows in inches; and SUM, the distance, in feet, of the last row of a given vegetable from the north end of the garden.

The first row of the first vegetable is always planted six inches inside the border. Digital Gardener will calculate the length required for the garden. If the recommended length exceeds the specified length by more than 10 percent, a warning message and options for proceeding will appear. One option, of course, is to accept the recommended new length and break out the rototiller, fertilizer and mulch and get started!

When you are satisfied with the plot, press 1 for a printout of the garden. Each group of rows will be identified by the vegetable's name, and the number of rows of each vegetable will appear. //

GARDEN LAYOUT PROGRAM TAKE APART

Lines 100-190 initialize program variables
Lines 240-340 input the length and width of the garden
Lines 350-580 let you choose which vegetables you want to plant
Lines 600-760 display which vegetables you've selected
Lines 790-1000 calculate the planted garden
Lines 1065-1090 print the vegetable list
Lines 1190-1280 sort the vegetables by height
Lines 1320-1520 allow you to change the number of plants and rows
Lines 1580-1700 handle errors
Line 1710 initializes several arrays with vegetable data
Lines 1750-1930 print a plot of the garden
Lines 1940-2050 display the main menu
Lines 2060-2370 contain the data for each vegetable

Charles Bartish, Ph.D., is a chemical research manager in Allentown, Pennsylvania. He uses Digital Gardener himself to successfully plot vegetable gardens from a 3×5-foot postage stamp to a monster 25×50-foot family plot that yielded an enormous crop.

San Franciscan Scott Anthony holds a B.A. in biology from Dartmouth College. Presently he is both a fine and commercial artist, musician and computer software and hardware developer.

Of Crays, Kids and Grand Pianos

by MARGOT COMSTOCK

Margot Comstock was cofounder and editor of Softalk. *It was great fun, but it was just one of those things.*

OFF IN A CLOUD OF CARBONATED DUST

Steve Jobs is gone from Apple and, amazingly, he has left not a trace—at least, so one would be led to believe by both the fluff and substance of January's Sculley-style Media Event, The 1986 Apple World Conference. Held in tandem (or trandem) with Mac and Apple II trade shows, the conference sequentially favored developers, user group potentates and dealers with mouth-watering looks at the new supercharged Macintosh Plus and a lot of well-tailored cheerleading. Beside the hoopla, Apple II was quietly and pervasively in evidence doing its thing better than ever before, as usual.

The omission of any mention or reference to Jobs kind of snuck up slowly on invitees somewhere in the first minute and a half of the big to-do. A rallying film of corporate Apple at work, soundtracked with yet another original rocking Apple song, shouted his absence in every closeup of every intense and loyal nonJobs face. Oh, well.

Perhaps Jobs should have consulted Coca-Cola before he messed with John Sculley; Coke's mangled mixing of mystery formulae might possibly have been directly attributable to Mr. Sculley's activity at the helm of PepsiCo. If it wasn't, surprise, because Sculley's plotting of Apple's course is clear, clever, and confidence-inspiring.

AN EAR TO THE FLOOR

It appears that with Jobs's exodus, Sculley finally found a moment to sit back and listen. He listens well. Said Sculley in his keynote address for the Apple World Conference, "We want to know about you, too; what your priorities are, what you need from Apple, how you see the future. . . . Apple World isn't just another Apple spectacular. It signals the beginning of a new era, an era of cooperation and responsiveness—and the beginning of a dialogue with you that will continue throughout the decade."

The first result of what Sculley's hearing is the Macintosh Plus. Not a new machine, not a revolutionary change—just the old Mac with the souped up speed and power people want, and then some. Rumor has it that a super II, streamlined with similar improvements, is just around the corner. Like the new Mac, the II to come will be upwardly compatible, its predecessors upwardly convertible; which means the new hard stuff will run all the old soft stuff, though not necessarily vice versa, and that upgrade kits will be available to make old soldiers act like new.

It's Sculley's intention also that data generated on any Apple shall be immediately readable and usable by any other Apple. The advent of three and one-half inch drives for Apple IIs is a step in this direction.

A few Apple II Plus owners at the Apple II show seminars complained about the increasing lack of downward compatibility: the fact that not all the stuff for the IIe and IIc will run on the II Plus. But that kind of compatibility comes extremely dear in the overall scheme of things: it stifles innovation and progress.

A GOLDEN APPLE

Speaking of upward and downward compatibility, for the planning of future Apple architectures, Apple has just purchased a Cray XMP 48—"one of the best personal computers," quipped Jean-Louis Gassée, former honcho of Apple International in

Paris and now VP of Product Development in Cupertino.

But before you run down to your local Computerworld to see whether this PC Apple chooses even over Mac is better than your II, take note that Apple is buying number 11 of that model Cray, which retails (so to speak) for a mere $15 million. The Cray, of course, isn't really a personal computer but the biggest and most powerful computer in the world.

The other Steve is definitely not missing from Apple. Steve Wozniak, who invented the object of our devotion in the first place, was gathering crowds and making them smile throughout the three-day do.

Oh, did I change subjects too suddenly? You bet your life I didn't.

Imagine Beethoven getting to compose on a Steinway grand piano instead of a clavichord. Imagine Hippocrates getting to work in the research labs of a modern hospital. Imagine Galileo getting to play with the telescope at Mount Palomar. Imagine Woz getting to program on a Cray.

One person who can clearly imagine Steve Wozniak working on a Cray is Woz himself. "I've got ten programs I've never been able to run because they're too big. I'll run them," Woz said.

INPUT FROM A USER INTERFACE

Apple user groups throughout the country and around the world are corporate Apple's only direct link with the people who own and use Apples and Macintoshes. No longer composed almost exclusively of kids and hackers, user groups now boast members of all ages, interests and levels of expertise.

"Our group offered a novice class and there was hardly anyone in it under forty," said a representative of the Stanford (California) User Group. Nor are most of that group's members technically minded.

Of the Apple owners participating in a question-and-answer session at the Apple show, about two-thirds had attended a user group at least once; more than half of those had gone back again. Of those who had never attended, half would like to go if they knew of a group available to them.

The major interests among these people were expanding or upgrading their systems and learning about software. They're looking for faster, more powerful machines and well-honed software that does specifically what they want, if possible, and at least what it claims to do.

Part of Apple's new program is to strengthen its ties with user groups and to listen to what the groups think and want in their computers. At the Apple World Conference, John Sculley announced a support program between Apple and nearly six hundred Apple user groups: "The two-way communication program we'll establish will strengthen the supportive relationships between user groups, dealers, and Apple. So to all of you out there who are part of Apple's user groups, I'm pleased our relationship will now be stronger."

Should anyone have failed to find clearly definable substance in this portion of Mr. Sculley's remarks, Apple's hosting of a hundred user group leaders at the conference might have allayed his fears. That and a dinner at Maxwell's Plum just for special Apple people, a few press, and these users, with Woz speaking of black boxes and blue meanies and beige Apples, went far to inspire confidence in Apple's new open-ear policy.

It's a good direction.

Beside the hoopla, Apple II was quietly and pervasively in evidence doing its thing better than ever before. . .

BLOWING THE BIG BLUE BLAHS

Under Sculley's leadership, rumored to be abetted by the very able input of former Apple prez Mike Markkula, Apple seems on the verge of discovering the market some of us have seen as its destiny all along.

People who buy Apples seem to share being somehow special. The somehow can be any number of different ways, but it's always there. And if being special were a common trait of the great majority of people, it wouldn't be special anymore.

So, if Apple is to continue to produce the computers of choice among special people, the computers on the cutting edge of innovation and revolution, it might as well kiss number one on the Fortune 500 good-bye right now—and the better for it. Most people don't want special, they want safe. They want established. They want secure. They want Dvorak.

continued on next page

So the majority of people will continue to buy IBM and its imitators. Like IBM, they'll wait for new ground to be broken, built-up, Good-Housekeeping approved, and filled with that lived-in feeling before they'll venture near. A lot more people buy Commodores because they can't yet afford Apples or IBMs.

THE CHOICE OF PRIVILEGE

But the smaller number who'll always choose Apples are the ground breakers, the pioneers, the early settlers, the inventors, the decision makers. People who grab for any sign of innovation and progress as for a life buoy in a sea of mediocrity. They'll support Apple and Apple-like companies as long as they can find them. Most of us wouldn't be Apple people anymore if Apple turned away from the very qualities that keep it from being number one in volume.

Steve Wozniak was gathering crowds and making them smile.

Too many people resent Apple because it dares to be different, and they don't. But among the rest of the world, even those people who wait for the three reassuring letters, Apples can become more and more the computers of prestige, of distinction—the forerunner to be admired and aspired to.

There's a lot to be said for such a clientele.

You see, the fact that Apple has always made machines that are easier to use and a lot more fun than their contemporaries does not make them Volkswagen. Anyone who can drive a Rabbit can drive a Silver Shadow just as well.

MORE THAN MUSIC

John Sculley understands this. In a discussion with John Naisbitt, author of *Megatrends* and chairman of The Naisbitt Group, a trend analysis and research organization, Sculley expressed his vision that Apple will become "the most exciting corporation by the turn of the century."* "Not the biggest, but the most exciting," Naisbitt noted. Sculley sees "very fundamental things" happening in personal computers in the near future—if Apple continues to be the kind of company it is. "Apple's got a unique chance to shape a lot of those things. If it doesn't, . . . many of them won't happen."

Computers will be as natural for people to use as telephones—though one hopes not quite as intrusive; and their integration into our lives will make those lives richer, more productive and more fun. As far as productivity goes, Sculley maintains that Apple makes the highest revenue per employee of any of the Fortune 500 companies—and he attributes this to the total use of personal computers.

But Sculley's vision goes beyond production alone. Apple is and is to be a corporation of people. Apple employees have among them lots of kids; and Apple provides day care centers—rife with computers. In the great halls between office groups at Apple there are Ping-Pong tables, free arcade game machines, exhibits of real art. A beautiful grand piano graces one hall, and though I've never heard it being played, that might have been because of the young man softly strumming his guitar in the same room when I was there.

THE RIGHT TO BE RIGHT—NATURALLY

It all sounds very idyllic, especially if one's memory is shorter than six months and you've never heard of Next. Well, it's still a business, and people, singular or plural, can still be fired. Nevertheless, it looks like John Sculley is again trying to make the company match the products it represents—innovative, efficient, dependable and a whole lot of fun.

Can he do it? Well, consider this attitude: "Crisis is an incredible forcing mechanism. It forces you to make choices that you might not make on such an accelerated basis." So far, few would quarrel. "It forces you to make more right choices than wrong choices. . . ." Come again? Apparently to Sculley, making right choices is so natural that whether you can know which is right or not seems automatic, self-evident.

Not a bad person to find at the helm of the company that makes products we depend on and enjoy so much.

*"Sculley Sets New Course for Apple Computer," *Re-Inventing the Corporation Newsletter*, January 1986. The Naisbitt Group, Washington, DC.//

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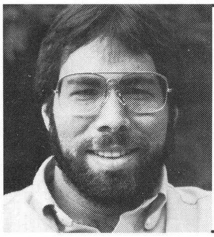

"I recommend Applied Engineering products wholeheartedly."

Steve Wozniak, the creator of Apple Computer

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Around the world in

SHUTTLE TRACKER

by PHILIP CHIEN

[Editor's note: On January 28, the space shuttle Challenger exploded shortly after takeoff, killing all seven crew members. As this issue of **II Computing** *goes to press, the causes of the explosion are unknown. It's unlikely that the entire shuttle project will be scrapped because of the catastrophe, but until NASA determines exactly what went wrong with Challenger, the schedule of shuttle flights for 1986 may be delayed or reduced. We don't know whether the Jupiter probe missions will take place in May. We do believe, though, that there will be future shuttle flights—and that you'll enjoy using Philip Chien's* **Shuttle Tracker** *program to track those flights.* —**II Computing** *Editors]*

One of the most important functions of NASA's Space Transportation System—the space shuttles—is launching deep-space probes that would be difficult or impossible to send on their way with conventional rockets. These flights depend on critical launch windows to guarantee that the probes reach their proper destinations.

Two such probes are scheduled to be launched this May. Nicknamed Ulysses and Galileo, they'll head toward Jupiter to gather data and relay it back to earth. Making sure everything is correctly positioned is essential—the shuttle must be in the right place on the right day for the probe launch, or it will be more than a year before Jupiter is in the right spot to try again.

NASA keeps track of exactly where the space shuttle is at any given moment with several mainframe computers. You can track it too, using a program for your Apple. The **Shuttle Tracker** program plots the path of a space shuttle over a map of the earth displayed on your Apple screen. In addition, a display at the bottom of the screen tells you where the shuttle is, how long it's been in orbit, and other technical data.

Shuttle Tracker is listed in this issue's Software Library—but before you type it in, you'll need a hi-res

ninety minutes

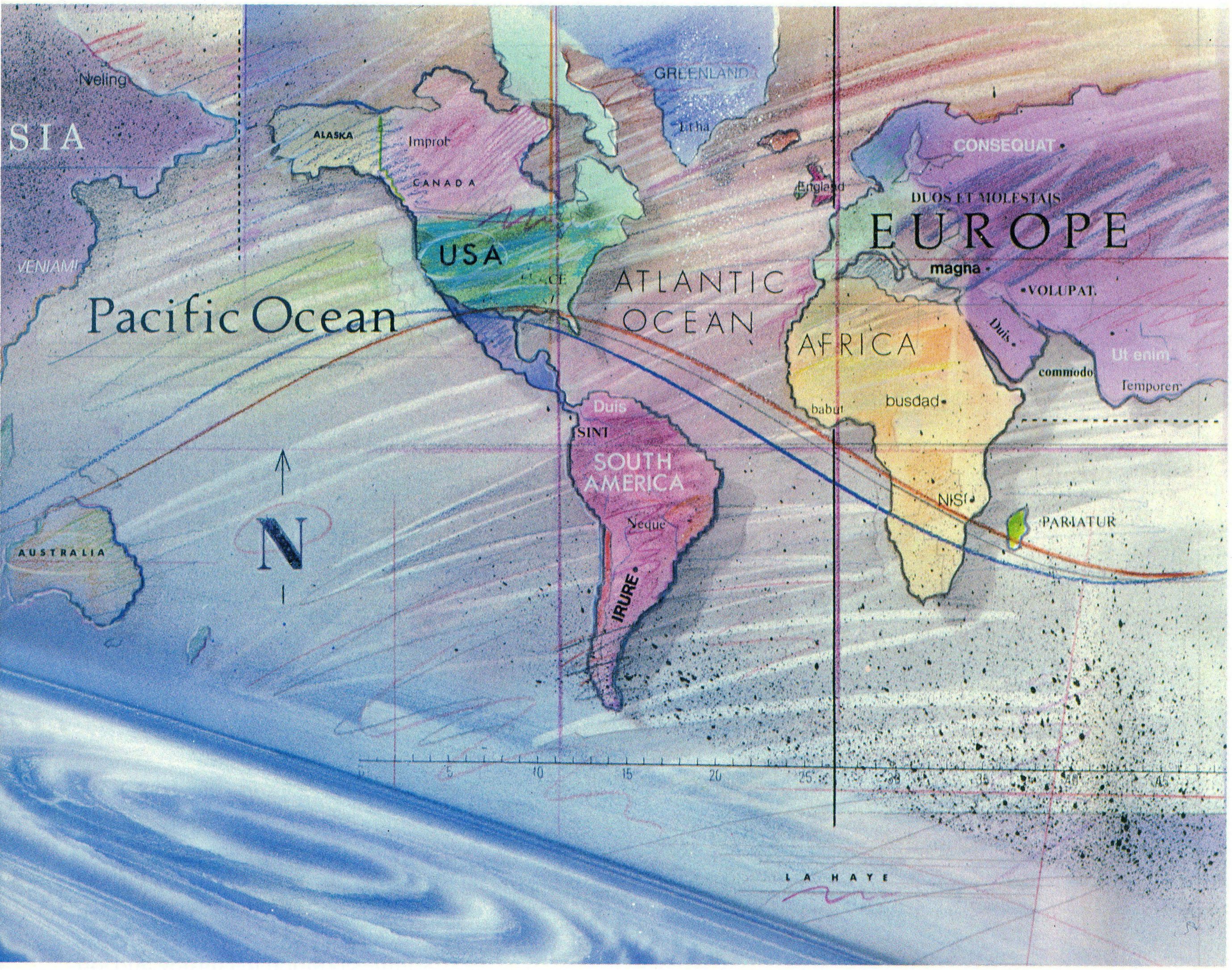


ILLUSTRATION BY BARNEY LAHAVRE

map of the earth. Fortunately, Apple Computer has already solved that problem for you: back in 1979, Apple's Bill Atkinson created a hi-res map of the world, which became part of the Apple education demo, as well as some versions of the DOS Tool Kit. We've used that map here, in slightly modified form, courtesy of Apple Computer. The map is on this month's Action Disk and the Softstrip in the Software Library section (see the accompanying text box for information on the Softstrip). (It's also available this month on CompuServe's Apple user's group, MAUG; log on CompuServe, type GO APPLE2, and look for the file named WORLD.PIC in Database Library 5, the games and graphics database.)

Along with the usual geography, Apple's map includes the continent Apple near Australia (see Figures 1 and 2). The ***II Computing*** version also includes a compass indicator, as well as the lost continent of Atlantis in the south Atlantic Ocean.

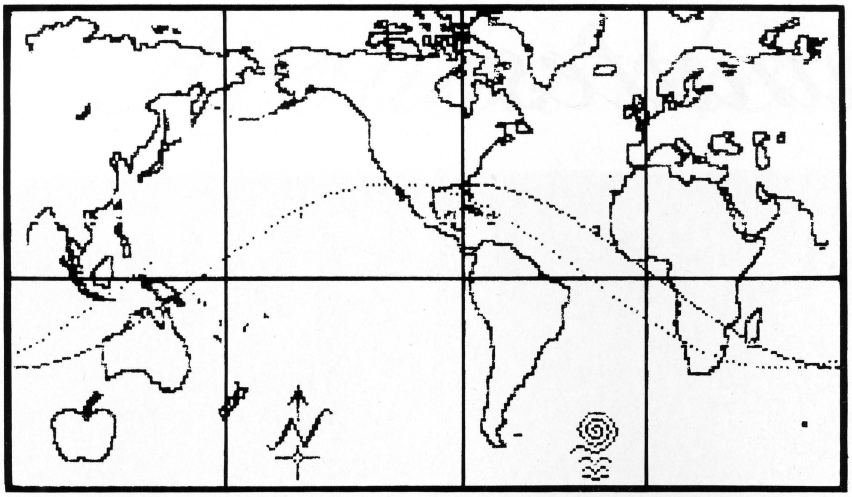
Once you've got your map, you can type in the program SHUTTLE from the Software Library section on page 75, or load it from the Action Disk or Softstrip.

When you run the program, it first asks you what kind of flight you want: a satellite deployment orbit or an earth observation orbit. About 90 percent of all shuttle flights go into the most energy-efficient orbit, which reaches a maximum latitude of 28.5 degrees — the satellite deployment orbit (Figure 1). Earth observation missions reach much higher latitudes (up to 57.1 degrees) to look over as much of the earth as possible (Figure 2). The Jupiter probe missions will both use satellite deployment orbits.

Next you'll be asked the altitude of your mission in kilometers. Though you can specify any altitude greater than 0 km (which is the earth's surface), most shuttle flights average between 250 km and 300 km. The flights to launch the Jupiter probes will run at about 241 km.

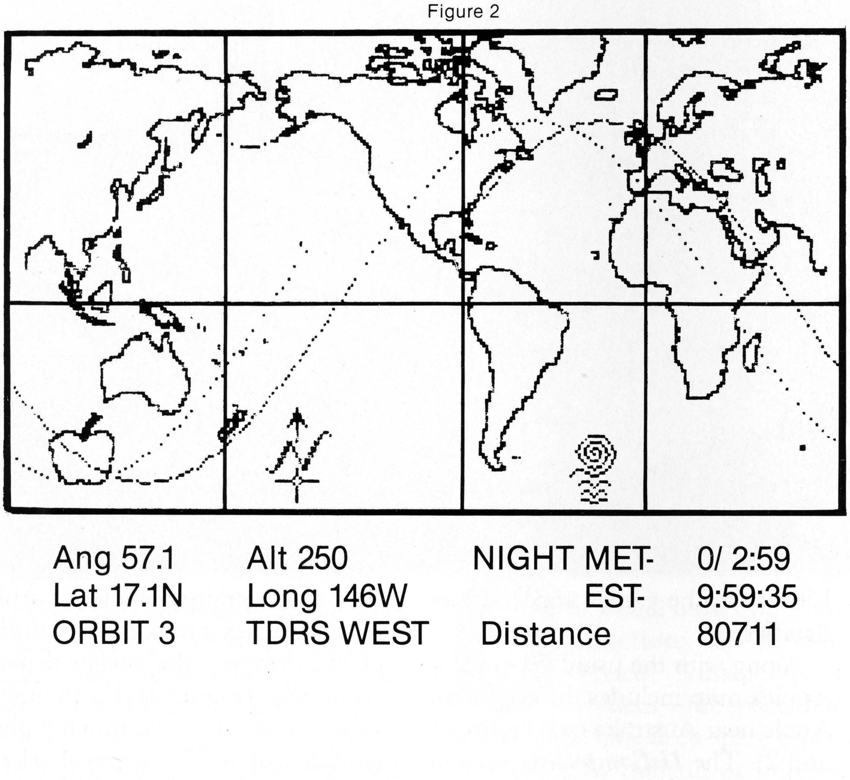
continued on next page

Figure 1



Ang 28.5 Alt 250 NIGHT MET- 0/ 2:41
Lat 4.7N Long 147E EST- 9:41:35
ORBIT 3 TDRS WEST Distance 72342

Figure 2



Ang 57.1 Alt 250 NIGHT MET- 0/ 2:59
Lat 17.1N Long 146W EST- 9:59:35
ORBIT 3 TDRS WEST Distance 80711

Table 1

Flight	launch date, time	duration	altitude	orbit type
41B	Feb 3, 8:00 am	7/23.17	300 km	satellite
41C	Apr 6, 8:59 am	6/23.40	390 km	satellite
41D	Aug 30, 8:41 am	6/56.00	300 km	satellite
41G	Oct 5, 7:03 am	8/05.23	350 km	earth obsv
51A	Nov 8, 7:15 am	7/23.45	300 km	satellite

Then you'll need to specify how long your shuttle flight will last, in the format D/HH.MM. A three-day flight would be entered as 3/00.00; a five-day, six-hour-30-minute flight would be entered as 5/06.30. You can enter any flight length up to about 12 days. The map of the world appears next, and the program asks what time zone it should use. You can enter any time zone, from 0 to 23; if it's within the continental United States, the screen will indicate the time zone by its initials (PST, MST, CST, or EST). Some of the time zones are especially important to NASA: 12 is Central Standard Time (Houston time, the schedule used aboard the shuttle); 13 is Eastern Standard Time (the Kennedy Space Center); 18 is Greenwich Mean Time. Remember, these times are in standard, not daylight time.

Finally, you'll need to enter the shuttle's launch time, in the format HH.MM. The time should be in 24-hour format: 00.00 is midnight, 23.59 is one minute before midnight, 12.00 is noon, and 15.35 is 3:35 pm. Enter the time, press RETURN, and your shuttle's flight begins.

The text window at the bottom of the Apple's screen shows you technical data on your shuttle's flight. It displays the orbit number, the local time, the Mission Elapsed Time (how long it's been since liftoff), the shuttle's position in latitude and longitude, the distance traveled (in kilometers), whether the shuttle is in daylight or darkness, and which TDRS tracking satellite is in view.

TDRS stands for "Tracking Data and Relay Satellite." For more than 20 years NASA used dozens of ground stations to track and communicate with space missions; each ground station was in touch with the spacecraft for only a few minutes at a time. With the TDRS system, Mission Control will be able to stay in constant touch with the shuttle using just two satellites. The first TDRS satellite was launched in 1983. The second was destroyed in the January 28 accident, but a replacement will probably be launched soon after the shuttle program resumes.

The TDRS satellites will be in geosynchronous orbit, circling the earth at the same speed that it turns, so each seems to hover over a particular spot on the equator. The satellite NASA calls TDRS East sits above Brazil at longitude 41 E; TDRS West will sit above Indonesia at 139 W.

The shuttle's orbits are plotted on the map in three different colors, so it's easier to tell the separate orbits. It takes the program only about two minutes to complete each orbit. The real shuttle takes about 90 minutes for each orbit, so the program is about 45 times as fast as the real thing. In Table 1 you'll find data for the five shuttle flights of 1984; you can use that data with the Shuttle Tracker program to get an idea of how those shuttle flights ran.

You can track the Jupiter probe shuttle flights as they happen, though, rather than 45 times faster than reality. Just add a single line to the program:

```
2315 GET K$ : POKE -16368,0
```

Then run the program, using the satellite deployment orbit and an altitude of 241 km. When you start the program, nothing will happen until you press the space bar or any other key; then the program will step through the flight slowly. You can stop it at any time by releasing the key. By hitting the space bar occasionally to update the time, you can track the shuttle's position from minute to minute as it circles the globe.

With Shuttle Tracker, you'll know exactly where the shuttles are when they launch their probes toward Jupiter.

PROGRAM TAKE-APART

Line 100 calls the subroutine that initializes the program at line 9000.
Line 200 calls the subroutine that forms the main program loop at line 2000.
Line 1000 starts the subroutine that prints the time.
Line 2010 starts the FOR/NEXT loop that runs the length of the shuttle's flight.
Line 2020 is a "fudge" that corrects for the extra time it takes the shuttle to take off, since the first orbit takes six minutes longer than each later orbit.
Lines 2030 to 2310 calculate and display the flight data at the bottom of the screen, and plot the new shuttle position on the map.
Line 2320 ends the main program loop, and line 2330 ends the program.
Lines 9020 to 9060 set up arrays and the hi-res screen, and load the world map, WORLD.PIC.
Lines 9070 to 9250 print the title screen and ask for the mission data.
Lines 9270 to 9350 set up constants the program uses. KT is the length of time the shuttle takes to orbit the earth, calculated with Kepler's third law. KD is used to calculate the circumference of the shuttle's orbit for distance calculations. L0 and L8 are longitudes 0 and 180, respectively; LK is the longitude of the Kennedy Space Center.
Lines 9360 to 9390 initialize variables and functions.
Lines 9410 to 9460 set up the map display on the hi-res screen.

Philip Chien, who lives near the Kennedy Space Center, has a strong interest in the space program. He also operates a 24-hour computerized bulletin board, Earth News Central; it can be reached at (718) 934-0774.

Softstrip from Cauzin Systems

There's something new in this month's ***II Computing***: the Softstrip from Cauzin Systems. The **Shuttle Tracker** program, along with its accompanying map of the earth, appears in the Program Listings section on page 77 in this special machine-readable form.

The Softstrip is a new way to include computer data and programs in printed publications such as books and magazines. Each Softstrip contains about 5K of data, program listings, or graphics—anything that can be put on a computer disk file.

You can read the Softstrip directly into your Apple II, II+, IIe or IIc with a special Softstrip reader that plugs into your computer through the cassette port (or, in the case of the IIc, through the serial port). The reader costs $199, about the same as an inexpensive printer or Apple-compatible disk drive. The Softstrip reader can be used with any book or magazine that uses the Softstrip format—and with special software you can use a dot-matrix printer to create your own machine-readable Softstrips.

We're so excited about the Softstrip that we've made special arrangements with the manufacturer, Cauzin Systems, so you can see the Softstrip reader in action. Just bring this issue of ***II Computing*** and a formatted DOS 3.3 or ProDOS disk to your Cauzin dealer. The dealer will read your Softstrip free of charge, and you'll see how easy getting software out of a magazine can be.

For the address of the Cauzin Softstrip dealer nearest you, call Cauzin Systems toll-free at 1-800-533-7323 or, in Connecticut, (203) 573-0150. Be sure to tell the operator that you need the name of a dealer who's equipped to copy the Softstrip onto your Apple II disk.

