Recreational COMPUTING

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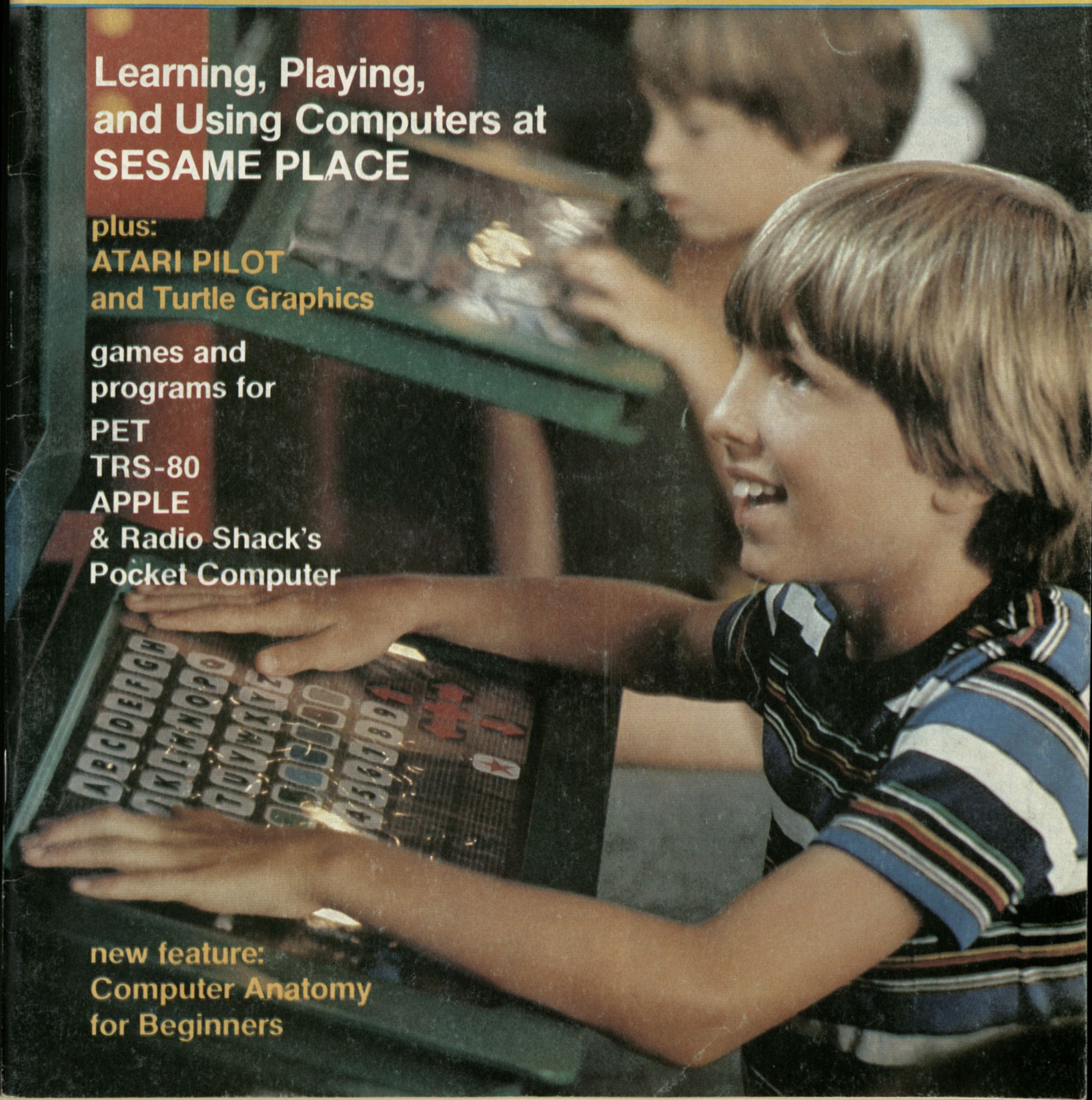
Adventures in Home Learning and Leisure