And be sure to let us know how you like this experiment in making ***II Computing's*** programs easier to use.//

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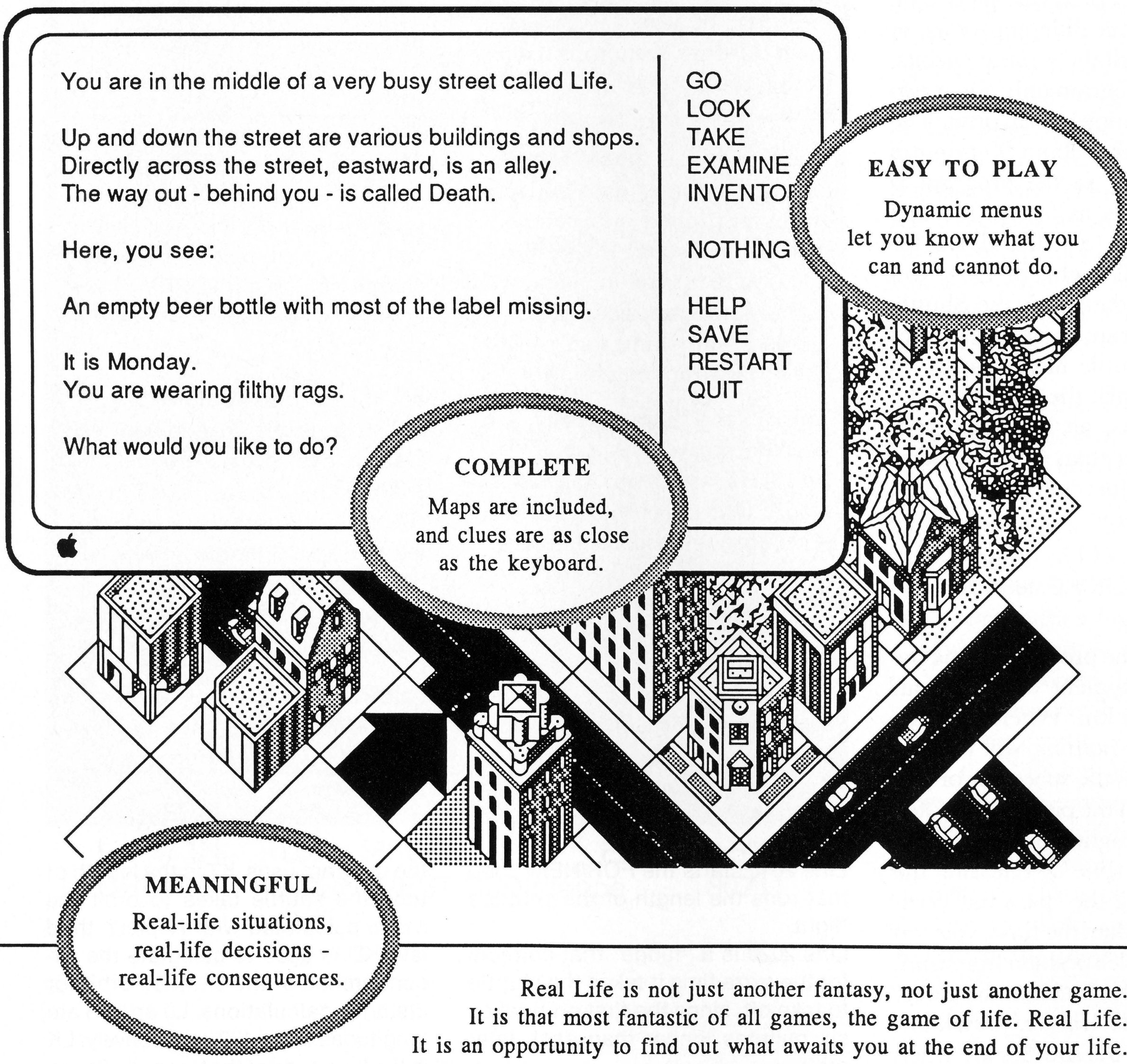

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Due to the delicate nature of some Real Life issues, this product is not recommended for children under 13.

IRS ✓ TRIES OUT ELECTRONIC RETURNS

by MARD NAMAN

For the first time, this year the Internal Revenue Service is allowing taxpayers to file their returns electronically from computers. It is a test program called the Electronic Filing Project. The program is offered in three metropolitan areas (Cincinnati, Phoenix and parts of North Carolina) and will enable individual taxpayers to file electronically using approved tax-preparation services. The program will operate through this tax season—until April 15.

This new service will eliminate most of the manual processes used by the IRS to process the old paper returns. As a result, people should get their refunds up to three weeks faster.

H&R Block, which annually processes 10 percent of the nation's tax returns, was the first tax-preparation service to announce participation in the pilot project. Six other firms have followed suit. Under this program, taxpayers will bring in their tax information to H&R Block or another tax-preparation service. Block then transmits the tax returns prepared from its computers directly to the IRS. (Block is using the Sears Communications Network to transmit.) This year, personal computer owners cannot file directly with the IRS. However, if the current program is successful direct electronic filing may ensue.

The electronic filing program comes at a good time. Last year, the IRS struggled through terrible backlogs, and many people received their tax returns late. Even now, more than 25,000 taxpayers haven't gotten their 1984 refund checks, and the

continued on next page

"Taxpayers should get refunds three weeks earlier."

IRS hasn't answered 1.2 million letters from taxpayers.

Electronic tax filing may be the answer. According to Wilson Fadely, a Washington D.C., spokesman for the IRS, electronic filing will eliminate weeks of work for the IRS. "We save all that paper processing at the beginning of processing tax returns," says Fadely. "As it is now, we have to hire thousands of people at the beginning of the filing season to handle the work load. It's a very paper-intensive operation—all this paper-type work that has to be done before it eventually gets into the computer. With electronic filing, it's going to eliminate that front-end part of it." Of course, in addition to saving all that time, the government hopes to save lots of money in processing the returns.

If all works out and the electronic filing system goes nationwide, the government will save millions of dollars every year. Clearly, that is the long-range plan. "A major part of our tax-system redesign for the 1990s and for the year 2000 will be electronic filing," says Fadely.

H&R Block and other tax preparation services will be looking carefully at another aspect of electronic filing: customer acceptance of the idea. "At this point," says Tom Block, president of tax operations, "we want to make sure the system works and that there is taxpayer interest and demand for the service. All our research tells us there is a lot of consumer interest in getting a fast refund." In fact, Block offers a nonelectronic rapid refund service in Canada, and according to Tom Block that service has "excellent demand."

Block says the success of the service depends on the IRS getting refunds back to people earlier than it does now. "Ultimately, what we will measure is how fast people will be able to get refunds, because that's what people want, that's the whole idea of this project from the consumer's point of view."

According to Block, the service will cost "under $20" for the electronic filing service. That, of course, does not include the tax-preparation service. Block will also electronically transmit returns for people who have their returns prepared by another tax service.

Sears will be responsible for the actual transmission of data from H&R Block to the IRS. According to Doug Fairweather, a spokesman for Sears, information will be transmitted over telecommunication lines using a DEC computer system and a 3780 protocol. Fairweather says, "The IRS has installed a receiving device not directly online, to enhance security; a second device does the same kind of edit checks and tests that they would get if they manually keyed in the tax forms."

Someday, home computer owners will be able to bring their floppy disks to H&R Block or send data directly via modem to either Block or the IRS. But this is clearly in the future. According to Fairweather, "We're at least two years away from people bringing in their own disks." At that point, says Fairweather, "there are certain legalities that have to be addressed. If we're going to be a transmitter only, then there are certain rules we have to live by. If we're also going to be responsible for the accuracy of the return, that means we would have to validate the information on the disk."

Tom Block agrees that personal computer users may soon be able to bring floppy disks containing tax information to their tax-preparation service, but says it "certainly won't happen in 1986," adding that expansion of the present trial program will be at the discretion of the IRS.

Fairweather strongly believes that widespread electronic filing will soon be here. "If there is public acceptance and if it's technically and financially acceptable, I think you will find that in six to ten years, at least half the individual tax returns will be filed this way. There's just so much benefit."

But right now, Fadely of the IRS says, "We will evaluate this test program by early next summer. Based on the results of that test, we have to determine how we're going to expand electronic filing if, in fact, we are going to expand it." The IRS will also decide whether or not to include other types of taxpayers—right now, it's only for individuals who are receiving refunds.

The electronic tax return program is part of a larger plan by the IRS to maximize its use of computers and operate more efficiently. Another facet of their long-range planning is what the IRS calls "Return Free." Basically, under this program, taxpayers will no longer have to prepare their own returns—the IRS will do it. This is for people who don't itemize their deductions and who now simply send in the 1040 form.

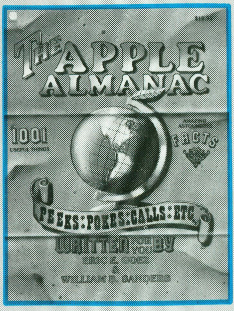
The IRS already receives basic information about income—wages, dividends, capital gains. Under the Return Free program, the IRS will feed all that information into its computers, calculate the tax liability and send the taxpayer a notice. Says Fadely, "This will complement electronic filing."

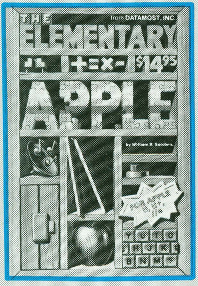
Furthermore, not only the tax preparation will be done electronically. The IRS may eliminate most refund checks. "We're looking at wiring your refund directly to your bank account," says Fadely.//

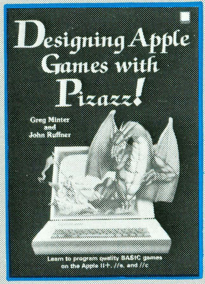
Mard Naman, a TV script-writer for PM Magazine, *freelances from his home in Santa Cruz, California.*

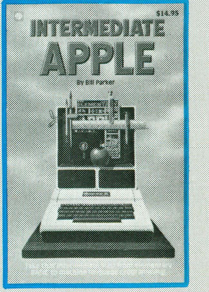
Everything you ever wanted to know about your

APPLE: FROM A TO Z









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ROBOT ROUNDUP

Latest Robot-Apple Connections

by KENDRA R. BONNETT

It has been two and a half years since HERO-1, RB5X and TOPO first appeared. Although we still cannot get a robot to clean up the kitchen and make the bed, the field of personal robotics continues to grow and become more interesting. "Optimists say that in five to ten years a robot will meet you at the front door with the newspaper and a martini. It will cook dinner, teach the kids and keep grandmother company," explains Sharon Smith of RB Robot Corporation in Golden, Colorado. Meanwhile, as we wait for robots to free us from life's little drudgeries, we can still have a lot of fun with them.

WHAT THEY CAN DO

The typical first-generation personal robot, such as RB Robot Corporation's RB5X or the Heath Company's HERO-1, looks like a canister vacuum or Star Wars' R2D2. If you are willing to spend between $2000 and $2500 ($1500 if you buy HERO-1 in kit form and even less if you buy HEROjr), you can have a personal robot that moves around in programmed patterns; it avoids walls, doors, people, and other obstacles and monitors its energy level.

RB5X and HERO-1 are both expandable. You can add, at substantial extra cost, extendable manipulator arms, voice synthesizers and voice recognition systems. Although these robots cannot do anything as practical as walk your dog or answer the door, RB5X has vacuum and fire extinguisher attachments.

TOPO (Androbot), another member of the triumvirate of first-generation personal robots, looks somewhat more human. Actually, I like to describe TOPO as a three-foot snowman with raccoon eyes. Digital TOPO ($1799) walks and talks like the other personal robots, but lacks working arms.

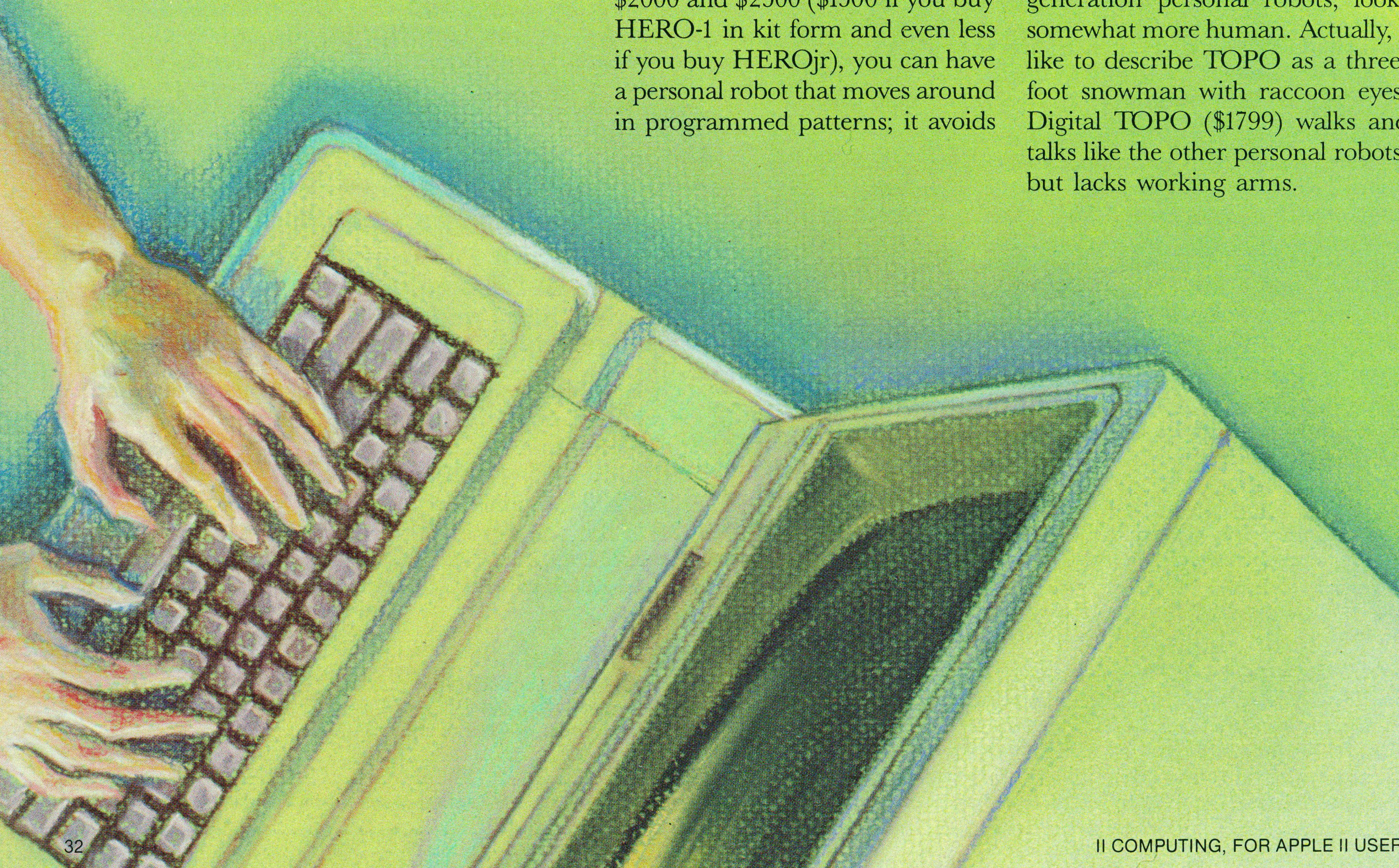
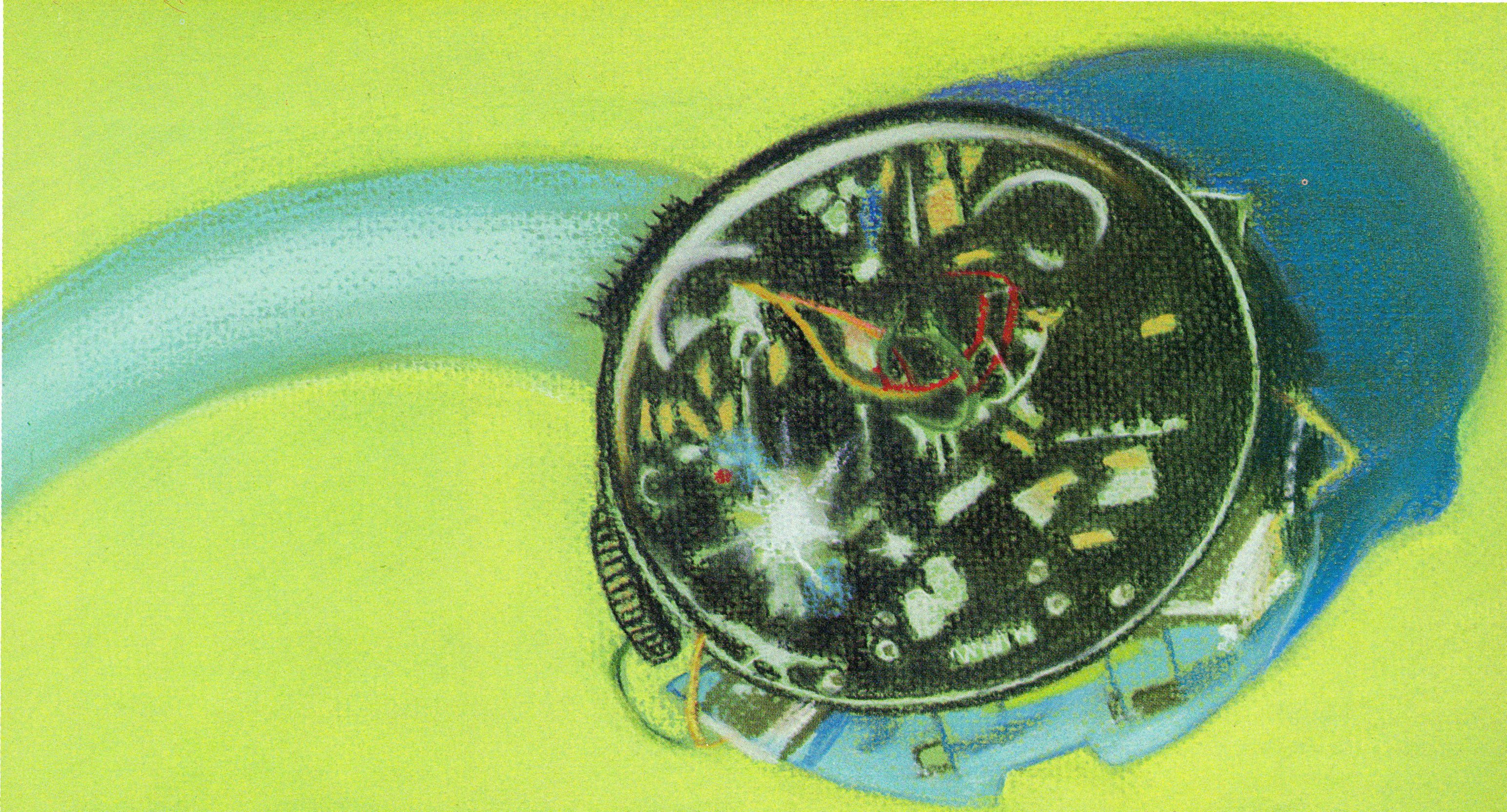


ILLUSTRATION BY NANETTE BIERS



THE APPLE II CONNECTION

TOPO interfaces to the Apple II computer and is programmable in Logo or Toposoft (a Forth-based language). You can also use your Apple II to program HERO-1 and RB5X. Bersearch Information Services' ROBI Hero/Apple interface ($199) has four programmable, bidirectional, eight-bit ports and easy-to-use software for transferring files. Interface Technology makes an Apple-Hero Communicator ($159) that is used in conjunction with the HERO Memcom board ($345) and a macro assembler.

Previously, RB5X was programmable using Tiny BASIC and assembly language. The new Robot Control Language (RCL) for the Apple makes programming much easier. Excaliber Technologies Corporation worked with RCL to provide a version of its SAVVY language for RB5X. Although the developers are reluctant to describe SAVVY as an artificial intelligence system, it does recognize speech and spelling patterns. This is good news for the programmer, since the software overlooks typos, misspellings and many syntax errors. Prices range from $179 (one-disk system without SAVVY) to $595 (two-disk system with SAVVY).

TURTLE ROBOTS

Turtle robots are typically used in the classroom to teach Logo. They can be programmed to move along a floor or tabletop in any direction or pattern, allowing youngsters to see the results of their programming efforts.

Most turtles are circular platforms with transparent plastic domes. Tasman Turtle and Turtle Tot are good examples. They move, blink and beep. Both have touch sensors that let them bounce off walls and other obstacles and offer optional speech synthesis systems. Best of all, you can program these and most turtles in Logo to draw by instructing them to raise and lower a felt-tip pen attached to the platform. Tasman Turtle ($849.95), sold through Follett Library Book Company, also can be programmed in BASIC. Harvard Associates, Inc., distributes Turtle Tot ($399.95).

The Amarobot Turtle Kit ($249) is affordable and expandable. Special options are planned: a vacuum attachment, infrared data link, vision, voice and arm—most in the $50 range. Model II, the Apple version, will be available in a couple of months. Send $3 to Amarobot for a catalog.

Recent additions to the turtle line prove that all turtles are not housed in plastic domes. The Valiant Turtle ($399.95) is an infrared remote-control device that looks like a real turtle. The system's independent stepper motors allow it to move with great accuracy and draw smooth arcs and circles. It is available from Harvard Associates, Inc., and supports most versions of Logo and Turtle Graphics.

Androbot has added a turtle to its product line. F.R.E.D., which stands for Friendly Robotic Educational Device, does not look like a turtle. Rather it looks like TOPO's head on a platform, with a penholder in the neck. F.R.E.D. ($569) stands 12 inches high, weighs 2-1/2 pounds and has an infrared remote-controller device and a voice chip. Special sensors keep F.R.E.D. from rolling off the edge of a table, and with Fredsoft ($79) software you can use F.R.E.D. with your Apple II.

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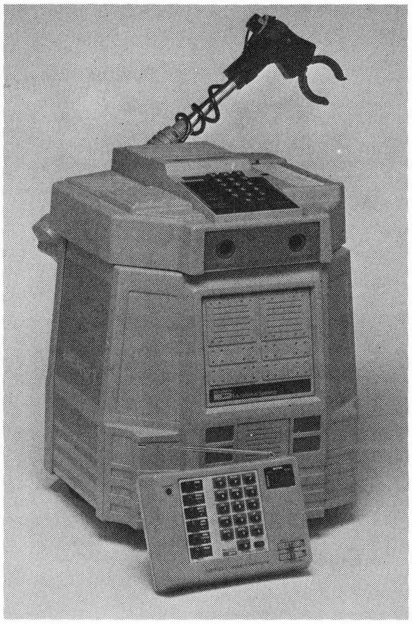
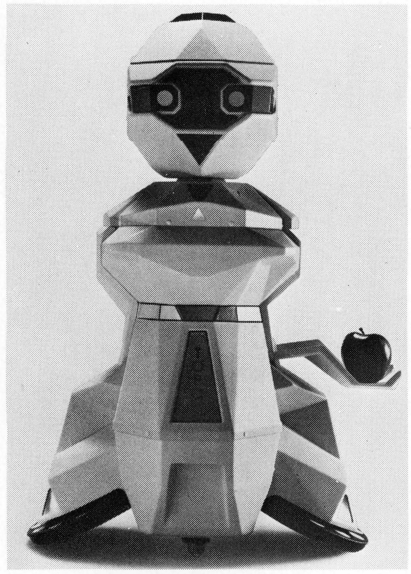
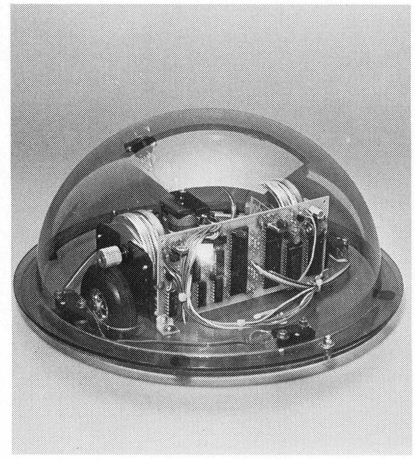


HERO-1



TOPO



TURTLE TOT

ROBOT KITS

One of the more recent developments in the home and hobby robot field is the increase in kits. Even the big toy companies are getting involved. Ideal sells a new Erector construction set for building motorized, remote-control devices. The Erector 725 ($40) includes everything needed to build the Maxx Steele robot.

Milton Bradley offers the ROBOTIX motorized, modular building system. ROBOTIX kits ($45 to $60) feature a mobile controller that you can hold or build into the robot design. You can add Crabapple Systems' KELP (Kinetic Helper Board) Apple interface and program your ROBOTIX system in BASIC. Both the KELP-4 motor controller ($89.95) and KELP-8 motor controller ($119.95) include cables, software and instructions.

Fischertechnik construction kits include a robotic computing kit scheduled to reach stores in August. The basic kit ($125) includes plans for building robotic projects, ranging from a simple tabletop traffic light designed to teach basic input/output (I/O) operations to a solar-cell tracking system that follows the sun. This is a nondedicated building system, which means you can also design your own robots. An interface ($95) lets you program the robots on your Apple II computer.

TransTech Systems supports the Fischertechnik system with a wide range of add-on kits. You can build model mechanical, pneumatic, electro-mechanical and electronic systems, which you can interface to an Apple II. Interface kits range from $189.99 to $269.99. The catalog lists the full line of products.

Movits ($25-$75) are Japanese robot kits that are sweeping the American market. The more than 10 kits currently available have such unlikely names as Monohopper, Avoider, Monkey, Peppy and Piper Mouse. They use light sensors, sound sensors and infrared sonar systems. The Memocon Crawler has a keypad you can use to program movement, sound and light. A new $40 interface connects the Memocon to the Apple II so that you program and store intricate routines. OWI Incorporated, the American distributor, can tell you the name of a dealer or mail-order house in your area. Two sources are Rio Grande Robotics (Las Cruces, NM) and Robot Center (San Jose, CA).

If you can use a soldering iron and are interested in working with electronic components such as resistors, photocells, transistors and light-emitting diodes (LEDs), Spectron Instrument Corporation offers a variety of kits, computer interfaces, sensors and peripheral devices in a range of prices. Send for the catalog.

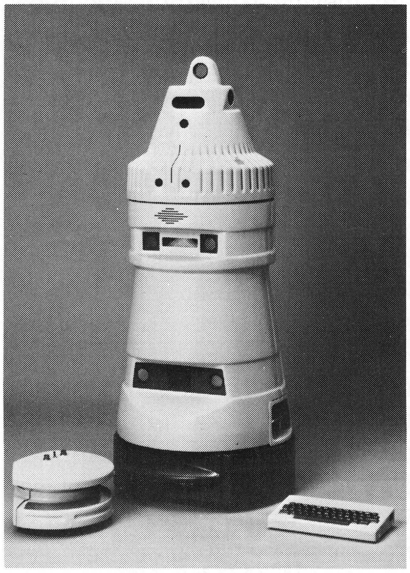
ROBOT ARMS

Perhaps by now you have seen an industrial robot arm; if so, you can envision what these little Apple robot arms look like. Several models for the Apple are currently on the market. You will have fun programming these arms, but cost puts them out of reach of the casual hobbyist. They are actually designed as sophisticated educational and research devices and can even be used for industrial planning.

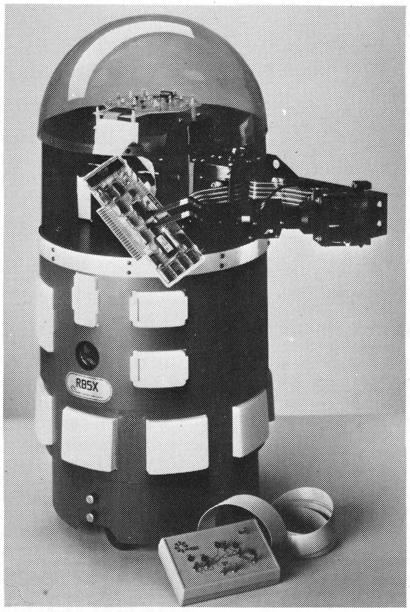
Some manufacturers and distributors include D&M Computing, Inc., distributors of Armdroid 1 ($1295 plus $200 for interface); Rhino Robots, makers of Rhino XR II ($5369, which includes robot, Apple CPU, disk drive, monitor and software); and Microbot Inc., manufacturers of MiniMover-5 ($1995 plus $245 for interface) and TeachMover ($2795).

SECOND GENERATION

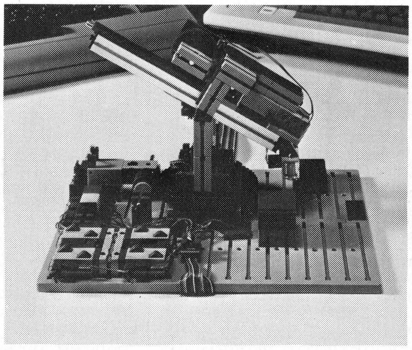
"The cost of personal robots will go up as robots are able to do more things," predicts Sharon Smith. "There is a balance between cost and what the robot can do. Right now, robots are a little expensive for what they actually do." Meantime, robot



GEMINI 1



RB5X



FISCHERTECHNIK

companies are looking to the second generation of personal robots. "The second generation includes programmable vacuuming and home security," Smith adds. These robots cannot move furniture, but they can sense and steer around obstacles as they vacuum on a programmed route.

Second-generation robots will also handle home security—sensing intruders and other hazards, and notifying the police, fire department or paramedics.

Some of these features are beginning to appear on home robots, and, as predicted, are expensive. Arctec Systems manufactures Gemini, a four-foot tall, 75-pound, programmable robot. The deluxe Gemini ($6995 or $3495 in kit) uses CMOS circuitry to conserve energy, and onboard sonar and infrared navigation systems. It has 100K of ROM with an integrated artificial intelligence system, 74K RAM, and environmental sensors for light, sound, motion, distance, temperature, body heat and barometric pressure. Other models range from $995 to $2000. An Apple-Gemini Communicator ($159.95) lets you program and download software to the robot.

Both first- and second-generation robots depend on three separate but interactive technologies. They both must have sensors, usually sonar, touch-sensors, or infrared. They need a way of affecting the environment—such as wheels for mobility or manipulator arms—and they must have computing power. This last is perhaps most important and still needs the most development. Until artificial intelligence can simulate human thought, robots will be limited to predefinable tasks.

"I like to describe TOPO as a three-foot snowman with raccoon eyes."

DOING IT YOURSELF

As the robot craze continues to catch on, more information is available for hobbyists who want to make their own robots. The **Robotics Society of America** offers tips on finding inexpensive supplies, news of industrial robot developments, a calendar of events and a hefty schedule of seminars on robot-related subjects. Contact Walter Tunick for the location of the chapter in your area or for information on starting a new chapter. The address is 200 California Avenue, Suite 215, Palo Alto, CA 94306.

Other groups include the **Homebrew Robotics Club**, 91 Roosevelt Circle, Palo Alto, CA 94306, and **Robot User Group (HERO-1)**, Heathkit Electronics, 2001 Middlefield Road, Redwood City, CA 94061.

If you are somewhat mechanical and a hobbyist at heart, then making your own Apple-controlled robot will not be that difficult or expensive. You can get parts from mail-order sources such as Spectron Instrument Corp., William Olivadoti at Laboratory A, and the Robot Shop. Send for their catalogs and ordering information.

Let us say you want to start with a simple robotic arm with one joint. Movement of the joint is coupled to a gear train and electronics that convert logic-level signals into power to drive the motor. You can make the actual arm from an Erector set, wood, metal or any material you can work easily.

Instructions for the arm come from your Apple via any of the Apple I/O connector slots. You can start with a Super Serial or Grappler card or design your own interface, then control I/O with a simple BASIC program. PEEKs and POKEs open the ports and send appropriate pulses. For example, to extend the robot arm, turn on the servo and send it pulsed messages for as long as you want it to continue extending.

continued on next page

ROBOT I/O

After you have produced remote-controlled motion, you can think about the next step. Each port contains eight bits or lines over which you can transmit information between the computer and external device. These bits can be pulsed in 256 combinations.

With so many lines to the outside world, you can direct multiple motors—arms, wheels, even a rotation head. Your Apple can also accept sensor input, which can be used to keep the robot from running into objects. "Many hobbyists use sonar on their robots," says Tom Burke, who builds and services robots for the University of California at Berkeley's Lawrence Hall of Science. Until a few years ago, sonar was very expensive, but Polaroid's sonar-using autofocus cameras have made the technology small and cheap enough for the hobbyist. Evaluation kits for the Polaroid sonar system cost around $100. You can interface them with an Apple. The sonar has a range between one and 39 feet and a resolution of one inch. Of course, the further from the source, the lower the resolution.

"You can wire inexpensive Radio Shack infrared LEDs and phototransistors, of the same wavelength, into a line-tracer circuit," adds Burke. The phototransistor measures the difference between light and dark, keeping the robot on track over a solid line on the floor.

On the other hand, making your Apple recognize objects is difficult. This requires more computing power than most Apple systems are set up to handle, as well as highly sophisticated sensory equipment.

Jim Strope, head of the Robotics Society of America's San Francisco chapter, says that many hobbyists are using a round robot platform with two unidirectional casters and two bidirectional wheels, all arranged in a square. If one wheel is on and the other off, the platform rotates. If both are moving constantly, the robot moves forward, and so forth.

This gives you an idea of the many ways you can use your Apple II computer to control a robot or robotic device. You can spend as much or as little time and money as you like. But to prove that anything is possible, here is something you can buy—provided money is no object. Scarab Robotics has a robot bar, called Scarab X-1. It is 10 feet by 8 feet and holds 36 liquor bottles, a half keg of beer, wine and mixers. Program the system via your Apple II and Votan voice system, then place your order through a wireless FM transmitter. The robot bar serves up your favorite brand—pure luxury at $65,000.//

Kendra R. Bonnett is a free-lance writer living in Sausalito, California. She is the author of The Everyone Can Build a Robot Book *(Simon & Schuster).*

RESOURCES

Amarobot
906 Bancroft Way
Berkeley, CA 94710

Androbot Inc.
550 Charcot Ave.
San Jose, CA 95131

Arctec Systems
9104 Red Branch Rd.
Columbia, MD 21045

Bersearch Information Services
26160 Edelweiss Circle
Evergreen, CO 80439

Crabapple Systems Inc.
118 Commercial St.
Portland, ME 04101

D&M Computing, Inc.
P.O. Box 2102
Fargo, ND 58107

Fischertechnik
175 Route 46
Fairfield, NJ 07006

Follett Library Book Co.
4506 Northwest Highway
Crystal Lake, IL 60014

Harvard Associates, Inc.
260 Beacon St.
Somerville, MA 02143

Heath Company
Benton Harbor, MI 49022

Ideal Toys
(Check with your local toy store.)

Interface Technology
P.O. Box 3040
Laurel, MD 20708

Microbot Inc.
453-H Ravendale Dr.
Mountain View, CA 94043

Milton Bradley
443 Shaker Rd.
E. Longmeadow, MA 01028

William Olivadoti
Laboratory A
1155 Santa Clara Ave.
Alameda, CA 94501

OWI Incorporated
1160 Maholo Place
Compton, CA 90220

Polaroid Corp.
Commercial Battery Div.
784 Memorial Dr.
Cambridge, MA 02139

RB Robot Corp.
14618 W. 6th Ave.
Suite 201
Golden, CO 80401

Rhino Robots, Inc.
308 S. State St.
Champaign, IL 61820

Rio Grande Robotics
1595 W. Picacho, #28
Las Cruces, NM 88005

Robot Center
1045 Saratoga-Sunnyvale Rd.
San Jose, CA 95129

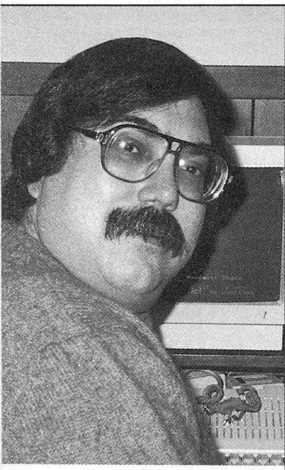
Robot Shop
P.O. Box 582
El Toro, CA 92630

Spectron Instrument Corp.
1342 W. Cedar Ave.
Denver, CO 80223

TransTech Systems
9889-E Hibert St.
San Diego, CA 92131

Of War and Peace—and Integrity Too

by NEIL SHAPIRO



Neil Shapiro is editor-in-chief of MacUser *magazine and is also chief Sysop of the MAUG Apple Group on CompuServe.*

What is the sound of one disk spinning?

Although **Ultima IV** (Origin Systems) does not address that issue, the game is embedded within a deep and all-pervading philosophical framework. And as if that isn't enough, it's also a fun way to spend any number of afternoons.

Fun and philosophy? Well, even more than that, this new program is a whole new type of computer game. With the release of Ultima IV, the Ultima series by Lord British has matured into not just the best fantasy role-playing game on or off the video screen, but it pioneers a new way computers can help people interact not only with a computer program but with each other.

Subtitled The Quest of the Avatar, this new adventure takes up where Ultima III left off. Although the evil Mondain, Minax and Exodus were dispatched in the earlier Ultima games, the fantasy land of Sosaria (now part of a larger realm called Britannia) is again facing problems of evil hordes of creatures defacing the land in far worse ways than simply writing graffiti on subway walls.

It is up to you to penetrate mystery after mystery to find out what is wrong, who is behind it, and how to fix things. And many of the mysteries are questions that have plagued philosophers for millenia.

The game begins when you visit a colorful fair and the tent of a strange person who lays Tarot-style cards on a table in response to your answers to various questions. If a knight claimed a victory that was yours, would you demand your own name be honored? Would it be more important to you to complete a very important mission or to see a hungry soul fed? Many of the questions asked seem easy on the surface, but carry deep implications.

Your answers to these questions will determine the type of being you will be as you try to complete the quest. Each of the types of beings—Mages, Paladins, Fighters, Druids, Shepherds, Bards, Tinkers and Rangers best represent one of the eight fine points of humanity that you may strive for spiritually and physically. Finding what these points are and understanding and developing them in your own character will be a major portion of your quest.

The Land of Britannia is 16 times larger than the realm of Sosaria alone, so there is much more onscreen map area than in Ultima III. You control movement on the scrolling map by entering keyboard commands.

The hi-res map is a beautiful land of grasses and plains, mountains and seas, complete with animated waves and flags that shimmer atop Lord British's own castle. Dotted on the main map are many other castles, towns and villages. Entering these on-screen areas will introduce you to the people of Britannia. A cloth tapestry map included in the packaging complements the on-screen map.

Hundreds of men and women wait to meet you and help guide you on your quest through both life and this adventure. Every time you enter a town to visit its shops and taverns, you will have to speak—transact—with the animated people you meet on the streets. Each figure has a personal name and engages you in conversation. Many of the figures have interesting life histories and a few special people will want to join you on your quest if, in their eyes, you have become a worthy enough person for them to follow.

Some of the people tell you what special virtues their own town may have to teach, if you are willing to learn. Others will tell you, if they recognize in you already attained virtues, runes to recite at hidden shrines. Or they may tell you of dungeon secrets that need to be revealed.

Of course, even the most enlightened warriors must someday draw swords or conjure bolts of lightning so that the unredeemable may not conquer. The new systems of combat and magic devised for Ultima IV extend those developed in the previous epics.

Combat takes place on a secondary, windowed tactical display. On the tactical display, you can see every member of the party. You can control each member's movement and use of weapons. Unlike Ultima III, both defender and opponents can retreat from the battle—but think before you retreat, and think too before you prevent others from running. For, like everything else in the game, your philosophy of fighting will affect the quest's final outcome.

Magic is far more realistic than in previous games. You must obtain various items to conjure with ahead of time and then combine them to yield a proper spell. You must prepare spells before the heat of battle and stockpile them even though you are never sure what enemies you may encounter.

Sea battles, too, have taken on a new flavor with the addition of wind to the world. Sailing your war sloop is no longer a simple matter of keyboard nimbleness. Instead, a good captain must know—or discover—how to make the direction of the wind work for his progress rather than against it.

As in the other Ultima games, mystical gates can transport you from one area of the realm to another. These new Moon Gates are dependent on phases of both of Britannia's moons, and the canny adventurer must master their meaning and their use. For these gates, you need the cloth map.

If you have a Mockingboard and a IIe or II+, prepare yourself for a treat! You must hear the stereo music background to the game to believe it. As in an opera, many characters and situations have their own repeating themes within a grander work. Unfortunately, however, the program will not recognize the IIc variety of Mockingboard (this is the program's only oversight).

You will need some time to get used to Ultima IV before you feel comfortable with the new gaming system. Many of the things you would be rewarded for doing in a typical adventure game will work against you in this more realistic and humanistic one. For example, during my first game (and the shame of it even now makes my vision blur) I stole golden treasures that seemed to be mine for the taking. After lengthy playing sessions I finally realized that, just as in our own world, I would have to live with the mistakes of my past, or (unlike our world) I would have to reboot the disk and try again.

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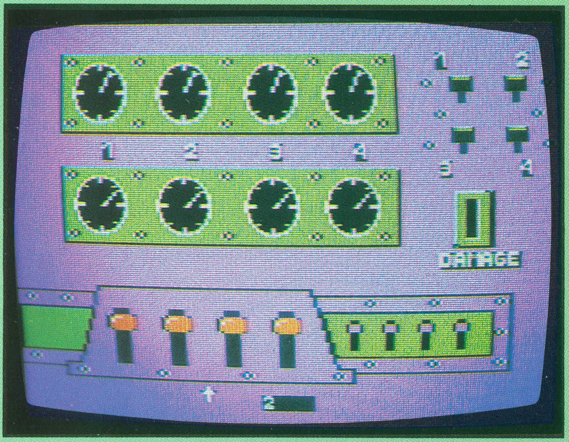
ULTIMA IV

ULTIMA IV

KING'S QUEST

KING'S QUEST

UNDER FIRE!



THE DAM BUSTERS

More than any other game I have seen, Ultima IV demands your full participation. But once you enter into the game, the reward is not only a believable framework within which to play out a fantasy. It is also somewhat of a guide to approaching the more mundane aspects of the real world in a philosophical manner.

Ultima IV is a fascinating excursion, a tour de force that mixes computer programming with the same insightful muses that in the past have produced our greatest works of fantasy literature and poetry.

BEAUTY AND THE DISK

King's Quest II (Sierra On-Line) is the latest in a long tradition of adventure games that transcend the usual run-of-the-mill illustrated adventure. Like King's Quest, its predecessor, this sequel (subtitled Romancing the Throne) pushes the Apple's graphics to new limits while maintaining a most engrossing story line.

King Graham, who was installed on his throne in the first game, is on a quest to save the lovely maiden Valanice from the clutches of the crone Hagatha. Revealed to him in a vision, the lovely lady must be found so she can reign beside him as Queen of Daventry.

To find her, he has to find three keys to an enchanted land where she is captive. It is not an easy quest—but is a most beautiful one.

The double hi-res pictures (the game requires 128K on an Apple IIc or IIe) are a joy to see. As you move King Graham by joystick, each screen assumes an ethereal three-dimensionality. You can walk Graham behind a towering tree or swim him across an emerald lake. Although you must enter many commands through the keyboard, that does not interfere with the on-screen illusion.

The artists who have brought to life the vision of designer Roberta Williams and story author Annette Childs deserve much recognition. The artwork and animation is almost Disney-like in quality and execution.

For puzzles that entrap and challenge the mind, and for graphics that will dazzle and delight the eye, join with King Graham to find his Lady Love.

SIMULATIONS OF HARSHER WORLDS

Although, as the two games above demonstrate, computers can take you into a world of fantasy, they can also simulate events from our own, less enchanted, history.

Under Fire! from Avalon Hill finally establishes that the company is as serious about computer

FOR THE FUN OF IT

games as it is about board games. A simulation of WWII tactical-level infantry combat, Under Fire! by Ralph Bosson is both an accurate simulation and one that employs the computer well, from graphics to calculation routines.

Each individual soldier (German, United States, Russian) is tracked on a meticulously executed hi-res map of various battlefields. You can view the map at three levels of magnification at various times in the game; this gives you a sort of Greek god-like feeling as you zoom in on and control the life and death actions "below."

Besides the included scenarios, Under Fire! contains an excellent game-designer module called the Mapmaker routines. You use the module to design your own terrained battlefield, using the joystick to move and place everything from houses to soldiers.

I wish it was easier to identify which unit will move before you actually see it moving. But overall, this is the finest computer game that Avalon Hill has produced to date and is one of the best computer wargame simulations I've seen.

If dodging bullets isn't your cup of tea then perhaps you would be more interested in playing **The Dam Busters** from Accolade. This game is also a tactical simulation of WWII combat but instead of being a soldier, you take all crew positions in a Lancaster-class bomber: pilot, front gunner, tail gunner, bomb specialist, navigator, first and second engineers. To make a succesful bomb run from England to your target, you must master the skills of each crew position.

On a nighttime mission, the lights of the cities pass below you as you fly via joystick while attempting to control such variables as engine speed, bomb-bay doors, and even an occasional on-board fire. Searchlights pick you out for the German fighter patrols and flak pops about you. Can you survive to make your final run? The Dam Busters will test your ability to plan and to understand complex variables as well as testing your eye-hand coordination.

Meanwhile, for those who have been following Strategic Studies Group's **When Superpowers Collide** series of simulation games, you'll be glad to hear that, in some ways, the fourth scenario is the best yet. **Norway 1985** introduces the concept of ski infantry. Switch the background from black to white, and this new game gives you an actual feel of snowbound warfare as the Soviets try to invade Norway in a mythical 1985 conventional war.

If you have not yet started off on these games, pick up the latest version of **Germany 1985**, which is the first game in the series and introduces the basic rule structure that the other three games (**RDF 1985**, **Baltic 1985** and now Norway 1985) in the series all share. The idea of simulating a wordwide conflict with modern weapons at a Grand Tactical level was visionary in computer gaming when it debuted. Now that the concept has matured this series is just a must-have for any wargaming computerist.

So keep your powder dry, your nose up and your moral framework strong! Who knows what the future holds in store. . .//

NORWAY 1985

PRODUCT INFORMATION

ULTIMA IV
distributed by Electronic Arts
2755 Campus Drive
San Mateo, CA 94403
(415) 571-7171
$59.95

KING'S QUEST
Sierra On-Line
Coarsegold, CA 93614
(209) 683-6858
$49

UNDER FIRE!
Avalon Hill Game Co.
4517 Harford Road
Baltimore, MD 21214
(301) 254-9200
$59.95

THE DAM BUSTERS
Accolade
20863 Stevens Creek Blvd.
Cupertino, CA 95014
(408) 446-5757
$34.95

NORWAY 1985
distributed by
Strategic Simulations, Inc.
883 Stierlin Road, Bldg. A-200
Mountain View, CA 94043
800-772-3545 x335
$34.95

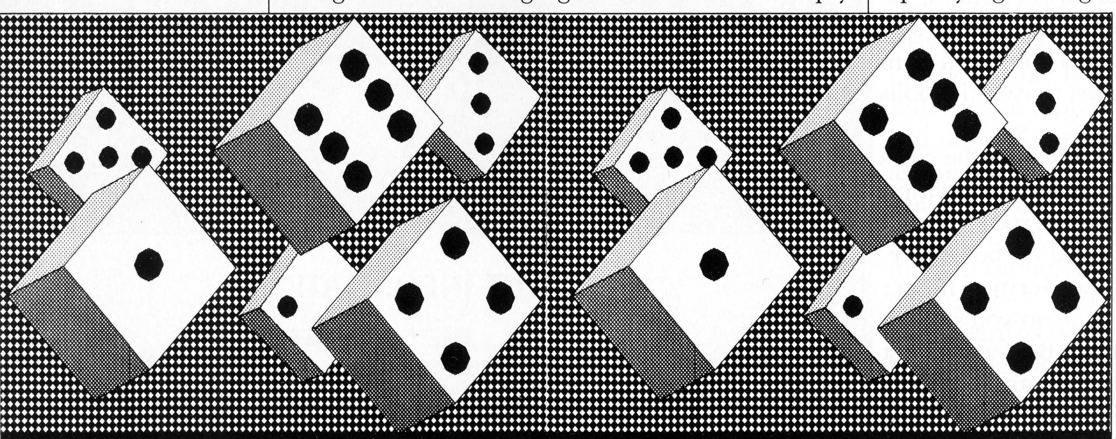
Dice Simulator

by JOCK ROOT
Program by MICHAEL J. BIANCALANA, Technical Assistant

Jock Root, former education and assembly-language editor of Softalk, *is a microcomputer consultant with a background in math, philosophy and electronics.*

Rolling dice on a computer is more complicated than you might think. Never mind the difficulties of hi-res graphics—the hardest part may be just getting the dice to roll randomly.

Applesoft BASIC's RND(X) function generates a random number between 0 and 1—a fraction that's greater than or equal to zero but always less than 1. It's a useful function to have when your program needs a number with an unexpected value; in a game or simulation, it can help make things more challenging and lifelike—or simply more unpredictable. But RND(X) has some limitations, too. In certain situations it tends to repeat itself, it skips many possible numbers, and it usually runs through exactly the same "random" numbers in exactly the same order.



Instead of RND(X), **Dice Simulator** uses a short random-number subroutine in BASIC. It's only four lines long, but it generates a nearly-random number that won't fall into short repeating sequences. It also uses an easy way of guaranteeing a different set of numbers each time from any random-number generator—including RND(X).

What, exactly, is *random*? Scientifically, randomness is defined by two characteristics: range and equal probability.

The *range* of a random number is just what you'd expect: it specifies the limits a random number must be between. When you pick a number between 1 and 10, the range is from 1 to 10. Range also specifies what numbers within the limits you can use: when you ask for a number between 1 and 10, you usually just mean the whole numbers. Specifying a range may be simple (any number between 0 and 1) or more complex (an integer, evenly divisible by 3, less than or equal to 30 and greater than or equal to 12).

The other half of the definition of randomness is *equal probability.* That means each number within the random-number generator's range has the same likelihood of occurring. Thus, a six-sided die is random (if it's not loaded) because it gives you an equal chance of rolling any number from 1 to 6.

But there's a third factor, too—the reason we use random-number generators for games and simulations. A random number should be unpredictable—a number you can't anticipate. Given several random numbers in a row, you shouldn't be able to predict what number will come next. That's what we think of when we hear the word *random*—and it's something we want our random-number generator to do.

continued on page 44

GAME FRAME
continued from page 42

Nothing in a computer is supposed to be truly random, of course: something really random usually means a malfunction. But a computer can do a good imitation of randomness, producing a long series of hard-to-predict numbers. The longer the series is, and the more numbers it covers, the longer it will be before the sequence starts to repeat itself. Normally, a computer creates random numbers by using a formula on one number, called the *seed*, to produce a new number. If the formula is well-designed, it will produce a long series before it begins to repeat itself.

Since a formula always works the same way, there's another factor to consider: if your formula always begins with the same seed, it will always produce the same sequence of random numbers. That can make games and simulations on a computer predictable, too. It's important to vary the starting point or change the sequence to make a random-number generator unpredictable.

Applesoft's RND(X) tends to repeat itself.

You can test how well a random-number generator works on any Apple II with a high-resolution display, using a program originally developed by Gary Faulkner, Tom Hare, John Russ and David Sparks. Described in the January 1983 issue of *Call-A.P.P.L.E.* magazine, it takes just three lines in BASIC:

```
10 HGR : HCOLOR=3 : POKE 49234, 0

20 X=RND(1) * 280 : Y=RND(1) * 192

30 HPLOT X,Y : GOTO 20
```

The routine plots points on the hi-res display, with randomly selected vertical and horizontal positions. With a good random-number generator in line 20, the screen will eventually be completely filled with white dots. With the Applesoft RND function, the screen starts filling with dots, but long before the screen is completely full, new dots stop appearing. The program is still generating numbers, but it's repeating itself: since the new dots are plotted on top of the old ones, you can't see any change. Applesoft's random-number formula just isn't good enough.

In the same article where they presented their random-number test routine, Faulkner, Hare, Russ and Sparks also offered a much better formula for generating random numbers:

S'=(8192 * S) mod 67099547

This is a very reliable way of producing random numbers, but it uses more math than some of us have. The four authors also wrote their program in 210 bytes of assembly language, which is more work than some of us were looking for.

If you don't care about whether your random numbers have a scientific pedigree, you can do a pretty good random-number generator in four lines of BASIC (well, five if you count the RETURN for this subroutine). This subroutine may not be as good as the assembly-language routine, but it can produce 5,000 random numbers without repeating itself. Here's the subroutine:

```
1000 REM RANDOM NUMBER WILL BE RETURNED IN R

1010 R=SQR (S)

1020 R=R—INT(R)

1030 S=10 * ( R+OLD )

1040 OLD=R+1

1050 RETURN
```

This random-number routine requires two seeds, not one. By using both OLD and S as seeds, the routine repeats much less frequently.

Here's how it works. Line 1010 takes the square root of the main seed *S* and puts the result in *R*. Since S is greater than 1, the square root will have an integer part and a fractional part. Next, in line 1020, the integer part is stripped off, so R is now between 0 and 1—the same range as RND(X). This is the random number.

In line 1030, the random number is added to

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GAME FRAME
continued from page 44

the second seed, OLD, then multiplied by 10. This provides a new value for S that's greater than 1. Finally, line 1040 supplies a new value for OLD by adding 1 to R.

And that's all there is to it! You can test it with the hi-res plotting test listed earlier by entering the test and the subroutine, changing line 20 to:

20 GOSUB 1000 : X=R * 280 : GOSUB 1000 : Y=R+192

There are a few special cases to watch out for. If S is zero, the first random number will be zero; if OLD is also zero, the random numbers will soon repeat. You should initialize S and OLD to nonzero values before you start using the subroutine.

Scientifically, randomness is defined by range, equal probability and unpredictability.

But what nonzero values should you use? A random-number generator will always produce the same series of numbers when it starts with the same seeds. Where can you get random nonzero values to initialize your random-number generator?

If your program keeps a disk file (for example, a list of high scorers), you could simply record the previous seed on disk when you end the game, and recover it when you start up again. If your program doesn't keep a disk file but you have a clock board in your Apple, you could use the current time as a seed; if you have an electronic thermometer, you could use the temperature.

But the Apple provides an easier way to randomize the seed for RND(X). When the Apple is waiting for input from you, it checks the keyboard over and over—and every time it checks, it adds 1 to a counter in memory. The counter counts from 0 to 65535, then starts over.

You can PEEK at this counter, which is stored at memory addresses 78 and 79, to get a random seed S for your random-number generator, like this:

S=PEEK(78)+256 * PEEK(79)

If you can get by with a seed that's between 0 and 255, you can simply use

S=PEEK(78)

There's a catch, though: before you PEEK at the counter, your program must use an INPUT statement, which activates the keyboard input counter. Otherwise, that counter won't count—and you won't have a random seed.

Once you have your random seed, you can use the values to initialize S and OLD in the random-number subroutine. Be sure to check the values to make sure they're not zero.

Even RND(X) works better with a nonzero seed. To initialize it to a seed value S, use the statement:

R=RND(-S)

This starts a different series for each value of S. Again, remember to make sure the S you get by PEEKing is not zero.

Dice Simulator uses both the random-number subroutine and the random-seed routine. Type it in from the Software Library on page 73, or boot it from the Action Disk. Rolling the dice is as simple as RUNning the program and hitting the space bar to roll the dice. You can use it for any game you'd normally use dice for—whether it's a casual round of computer craps or a long session of Monopoly—and it's about as close to real dice as your Apple II can get.//

PROGRAM TAKE-APART

Line #'s	Use
120	gets the seed for Random-Number Generator.
140-150	are an input routine to roll the dice.
210-330	calculate values for the visible faces on the dice.
500-580	display the dice tumbling from the top of the screen.
590-880	plot the dots on the faces of the dice.
1000-1040	are Root's Random-Number Generator.
9000-9060	load the shape table for the dice.
9100-9200	set up an array of X,Y coordinates for the dots on the dice.

Let's compare Apples™ to Apples.™

An Apple IIc

An Apple IIc with Z-RAM

The Apple IIc on the right works exactly the same as the Apple IIc on the left. Almost. The Apple on the right has a powerful memory expansion coprocessing card called Z-RAM. From Applied Engineering. Which means the Apple on the right can completely load AppleWorks into RAM—and then run it up to thirty times faster than the Apple on the left.

Z-RAM also acts as a solid-state disk drive. Which means the Apple on the right will load and store programs up to 30 times faster. And, our included RAM disk is compatible with Applesoft, PRO-DOS, DOS 3.3, PASCAL and CP/M.

Turbo Charged AppleWorks.

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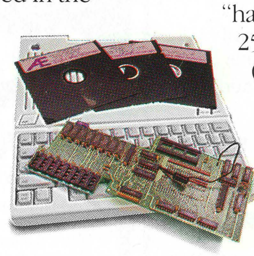
Take a closer look.

There's more. Z-RAM has a built-in high speed Z-80B microprocessor that allows you to run CP/M programs. Which means you now have access to the single largest body of software in existence, including popular packages like WordStar, dBase II, Turbo PASCAL and Microsoft BASIC. A 16 bit option is also available.

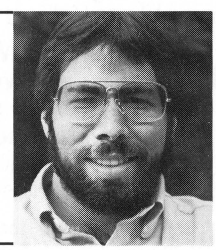


And still more. Z-RAM is compatible with all IIc software and hardware, installs easily in just ten minutes with a screwdriver (slightly longer without), is available with 256K or 512K of additional memory (a 256K Z-RAM can be upgraded to 512K at any time). Z-RAM is easily handled by the IIc power supply with our patent pending power saving design.

The only thing better than that would be a recommendation from Steve Wozniak.

"I recommend Applied Engineering products wholeheartedly." (Of course, Steve's IIc has a Z-RAM installed.)

Steve Wozniak, the creator of Apple Computer



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Z-RAM comes complete with simple instructions, RAM disk software, Z-80 operating system, CP/M manual. And a five year "hassle free" warranty. Make a good Apple great. With 256K Z-RAM "384K total" ($329); with 512K "640K total" ($389); 16 bit option may be added later ($89).

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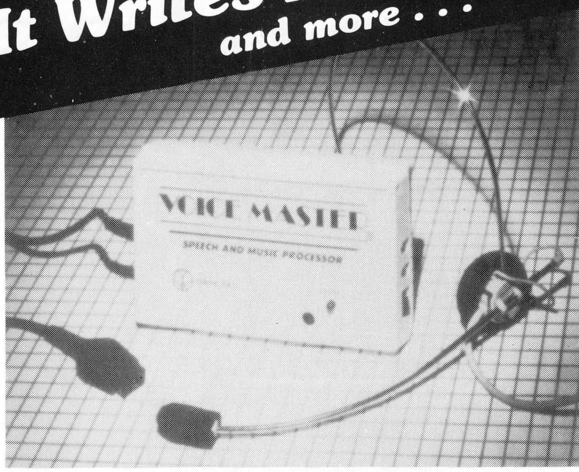

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Complete Columnar Transpositions

by CAXTON C. FOSTER

Over the last several installments of "Tales From the Crypt" we've been working with substitution ciphers. This time, just for variety, let's look at something different: transposition ciphers. As you may remember, in a transposition cipher the letters themselves aren't changed, but they've been scrambled—each letter's position in the message has been changed. Of course, to be useful as a cipher, the new order must be one that allows the recipient to reconstruct the original message, but only if he possesses a keyword.

Suppose we choose the keyword SMITH, which has five letters. We write down our message in rows under the keyword, each row five letters long:

S	M	I	T	H
n	o	w	i	s
t	h	e	t	i
m	e	f	o	r
a	l	l	g	o
o	d	m	e	n
t	o	c	o	m
e	t	o	t	h
e	a	i	d	o
f	t	h	e	i
r	p	a	r	t
y	x	x	x	x

Since the last line doesn't come out even with the rest, we've added X's to fill it out. These X's serve as "nulls"; we could have used any letter, and choosing common letters makes it harder to break the cipher than using rare letters like X or Q.

Now we'll select the column for which the letter of the keyword is earliest in the alphabet: H in column 5. Read off the letters in column 5 and write them out in blocks of five. Then take the next earliest letter—I in column 3—and read out those letters top to bottom. Continue until you've read out all five columns. The result:

SIRON MHOIT XWEFL MCOIH AXOHE LDOTA
TPXNT MAOTE EFRYI TOGEO TDERX

The recipient of this text knows that the message is a complete columnar, so he counts letters and gets 55. Since the keyword has five letters, he divides 55 by 5 and discovers that there should be 11 letters in each column. He writes out the keyword, puts the first 11 letters under the H, the next 11 under the I, and so on.

Someone intercepting the text doesn't have the keyword, but suppose he knows that this is a complete columnar. He too can count to 55; since 55 is 5 times 11, the keyword must be either 5 or 11 letters long. It's a well-known fact that in any sample of English 40 percent of the letters are vowels (A, E, I, O, U or Y), even when the sample is quite small. So the interceptor writes out the message both ways—5 columns wide and 11 columns wide—and counts the number of vowels in each row:

I		II	
SWONI	– 2	SMXMALTMETT	– 2
IEHTT	– 2	IHWCXDPAFOD	– 3
RFEMO	– 2	ROEOOOXORGE	– 7
OLLAG	– 2	OIFIHTNTYER	– 5
NMDOE	– 2	NTLHEATEIOX	– 5
MCOTO	– 2		
HOTET	– 2		22
OIAED	– 4		
IHTFE	– 2		
TAPRR	– 1		
XXXYX	– 1		
	22		

Of 55 letters, 22 are vowels—exactly 40 percent. We also expect 40 percent of the letters in each

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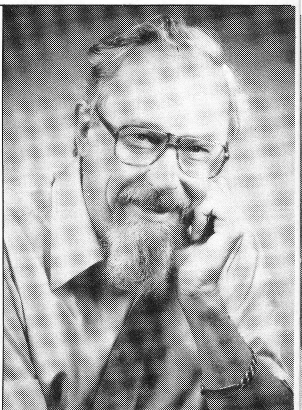


Caxton C. Foster, a Ph.D. in Electrical Engineering, was a Computer Science professor at the University of Massachusetts. Currently he is a consultant to Mount Castor Industries of East Orleans, MA, which designs computer programs for school administrative use. Dr. Foster is the author of five books and numerous technical articles.

row to be vowels. In block I, that's two vowels per row, and that's what we usually get. In block II we expect 40 percent of 11, or 4.4 vowels per row. Though we average out to that, the distribution doesn't seem to be quite as smooth in block II as in block I.

Fortunately, there's a more scientific way of determining the smoothness of a distribution than just intuition. This measure of smoothness is called the variance. The formula for the variance is

$$M = ((x_1^2+x_2^2+x_3^2+\ldots+x_n^2)\ /\ n)-x_{AV}^2$$

where x_1, x_2, etc. are all sample values and x_{AV} is the average of all the samples. In simpler English: Take the square of each value. Find the average of these squares (by adding them up and dividing by the number of squares). Then find the average of samples before squaring, and subtract it from the average of the squares.

Let's do the calculation for block I, where $n=11$ and $x_{AV}=2$:

$$2^2+2^2+2^2+2^2+2^2+2^2+2^2+4^2+2^2+1^2+1^2=50$$

$$50/n=50/11=4.54$$

$$x_{AV}^2=2^2=4$$

$$M=4.54\text{-}4=0.54$$

Repeating the calculation for block II, where $n=5$ and $x_{AV}=4.4$, we get:

$$2^2+3^2+7^2+5^2+5^2=112$$

$$112/n=112/5=22.4$$

$$x_{AV}^2=4.4^2=19.36$$

$$M=22.4\text{-}19.36=3.04$$

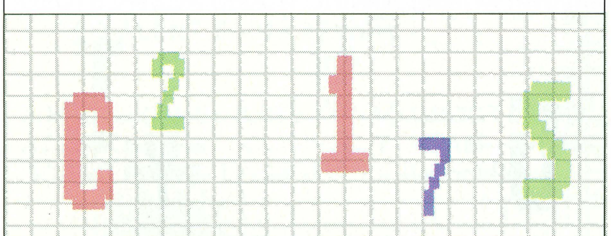
Since the variance for block I is smaller than that for block II, block I is more likely to be the correct choice. Remember, though, just because it's more likely doesn't mean it's sure to be correct.

SHUFFLING THE COLUMNS

When solving a complete columnar transposition cipher by hand, you can cut the block apart into individual columns, then move the columns around on a tabletop until you spot words or fragments of words. The problem with doing this on a computer is recognizing when partial words have been formed.

One way to simplify the task is by using digrams. Remember, a digram is just a pair of letters—like a partial word that's two letters long. Last issue's "Crypt" included a table of how frequently each digram appears within words. But in our message this time, all the words are run together, so Table 1 is a slightly different digram frequency table. It shows how frequently each digram appears in text where all the spaces and punctuation have been removed.

It's easy enough for the computer to try each column next to every other column, then pick out



the pair with the highest frequency digrams. We don't just want a large total count, though—that could be produced by one or two very popular digrams. We want popular digrams, but we want them all to be popular.

One good way to make sure that's the case is to examine the geometric average of the digram frequencies. To find the geometric average, multiply the n frequencies together and then take the n-th root of the product:

$$GA=(x_1 * x_2 * x_3 * \ldots * x_n)^{1/n}$$

Let's look at two different sets of column juxtapositions. The first sets column 5 next to column 1 (the correct positioning); the second sets column 5 next to column 2. First we'll check Table 1 and find the frequency of each of the digrams these juxtapositions produce.

continued on next page

5-1	5-2
I S – 89	I W – 2
T I – 111	T E – 95
O R – 101	O F – 86
G O – 17	G L – 6
E N – 121	E M – 47
O M – 48	O C – 17
T H – 297	T O – 105
D O – 30	D I – 53
E I – 40	E N – 23
R T – 48	R A – 65
X X – 0	X X – 0

Now we'll multiply the frequencies together to find the geometric average. We won't multiply by zero when we get to the last frequency, though; that would make the whole product zero. Those frequencies aren't really zero—they're just a small fraction that got rounded down—so instead, we'll multiply by one for those cases.

5-1: $89*111*101*17*121*48*297*30*40*48 = 1.68\times10^{18}$

GA=45.4

5-2: $2*95*86*6*47*17*105*53*23*65=6.51\times10^{14}$

GA=22.2

Since the geometric average is higher for the first pair, it's more likely to be correct than the second pair.

Your challenge for this time is to write a program that analyzes a complete columnar transposition cipher on your trusty Apple. Break the task into smaller parts and it won't seem so impossible:

1. Read in the ciphertext
2. Strip out the blanks
3. Count letters
4. Try all possible arrays and pick the one with the most even distribution of vowels
5. Set up that array
6. Read in the digram frequencies from data statements

7. Try all possible column pairs in both orders
8. Select the best pair
9. Find the best column to precede this partial block and the best to follow it
10. Repeat (9) until finished.

Once you've written your program, try a few examples you've made up yourself so you'll know if it's working. Then, once it's worked on samples you know, try an unknown. Good luck.

SAMPLE COMPLETE COLUMNAR CIPHERS:

1. HLUTR IFNAT SHTBN AITTH ASOTE GNOIE AKEWU RSEFN ORSEY DTRTC IALOE SNHAH TCFLM N (Mark Twain)

2. TSNLB GIIWH MHDER ANETE AUNTT ITEEE OECTE VWSDA CLUUN OHNNM SROOA IHHOT TWTEO ALPNT EOICU TEWBH

3. HXONE OLHED ILRTB KNNAO OROGT ETARV ATSEH NTERN IICLT HOIOT MTAEF XREHI ODANE PWWSI LI (Sir Joshua Reynolds)

4. AEGAA OLLRE NLLOL ISRTL RIDIT AALTY UGIEA IIRDO USTTO AFTCS AHASF IESTE IYWNA NDBTD CNGES AE

DISCUSSION OF LAST COLUMN'S CHALLENGES

The solution to challenges 3.1 and 3.2 form a single program that appears in Figures 1 through 6.

Challenge 3.1 was to write a program that would count digrams. First, of course, you'll need a sample of plaintext to work on; in Figure 1, the first few lines of the program allow you to type a plaintext message into array P%. The message will be N characters long, and stored as ASCII characters: A=65, B=66, and Z=90. All spaces and punctuation are still part of the message.

To count the digrams, the program creates the array D% in line 50. D% is a 27-by-27 array; the first 26 elements represent the 26 letters of the alphabet, and the 27th is for spaces and punctuation. Lines 120 and 130 pick out the i-th and i+1-th letters and subtract 64, so that A=1 and Z=26. Lines 140 and 150 handle spaces and punctuation.

continued on next page

Figure 1

```
 50  DIM D%(27,27),P%(256)
 55  HOME
 60  PRINT "ENTER YOUR TEXT. END
 IT WITH A '/'."
 65  PRINT "PRESS CAP LOCK TO GE
T ALL CAPS"
 70  PRINT :N = 0
 75  GET R$:X =  ASC (R$):
 80  IF X = 8 AND N = 0 THEN 75
 85  IF X = 8 THEN  PRINT " " CH
R$ (8) CHR$ (8);:P%(N) = 32:N =
N - 1: GOTO 75
 90  IF R$ = "/" THEN 110
 95 N = N + 1:P%(N) = X: PRINT R
$;: IF N < 256 THEN 75
 110  FOR I = 1 TO N - 1
 120 A = P%(I) - 64
 130 B = P%(I + 1) - 64
 140  IF A < 1 OR A > 26 THEN A
= 27
 150  IF B < 1 OR B > 26 THEN B
= 27
 160 D%(A,B) = D%(A,B) + 1
 170  NEXT I
```

It's easy enough to print out this array using a nested loop (Figure 2). The punctuation and spaces print out as "*".

Figure 2

```
 180  REM * SET UP THE PRINT CHA
RACTERS
 190  DIM PC$(27)
 200  FOR I = 1 TO 26
 210 PC$(I) =  CHR$ (I + 64)
 220  NEXT I
 230 PC$(27) = "*"
 240  REM * NOW PRINT THE DIGRAM
S
 250  FOR I = 1 TO 27
 260  FOR J = 1 TO 27
 270  IF D%(I,J) = 0 THEN 290
 280  PRINT PC$(I)PC$(J)" - "D%(
I,J)
 290  NEXT J
 300  NEXT I
```

Challenge 3.2 was to computerize the consonant line method of finding consonants and vowels. Remember how this method works: you count letter combinations to determine, for each letter, the number of different neighbors it has. The letters with the smallest number of neighbors are probably consonants, and the most frequent neighbors of those consonants are probably vowels.

In the digram array we calculated for Challenge 3.1 we have most of the information we need. We know how many times each digram occurs, so it's easy to calculate how often each letter has another letter as a neighbor (Figure 3). We'll use array C% to count how many different neighbors each letter has. Notice that we only count each new neighbor once; for example, if both the pair "AB" and "BA" are present, we only count that as one additional neighbor for the letter B.

Figure 3

```
 310  REM * C% - COUNT NUMBER OF
 LETTERS CONTACTED
 320  REM * U% - THIS LETTER HAS
 ALREADY BEEN USED
 330  REM * B% - APPEARS BEFORE
THE VERTICAL LINE
 340  REM * A% - APPEARS AFTER T
HE VERTICAL LINE
 350  REM * CL% - APPEARS ON THE
 HORIZONTAL LINE AS A CONSONANT
 360  DIM C%(26),U%(26),B%(26),A
%(26),CL%(26)
 370  FOR I = 1 TO 26
 380  FOR J = 1 TO 26
 390  IF D%(I,J) > 0 OR D%(J,I)
> 0 THEN C%(I) = C%(I) + 1
 400  NEXT J
 410  NEXT I
```

Next, we search for the letter with the smallest number of neighbors (Figure 4). Array U% keeps track of which letters have already been used, and array CL% keeps track of which letters are probably consonants. At line 480, F indicates the unused letter with the smallest number of neighbors. We'll mark it as used in array U%, and mark it as a consonant in array CL%.

Figure 4

```
 420  FOR I = 1 TO 26
 430 M = 1000
 440  FOR J = 1 TO 26
 450  IF U%(J) > 0 THEN 470
 460  IF C%(J) < M THEN M = C%(J
):F = J
 470  NEXT J
 480 U%(F) = 1:CL%(F) = 1
```

Next, we'll find each of this letter's neighbors (Figure 5). If the neighbor precedes the letter, it adds to the neighbor's count in the "before" array, B%. If it comes after the letter, it adds to the neighbor's count in the "after" array, A%.

Figure 5

```
 490  FOR J = 1 TO 26
 500 B%(J) = B%(J) + D%(J,F)
 510 A%(J) = A%(J) + D%(F,J)
 520  IF A%(J) + B%(J) > 0 THEN
U%(J) = 1
 530  NEXT J
 540  NEXT I
```

Now all that remains is to print out the consonants, and then the possible vowels with their counts (Figure 6).

Figure 6

```
550  PRINT  CHR$ (4);"PR#1"
560  FOR I = 1 TO 26
570  IF CL%(I) > 0 THEN  PRINT
CHR$ (I + 64);
580  NEXT I
590  PRINT
600  FOR I = 1 TO 26
610  PRINT  CHR$ (I + 64)"  "B%
(I),A%(I)
620  NEXT I
630  PRINT  CHR$ (4);"PR#0": EN
D
```

The complete answer to last month's challenges can also be found in this month's Software Library and on the Action Disk.//

The first correct response to the challenge in the December/January issue was submitted by Brian Hahn of Clinton, WI. He received a six-issue subscription to ***II Computing***'s Action Disk. Right behind Brian were Elaine Chojnowski of Newington, CT; Walter Motter of Blackwood, NJ; and Peter Brown of Arlington, VA. The encrypted messages were:

1. Put three grains of sand inside a vast cathederal and the cathederal will be more closely packed with sand than space with stars.
2. Do not do unto others as you would that they should do unto you. Their tastes may not be the same.
3. One can't judge Wagner's opera Lohengrin after a first hearing, and I certainly don't intend hearing it a second time. (Gioacchino Rossini)
4. In a museum in Havana there are two skulls of Christopher Columbus, "one when he was a boy and one when he was a man."

Patrick Hurst of Ames, IA, wrote asking, "Was 'cathedral' intentionally misspelled in crypt number one, and was the use of cyphertext 'L' to represent plaintext 'L' in number four an oversight?" Would you believe "cathederal" is the British spelling? Would you believe old Middle English? Would you believe that everybody who knows me knows I'm the world's worst speller? Ask the editors of ***II Computing***.

The American Cryptogram Association has a rule that no letter can stand for itself in an Aristocrat. I ignore their rule.

An error appeared in the February/March "Crypt" column, in Figure 1 on page 30. In the table of digram occurrences per 10,000 digrams, the first letter of the digram is along the *left edge* of the table, and the second letter is across the *top*.

Table 1
(Occurrences per 10,000 Digrams)

Second letter of digram

First Letter of Digram	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	
A	2	20	41	37	1	10	19	3	29	1	10	82	27	156	1	19	0	87	82	117	9	18	9	2	21	1	A
B	14	1	0	0	47	0	0	0	8	1	0	19	0	0	18	0	0	9	3	1	17	0	0	0	12	0	B
C	42	1	6	1	48	1	0	46	20	0	13	12	1	0	60	1	0	12	3	31	10	0	0	0	3	0	C
D	37	16	8	10	64	10	6	14	53	2	1	8	9	8	30	7	1	13	25	41	13	2	13	0	7	0	D
E	98	20	60	115	45	32	18	23	40	3	5	54	47	121	36	35	5	175	134	81	8	24	39	15	17	1	E
F	22	2	5	2	20	14	2	5	26	1	0	7	4	2	42	4	0	19	6	36	8	1	3	0	2	0	F
G	21	3	2	2	31	3	3	25	17	0	0	6	3	6	17	2	0	17	8	16	7	0	3	0	2	0	G
H	88	2	3	1	261	2	1	4	72	0	0	2	3	3	45	2	0	8	5	23	7	0	4	0	4	0	H
I	19	7	52	28	28	16	22	2	0	0	5	37	28	189	55	7	1	26	89	89	10	20	2	2	0	5	I
J	2	0	0	0	4	0	0	0	0	0	0	0	0	0	46	0	0	0	0	0	5	0	0	0	0	0	J
K	5	1	1	0	22	1	0	2	10	0	0	2	1	5	3	1	0	1	5	3	0	0	2	0	1	0	K
L	47	5	5	27	70	8	2	3	53	0	3	52	5	2	36	6	0	3	16	16	11	3	4	0	37	0	L
M	49	9	2	1	64	2	0	2	28	0	0	1	8	1	30	17	0	4	10	8	10	0	2	0	5	0	M
N	49	8	37	108	64	11	83	11	40	2	5	9	8	10	51	6	1	5	48	121	8	4	11	0	10	0	N
O	14	14	17	19	6	86	9	8	10	1	7	31	48	132	26	21	0	101	30	49	78	16	32	1	4	0	O
P	26	1	0	0	37	1	0	7	12	0	0	20	2	0	28	11	0	33	5	9	8	0	1	0	1	0	P
Q	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0	0	0	0	0	Q
R	65	7	15	19	146	7	9	9	60	1	8	11	18	15	66	9	0	12	43	48	11	6	8	0	19	0	R
S	62	12	23	8	74	13	4	40	63	1	5	11	15	10	57	24	1	7	47	124	25	2	21	0	5	0	S
T	62	9	11	6	95	8	3	297	111	1	1	14	10	4	105	6	0	35	38	50	20	1	21	0	18	0	T
U	10	7	14	8	11	2	12	1	8	0	0	28	10	33	1	12	0	40	37	36	0	0	1	0	1	0	U
V	9	0	0	0	65	0	0	0	19	0	0	0	0	0	5	4	0	0	0	0	0	0	0	0	0	0	V
W	42	1	1	1	31	1	0	33	33	0	0	2	1	8	21	1	0	3	4	3	0	0	1	0	1	0	W
X	2	0	2	0	1	0	0	0	2	0	0	0	0	0	1	5	0	0	0	3	0	0	0	0	0	0	X
Y	17	7	7	5	12	6	2	7	12	1	1	4	7	3	23	6	0	4	17	19	1	1	9	0	1	0	Y
Z	2	0	0	0	4	0	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	Z
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	

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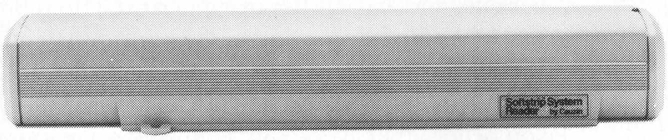

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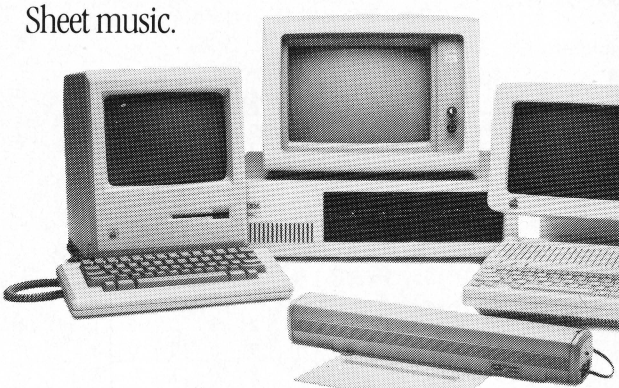

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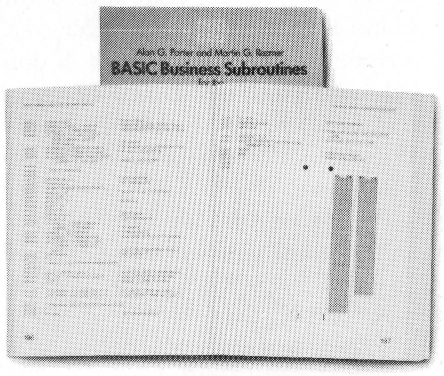

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MARBLE MANIA RUNNING WILD

The data strips, on the far right, contain the program **MARBLE MANIA** by Bill Marquardt, which appeared in the Dec./Jan. 1986 issue. This challenging puzzle demonstrates some of the basic graphics techniques of your Apple.

The object of the game is to jump over a an adjacent marble (provided there is a space to jump into) and remove the jumped marble from the board, until no more jumps can be made. But there's a twist. You only win if the last marble left is in the center of the board.

COLORFUL LADY

The third data strip to the right contains the program **LADYBUG** by Steve Koepke, which appeared in the Oct./Nov. 1985 issue. It's a delightful drawing program that will introduce youngsters to computer graphics.

This easy, colorful program uses a graphic ladybug to help you doodle, sketch, and draw pictures on your monitor. It can be used with either the keyboard or a joystick. Press "O" to change color.

WHO YOU GOING TO CALL… ECTO BLASTER!

It's a dark, stormy night and you're home alone. Suddenly, out of nowhere Ghosts appear and rush about trying to drive you out. The only way you can rid yourself of these ectoplasmic interlopers is by de-energizing them. Fortunately, you are armed with the very latest anti-ghost weapon called **ECTO BLASTER** (the data strip on the far right.) Squirt a dose of entropy juice at the enemy and its done for.

This program appeared in the Oct./Nov. issue. A joystick or your keyboard can be used to operate this sophisticated weapon. If you use the keyboard use key **I**, **J**, **K**, or **M** to control position of the weapon. The **SPACEBAR** substitutes for the trigger button.

Read in the data strips and RUN the program. Follow any instructions on the screen and enjoy. Exit anytime by pressing CONTROL-RESET.

StripWare Library Nos. 189-191

Cellular Automata, Part II

by DANIEL WOLF, PH.D.

One of the most interesting areas of mathematical theory that you can explore using your computer is the world of cellular automata.

What are cellular automata (CA)? They come in many shapes and sizes, but they share a few basic characteristics. Each CA consists of a collection of "cells," organized so that each cell borders on other, neighboring cells. Each cell also has an identifiable condition or state, which can change over time.

In my last column, I presented two programs that demonstrate how one-dimensional (or linear) cellular automata can work. For linear CAs, the universe is a row of cells; each cell can be either "on" or "off." The cells also act like miniature computers: using as input how many of its neighbors are on and how many are off, each cell uses a simple "program" to decide whether it should be on or off in the next generation. In the BASIC programs I presented last time, the CAs were stored in one-dimensional arrays, and each cell had a simple "program."

What makes a CA interesting is that it changes from generation to generation, as some of the cells change from one state to another. If you display the CA on a computer's screen, what you see will change according to a well-defined set of rules, in interesting and unpredictable patterns. That's one reason that cellular automata have been a favorite pastime for computer hobbyists since the most famous CA, John Conway's The Game of Life, first appeared in Martin Gardner's "Mathematical Recreations" column in *Scientific American* in the 1970s.

Life is a two-dimensional CA that works on a checkerboard-style grid. Each cell has eight neighbors (see Figure 1), rather than only two as in a linear array. That means many combinations of neighbors can affect the state of a cell in its next generation—there are 256 different combinations of neighbors for each cell. Life doesn't check for all those possible combinations, though. Instead, each cell just counts the total number of neighbors that are on and off. (A Life cell doesn't care specifically which neighbors are on, just how many.) Then, based on the state of the cell and its neighbors, the cell will be either on or off in the next generation.

The rules for deciding whether a cell is on or off in the next generation are fairly simple:

1. If a cell is on and exactly two or three of its neighbors are on, the cell will be on in the next generation.

2. If a cell is on and fewer than two neighboring cells are on, the cell will be off in the next generation. Likewise, if more than three neighboring cells are on, the cell will be off in the next generation.

3. Finally, if a cell is off but exactly three neighbors are on, the cell will be on in the next generation.

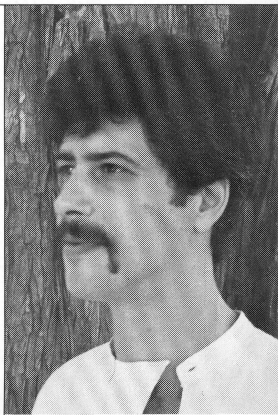
Here's a simpler version of the same rules:

A. If two neighbors are on, do nothing.

B. If three neighbors are on, make the cell on in the next generation (regardless of whether it is on or off now).

C. If 0, 1, 4, 5, 6, 7 or 8 neighbors are on, make the cell off in the next generation (again, regardless of its present state).

continued on next page



Daniel Wolf is a scientist who likes to use microcomputers to explore mathematic and scientific concepts. A musician as well, Dr. Wolf has an academic background in biology, physics and math.

FIGURE 1

CELL PLUS NEIGHBORS, FOR LIFE AND BZ ALGORITHMS IN THIS ARTICLE.

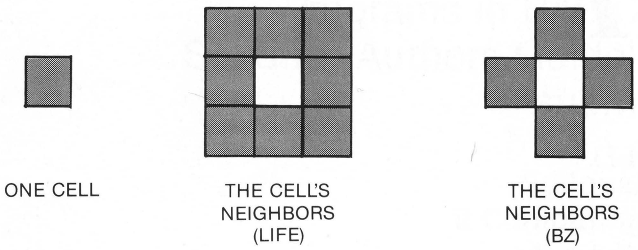


FIGURE 2

DETAILS OF ONE GENERATION OF LIFE'S EFFECT ON CELLS AND NEIGHBORS

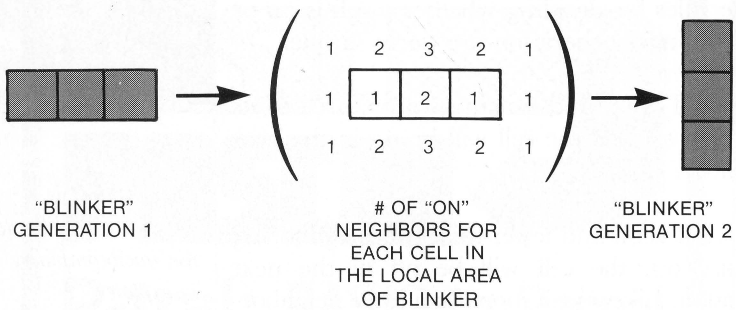


FIGURE 3

SOME WELL-KNOWN LIFE SEED PATTERNS

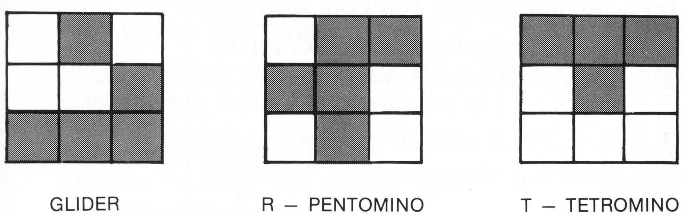


Figure 2 shows an example of a cell with its neighbors, and Life's effects after one generation. It's a small, simple pattern, so it's easy to work out the next generation of cells by hand. But for larger or more complex patterns, calculating the results for every cell can take a long time. That's where a computer can come in very handy.

Enter the **Life** program listed on page 67 (or boot from the Action Disk). Life runs The Game of Life in BASIC, using your Apple II screen as a 40 by 19 grid. The program uses a machine language subroutine to work out the results of applying Life's rules to each cell in about one second per generation. You could write a simple BASIC routine to do the same thing, but it would be pretty slow for any sizable array.

As you learned from experimenting with the linear automaton program last time, the evolving patterns of the cellular array depend on the initial pattern of on and off cells. The same is true of Life. You can enter starting patterns by typing in strings of 1's and 0's; if you want to skip a whole line, just use the RETURN key to enter a line of all 0's.

Because Life is so well-known, many interesting initial patterns have been discovered. I enthusiastically recommend *The Recursive Universe* by William Poundstone, a book that's entirely about Life and its mathematical meaning. Poundstone describes many examples of initial patterns with unexpected Life cycles. Over the years some of these special initial patterns have been given engaging names that describe their actions as the generations progress. A few of these are shown in Figure 3: the glider, the r-pentomino and the t-tetromino.

Try typing these patterns into the Life program and watch the results. If the evolution of a glider seems too surprising, work the pattern out with pencil and graph paper for a few generations.

CAs can get even more interesting and complicated than Life. By letting each cell have more than two possible states and a more complex cellular "program," unlimited possibilities arise. Type in the BZ program listed on page 68 (or boot from the Action Disk), and you'll see a four-state automaton in action. Instead of 0 and 1, the four states are represented by " ", " + ", " – ", and "*." This CA's cells are only sensitive to four of its neighbors (not eight, as in Life). Experiment with the program, beginning with as random a starting pattern as you can. Its result may surprise you.

The algorithm for this program was originally published in *Science* in 1983; it was discovered by astronomers using CA algorithms to simulate the evolution of the structure of galaxies! The astronomers found that this CA simulation helped answer questions about a famous chemical reaction called the Belousov-Zhabotinsky (BZ) reaction. The BZ reaction generates spiral waves of color; it's a powerful demonstration of how a simple system can organize itself into complex structures, without any obvious mechanism. CA experiments have helped to clarify the BZ reaction at the molecular level.

In fact, there is a whole new branch of physics that's interested in self-organizing systems, and cellular automata have already had some impact on this new field of *nonequilibrium thermodynamics.* It has also been proven that CAs can be used to perform arbitrary computations. An array of programmable cells can simulate complex numerical computations.

Why do mathematicians and scientists fool around with things such as cellular automata that seem so simple? The answer is a tongue-twister: computational irreducibility. That simply means it can be impossible to guess what a future generation of a CA will look like without actually producing the generations one by one. There may be no shortcut to generate the tenth generation of a CA directly from the first generation, no way to reduce the computation.

That's very different from a numerical formula such as addition. For example, if you add 10 to itself over and over again, you get a series of numbers that increase by 10. After two generations, the sum is 20; the 15th generation is 150. For addition, there is a direct shortcut for predicting any future generation: just use multiplication. In the same way, you can calculate the value of a number multiplied by itself again and again by taking the number to a power.

But CAs don't work that way. Computational irreducibility means you can't multiply or square generation five of a CA to produce generation 25. You may have to pass through all the generations from six through 24 in order to view generation 25. Not all CAs are computationally irreducible, but the most interesting ones are.

Now that we've toured part of the universe of cellular automata, use your imagination to create CAs of your own design. What happens if you make three-dimensional CAs, in which each cell has 26 neighbors? What happens when you create CAs with 5, 6 or 100 states?

Suppose you start with a single cell that can have 100 states. A human being begins as one cell; roughly 50 cell divisions take place during human fetal development, so a newborn baby has about one quadrillion (1,000,000,000,000,000) cells of about 100 different types (skin, liver, muscle, etc.). Is it possible to design a three-dimensional CA that, after 50 generations, looks something like an animal? Can a CA simulate biological development?//

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(Byte, January, 1983)		(2000 5 character strings-Sybex BASIC for Scientists and Engineers)	

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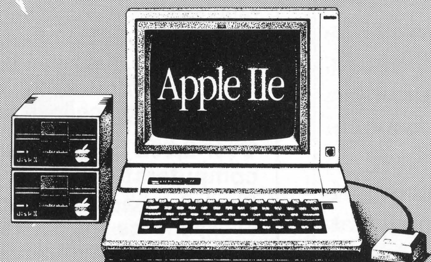

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***II Computing**'s type-in listing section includes every full-length program from this issue. We've included them all together for your convenience. It will be easy for you to remove these pages and save them in a binder if you wish. All of the following programs work with DOS 3.3 and Pro Dos.*

NOTE: *If you have the Action Disk version of **II Computing**, you can use all these programs immediately. Just follow the instructions in the corresponding articles.*

TYPO II (TYPE YOUR PROGRAM ONCE)

Nothing is more frustrating than typing in a long program, only to find it doesn't work. At ***II Computing*** we are careful to test each program listing before publication, and all listings are computer generated, so they should be accurate.

Therefore, if your typed-in program doesn't work, you probably made a typing error. Fortunately, if you use TYPO II, it's easy to find and fix most of those mistakes.

TYPO II is a program that verifies your typing accuracy after you enter BASIC listings from our magazine. TYPO is an acronym for "Type Your Program Once." We will use this program to help you with BASIC listings in all future issues of ***II Computing***.

With TYPO II, you have two ways to check your work. (1) It generates a two-letter code for each program line. This protects against misstrikes, transpositions, dropouts and extra characters. (2) It generates a total checksum for the whole program that requires all lines to be correct and in the correct order.

```
PROGRAM: SAMPLE CODES
CODE LINE#   CODE LINE#  CODE LINE#

 SI  10       SF   40     SH   70
 MS  20       GV   50     DS   80
 RA  30       ST   60     NV   90

TOTAL CHECKSUM = 315162
```

When you use TYPO II on your program, you should get the same line codes and checksum that appear for that program in the magazine. If you don't, there is a typing error in the line or lines where your codes and ours do not agree.

IMPORTANT: TYPO II works with Applesoft BASIC running with DOS 3.3 or ProDOS. It does not work with Integer BASIC. Correct spacing is very important. Applesoft automatically inserts one space after each REM or DATA command, so keep this in mind when entering your lines. Check spacing first when line codes do not agree.

HERE'S WHAT YOU DO

1. Load DOS 3.3 or ProDOS into memory, then insert a formatted disk in your disk drive.

2. When you see the symbol], you are in Applesoft BASIC. Proceed to type in the TYPO II MAKER program from this magazine (see listing). You only need to do this once; thereafter you load TYPO II from your disk. Note: ProDOS does not permit spaces in file names, so enter TYPO II as TYPOII, and TYPO II MAKER as TYPOII.MAKER.

3. Verify this program carefully the old way. It is possible to use TYPO II to check itself, but this would cause more problems than it's worth.

4. Now, run the TYPOII.MAKER program. This saves a text "command" file named TYPOII on your disk. Your Apple executes this command file just as if you entered it from your keyboard. Also, the "maker" program creates a binary file for its assembly language routine. For protection, make an extra copy on a different formatted disk by running TYPOII.MAKER again.

5. Type in any BASIC program from our magazine, including spaces as indicated and complete REM statements for all lines requiring them.

6. Remember: Always save your typed-in program to disk before you run it. This backup file helps protect you against mistakes, power loss, misunderstood instructions, computer lockup, and so on.

7. Then type EXEC TYPOII (return). You have now loaded the TYPOII command file from disk. The letter codes are displayed vertically on the screen next to their corresponding line numbers. You can see them again by typing the command RUN 63000 (return). To pause and restart display, type (control)-S simultaneously.

8. Compare your line codes and checksum to those in the magazine. If your line code is different from the code in the magazine, you have made a typing error on that line. The final checksum will not agree until every line code in the program matches those printed. There is a remote possibility that all line codes will agree, but the final checksum will not. This can happen when errors occur in a line that generates the same letter codes as the correct line, and the two errors cancel each other out.

9. To correct a specific line, type LIST (line number) (return). You can then edit and correct that line. Occasionally, the line may appear to be absolutely correct, but the line codes will not agree. This is probably due to typing a control character that does not appear on the screen. Retype the entire line and try again. When you have made all corrections, type RUN 63000 (return).

10. Repeat the process of comparing and correcting until all the codes and checksums agree.

11. Delete TYPOII from your now corrected program with the command DEL 63000,63150 (return).

12. SAVE your program to disk, and delete the uncorrected backup file from your disk.

To use TYPO II with subsequent programs, call TYPO II from disk after typing in your program by entering the command EXEC TYPOII (return). This appends TYPO II to your program and runs it on all program lines lower than 63000. //

TYPO II MAKER

```
10 D$ =  CHR$ (4):F$ = "TYPOII"
20  FOR I = 0 TO 41: READ A: POKE
    768 + I,A: NEXT
30  PRINT D$;"BSAVE TYPOII.OBJ,A
    768,L42"
40  PRINT D$;"OPEN";F$: PRINT D$
    ;"WRITE";F$
50  PRINT "BLOAD TYPOII.OBJ"
60  LIST 63000,63150
70  PRINT "RUN 63000"
80  PRINT D$;"CLOSE";F$
90  END
100  DATA  160,1,132,30,164,30,1
    66,30,24,177,25,240,28,101
110  DATA  27,133,27,144,15,24,1
    65,28,105,1,133,28,144,6
120  DATA  165,29,105,0,133,29,2
    02,208,227,230,30,208,219,96

63000  REM  TYPO II
63010  REM  BY GERRY VILLAREAL
63020  REM  (C) 1985 ANTIC PUBLI
    SHING INC.
63030  REM  II COMPUTING
63040  TEXT : HOME : PRINT  SPC(
    11);"CODE      LINE NO.": POKE
    34,1
63050 CH = 0:C1 = 256:S =  PEEK
    (103) +  PEEK (104) * C1
63060 S1 = S + 3:N =  PEEK (S) +
     PEEK (S + 1) * C1
63070 LINE =  PEEK (S + 2) +  PEEK
    (S + 3) * C1
63080  IF LINE = 63000 THEN  PRINT
    SPC( 7);"TOTAL CHECKSUM = "
    ;CH: POKE 34,0: END
63090  POKE 25,S1 -  INT (S1 / C
    1) * C1: POKE 26, INT (S1 /
    C1)
63100  POKE 27,0: POKE 28,0: POKE
    29,0: CALL 768
63110 LV =  PEEK (27) +  PEEK (2
    8) * C1 +  PEEK (29) * C1 ^
    2
63120 CODE = LV -  INT (LV / 676
    ) * 676
63130 HCODE =  INT (CODE / 26):L
    CODE = CODE - (HCODE * 26)
63140  PRINT  SPC( 12); CHR$ (HC
    ODE + 65); CHR$ (LCODE + 65)
    ; SPC( 8);LINE
63150 CH = CH + LV + LINE:S = N:
    GOTO 63060
```


IMPORTANT NOTICE FOR ACTION DISK BUYERS

II Computing's ACTION DISK runs under ProDOS and boots automatically. All magazine programs appear on the menu. The disk also contains a program to convert programs to DOS 3.3 if desired. To get this program, "break" the menu by pressing the Control key and C key simultaneously. You will see the BASIC prompt] after which type -CONVERT. After this program loads, follow screen instructions. To set direction of transfer, press R. To start the conversion, press T. Be sure your destination disk is formatted for DOS 3.3. To return to menu, after prompt type RUN STARTUP.

COMPLETE COLUMNAR TRANSPOSITIONS

Article on page 49

```
10  REM  * TALES FROM THE CRYPT
    PART 4
20  REM  * BY CAXTON C. FOSTER
30  REM  * (C) 1985 ANTIC PUBLIS
    HING, INC.
40  REM   * II COMPUTING  VOL.1
    NO.4
50  DIM D%(27,27),P%(256)
55  HOME
60  PRINT "ENTER YOUR TEXT. END
    IT WITH A '/'."
65  PRINT "PRESS CAP LOCK TO GET
     ALL CAPS"
70  PRINT :N = 0
75  GET R$:X =  ASC (R$):
80  IF X = 8 AND N = 0 THEN 75
85  IF X = 8 THEN  PRINT " " CHR$
    (8) CHR$ (8);:P%(N) = 32:N =
    N - 1: GOTO 75
90  IF R$ = "/" THEN 110
95 N = N + 1:P%(N) = X: PRINT R$
   ;: IF N < 256 THEN 75
110  FOR I = 1 TO N - 1
120 A = P%(I) - 64
130 B = P%(I + 1) - 64
140  IF A < 1 OR A > 26 THEN A =
    27
150  IF B < 1 OR B > 26 THEN B =
    27
160 D%(A,B) = D%(A,B) + 1
170  NEXT I
180  REM * SET UP THE PRINT CHAR
    ACTERS
190  DIM PC$(27)
200  FOR I = 1 TO 26
210 PC$(I) =  CHR$ (I + 64)
220  NEXT I
230 PC$(27) = "*"
240  REM * NOW PRINT THE DIAGRAM
    S
250  FOR I = 1 TO 27
260  FOR J = 1 TO 27
270  IF D%(I,J) = 0 THEN 290
280  PRINT PC$(I)PC$(J)" - "D%(I
    ,J)
290  NEXT J
300  NEXT I
310  REM * C% - COUNT NUMBER OF
    LETTERS CONTACTED
320  REM * U% - THIS LETTER HAS
    ALREADY BEEN USED
330  REM * B% - APPEARS BEFORE T
    HE VERTICAL LINE
340  REM * A% - APPEARS AFTER TH
    E VERTICAL LINE
350  REM * CL% - APPEARS ON THE
    HORIZONTAL LINE AS A CONSANA
    NT
360  DIM C%(26),U%(26),B%(26),A%
    (26),CL%(26)
370  FOR I = 1 TO 26
380  FOR J = 1 TO 26
390  IF D%(I,J) > 0 OR D%(J,I) >
    0 THEN C%(I) = C%(I) + 1
400  NEXT J
410  NEXT I
420  FOR I = 1 TO 26
430 M = 1000
440  FOR J = 1 TO 26
450  IF U%(J) > 0 THEN 470
460  IF C%(J) < M THEN M = C%(J)
    :F = J
470  NEXT J
480 U%(F) = 1:CL%(F) = 1
490  FOR J = 1 TO 26
500 B%(J) = B%(J) + D%(J,F)
```

```
510 A%(J) = A%(J) + D%(F,J)
520  IF A%(J) + B%(J) > 0 THEN U
    %(J) = 1
530  NEXT J
540  NEXT I
550  PRINT  CHR$ (4);"PR#1"
560  FOR I = 1 TO 26
570  IF CL%(I) > 0 THEN  PRINT  CHR$
    (I + 64);
580  NEXT I
590  PRINT
600  FOR I = 1 TO 26
610  PRINT  CHR$ (I + 64)"   "B%(
    I),A%(I)
620  NEXT I
630  PRINT  CHR$ (4);"PR#0": END
```

TYPO II TABLE

Code	Line#	Code	Line#	Code	Line#
WJ	10	UV	20	UD	30
DK	40	KQ	220	AI	430
NX	50	CF	230	BK	440
FV	55	QF	240	RC	450
AC	60	BP	250	RO	460
DS	65	BR	260	KS	470
JW	70	RW	270	MF	480
SF	75	ZF	280	BK	490
ZR	80	KS	290	UD	500
UF	85	KQ	300	UD	510
KC	90	RM	310	IB	520
JR	95	IA	320	KS	530
KL	110	DR	330	KQ	540
NO	120	DP	340	PC	550
FH	130	FW	350	BI	560
ZG	140	GY	360	OH	570
ZZ	150	BI	370	KQ	580
XV	160	BK	380	HE	590
KQ	170	QR	390	BI	600
RI	180	KS	400	KD	610
TG	190	KQ	410	KQ	620
BI	200	BI	420	IP	630
ER	210				

Total checksum = 1065018

CELLULAR AUTOMATA PART II

Article on page 59

```
10  REM  * LIFE  CELLULAR AUTOMA
    TON
20  REM  * BY DANIEL WOLF PH.D.
30  REM  * (C) 1985 ANTIC PUBLIS
    HING, INC.
40  REM  * II COMPUTING  VOL.1 N
    O.4
50  POKE 116,63
60 D$ =  CHR$ (4)
70 N = 16384:O = N + 1024
80 LM = 40:LY = 19:MF = 40
90 T2 = 32:T = 10:UN = 1:ZR = 0
100  FOR A = ZR TO 159: READ B: POKE
    18432 + A,B: NEXT
110  FOR A = ZR TO 1023: POKE N +
    A,ZR: NEXT : CALL 18553
120  GOTO 180
130 GE = GE + 1: PRINT " II COMP
    UTING   LIFE   GENERATION ";
    GE
140  PRINT
150  FOR Y = ZR TO LY:TY = O + M
    F * Y: FOR X = UN TO LM: PRINT
     CHR$ (T2 + T *  PEEK (TY +
    X));: NEXT : NEXT
160  RETURN
170  PRINT : PRINT "USE ONLY 1'S
      AND  0'S, PLEASE": FOR A =
    0 TO 1000: NEXT : RETURN
180  FOR Y = UN TO LY:TY = N + M
    F * Y
190  HOME : PRINT : PRINT "ENTER
    THE ";Y;"TH STRING OF 40 1'
    S & 0'S"
200  PRINT : INPUT S$:L =  LEN (
    S$)
210  IF L > LM THEN L = LM:S$ =
    LEFT$ (S$,LM)
220  FOR X = UN TO L:B =  VAL ( MID$
    (S$,X,UN))
230  IF B <  > UN AND B <  > ZR THEN
    : GOSUB 170: GOTO 190
240  POKE TY + X,B: NEXT
250  NEXT
260  CALL 18553
270  HOME
280  VTAB 2: HTAB 1
290  GOSUB 130
300  CALL 18432
310  GOTO 280
320  DATA  169,0,133,224,169,80,
    133,228,169,40,133,226,133,2
    30,169,68
330  DATA  133,225,133,229,133,2
    27,169,64,133,231,162,19,160
    ,39,32,97
340  DATA  72,201,2,240,12,201,3
    ,240,4,169,0,240,2,169,1,145
    ,230
350  DATA  136,208,234,165,226,1
    33,224,165,227,133,225,165,2
```

continued on next page

```
        28,133,226
  360  DATA  165,229,133,227,24,16
        5,228,105,40,133,228,144,2,2
        30,229,24
  370  DATA  165,230,105,40,133,23
        0,144,2,230,231,202,208,191,
        32,121,72
  380  DATA  96,169,0,24,136,113,2
        24,113,226,113,228,200,113,2
        24,113,228
  390  DATA  200,113,224,113,226,1
        13,228,136,96,152,72,138,72,
        160,0,132
  400  DATA  230,132,232,169,68,13
        3,233,169,64,133,231,162,3,1
        77,230,145
  410  DATA  232,200,208,249,230,2
        31,230,233,202,16,242,104,17
        0,104,168,96
```

TYPO II TABLE

Code	Line#	Code	Line#	Code	Line#
GN	10	ON	150	XV	290
FX	20	GV	160	SZ	300
UD	30	XJ	170	YH	310
OX	40	QF	180	QU	320
HN	50	RR	190	SK	330
RR	60	YP	200	BV	340
PK	70	IN	210	RM	350
SQ	80	KQ	220	GL	360
NG	90	ZT	230	DD	370
EY	100	GI	240	ZB	380
ZM	110	FA	250	HB	390
YF	120	TT	260	JT	400
QK	130	FV	270	AA	410
HE	140	XH	280		

Total checksum = 1612257

BZ CELLULAR AUTOMATA

Article on page 59

```
10  REM  * BZ CELLULAR AUTOMATON

20  REM  * BY DANIEL WOLF PH.D.
30  REM  * (C) 1985 ANTIC PUBLIS
    HING, INC.
40  REM  * II COMPUTING VOL.1 NO
    .4
50  POKE 116,63
60 N(0) = 32:N(1) = 45
70 N(2) = 43
80 N(3) = 42
90 D$ =  CHR$ (4)
100 N = 16384:O = N + 1024
110 LM = 40:LY = 19:MF = 40
120 T2 = 32:T = 10:UN = 1:ZR = 0

130  FOR A = 0 TO 189: READ B: POKE
    18432 + A,B: NEXT
140  FOR A = ZR TO 1023: POKE N +
    A,ZR: NEXT : CALL 18583
150  GOTO 210
160 GE = GE + 1: PRINT " II COMP
    UTING   BZ   GENERATION ";GE

170  PRINT
180  FOR Y = ZR TO LY:TY = O + M
    F * Y: FOR X = UN TO LM: PRINT
     CHR$ (N( PEEK (TY + X)));: NEXT
    : NEXT
190  RETURN
200  PRINT : PRINT "USE ONLY 0,
    1, 2, AND 3'S, PLEASE!": FOR
    A = 0 TO 1000: NEXT : RETURN
210  FOR Y = UN TO LY:TY = N + M
    F * Y
220  HOME : PRINT : PRINT "ENTER
     STRING # ";Y;" OF 0,1,2,3'S
    "
230  PRINT : INPUT S$:L =  LEN (
    S$)
240  IF L > LM THEN L = LM:S$ =
    LEFT$ (S$,LM)
250  FOR X = UN TO L:B =  VAL ( MID$
    (S$,X,UN))
260  IF (B < 0) OR (B > 3) THEN
    : GOSUB 200: GOTO 220
270  POKE TY + X,B: NEXT
280  NEXT
290  CALL 18583
300  HOME
310  VTAB 2: HTAB 1
320  GOSUB 160
330  CALL 18432
340  GOTO 310
350  DATA  169,0,133,224,169,80,
    133,228,169,40,133,226,133,2
    30,169,68
360  DATA  133,225,133,229,133,2
    27,169,64,133,231,162,19,160
    ,39,177,226
370  DATA  208,6,32,112,72,76,62
    ,72,201,1,240,12,201,2,240,4

380  DATA  201,3,240,8,169,3,208
    ,6,169,2,208,2,169,0,145,230
    ,136
```

```
390  DATA  208,219,165,226,133,2
     24,165,227,133,225,165,228,1
     33,226,165
400  DATA  229,133,227,24,165,22
     8,105,40,133,228,144,2,230,2
     29,24,165
410  DATA  230,105,40,133,230,14
     4,2,230,231,202,208,176,32,1
     51,72,96
420  DATA  152,72,136,177,226,20
     1,3,240,25,200,177,224,201,3
     ,240,18,177
430  DATA  228,201,3,240,12,200,
     177,226,201,3,240,5,104,168,
     169
440  DATA  0,96,104,168,169,1,96
     ,152
450  DATA  72,138,72,160,0,132,2
     30,132,232,169,68,133,233,16
     9,64,133
460  DATA  231,162,3,177,230,145
     ,232,200,208,249,230,231,230
     ,233,202,16
470  DATA  242,104,170,104,168,9
     6
```

TYPO II TABLE

Code	Line#	Code	Line#	Code	Line#
ZF	10	HE	170	SZ	330
FX	20	HO	180	XO	340
XV	30	GV	190	QU	350
UU	40	RW	200	UQ	360
HN	50	QF	210	ZA	370
HQ	60	YC	220	HL	380
FX	70	YP	230	XU	390
FT	80	IN	240	NJ	400
RR	90	KQ	250	AB	410
PK	100	UE	260	ZA	420
SQ	110	GI	270	GJ	430
NG	120	FA	280	BN	440
XC	130	UI	290	UG	450
CM	140	FV	300	HK	460
XM	150	XH	310	IC	470
PI	160	YE	320		

Total checksum = 1662121

DIGITAL GARDENER

Article on page 17

```
10   REM    * GARDEN LAYOUT
20   REM    * BY CHARLES BARTISH
30   REM    * APPLESOFT CONVERSIO
     N
40   REM    * BY SCOTT ANTHONY
50   REM    * (C) 1986 ANTIC PUBL
     ISHING, INC.
60   REM    * II COMPUTING VOL.1
      NO.4
100  :
130   CLEAR
140  T1$ = "MY GARDEN":T2$ = "":T
     3$ = "COPYRIGHT (C) 1986 ANT
     IC PUBLISHING"
150  PFLAG = 0:C$ = "HIT ANY KEY
     TO CONTINUE . . ."
160   DIM R$(30),VEG$(30),TEMP$(3
     0): DIM RD(30),RT(30),PD(30)
     ,PT(30),PL(30),NT(30),HS(30)
     ,HT(30),RS(30),RZ(30),RG(50)
170   DIM BL$(20),GARDEN$(14):J$ =
      "HIT A KEY TO CONTINUE"
180  L = 30:W = 15:I = 1: REM
      DEFAULT DIMENSIONS IN FEET
190   GOSUB 1710: REM     INIT DA
     TA
200   GOTO 1940
240   REM      ** MAIN PROGRAM **
250  I = 2
260   HOME : INVERSE : PRINT "SEL
     ECT THE SIZE OF YOUR GARDEN"
     : NORMAL : PRINT : PRINT
270   PRINT "IF YOU'RE NOT SURE O
     F THE PROPER SIZE,": PRINT "
     ENTER 30 FOR LENGTH AND 15 F
     OR WIDTH."
280   PRINT "WE'LL TELL YOU HOW M
     UCH ROOM YOU NEED.": PRINT :
      PRINT : PRINT
290   INPUT "THE LENGTH IN FEET I
     S ";R$
300  L = VAL (R$): IF VAL (R$) =
     0 THEN 290
310   INPUT "THE WIDTH IN FEET IS
      ";R$
320  W = VAL (R$): IF VAL (R$) =
     0 THEN 310
330   IF W > L THEN N = L:L = W:W
     = N
340  FACT = L * W / 450
350   REM     PRINT VEGETABLE CHOI
     CES
360   HOME : HTAB 5: INVERSE : PRINT
      "CHOOSE FROM THESE VEGETABLE
     S": NORMAL : PRINT
370  M = 0: FOR N = 1 TO 15:M = N
     + 15
380   HTAB 1: PRINT VEG$(N);: HTAB
      20: PRINT VEG$(M)
390   NEXT N
400   PRINT : PRINT : PRINT "LET'
     S PICK THE VEGETABLES WE WAN
     T. . .": PRINT : PRINT J$
410   GET A$
420   HOME : PRINT : PRINT "EACH
```

continued on next page

```
    VEGETABLE WILL FLASH ONTO TH
    E      SCREEN.  IF YOU WANT
    TO PLANT THAT      VEGETABLE
    , RESPOND WITH <Y> FOR YES O
    R  JUST <RETURN> FOR NO.": PRINT
    : PRINT
430  PRINT J$: GET A$
440  HOME : VTAB 4: HTAB 8: PRINT
    "DO YOU WANT. . .?"
450 I = 1
460  FOR N = 1 TO 30
470  VTAB 10: HTAB 14: CALL  - 9
    58: PRINT VEG$(N): GET A$: IF
    A$ <  > "Y" THEN 510
480 VEG$(I) = VEG$(N)
490 RD(I) = RD(N):PD(I) = PD(N):
    PL(I) =  INT (PL(N) * FACT):
    HS(I) = HS(N)
500 I = I + 1
510  NEXT N
520 M = I - 1: HOME
530  PRINT "       YOU HAVE SELEC
    TED. . .": PRINT : PRINT
540  FOR N = 1 TO M
550  PRINT VEG$(N)
560  NEXT N
570  PRINT : PRINT : PRINT "IS T
    HIS OK? (Y/N) ";: GET A$
580  IF A$ <  > "Y" THEN 360
600  HOME : HTAB 10: INVERSE : PRINT
    "VEGETABLE PRODUCTION": NORMAL
    : PRINT
610  PRINT "VEGETABLE";: HTAB 20
    : PRINT "ROWS";: HTAB 30: PRINT
    "PLANTS"
620 J = 0
630  FOR N = 1 TO M
640 RS(N) = (PLT(N) * PD(N)) / (
    12 * (W - 1))
650 RS(N) =  INT (RS(N) + 0.5): IF
    RS(N) < 1 THEN RS(N) = 1
660  VTAB N + 4: HTAB 1: PRINT V
    EG$(N);: HTAB 20: PRINT RS(N
    );: HTAB 30: PRINT  INT (PLT
    (N))
670 J = J + RS(N)
680  NEXT N
690  PRINT : PRINT "  TOTAL ROWS
           ";: HTAB 20: PRINT
    J
700  PRINT : PRINT : PRINT
710  VTAB 20: HTAB 8: PRINT "1 -
    CHANGE ROW/PLANT NUMBERS": HTAB
    8: PRINT "2 - LOOK AT PLANT
    LIST AGAIN": HTAB 8: PRINT "
    3 - CONTINUE"
720  GET A$
730  IF A$ = "1" THEN  GOSUB 132
    0
740  IF A$ = "2" THEN  GOTO 600
750  IF A$ = "3" THEN  GOTO 770
760  GOTO 600
770  HOME : VTAB 10: HTAB 10: PRINT
    "SORTING BY HEIGHT. . .": GOSUB
    1190
780 I = 0:II = 0:LG = 0
790  HOME : HTAB 13: INVERSE : PRINT
    "GARDEN SUMMARY": NORMAL : PRINT

800  PRINT "VEGETABLE";: HTAB 14
    : PRINT "P DIST";: HTAB 22: PRINT
    "ROWS";: HTAB 28: PRINT "R D
    IST";: HTAB 36: PRINT "SUM"
810  HTAB 13: PRINT "(INCHES)";:
    HTAB 22: PRINT "(#)";: HTAB
    27: PRINT "(INCHES)";: HTAB
    35: PRINT "(FEET)"
820 RM = 0
830  FOR J = 1 TO M
840 H = 30: GOSUB 1490:HS(I) = H
    S(I) + 30
850  FOR K = 1 TO RS(I)
860 II = II + 1
870  IF II > 50 THEN  GOSUB 1130
    : END
880  IF K = 1 AND RM > RD(I) THEN
    RG(II) = LG + RM: GOTO 900
890 RG(II) = LG + RD(I)
900 RG(1) = 6
910 LG = RG(II)
920  NEXT K
930 RM = RD(I)
940 LTT =  INT (10 * LG / 12) /
    10: IF LTT > 99.9 THEN LTT =
     INT (LTT)
950  PRINT VEG$(I);: HTAB 15: PRINT
    PD(I);: HTAB 22: PRINT RS(I)
    ;: HTAB 28: PRINT RD(I);: HTAB
    36: PRINT LTT
960  NEXT J
970  FOR J = 1 TO M:HS(J) = HS(J
    ) - 30: NEXT J
980 LG =  INT ((LG / 12) + .5): REM
    LG =  INT (LG + .5)
990  PRINT : PRINT "THE GARDEN L
    ENGTH IS: ";LG;" FEET"
1000  PRINT "THE GARDEN  WIDTH I
    S: ";W;" FEET": PRINT "DIFFE
    RENT VEGETABLES: ";M:NUM = M

1010  PRINT : PRINT  CHR$ (4);"P
    R#0":PFLAG = 0
1020  IF LG > 1.15 * L THEN  GOTO
     1600
1030  PRINT : PRINT "PRESS:   1
     - TO PLOT THE GARDEN"
1040  HTAB 10: PRINT "2 - PRINT
    GARDEN SUMMARY"
1050  HTAB 10: PRINT "3 - FOR ME
    NU"
1060  GET A$:A =  VAL (A$): ON A
     GOTO 1760,1070,1940
1065  REM   * PRINT VEGATABLE LI
    ST
1070 FLAG = 1: PRINT
1080  PRINT  CHR$ (4);"PR#1"
1090  GOTO 780
1130  HOME : PRINT "YOU HAVE MAD
     E YOUR GARDEN TOO BIG FOR
     THIS PROGRAM TO HANDLE. THE
     SIZE SHOULD BE FEWER THAN 50
      ROWS."
1140  PRINT : PRINT "REDIMENSION
      RG() IN LINE 140 FOR MORE
      ROWS, AND RUN AGAIN."
1150  RETURN
1190 I = 1
1200  FOR H = 1 TO 30
1210  FOR J = 1 TO M
1220  IF HS(J) = H THEN TEMP$(I)
```

```
    - VEG$(J):PT(I) - PD(J):RT(
    I) - RD(J):NT(I) - PL(J):HT(
    I) - HS(J):I - I + 1:J - M: GOTO
    1240
1230  NEXT J
1240  NEXT H
1250  FOR I - 1 TO M
1260 VEG$(I) - TEMP$(I):PD(I) -
    PT(I):RD(I) - RT(I):PL(I) -
    NT(I):HS(I) - HT(I)
1270  NEXT I
1280  RETURN
1320 I - I + 1: FOR N - 1 TO M: HOME

1330  HTAB 17: INVERSE : PRINT "
    CHANGES": NORMAL
1340  PRINT : PRINT "TO CHANGE N
    UMBER OF ROWS,   TYPE <R>
     TO CHANGE NUMBER OF PLANTS,
     TYPE <P>: "
1350  PRINT : PRINT : PRINT "VEG
    ETABLES";: HTAB 20: PRINT "R
    OWS";: HTAB 30: PRINT "PLANT
    S"
1360  PRINT : PRINT VEG$(N);: HTAB
     20: PRINT RS(N);: HTAB 30: PRINT
     PL(N)
1370  PRINT : PRINT "ROWS <R> OR
     PLANTS <P> ";: GET A$
1380  IF A$ - "R" THEN  GOSUB 14
    20: GOTO 1400
1390  IF A$ - "P" THEN  GOSUB 14
    40
1400  NEXT N
1410  RETURN
1420  PRINT : INPUT "ENTER THE N
    EW NUMBER OF ROWS: ";R$:RS(N
    ) - VAL (R$)
1430 PL(N) - (RS(N) * 12 * (W -
    1)) / PD(N): RETURN
1440  PRINT : INPUT "ENTER THE N
    EW NUMBER OF PLANTS: ";R$:PL
    (N) -  VAL (R$)
1450 RS(N) - (PL(N) * PD(N)) / (
    12 * (W - 1)): RETURN
1490  FOR N - 1 TO M
1500  IF HS(N) < H THEN H - HS(N
    ):I - N
1510  NEXT N
1520  RETURN
1580  REM    ERROR SUBROUTINES
1600  HOME : PRINT "THE LENGTH I
    S GREATER THAN YOUR LIMIT.":
     PRINT : PRINT "   CHOSEN: "
    ;L: PRINT "   ACTUAL: ";LG
1610  PRINT : PRINT : PRINT "HER
    E ARE YOUR OPTIONS:"
1620  PRINT : PRINT "1 - CONTINU
    E - ACCEPT LENGTH"
1630  PRINT "2 - REDUCE ALL ROWS
     BY 10%"
1640  PRINT "3 - CHANGE # OF ROW
    S/PLANTS"
1650  PRINT "4 - CHANGE DATA OF
    CERTAIN VEGETABLES"
1660  GET A$:A -  VAL (A$): ON A
    GOTO 1670,1680,600,1700
1670 L - LG: GOTO 780
1680  FOR J - 1 TO M:RD(J) -  INT
    (RD(J) * .90): NEXT J
1690  GOTO 780
1700  HOME : PRINT "TO CHANGE VE
    GETABLE DATA, THE PROGRAM
    MUST END AND THE PROPER DATA
     STATEMENTS FOUND FROM LINES
     8000-8300 MUST BE      CHAN
    GED.": END
1710  FOR N - 1 TO 30: READ VEG$
    (N),RD(N),PD(N),PL(N),HS(N):
     NEXT
1720  RETURN
1750  REM  * PRINT PLOT OF GARDE
    N
1760  HOME : HTAB 10: INVERSE : PRINT
     "PRINT PLOT OF GARDEN": NORMAL
     : PRINT : PRINT
1770  INPUT "WHAT DO YOU WANT TO
     NAME THE GARDEN?    ";NAME$

1780  PRINT  CHR$ (4);"PR#1"
1785  HOME
1790  HTAB 40 - ( LEN (NAME$) /
    2): PRINT NAME$
1800  PRINT : PRINT
1810 S - 40 - (W / 2)
1820  HTAB S
1830  FOR N - 1 TO W: PRINT "-";
    : NEXT N: PRINT "-"
1840  FOR J - 1 TO NUM
1850  FOR K - 1 TO RS(J)
1860  HTAB S: PRINT "! ";VEG$(J)
    ;" ";: FOR N - 1 TO W - ( LEN
    (VEG$(J)) + 3): PRINT "*";: NEXT
    N: PRINT " !"
1870  NEXT K
1880  NEXT J
1890  HTAB S
1900  FOR N - 1 TO W: PRINT "-";
    : NEXT N: PRINT "-"
1910  PRINT : HTAB S: PRINT "LEN
    GTH - ";L
1920  HTAB S: PRINT "WIDTH  - ";
    W
1930  PRINT  CHR$ (4);"PR#0": HOME
    : GOTO 780
1940  TEXT : HOME : GOSUB 2040: GOSUB
    2050
1950  PRINT : PRINT : HTAB 5: PRINT
    "THIS PROGRAM WILL ASSIST YO
    U IN ": PRINT : HTAB 17: INVERSE
    : PRINT "PLANNING": NORMAL :
     PRINT : HTAB 1: PRINT " YOU
    R SPRING GARDEN, BUT YOU'LL
    HAVE TO": PRINT
1960  HTAB 18: INVERSE : PRINT "
    PLANT": NORMAL : PRINT : HTAB
    15: PRINT "IT YOURSELF": PRINT
    : PRINT : PRINT : PRINT C$;:
     GET A$
1970  HOME : PRINT : PRINT "PRES
    S NUMBER OF CHOICE:"
1980  PRINT : HTAB 8: PRINT "1 -
    PLAN NEW GARDEN"
1990  HTAB 8: PRINT "2 - PRINT G
    ARDEN PLAN"
2000  HTAB 8: PRINT "3 - QUIT": PRINT
    : GET A$
2010 A -  VAL (A$): ON A GOTO 24
    0,1760,2060
2020  GOTO 1940
```

continued on next page

```
2040  FOR N = 1 TO 40: PRINT "*"
     ;: NEXT N: FOR K = 1 TO 4: PRINT
     "*";: FOR M = 2 TO 39: PRINT
     " ";: NEXT M: PRINT "*";: NEXT
     K: FOR N = 1 TO 40: PRINT "*
     ";: NEXT N: RETURN
2050  VTAB 3: HTAB 22 -  LEN (T1
     $) / 2: PRINT T1$: VTAB 5: HTAB
     22 -  LEN (T2$) / 2: PRINT T
     2$: VTAB 5: HTAB 22 -  LEN (
     T3$) / 2: PRINT T3$: RETURN

2060  HOME : VTAB 10: HTAB 18: PRINT
     "DONE": END
2070  REM     DATA VEGETABLE, RO
     W DISTANCE, PLANT DISTANCE,
     STANDARD # PLANTS, HEIGHT SE
     QUENCE
2080  DATA "ASPARAGUS",42,18,10,
     3
2090  DATA "BEANS - SNAP BUSH",1
     8,4,172,18
2100  DATA "BEANS - SNAP POLE",3
     6,6,58,1
2110  DATA "BEANS - LIMA",24,3,2
     28,8
2120  DATA "BEETS",20,2,85,12
2130  DATA "BROCCOLI",24,18,6,9
2140  DATA "BRUSSELS SPROUTS",24
     ,18,6,10
2150  DATA "CABBAGE",24,18,10,19

2160  DATA "CANTELOUPE",60,24,8,
     20
2170  DATA "CARROTS",12,2,85,26
2180  DATA "CAULIFLOWER",24,18,6
     ,11
2190  DATA "CELERY",24,6,29,13
2200  DATA "CB1-BRUS/BRO/CAU",24
     ,18,6,9
2210  DATA "CB2-CARRT/RADSH",12,
     2,85,26
2220  DATA "CORN",12,12,45,2
2230  DATA "CUCUMBERS",36,18,10,
     5
2240  DATA "EGGPLANT",24,18,10,6

2250  DATA "LETTUCE-HEAD",18,12,
     15,16
2260  DATA "LETTUCE-LEAF",18,3,5
     7,25
2270  DATA "ONIONS",12,4,129,24
2280  DATA "PEAS",24,3,228,7
2290  DATA "PEPPERS",24,18,10,17

2300  DATA "POTATOES",30,12,45,1
     4
2310  DATA "PUMPKINS",60,24,8,22

2320  DATA "RADISHES",12,1,85,28
2330  DATA "SPINACH",18,3,57,27
2340  DATA "SQUASH",48,18,10,21
2350  DATA "TOMATOES",36,36,15,4

2360  DATA "TURNIPS",18,2,85,15
2370  DATA "WATERMELON",72,36,5,
     23
```

TYPO II TABLE

Code	Line#	Code	Line#	Code	Line#
TI	10	XU	740	TK	1490
PV	20	BJ	750	BI	1500
ON	30	XR	760	LA	1510
QX	40	SN	770	GV	1520
AX	50	WH	780	TE	1580
TD	60	MX	790	YG	1600
CG	100	OO	800	OW	1610
HH	130	MI	810	GL	1620
MN	140	OM	820	UG	1630
XU	150	TC	830	JA	1640
TQ	160	SL	840	UX	1650
RF	170	SA	850	EP	1660
DH	180	NB	860	HX	1670
CT	190	UF	870	KY	1680
IE	200	KR	880	YR	1690
QT	240	NX	890	CN	1700
YP	250	NF	900	VP	1710
CW	260	UF	910	GV	1720
FN	270	KU	920	FU	1750
GE	280	WH	930	EK	1760
MR	290	LY	940	IY	1770
KE	300	VX	950	PC	1780
WA	310	KS	960	FV	1785
FL	320	QN	970	RA	1790
HI	330	SU	980	HC	1800
PX	340	MG	990	RL	1810
VJ	350	OU	1000	ME	1820
SH	360	RA	1010	DD	1830
TM	370	FX	1020	NX	1840
WK	380	YX	1030	SJ	1850
LA	390	KW	1040	LT	1860
QG	400	WZ	1050	KU	1870
QM	410	DP	1060	KS	1880
EZ	420	OA	1065	ME	1890
JE	430	VD	1070	DD	1900
DE	440	PC	1080	JT	1910
YM	450	YR	1090	WH	1920
AI	460	AG	1130	JM	1930
YU	470	TB	1140	PC	1940
YO	480	GV	1150	SC	1950
EZ	490	YM	1190	PQ	1960
PL	500	ZW	1200	CS	1970
LA	510	TC	1210	KR	1980
RU	520	XJ	1220	PK	1990
EG	530	KS	1230	AY	2000
TK	540	KO	1240	EG	2010
EL	550	TA	1250	IE	2020
LA	560	GT	1260	DK	2040
UF	570	KQ	1270	MZ	2050
CN	580	GV	1280	YP	2060
QN	600	PX	1320	MW	2070
GG	610	LP	1330	EE	2080
YK	620	PU	1340	BF	2090
TK	630	EI	1350	HR	2100
HC	640	OU	1360	MR	2110
EG	650	QF	1370	PH	2120
WE	660	HY	1380	QY	2130
MB	670	GB	1390	KB	2140
LA	680	LA	1400	JE	2150
FK	690	GV	1410	KA	2160
ZU	700	KH	1420	OK	2170
EY	710	ZR	1430	VD	2180
QM	720	OA	1440	NW	2190
XO	730	NY	1450	JK	2200

AP	2210	DI	2250	YV	2290		GX	2330	JZ	2350	QA	2370
YD	2220	NC	2260	XL	2300		XI	2340	RC	2360		
HM	2230	CK	2270	KL	2310							
CS	2240	CK	2280	GX	2320							

Total checksum = 9869078

DICE SIMULATOR

Article on page 42

```
10  REM  * DICE SIMULATOR
20  REM  * BY MICHAEL J. BIANCAL
    ANA
30  REM  * (C) 1985 ANTIC PUBLIS
    HING
40  REM  * II COMPUTING  VOL.1 N
    O.4
50 :
100  REM  * INITIALIZE
110  GOSUB 9000: POKE 232,0: POKE
    233,96
120 S =  PEEK (78) +  PEEK (79) *
    256
130  REM  * INPUT
140  VTAB 22: PRINT " SPACE BAR
    TO ROLL THE DICE": PRINT " <
    ESC> TO END": GET A$
150  IF A$ =  CHR$ (27) THEN  END

200  REM  * CALCULATE DICE
210  GOSUB 1000:D1 =  INT (R * 6
    ) + 1: GOSUB 1000:D2 =  INT
    (R * 6) + 1
220  IF D1 = 1 THEN YD1 = 2:ZD1 =
    3
230  IF D1 = 2 THEN YD1 = 4:ZD1 =
    6
240  IF D1 = 3 THEN YD1 = 5:ZD1 =
    1
250  IF D1 = 4 THEN YD1 = 1:ZD1 =
    5
260  IF D1 = 5 THEN YD1 = 3:ZD1 =
    6
270  IF D1 = 6 THEN YD1 = 2:ZD1 =
    4
280  IF D2 = 1 THEN DY2 = 2:DZ2 =
    3
290  IF D2 = 2 THEN DY2 = 4:DZ2 =
    6
300  IF D2 = 3 THEN DY2 = 5:DZ2 =
    1
310  IF D2 = 4 THEN DY2 = 1:DZ2 =
    5
320  IF D2 = 5 THEN DY2 = 3:DZ2 =
    6
330  IF D2 = 6 THEN DY2 = 2:DZ2 =
    4
500  REM  * ROLL THE DICE
510  TEXT : HOME : HGR : HCOLOR=
    3: ROT= 0: SCALE= 1
520  FOR I = 20 TO 140 STEP 16
530  ROT= I: DRAW 1 AT 100,I: ROT=
    I + 16: DRAW 1 AT 180,I: POKE
     - 16336,0: ROT= I: XDRAW 1 AT
    100,I: ROT= I + 16: XDRAW 1 AT
    180,I
540  NEXT I
550  FOR I = 1 TO 5: POKE  - 163
    36,0: NEXT I
560  FOR P = 1 TO 100: NEXT P
570  ROT= 0: DRAW 1 AT 130,125: DRAW
    1 AT 180,129
580  PRINT D1"  "D2
590  REM  * PLOT THE DICE FACES
600  REM  * TOP FACE
610  IF D1 = 1 OR D1 = 3 OR D1 =
    5 THEN  HPLOT X(1),Y(1)
620  IF D1 <  > 1 THEN  HPLOT X(
    2),Y(2): HPLOT X(3),Y(3)
630  IF D1 > 3 THEN  HPLOT X(4),
    Y(4): HPLOT X(5),Y(5)
640  IF D1 = 6 THEN  HPLOT X(6),
    Y(6): HPLOT X(7),Y(7)
650  IF D2 = 1 OR D2 = 3 OR D2 =
    5 THEN  HPLOT X(1) + 50,Y(1)
     + 4
660  IF D2 <  > 1 THEN  HPLOT X(
    2) + 50,Y(2) + 4: HPLOT X(3)
     + 50,Y(3) + 4
670  IF D2 > 3 THEN  HPLOT X(4) +
    50,Y(4) + 4: HPLOT X(5) + 50
    ,Y(5) + 4
680  IF D2 = 6 THEN  HPLOT X(6) +
    50,Y(6) + 4: HPLOT X(7) + 50
    ,Y(7) + 4
700  REM  * LEFT FACE
710  IF YD1 = 1 OR YD1 = 3 OR YD
    1 = 5 THEN  HPLOT X(8),Y(8)
720  IF YD1 <  > 1 THEN  HPLOT X
    (9),Y(9): HPLOT X(10),Y(10)
730  IF YD1 > 3 THEN  HPLOT X(11
    ),Y(11): HPLOT X(12),Y(12)
740  IF YD1 = 6 THEN  HPLOT X(13
    ),Y(13): HPLOT X(14),Y(14)
750  IF DY2 = 1 OR DY2 = 3 OR DY
    2 = 5 THEN  HPLOT X(8) + 50,
    Y(8) + 4
760  IF DY2 <  > 1 THEN  HPLOT X
    (9) + 50,Y(9) + 4: HPLOT X(1
    0) + 50,Y(10) + 4
770  IF DY2 > 3 THEN  HPLOT X(11
    ) + 50,Y(11) + 4: HPLOT X(12
    ) + 50,Y(12) + 4
780  IF DY2 = 6 THEN  HPLOT X(13
    ) + 50,Y(13) + 4: HPLOT X(14
    ) + 50,Y(14) + 4
800  REM  * RIGHT FACE
810  IF ZD1 = 1 OR ZD1 = 3 OR ZD
    1 = 5 THEN  HPLOT X(15),Y(15
```

continued on next page

```
 )
820  IF ZD1 <  > 1 THEN  HPLOT X
 (16),Y(16): HPLOT X(17),Y(17
 )
830  IF ZD1 > 3 THEN  HPLOT X(18
 ),Y(18): HPLOT X(19),Y(19)
840  IF ZD1 = 6 THEN  HPLOT X(20
 ),Y(20): HPLOT X(21),Y(21)
850  IF DZ2 = 1 OR DZ2 = 3 OR DZ
 2 = 5 THEN  HPLOT X(15) + 50
 ,Y(15) + 4
860  IF DZ2 <  > 1 THEN  HPLOT X
 (16) + 50,Y(16) + 4: HPLOT X
 (17) + 50,Y(17) + 4
870  IF DZ2 > 3 THEN  HPLOT X(18
 ) + 50,Y(18) + 4: HPLOT X(19
 ) + 50,Y(19) + 4
880  IF DZ2 = 6 THEN  HPLOT X(20
 ) + 50,Y(20) + 4: HPLOT X(21
 ) + 50,Y(21) + 4
890  GOTO 130
1000  REM  * ROOT'S RANDOM NUMBE
 R GENERATOR
1010 R =  SQR (S)
1020 R = R -  INT (R)
1030 S = 10 * (R + OLD)
1040 OLD = R + 1
1050  RETURN
9000  REM  * SHAPE TABLE FOR DIE

9010  DIM X(21),Y(21): HGR : HOME
 : TEXT
9020  FOR I = 0 TO 157: READ P: POKE
 24576 + I,P: NEXT
9030  DATA  1,0,4,0,54,54,54,54,
 54,54,54,54,54,54,62,55,63,5
 5,63,62,63,62,55,63,55,63,62
 ,63,62,63,62,193,63,60,63,60
 ,39,63,39,63,60
9040  DATA  63,60,39,63,39,63,36
 ,36,36,36,36,36,36,36,36,36,
 44,37,45,37,45,44,45,44,37,4
 5,37,45,44,45,44,101,14,45,4
 6,45,46,53,45,53,45
9050  DATA  46,45,46,53,45,173,2
 5,55,63,55,63,62,63,62,55,63
 ,55,63,62,63,62,55,63,60,39,
 63,39,63,60,63,60,39,63,39,6
 3,60,63,150,146,82,73
9060  DATA  73,73,73,81,73,73,54
 ,54,54,54,54,54,54,54,54,6,0
 ,5,0,5,0,5,0,5,0,5,0,5,0,5,0
 ,5,0,5,0
9100  REM  * COORDINATES FOR SPO
 TS
9110  FOR I = 1 TO 21: READ X(I)
 ,Y(I): NEXT I
9120  DATA  107,125,107,120,107,
 130,92,125,121,125,100,127,1
 14,123
9130  DATA  95,140,87,129,104,15
 0,87,143,104,136,95,147,95,1
 32
9140  DATA  120,140,127,129,110,
 150,127,143,110,136,120,146,
 120,132
9200  RETURN
```

TYPO II TABLE

Code	Line#	Code	Line#	Code	Line#
KT	10	EA	530	YR	820
FA	20	KQ	540	TG	830
IV	30	RP	550	WV	840
YP	40	OS	560	AD	850
CG	50	HV	570	GW	860
IX	100	GF	580	MD	870
FK	110	TD	590	LK	880
WT	120	MH	600	XQ	890
XX	130	RV	610	OK	1000
OK	140	LQ	620	XX	1010
PP	150	VG	630	OB	1020
YL	200	BN	640	IF	1030
WU	210	EH	650	TW	1040
TF	220	VI	660	GV	1050
WF	230	PQ	670	PR	9000
TO	240	XD	680	BI	9010
UR	250	RG	700	YL	9020
WJ	260	HM	710	FQ	9030
UV	270	IA	720	HX	9040
VX	280	WA	730	IO	9050
YX	290	DN	740	TY	9060
WG	300	JF	750	VA	9100
XJ	310	LW	760	AQ	9110
ZB	320	KO	770	UV	9120
XN	330	TH	780	OB	9130
TS	500	EQ	800	EV	9140
WW	510	OA	810	GV	9200
EB	520				

Total checksum = 3773076

COMING IN THE NEXT ISSUE

- The Computer-Video Connection
- An Introduction to Apple Graphics
- Artists Who Use IIs
- Create Your Own Fonts
- Which Monitor Is For You?
- Printer Interface Cards
- Plus: Shapiro, Comstock, Foster, Wolf

Reviews of: MouseWrite, popular drawing programs for kids and grown-ups . . . and more!

SHUTTLE TRACKER

Article on page 24

```
10  REM * SHUTTLE TRACKER
20  REM * BY PHILIP CHIEN
30  REM * (C) 1985 ANTIC PUBLISH
    ING, INC.
40  REM * II COMPUTING  VOL.1 NO
    .4
90  LOMEM: 16384
100  GOSUB 9000
200  GOSUB 2000
1000  REM  * HH:MM ROUTINE
1010 H =  INT (K / 60)
1020  IF H < 10 THEN  PRINT " ";

1030  PRINT H;":";
1040 B = 60:M =  FN M(K)
1050  IF M < 10 THEN  PRINT "0";

1060  PRINT M;
1070  RETURN
2000  REM  * MAIN LOOP
2010  FOR T = 0 TO LF STEP DT
2020  IF T > 30 THEN F = 6: REM
     LAUNCH FUDGE
2030 OB =  INT ((T * KT + A(MI,2
    )) / 262.1111) + 1: REM  CAL
    CULATE ORBIT
2040  IF OB > OO THEN  VTAB 23: PRINT
    "ORBIT ";OB:OO = OB:Z =  PEEK
    ( - 16336) +  PEEK ( - 16336
    ):B = 3: HCOLOR= C( FN M(OB)
    ): REM  NEW ORBIT
2050 B = 280:X =  FN M(T * KT +
    LK):Y =  FN Y(T)
2060  HPLOT X,Y
2070 LA$ =  STR$ ( INT ( ABS (Y -
    90) * 9.5)): REM  CALCULATE
    LATITUDE
2080  IF  LEN (LA$) < 3 THEN LA$
     = " " + LA$: GOTO 2080: REM
     CHEAP PRINT.USING FUNCTION
2090  VTAB 22: PRINT "LAT "; LEFT$
    (LA$,2);"."; RIGHT$ (LA$,1);
     CHR$ ( SGN (Y - 90) * 2.5 +
    80.5);"  ";
2100 LN =  INT (((X - L0) + 280 *
    (X < L8)) * 1.286): REM  CAL
    CULATE LONGITUDE
2110  POKE 36,11: PRINT "LONG ";
     ABS (LN); CHR$ (78 -  SGN (
    LN) * 9);"   "
2120  VTAB 23: POKE 36,11
2130  IF X > 104 AND X < 259 THEN
     PRINT "TDRS EAST": GOTO 215
    0
2140  INVERSE : PRINT "TDRS WEST
    ": NORMAL
2150  VTAB 21: POKE 36,20
2160 B = 24:DN =  FN M(X / 11.66
    7 + (F + LT + T) / 60 - TZ):
     REM  CALCULATE SUN TIME
2170  IF DN > 5 AND DN < 19 THEN
     INVERSE : PRINT " DAY ": NORMAL
    : GOTO 2190
2180  PRINT "NIGHT"
2190  VTAB 21: POKE 36,26: PRINT
    "MET- ";:ME =  INT (F + T)
2200 D =  INT (ME / 1440)
2210  IF D < 10 THEN  PRINT " ";
    : REM  IF LESS THAN 10 DAYS,
     PRINT SPACE
2220  PRINT D;"/";
2230 B = 1440:K =  FN M(ME): GOSUB
     1000: REM  PRINT HH.MM FOR
    MET
2240  PRINT
2250  VTAB 22: POKE 36,26: PRINT
    TZ$;"- ";
2260 B = 1440:K =  FN M(F + LT +
    T): GOSUB 1000: REM  PRINT
    LOCAL TIME
2270  PRINT ":";
2280 S =  INT ((T -  INT (T)) *
    60): REM  CALCULATE SECONDS
2290  IF S < 10 THEN  PRINT "0";

2300  PRINT S
2310  VTAB 23: POKE 36,23: PRINT
    "DISTANCE "; INT (T * KD)
2320  NEXT T
2330  END
9000  REM  * SETUP PROGRAM AND G
    ET INPUTS
9020  DIM C(3),A(2,2),T$(23)
9030  HGR : TEXT : CALL  - 936
9040  PRINT  CHR$ (4);"BLOAD WOR
    LD.PIC,A$2000": REM  LOAD PI
    CTURE OF THE WORLD
9050  FOR X = 1 TO 2: FOR Y = 0 TO
     2: READ A(X,Y): NEXT Y,X: REM
     ORBIT DATA
9060  FOR Z = 10 TO 13: READ T$(
    Z): NEXT Z: REM  TIME ZONES
9070  PRINT "******************
    *******************"
9080  PRINT "**           SHUTTLE
     TRACKER           **"
9090  PRINT "**           BY PHIL
    IP CHIEN           **"
9100  PRINT "**  (C) 1985 ANTIC
    PUBLISHING, INC.  **"
9110  PRINT "**     II COMUTING
    VOLUME 1 NO. 4     **"
9120  PRINT "******************
    *******************"
9130  PRINT : PRINT
9140  PRINT "ORBIT: 1) 28.5  - D
    EPLOY SATELLITES"
9150  PRINT "        2) 57.1  - E
    ARTH OBSERVATION"
9160  PRINT
9170  INPUT "WHAT KIND OF MISSIO
    N?";MI
9180  PRINT : PRINT
```

continued on next page

```
9190  INPUT "ALTITUDE (KM) ?";AL
9200  PRINT : PRINT
9210  INPUT "LENGTH OF FLIGHT D/
    HH.MM ?";LF$
9220  VTAB 21: POKE  - 16304,0: POKE
     - 16297,0: REM  SET GRAPHIC
    S MODE
9230  PRINT "0....3....6....9...
    .12...15...18...21..."
9240  INPUT "WHICH TIME ZONE?";T
    Z
9250  INPUT "LAUNCH TIME HH.MM ?
    ";LT$
9260  REM  * SETUP CONSTANTS AND
    FUNCTIONS
9270 TZ$ = "LT ": REM  LOCAL TIM
    E
9280  IF TZ > 9 AND TZ < 14 THEN
    TZ$ = T$(TZ): REM  INSIDE CO
    NTINENTAL US
9290  IF TZ = 18 THEN TZ$ = "GMT
    ": REM  ZULU TIME
9300 LT =  VAL ( LEFT$ (LT$,2)) *
    60 +  VAL ( RIGHT$ (LT$,2))
9310 LF =  VAL ( LEFT$ (LF$,1)) *
    1440 +  VAL ( MID$ (LF$,3,2)
    ) * 60 +  VAL ( RIGHT$ (LF$,
    2)) - 6
9320 KT = 1579806 /  SQR ((AL +
    6378) ^ 3): REM  KEPLER'S 3R
    D LAW
9330 KD = 37851 /  SQR (AL + 637
    8): REM  DISTANCE CONSTANT
9340 L0 = 213:L8 = L0 - 140: REM
    0 & 180 LONGITUDE
9350 LK = 152: REM  KSC LONGITUD
    E
9360 C(0) = 2:C(1) = 3:C(2) = 6:
    REM  RED WHITE & BLUE ORBIT
    COLORS
9370 OO = 1:F = 0:DT = .4
9380  DEF  FN Y(X) =  INT ( SIN
    (X * KT / 41 - A(MI,1)) * A(
    MI,0) * 1.0526 + 90)
9390  DEF  FN M(X) =  INT (X -  INT
    (X / B) * B): REM  MOD FUNCT
    ION
9400  REM  * SETUP SCREEN
9410  HCOLOR= 3: HPLOT 0,90 TO 2
    79,90: REM  EQUATOR
9420  HPLOT L0,0 TO L0,159: HPLOT
    L8,0 TO L8,159: REM 0 & 180
    LONGITUDES
9430  HPLOT LK,0 TO LK,159: REM
    KSC LONGITUDE
9440  PRINT : PRINT : PRINT : REM
    SCROLL UP SCREEN
9450  VTAB 21: PRINT "ANG ";A(MI
    ,0);: POKE 36,11: PRINT "ALT
    ";AL
9460  VTAB 23: FLASH : PRINT "LA
    UNCH": NORMAL
9470  RETURN
9480  DATA 28.5,1.57,68,57.1,2.7
    ,17
9490  DATA PST,MST,CST,EST
```

TYPO II TABLE

Code	Line#	Code	Line#	Code	Line#
II	10	PJ	2180	HC	9180
KC	20	XI	2190	MH	9190
SW	30	SV	2200	HC	9200
BQ	40	PK	2210	RJ	9210
UY	90	FF	2220	YP	9220
HI	100	ND	2230	AI	9230
GU	200	HE	2240	UD	9240
FY	1000	AU	2250	ZL	9250
YB	1010	XJ	2260	OC	9260
ZZ	1020	HB	2270	UE	9270
HQ	1030	GK	2280	XN	9280
JM	1040	GJ	2290	DA	9290
FX	1050	NO	2300	SE	9300
TX	1060	UX	2310	NM	9310
GV	1070	LM	2320	AB	9320
ZZ	2000	EY	2330	OW	9330
ZK	2010	LU	9000	II	9340
HQ	2020	RN	9020	XW	9350
WN	2030	BV	9030	KW	9360
GR	2040	GQ	9040	DN	9370
VN	2050	JE	9050	QP	9380
FF	2060	XS	9060	YM	9390
LR	2070	US	9070	CR	9400
NA	2080	QD	9080	FB	9410
OH	2090	LI	9090	GI	9420
JK	2100	WD	9100	FS	9430
HR	2110	QT	9110	NN	9440
GD	2120	US	9120	XG	9450
TM	2130	HC	9130	OX	9460
DD	2140	NV	9140	GV	9470
FW	2150	JW	9150	AQ	9480
XP	2160	HE	9160	RT	9490
AA	2170	US	9170		

Total checksum = 4100727

II ERR IS HUMAN

The editors of II Computing are pleased to announce that the program listings in the Dec/Jan and Feb/Mar issues were relatively clean. As this issue goes to press not a single bug has been reported. However, in the Music Graph article from our Feb/Mar issue we've discovered a discrepancy between the line numbers in the BASIC listing on page 55 and the program breakdown on page 39. Reducing the line numbers in the program breakdown by 50 will correct this discrepancy. We apologize for this oversight.

CAUZIN SOFTSTRIP

(See text box, page 27.)

Note: The Cauzin Softstrip Reader will not work in conjunction with any accelerator boards for the Apple II. Be sure the Apple is running at normal speed before attempting to read the Softstrip.

1 2 3

Science Toolkit (Master Module)

by JOHN DIPRETE

SCIENCE TOOLKIT
(Master Module)
Broderbund Software, Inc.
17 Paul Drive
San Rafael, CA 94903-2101
(415) 479-1170
Apple II+/IIe/IIc
64K
printer optional
(Apple II+
requires joystick port adapter)
$59.95.

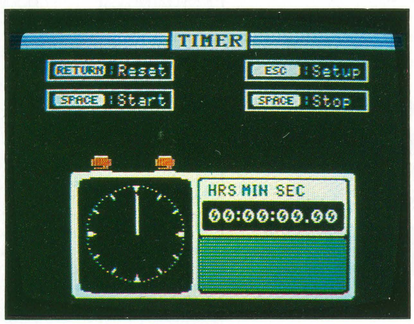
Tread in the famous footsteps of Galileo, Copernicus and Newton. Penetrate the mysteries of nature, probe the laws of matter and energy. Perform classic experiments with your Apple, in a way no master of the past could have dreamed possible.

Your entry into this realm of exploration requires **Science Toolkit**, the first in a series of projected laboratory modules from Broderbund. If you like bargains, for $59.95 this is it. Science Toolkit has outclassed the competition and pioneered a bold new enterprise for responsible, budding researchers.

Packed with this introductory kit are a thermistor (thermometer) and light probe meter (photocell), each attached to a four-foot cord that is plugged into the module's interface box. The latter is a compact unit that comes with a three-foot cord which you plug into your Apple's joystick port.

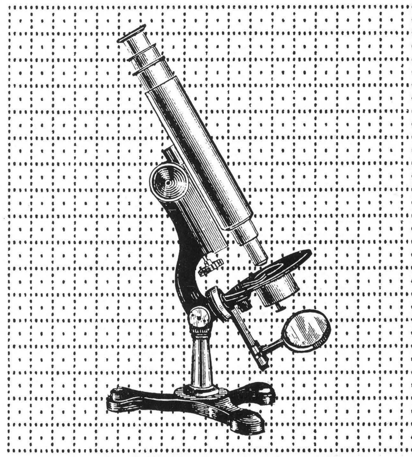
Each tool uses electricity to measure light or heat intensity. The thermistor registers its readings in degrees Celsius and Fahrenheit, and the light meter charts illumination in foot candles. Graphics reveal these measurements on your computer screen. Thus, if you placed your thermistor in cold water, the low-temperature reading would register almost instantly on your Apple monitor.

When you are initially getting the hang of these instruments, be careful not to choose the wrong input socket on the interface box when plugging in the light meter, or else prepare to witness some weird stuff—such as seeing your red thermometer gauge go up or down, in response to light fluctuations around



you. What's more, if the level goes too high, an alarm goes off! On a happier note: expect to enjoy the lively sound effects that occur when the mounting foot-candle columns respond to growing brightness. As the brightness of your surroundings increases, the beats of sound speed up and the pitch rises.

The kit also contains a User's Manual and Experiment Guide,



disk, do-it-yourself cardboard assemblies of several tool accessories, and stick-on labels. The spiral-bound manual is 127 pages long, and offers the clearest, most straightforward directions I have ever read. The contents include Experiments with Plant Growth, Experiments with Chemical Energy, Experiments with Light and Color, and more. A delightful reading experience.

In addition to the light meter and thermistor, two other tools—both represented on your monitor—are available for your experiments. They are the timer and the strip chart. The timer records seconds to the nearest hundredth of a second. The strip chart collects data automatically and can be set for a specific period of time, not exceeding 24 hours. You can scroll the strip chart in either direction to retrieve data. If you own a printer, you can also store the strip chart's data in permanent printed form.

The tools described in the para-

continued on page 80

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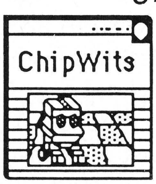

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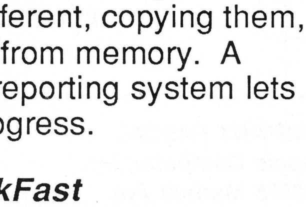


BRAINPOWER, INC.
24009 Ventura Boulevard, Box 250
Calabasas, CA 91302
(818) 884-6911

SCIENCE TOOLKIT
continued from page 78

graphs above can be combined in many ways. For example, you can program the light meter to relay incoming data to the strip chart, and then track down any variations in lighting that have occurred over a given time. For one experiment, you can set up the light meter at a certain entrance in your home (if the cord isn't long enough, you can always buy an extension), and later scan the strip chart to discover the number of times the light has been "tripped" (that is, suddenly lessened in intensity). The total number of fluctuations should reveal how often someone has entered (or left) the room. It's like having a burglar alert system! Not surprisingly, most light-sensitive doors and warning devices based on the photocell rely on a similar arrangement.

Another experiment in the manual suggests you use the timer, synchronized to the light meter, to investigate how gravity affects the rate of rolling objects down a plane—the latter variously inclined at different angles. First, have a friend start the timer at the exact instant an object is released from the top of the plane. When the object passes the light meter rigged at the bottom of the incline, the timer is automatically stopped. This exact moment is frozen on your screen.

A word on safety: children should receive at least a modicum of adult supervision. However, it's like using a chemistry set. If you follow the directions carefully, no hazards exist. The manual repeatedly warns against inappropriate actions, such as touching instruments against any part of the body or submerging them in corrosive substances such as nail polish remover or cleaning fluid. (Did I imagine the slight prickling I felt on my skin when my hand brushed too closely to the light meter? Perhaps it's worthy of note. However, I hasten to add that the experience wasn't at all "shocking.")

As long as you take the proper precautions, Science Toolkit appears to be a learning tool *par excellence*, and it should sharpen the wits and curiosity of the everyday science buff.//

John DiPrete has reviewed software for various publications in the past three years. His technical work has been cited in Physics Abstracts.

Instant Pascal

by CANDYCE M. ANDERSON

INSTANT PASCAL
Apple Computer, Inc.
20525 Mariani Ave.
Cupertino, CA 95014
(408) 996-1010
Apple IIc or IIe with 128K and at least 1 disk drive
mouse and 80-column monitor is optional
$140

Apple II Instant Pascal, a sophisticated window-oriented introduction to programming, is an educational package created by Robert Moll and Rachel Folsom along with THINK Technologies, Inc. Included in the package is a textbook (prepared by Houghton Mifflin Co.), a Pocket Guide to Instant Pascal and three disks.

The well-organized textbook teaches you how to write programs using the Pascal language. The Pocket Guide lists the predefined functions, procedures and syntax of Pascal and also describes the interface with Instant Pascal. The three disks include the master program disk, a tutorial disk and a sample programs disk.

You can use a mouse or the keyboard with Instant Pascal. The mouse makes it much easier and more fun. Whether or not you have programming experience, Instant Pascal provides a nicely organized and easy way to learn to program. It can be used as an introductory Pascal course in school or at home.

Like its sister language, Macintosh Pascal, Instant Pascal is designed with pull-down menus. The RUN menu has several different execution modes. From this menu you can run your program or select STEP, which walks you through the execution of your

continued on page 82

INSTANT PASCAL
continued from page 80

program. If you select STEP-STEP, you can sit back and watch a step-by-step execution of your program. Another menu, the WINDOWS menu, makes Instant Pascal a unique tool for programming in Pascal on the Apple.

You compose and edit your program in the program window and watch it run in the text or drawing window. Another window, the instant window, allows you to type in a valid Pascal statement and execute it right away to see how it will work. For debugging, the observe window allows you to enter an expression or variable name, then select STEP-STEP from the RUN menu and watch its value change as it automatically steps through your program. These menus provide a clear learning approach to Pascal because you see how each line of instruction performs.

Most Pascal languages need a compiler to translate the program into machine code for execution. Compiling often takes a lot of time, even if you only make a small change to the program. Instant Pascal uses an interpreter to do the translation while your program is running, statement by statement. Using an interpreter instead of a compiler lets you experiment without going through the time-consuming process of compiling.

However, execution speed is sacrificed. I wrote a small program using a loop to output the numbers from 1 to 100, and it took approximately two minutes. This makes Instant Pascal an inadequate language for developing professional applications. Instant Pascal is best as an instructional package, providing an upward path to the Mac.

Instant Pascal accesses the disk drive a lot. Apparently, the interpreter and the program editor are too big to reside together in memory.

The editing and formatting features of Instant Pascal are great. With the mouse, it is a breeze to move the cursor to any line you want to edit. All the predefined Pascal commands are in boldface. If you press RETURN at the end of a statement you have typed, that statement is automatically formatted with the proper indenting. These features help make your program listing easy to read. Unlike most Pascal languages, this includes instructions for drawing lines, circles, rectangles and ovals.

Although the price is a bit steep, Instant Pascal is a creative and innovative approach to programming for beginners.//

Candyce M. Anderson is a student of mathematics at Sonoma State University in the heart of wine country. She has had an Apple nestled in the grapes since 1978.

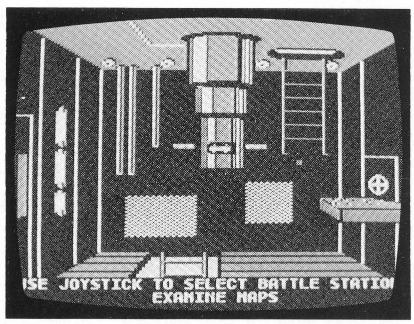
Silent Service

by RICH MOORE

SILENT SERVICE
MicroProse Software
120 Lakefront Drive
Hunt Valley, MD 21030
(301) 667-1151
64K
joystick
$34.95

Sid Meier and his team of simulation experts at MicroProse have outdone themselves with **Silent Service**, a re-creation of submarine operations in the Pacific during World War II. As a U.S. fleet submarine skipper, you can almost smell diesel oil and feel the deck rolling beneath your feet while searching the western Pacific for Japanese shipping.

Beginners can immediately take up target practice, and veterans can proceed to complex, historically accurate and challenging war-patrol scenarios. In-between are a variety of convoy actions, good for practicing tactics. You can gradually make



things more realistic by limiting detection capability, allowing convoys to zig-zag, contending with

continued on page 84

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Kobayashi Alternative	$40	$27
Lordlings of Yore	$40	$30
Micro League Baseball	$40	$27
MLB Team Disk	$20	$15
MLB General Manager	$40	$27
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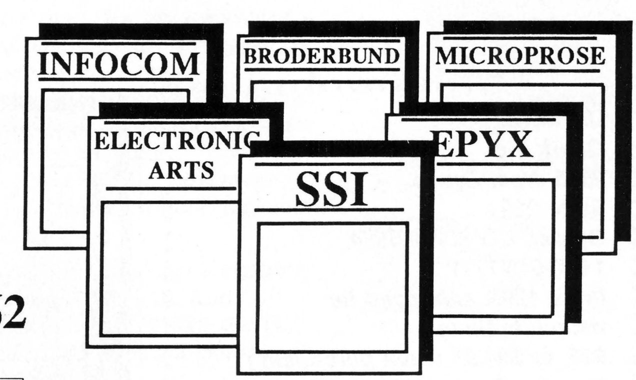

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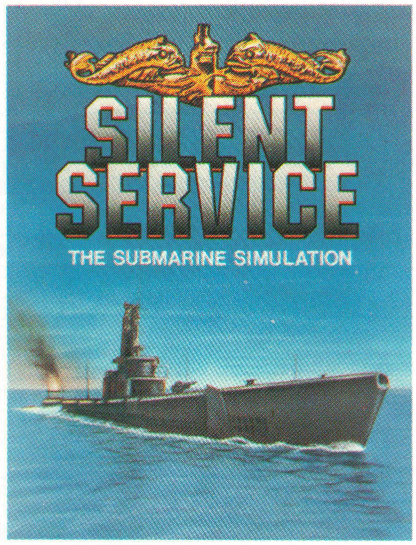
SILENT SERVICE
continued from page 82

dud torpedoes, performing repairs only in port and taking on tougher Japanese escorts. When you get an experienced seaman's eye, you can elect to manually provide "angle on the bow" for torpedo shots.

Some things are not optional, such as fuel and battery consumption and number of torpedoes remaining, as well as which tubes (bow or stern) they're in! Exceeding crush depth is not recommended. The sub can run aground in shallow water or be rammed by a ship if you're not deep enough! Depth charges and destroyer gunfire can ruin your whole day, but a thermal gradient in the water may save your ship. You have 80 shells for a four-inch deck gun, which may require some range adjustment for target motion.

The graphics are superb. Master control is from the conning tower screen, which can then take you to the bridge for a wide-angle view of the area. Maps and charts provide a bird's-eye tactical plot, and the instruments tell you what the sub is



doing. Damage reports give you a full-length view of your "boat" and the status of its major components. The view of cargo ships and tankers through the attack periscope is terrific, especially when it also shows the wakes of a spread of torpedoes speeding off toward their targets. The sight of angry escorts turning toward you will generate more than a little anxiety, particularly where the water is shallow.

The manual is extremely well done. A quick-start section lets you jump right in for target practice or convoy hunting, but most people will need to refresh their submarine tactics before going on to the more advanced scenarios. The manual provides everything you need to know in several interesting sections.

Keep in mind that submarine warfare is slow . You must evade the escorts to do any damage. To make the simulation run faster, you can accelerate the game rate to 32 times real time. Patrol mission transit time is effectively "stepped" by driving the sub across the patrol screen with the joystick. A submariner once told me, "You guys are in too much of a hurry. The destroyers want to strike at 0420, the aviators go when it's dark outside and both of Mickey's hands are on the 4, and the submarines just attack on Tuesday." Be patient, use stealth, and good hunting!//

Rich Moore is a naval flight commander and currently the computer simulations manager for the Naval War College's Computer Wargaming System in Newport, Rhode Island.

Catalyst

by MICHAEL J. BIANCALANA, Technical Assistant

CATALYST
Quark Inc.
2525 West Evans
Suite 220
Denver, CO 80219-5554
1-800-543-7711
IIc or 128K enhanced IIe
mouse optional
$99, or $34.95 when purchasing the new Apple UniDisk 3.5

Move over Macintosh! **Catalyst**, the new desktop interface from Quark, gives Apple II users Mac-like point and click access to all their most frequently-used programs. Like the Mac, Catalyst features mouse control, windows, icons, and a menu bar complete with pull-down menus. When you purchase the new UniDisk 3.5, Apple will include this

continued on page 86

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The Tax Advantage takes you line-by-line through Form 1040 and the other most common tax forms. It asks you for information in plain English, and you type in the numbers. Additionally, all forms and schedules (including Form 1040) are printed in IRS acceptable format.

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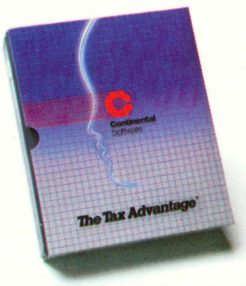

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CATALYST
continued from page 84

wonderful program selector for an additional $34.95.

To use Catalyst's powerful features you need an Apple IIc, or 128K enhanced IIe, and for best results I recommend using both a mouse and a high-capacity drive supported by ProDOS, like Apple's new 3.5" UniDisk. (The mouse and the disk drive are optional but highly desirable.) The 3.5" disks can hold up to 800K (as opposed to 143K with standard 5¼" disks).

Catalyst also works with hard disks and RAM disks. RAM disks provide the fastest access time and are available as plug-in boards containing extra memory configured to look like a disk drive.

Before using Catalyst, you'll need to copy it and the programs you'll use with it onto a single high-capacity ProDOS volume on a 3.5" disk, hard disk or RAM disk. Then you'll install your programs onto the Catalyst desktop—an easy matter, even for many copy-protected programs. A special Catalyst feature lets you transfer copy-protected programs to your disk by locking them to the Catalyst serial number.

Once you've installed your most frequently-used programs, you work with them from the "desktop." This is a well-drawn screen with a pointer, an arrow that marks your position on the desktop, a menu bar at the top of the screen featuring many pull-down menus, small labeled pictures of disks (icons) for all the ProDOS volumes connected to your Apple, and a picture of a trash can used for removing files and programs.

Catalyst copies and deletes files easily using the built-in file commands available either through the drop-down menus, or as a series of point, click and drag operations with the mouse. To catalog a disk, simply move the pointer to a disk icon and click the mouse button twice. A window opens on the desktop displaying ProDOS volume information, the total number of blocks free and used, and an icon for each resident program.

For me, Catalyst's most valuable feature lies in its ability to run a program, quit, and then return to the desktop. I can use Appleworks, work with Mousepaint, run the System Utilities, and return to Catalyst without having to switch a single disk. When I want to run a program I just double click the mouse button on a program icon, the desktop disappears and my program begins executing. The "Quit" option of most commercial software products returns me directly to the Catalyst desktop instead of presenting those annoying ProDOS "TYPE PREFIX" and "PATHNAME" messages. If I'm programming in Applesoft BASIC, typing "BYE" at the prompt returns me to the desktop.

The Catalyst Master and Backup come on a two 3.5" or 5¼" disks bundled with ProDOS, BASIC, Mousepaint, System Utilities, the ProDOS FILER, and a Quick Copy Program. In addition, Catalyst also features several built-in desktop accessories: a clock, calculator, puzzle, clipboard for cut and paste editing, and a Change Desktop function with which you can redesign your desktop—black on white, white on black, stripes, apples... In addition, you also get a well-written 135-page manual.//

The Bard's Tale

by JAMES V. TRUNZO

TALES OF THE UNKNOWN: VOLUME 1—THE BARD'S TALE
Electronic Arts
2755 Campus Dr.
San Mateo, CA 94403
(415) 571-7171
64K
$44.95

A fantasy role-playing game has arrived on the market that out-wizards Wizardry and out-fantasies Phantasie! And that, fans of swords and sorcery, is high praise indeed, for both Wizardry and Phantasie are excellent products. However, **The Bard's Tale** (officially titled **Tales of the Unknown: Volume 1—The Bard's Tale**) takes all the elements that comprise the best of computer role-playing and then goes them one better, making this the closest thing to actually playing Dungeons & Dragons with a group of friends and a Dungeon Master.

You'll notice one difference between this game and others of its genre the minute you open the package. There's a full-color map of a large town, complete with inns, temples, towers, a castle, statues and more than 200 houses. An entire adventure above ground beckons, before you even begin exploring dungeons (all of which are hidden, by the way).

The structures in the town are truly functional. Inns provide your adventurers with much-needed gossip and your Bard character with his much-needed beverage. The priests of the temples can heal your characters' wounds, raise the dead and restore lost levels if your group has had an unfortunate run-in with vampires or ghouls. And somewhere in the sprawling town is Garth's Equipment Shoppe, Roscoe's Energy Emporium (for recharging magic) and The Review Board where your characters can advance levels as they gain experience. The statues? Well, let's just say that they serve a purpose beyond mere decoration.

I mentioned a Bard character. This is a type of character relatively new to computer adventure gaming. The Bard was once a warrior and can still fight quite well, but now uses his love for music to aid him and his friends in any number of ways. His songs have magical effects on those who hear them. But don't let the Bard's throat get dry—if he can't sing, he can't help you nearly as much.

Another area handled with more sophistication and variety than usual is the magic system in The Bard's Tale. Magic Users can be one of four classes: conjurer, magician, sorcerer and wizard. Each of these classes uses a different type of magic. For example, conjurers create physical things such as fire and light, while wizards summon supernatural creatures. Characters steeped in magic may start out in one class and, after mastering all levels in that class, switch to another discipline. A Magic User who attains the top rung in all four classes becomes an incredibly powerful character called an Arch-Mage. Considering the threats that lie in wait for your group (traps and tricks as well as monsters), you'll need an Arch-Mage to survive.

The Bard's Tale is also visually interesting. As you travel about town, buildings scroll past you on either side, creating a believable three-dimensional effect. But the aesthetic pleasures of the dwellings in Skare Brae pale in comparison with the delightful animation of the people and monsters you encounter. An innkeeper lifts a mug while offering the services of the tavern; dragons stare malevolently before sending fireballs bursting toward you; wolves' eyes dart from side to side, sizing up their enemy—you! This type of animation is an especially nice touch.

This game out-wizards Wizardry and out-fantasies Phantasie.

The Bard's Tale is twice as big as a Wizardry scenario, with 16 full-colored, incredibly intricate dungeons, 85 magic spells, and over 400K of programming. It comes complete with logic puzzles, magic items used for discovering their purpose, and traps that may be more of a threat than the creatures you'll discover. Best of all, The Bard's Tale lets you transfer your beloved Wizardry or Ultima characters over to it, providing your time-nurtured adventurers with the ultimate adventure.//

James V. Trunzo teaches high school and designs fantasy role-playing games.

Time for Your Apple

II Computing's Clock Survey

by FRANK HAYES, Assistant Editor

Name	Manufacturer's address and phone	Computer	Internal or External	Occupies slot #	Special instruction procedures	Batteries
AE Timemaster II H.O.	Applied Engineering P.O. Box 798 Carrollton, TX 75006 (214) 241-6060	Apple II+ or IIe	Internal	Any except 0 (slot 4 recommended)	Set four DIP switches on card, install in slot	NiCad, not replaceable, 20-year life claimed
Business Card	Street Electronics Corporation 1140 Mark Avenue Carpinteria, CA 93103 (805) 684-4593	Apple IIe	Internal	1, 2, and 5 or 7	Set one jumper and 10 DIP switches on card, install in slot, mount cables	Replaceable, 1 year life claimed
LiveWire	Street Electronics Corporation 1140 Mark Avenue Carpinteria, CA 93103 (805) 684-4593	Apple IIc	External	N/A	Attach to printer port	Lithium, replaceable, 1 year life claimed
Mi-ChRon Time Stamp Module	The Mi-ChRon Company 2119 Stuart Street Longmont, CO 80501 (303) 651-1843	Apple II+ or IIe	Internal	Any except 0	None	Replaceable
ProClock	Practical Peripherals, Inc. 31245 La Baya Drive Westlake Village, CA 91362 (818) 991-8200	Apple II+ or IIe	Internal	Any except 0 (slot 4 recommended)	Set four DIP switches on card, install in slot	Lithium, not replaceable, 10 year life claimed
ProClock IIc	Practical Peripherals, Inc. 31245 La Baya Drive Westlake Village, CA 91362 (818) 991-8200	Apple IIc	Internal	N/A	Open IIc case (voids warranty), pull and re-install CPU, set three jumpers on card	Lithium, not replaceable
Seiko Datagraph 2001	Creative Peripherals Unlimited, Inc. 22952 Alcalde Drive Laguna Hills, CA 92853 (800) 228-1165	Apple II, II+, IIe or IIc	External	N/A	Plug interface into joystick port or serial port	AAA batteries
Thunderclock Plus	Thunderware, Inc. P.O. Box 1299 Orinda, CA 94563 (415) 652-1737	Apple II+ or IIe	Internal	Any except 0	None	Alkaline, replaceable, 4 year life claimed
Time-Trax	Creative Peripherals Unlimited, Inc. 22952 Alcalde Drive Laguna Hills, CA 92853 (800) 228-1165	Apple II+, IIe or IIc	External	N/A	Plug into joystick port or serial port	AA alkaline batteries
IIc System Clock	Applied Engineering P.O. Box 798 Carrollton, TX 75006 (214) 241-6060	Apple IIc	External	N/A	Plug into serial port	AA alkaline batteries
IIc System Clock	Creative Peripherals Unlimited, Inc. 22952 Alcalde Drive Laguna Hills, CA 92853 (800) 228-1165	Apple IIc	External	N/A	Plug into serial port	AA alkaline batteries

Does your Apple need a clock?

It's a reasonable question. A clock on your computer does what other clocks do: it tells you the time, and, like an alarm clock, can let you know when a particular time has arrived. Generally, you'll use a clock on your Apple for three things: (1) finding out what time it is, either on your screen or as part of a program, (2) automatically marking a disk file with the time and date each time the file is updated, (3) generating an interrupt that signals the computer to stop what it's doing and take care of some special task, such as scanning the keyboard or joystick ports.

Ask yourself these questions: Would you like your communications program automatically dial up CompuServe to (or other on-line services) to download information while you sleep—and phone rates are lower? Will it help you to know when each of your disk files was last updated? Do you want to automatically perform timing in BASIC programs? If the answers are yes, your

continued on next page

ProDos compatible	Patch for DOS 3.3 date stamping	Interrupts	Other functions on card	Type of manual	Price	Name
Yes	Yes	1/1024 sec, 1 sec, 1 minute, 1 hour	BSR controller interface (optional, $49)	40 pages, step-by-step programming examples, some source code, utilities on disk	$129	**AE Timemaster II H.O.**
Yes	No	1/1024 sec	Printer interface, serial port, print buffer (optional)	82 pages, programming examples, utilities on disk	$219.95	**Business Card**
Yes	No	None	Serial-to-parallel printer cable	40 pages, programming examples, utilities on disk	$100	**LiveWire**
Yes	Yes	No	None	16 pages, utilities on disk	$65	**Mi-ChRon Time Stamp Module**
Yes	Yes	1/1024 sec, 1 sec, 1 minute, 1 hour	None	64 pages, programming examples, utilities on disk	$159	**ProClock**
Yes	Yes	1/1024 sec, 1 sec, 1 minute, 1 hour	Screen dump	57 pages, step-by-step programming examples, diagrams and instructions, utilities on disk	$159	**ProClock IIc**
Yes	No	No	Wristwatch interface	80 pages, programming examples, illustrations, utilities on disk	$199	**Seiko Datagraph 2001**
Yes	Yes	1/2048 sec, 1/256 sec, 1/64 sec	BSR controller (optional)	60 pages, programming examples, utilities on disk	$150	**Thunderclock Plus**
Yes	No	No	None	26 pages, utilities on disk	$120	**Time-Trax**
Yes	No	No	None	10 pages, programming examples, utilities on disk	$79	**IIc System Clock**
Yes	No	No	None	4 pages, utilities on disk	$79	**IIc System Clock**

TIME FOR YOUR APPLE
continued from page 89

Apple needs a clock.

Which clock do you choose? Along with price, you should consider the complexity of the installation and how compatible the clock is with your existing hardware and software. Installing a clock on an Apple II, II+ or IIe can mean simply inserting the clock card in a slot and running the installation software. But some cards must go in a particular slot; some are multifunction cards that require special installation; some require lots of switch-flipping and jumper-setting.

For a IIc, installation may involve just plugging the clock module into the back of the computer, or it may require opening up the computer (which voids the warranty) and installing piggy-back boards inside.

Compatibility can be another problem. Must you modify either hardware or software to install the clock? That may limit your ability to move programs to and from your computer. Some programs expect to find a clock only in a particular slot, or expect the clock to provide the time and date in a particular format. If you've made a big investment in your software, you'll probably want to buy a clock that matches it.

Still another consideration is the clock's battery. Does the battery recharge itself? Can it be replaced? Find out how long it will last.

Multifunction cards often include a clock, and that can be an added plus, but consider price, installation complexity, and compatibility when you look at a multifunction card, too.//

Let's Talk

Russ Systems has a lot to say about telecommunications

by KEN GOEHNER

LET'S TALK
Russ Systems
320 Dufour St.
Santa Cruz, CA 95960
(408) 427-0310/online
(408) 427-1540/voice
128K
Apple IIe, IIc or III
two disk drives and ProDOS
$175.00

There's an exciting new star in the field of microcomputer telecommunications. Russ Systems has developed what may well be the most inexpensive, easy-to-use, and versatile online interactive database for the Apple IIe, IIc, and III on the market today. Called **Let's Talk**, this program allows you to set up and operate your own custom information-exchange network with no previous telecommunications experience and a minimum of computer knowledge.

Let's Talk is not a bulletin board system (BBS) per se. While there are some similarities, Let's Talk is best described as an electronic messaging system—a sophisticated multi-tiered communications package that can operate unattended 24 hours a day. You can access it with virtually any computer equipped with a modem from anywhere in the world, and it will automatically shift to match a caller's dial-in speed up to 2400 baud. Let's Talk is also completely menu-driven—all the menu selections and command options including "Help" are always on the screen, making this program a joy to use for the novice and expert alike.

The functions provided by Let's Talk fall into four basic categories: 1. presenting a library of information to your callers 2. accepting messages, orders and documents 3. electronic mail 4. teleconferencing.

All these functions can be presented in both public and private "branches" with various levels of password protection. Both the public and private branches of the online presentation, when selected, present base menus of their contents. These menus can contain up to ten entries which a caller may choose. Some of these selections could cause other submenus to appear with up to ten further selections. Thus users can file a large library of update information under headings, subheadings

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Two New Newsletters

Here are two newsletters that may be of interest to ***II Computing*** readers.

Open-Apple is a monthly newsletter edited and written by Tom Weishaar. Weishaar, who wrote the "DOStalk" column in *Softalk* magazine, aims at intermediate-level Apple users. He writes in a clear, lively style, and he's not afraid to get technical. In the "Ask (or tell) Uncle DOS" column, Weishaar answers questions from readers, and when he's guessing, he tells you ("Your problem with the Qume and AppleWorks is beyond me," he tells one reader in a recent issue; "I don't even know what a Printer Optimizer is"). Each eight-page issue of Open-Apple is a font of useful information and practical ideas for using your Apple. Subscriptions are $24 per year from Open-Apple, 10026 Roe Avenue, Overland Park, KS 66207.

A very different sort of newsletter is **QuestBusters**, "the Adventurer's Newsletter," written by Shay Addams. It runs 12 pages each month, and is filled with reviews of adventure games for Apple, Atari, Commodore and IBM computers. There's also a column for swapping hints on adventure games—and one for swapping the games themselves, too. $15 per year from QuestBusters, 202 Elgin Court, Wayne, PA 19087.//

LET'S TALK
continued from page 90

and sub-subheadings. When these functions are fully utilized, users can access over one thousand unique files of public information in a minimum of three keystrokes. Private branches of information can require different passwords as assigned by the system's operator (sysop) and as the system branches, more and more passwords may be required.

Let's Talk has a virtually unlimited range of business and personal applications—it can run your Apple and modem unattended and put your home, business or school online around the clock, answering your calls, providing information and services, and accepting data and documents uploaded into the private and public branches. With Let's Talk your computer can advertise and support products and services, list catalogs and special event calendars, accept orders while providing electronic mail and specialized information resources to callers anytime.

The uses and potential uses of Let's Talk are as different and varied as the imaginations of the users themselves. There are literally hundreds of Let's Talk databoards operating around the world right now from extended families staying in touch to online medical advice. There are some especially innovative and exciting applications that may spark the imaginations of users and potential users alike. Apple Computer itself is using Let's Talk to supply online grant information and support by the Apple Corporate Grants Division.

In the area of education Dr. Pat O'Donnell, of the Discovery School in San Francisco, is using Let's Talk as a repository for homework assignments, as a staff and student bulletin board and an in-house electronic mail service. They also publish a monthly online newsletter to other members of the National Independent Public School Association and use Let's Talk to swap correspondence around the country.

In San Antonio, Alex Garcia uses Let's Talk to run the Newscom Data Service, an online news service geared to the unique needs of local TV and radio stations. Newscom covers news specific to the San Antonio area—traffic, criminal activity, politics, weather, special events—as well as provides special reports in the areas of medicine, business, science, consumer information and education. In addition Newscom acts as a "wire service," accessing data from national and international news databases for local use. The net effect is that Newscom has actually enhanced local news coverage while cutting the costs to local media by just about eliminating redundant news gathering efforts and time lost chasing false news leads.

Finally Russ Systems itself uses Let's Talk as a marketing and support tool. By calling them via computer, you can sample the program first hand and find out how easy it is to use. You can go for a tour of the system, leave messages, ask questions, order and pay for a Let's Talk system and request technical assistance 24 hours a day.//

Ken Goehner is a free-lance writer and marketing consultant to the microcomputer industry. He lives in Oakland, California.

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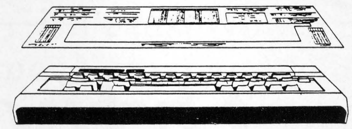

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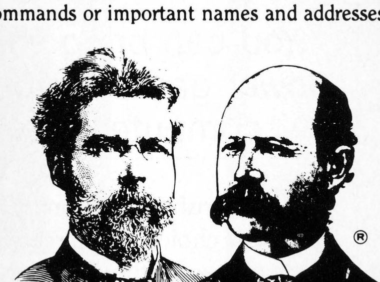

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```
COUNT WORD
----- ------------
10    A
1     ADDRESS
1     ADDRESSES
6     ALL
1     ALMOST
1     ALWAYS
```

```
1     WORK
1     WRITING
9     YOU
1     YOU'VE
8     YOUR
------------------
TOTAL WORDS: 402
CHARACTERS : 2013
CHARS/WORD : 5.0
```

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MacroWorks' *Alpha-Cat* program prints a sorted list of all the files (or just the AppleWorks files) on a disk. Perfect for disk I. D. labels!

$34⁹⁵ Friendly and unprotected

MacroWorks is easy-to-use, unprotected and compatible with all Apple IIc's and 128K IIe's. Like all Beagle Bros disks, you can make backups without hassle or special software.

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AD #MW1

Ortho's Computerized Gardening

by ANITA MALNIG, Associate Editor

ORTHO'S COMPUTERIZED GARDENING
Ortho Information Services
575 Market Street
San Francisco, CA 94105
(415) 894-5792
64K, 80 column
ProDOS
will not work with II+
separate versions for IIe and IIc
$49.95

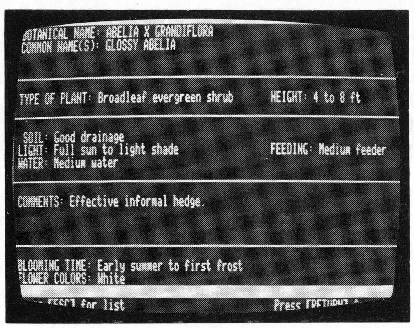
If you garden, you've probably read Ortho gardening books and know these people know their plants. Well, Ortho has put much of their knowledge on disk so you can bring your flower garden into the computer age.

Ortho's Computerized Gardening is essentially a huge database of 750 plants. An individual file for each plant contains the following information: botanical and common names, the type of plant it is (e.g., deciduous tree), its height, the color(s) of its blooming flowers, its blooming season, light, soil, water and feeding requirements and a comment line with remarks such as "semi-evergreen in colder climates."

To begin narrowing this wealth of information you enter your zip code in the "Define Your Growing Region" option of the first menu.

Then you choose the "Plant Selector" option to continue and are presented with the menu that's the meat of the program. If you select either "Botanical name" or "Common name" (the first two menu items) you get a list, possibly a very long one, of all the plants that will grow in your zip code area. (For my San Francisco zip I got 700.) Highlight your choice, using either arrow keys or mouse, and get the plant file described above. I enjoyed browsing through the lists.

When you're ready to get more serious about designing your garden here's what to do. Choose "Type of Plant" option, see a list of choices



You can bring your flower garden into the computer age.

such as "shrub" or "biennial," highlight your choice, and receive a list of all plants in that category that grow in your area. Other options to choose from in this manner are "Height" (anywhere from 1 inch to 100 feet), "Color" (nine choices), "Blooming Season" (13 options), "Light Requirements" and "Water Requirements." Or—you can choose "Personalized Plant List." Here, you

can ask for a groundcover that will bloom purple flowers in early spring, requires half-day sun and medium water. Chances are good you'll get what you ask for—I did.

You can print out any lists that appear on your screen and keep notes on your actual gardening activities using the program's Notebook and Calendar. You'll find, too, that the program's calculator will come in handy.

Ortho's Computerized Gardening doesn't tell you when or how many rows to plant, or how far apart each plant should be. However, the package does include an Ortho book called *Gardening Techniques* which offers some but not all of the additional information you'll need. The package also includes pamplets with brief, basic information on planting

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ORTHO'S COMPUTERIZED GARDENING
continued from page 94

> You can ask for a groundcover that will bloom purple flowers in early spring. . .

flowers and vegetables, although the program itself offers no information about vegetables.

If you have only one disk drive you'll do some disk swapping; the program comes with a two-sided disk (program and data) and you do use both sides. Both are copyable so with two drives you're in good shape. You will, however, need still a third disk for any notes you want to save. The documentation is adequate but wordy; in an attempt to be clear the writer gives you more than you need. You may have to configure the software for your printer; with my ImageWriter I didn't have to, but that may not always be the case.

In spite of these minor drawbacks, this is a program sure to intrigue an avid gardener. And if your local nursery doesn't carry the many species this program suggests, you just may start turning to exotic seed catalogs.//

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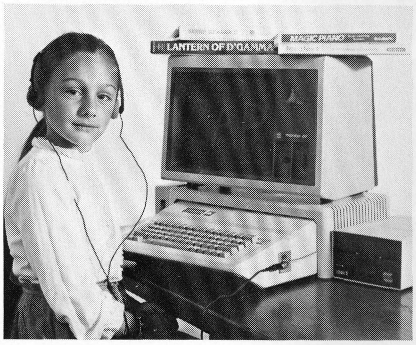


LITTLEJACK

Educational Software Review
1400 Shattuck Avenue, Suite 774
Berkeley, CA 94709
(415) 528-2788
$24.95

LittleJack is a headphone jack that installs easily in any Apple II, II+, or IIe to let you listen to your computer in privacy. The jack and included headphones are designed for libraries and schools where beeps, buzzes, music and explosions from a dozen computers can be a problem. With the special adapter that's included, you can also attach up to seven more headphones to each computer.

MOUSE DESK

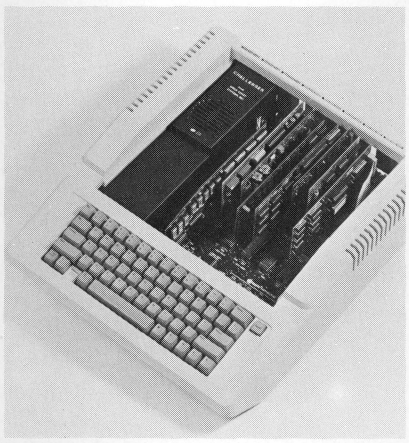
International Solutions
910 West Maude Avenue
Sunnyvale, CA 94086
(408) 773-0443
$39.95

Mouse Desk is a desktop organizer program from France that makes your Apple IIe or IIc act like a Macintosh. It adds icons, windows, and pull-down menus to ProDOS, so that moving, copying or deleting a file becomes a visual operation. Mouse Desk complements, but isn't limited to use with, the other International Solutions Mouse programs: Mouse Word, Mouse Calc and Mouse Budget. The program requires 128K RAM and ProDos, and works best with a mouse (though the keyboard can be used instead).

DIAMOND

Consistent Software, Inc.
1050 Duncan Avenue, Suite G
Manhattan Beach, CA 90266
800-345-3353
(213) 374-2304 (in California)
$69.95

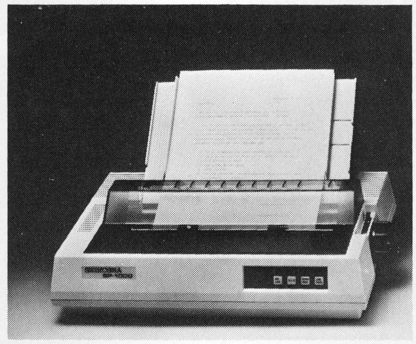
Diamond is a baseball/softball statistics tracking and scoring system. Not a game, it's a database program for coaches and managers who need to know exactly how their players are doing. Diamond lets you keep track of 30 players and 50 games, with more than 70 statistics, box and line scores, and even carpool assignments.



CHALLENGER HARD DISK DRIVE

Space Coast Systems, Inc.
301 South Washington Avenue
Titusville, FL 32781
(305) 268-0872
$1195 (10 MB), $1595 (20 MB)

The Challenger hard disk drive mounts inside your Apple II+ or IIe, replacing the original power supply. The drive comes in a 10- or 20-megabyte size and is highly shock-resistant, which reduces the chance of damage when the computer is moved. Each drive also includes a cooling fan and a new, smaller power supply that, the manufacturer says, is even more powerful than the original.



SEIKO SP-1000 PRINTERS

Hattori Corporation of America
1111 Macarthur Boulevard
Mahwah, NJ 07430
(201) 529-5730
$299

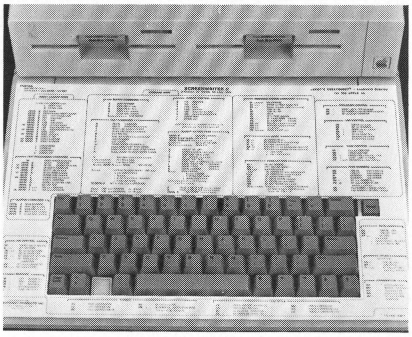
The **Seiko SP-1000** series of dot-matrix printers features automatic paper-loading, left and right margin settings, and a variety of character sets, with print speeds of 100 characters per second in draft mode and 20 cps in near-letter-quality mode. The SP-1000 is available with either a parallel or serial interface; one model, the SP-1000AP, plugs directly into the Apple IIc's printer port.

GET RICH!

Haba/Arrays, Inc.
6711 Valjean Avenue
Van Nuys, CA 91406
800-468-4222
800-367-4222 (in California)
$59.95 each, or all three for $99.95

The **Get Rich!** series consists of three financial planning programs. Financial Strategies helps you make investment decisions; Real Estate Planning walks you through mortgage and lease information; and Insurance Planning lets you decide what type of insurance is best for you. Each program includes worksheets and predefined calculations; Financial Strategies also includes a graphing module, so you can chart your profits.

NEW PRODUCTS



LEROY'S CHEATSHEET KEYBOARD OVERLAYS

P.O. Box 111368
Pittsburgh, PA 15238
(412) 781-1551
$5.95 each

These plastic-laminated keyboard overlays contain commands for frequently-used software. All commands are grouped by function and keystrokes are printed in boldface type; the sheets are die-cut to fit over your keyboard on the IIe. IIc reference cards lie above the keyboard. 20 cheatsheets are available for Apple IIe and IIc including Dos 3.3 commands, AppleWorks, Applesoft BASIC (ProDOS), Flight Simulator II and ScreenWriter II.

TAXWORKS

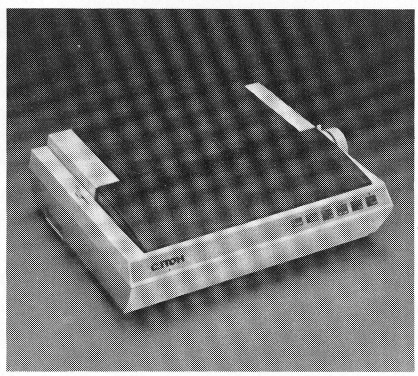
Personal Financial Services
P.O. Box 1401
Melville, NY 11747
(516) 261-8652
$21.95 (postpaid; available by mail only)

Taxworks is a set of templates for AppleWorks that transforms your Apple into a federal tax preparation system. The program does tax calculations, figures the lowest taxes you can pay, and prints out most tax schedules in a form you can file with the IRS.

SCIENTIFIC AND TECHNICAL BOOKS AND SERIALS IN PRINT 1986

R.R. Bowker Company
P.O. Box 1807
Ann Arbor, MI 48106
800-521-8110
$149.95

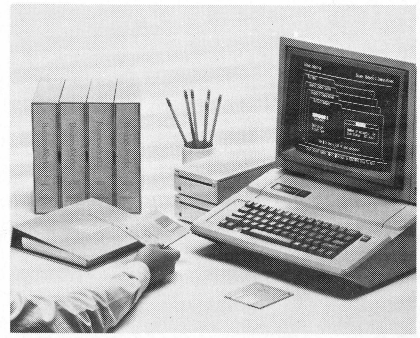
This three-volume set contains more than 4,000 pages listing 132,000 different publications, on topics ranging from pure science to applied engineering. The books, journals, and magazines listed come from 22 nations where vital scientific research is conducted and reported, including the Soviet Union. Full information, including how to order each publication, is included in every entry.



C. ITOH C-310 PRINTER

C. Itoh Digital Products
19750 South Vermont, Suite 220
Torrance, CA 90502
800-423-0300
(213) 327-2110 (in California)
$599

A new 80-column printer from C. Itoh, the **C-310** can print up to 300 characters per second in draft mode, 50 cps in near-letter-quality mode, or 28 cps in letter-quality mode. It also features a graphics resolution of 240×144 dots per inch, a variety of resident character fonts, a semi-automatic paper loader, and either a serial or a parallel interface.



BUSINESSWORKS

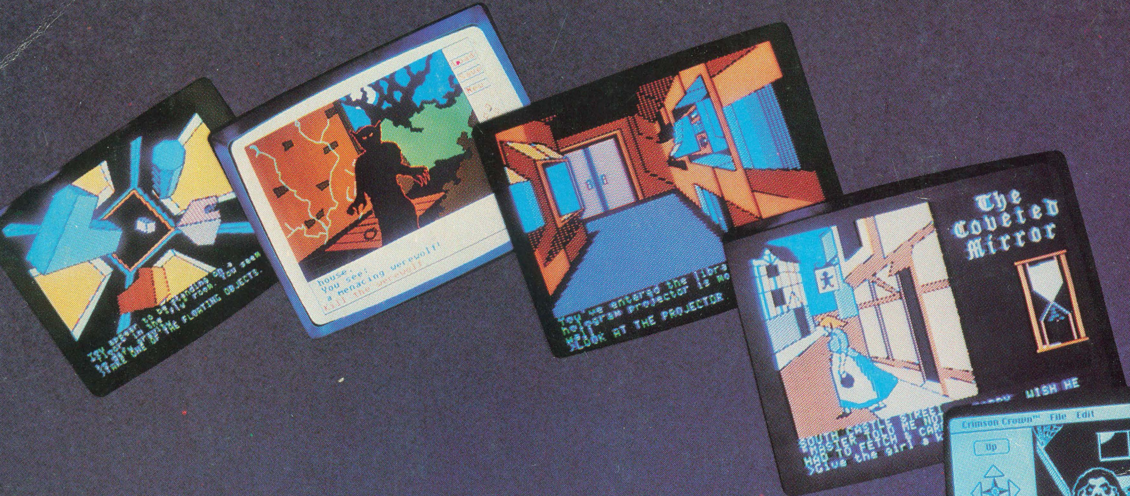
Manzanita Software Systems
1 Sierra Gate Plaza, Suite 200-A
Roseville, CA 95678
(916) 781-3880
$95 for System Manager; $395 each for General Ledger, Accounts Payable, Accounts Receivable and Inventory Control; $445 for Payroll

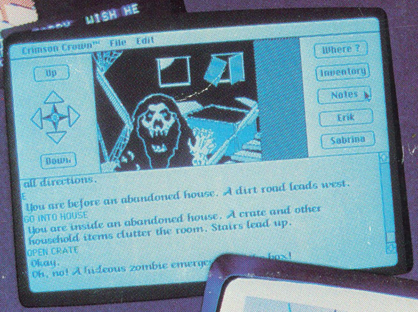
BusinessWorks is a full-featured business accounting system designed for an Apple IIe or IIc with Apple's new 3.5-inch UniDisk drives, or with a RAM card that has a minimum of 512K of memory. BusinessWorks looks and operates like AppleWorks, and comes in six independent modules that can be used separately or together to form a complete accounting system. In addition, the program can transfer spreadsheet information to and from AppleWorks.

UNIT CONVERSIONS

International Computing, Inc.
1501 Monroe
Madison, WI 53711
(608) 257-6648
$49.95

Unit Conversions is a menu-driven program for converting acres to square feet, kilowatts to horsepower, or light years to angstroms. International Computing claims the program offers more than 3,550 conversions, including metric, torque, viscosity and calendar functions.





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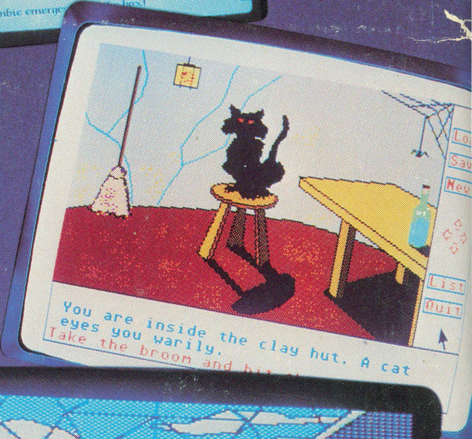

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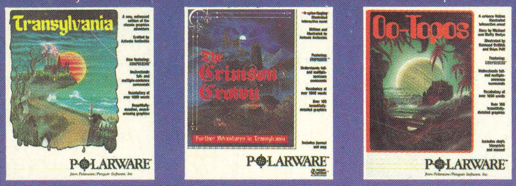

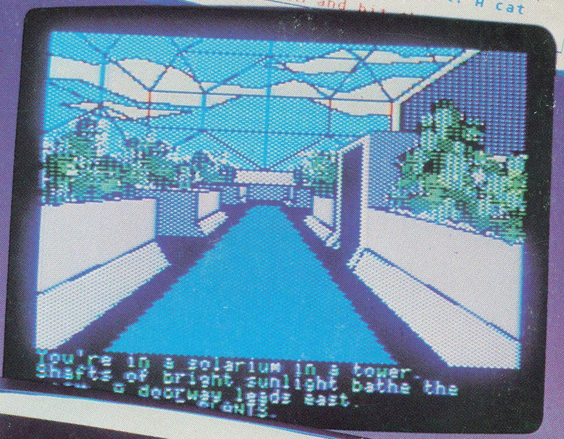

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