Vol. 9 No. 6 Issue 51 May - June 1981



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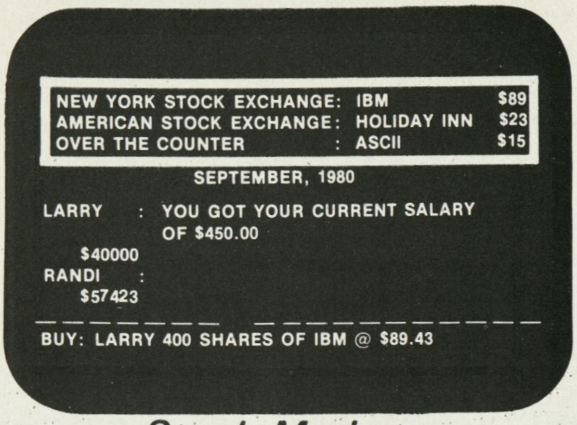
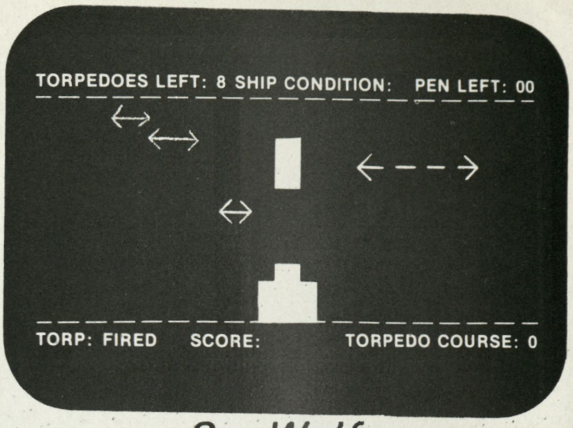


Stock Market



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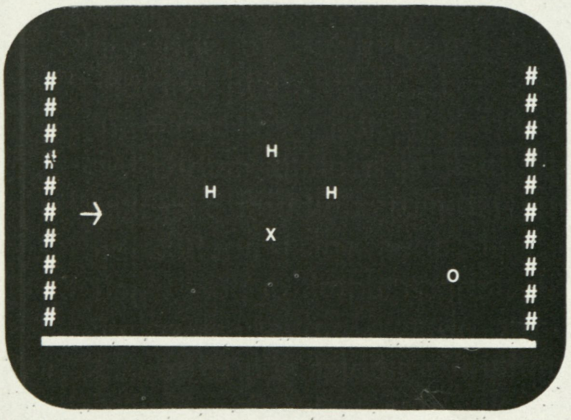
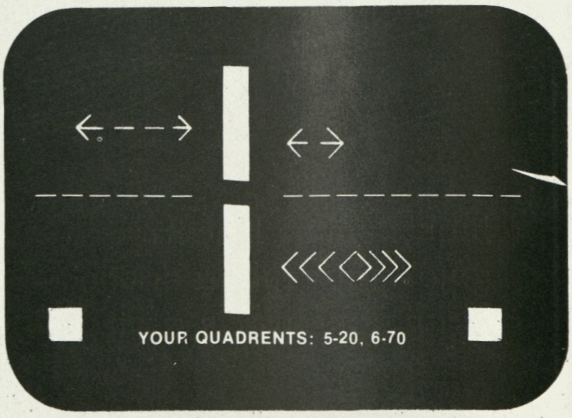


Star Fire



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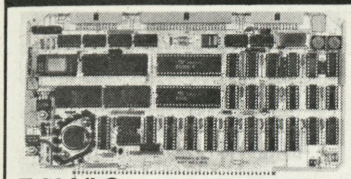

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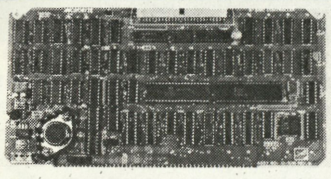

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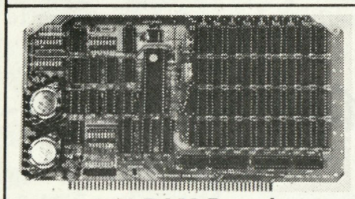

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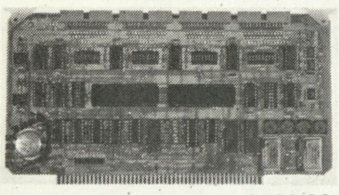

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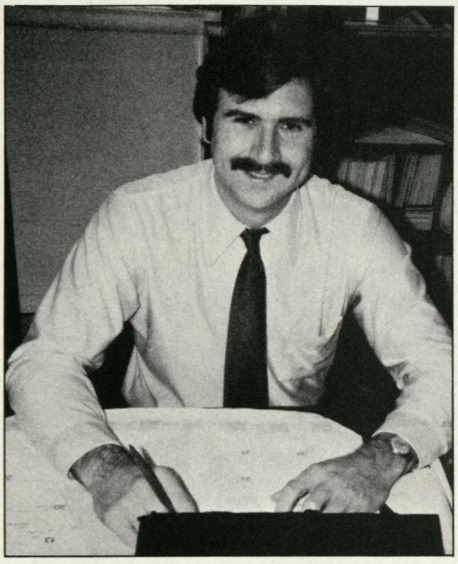
Publisher's Note

I was talking to a customer who recently ambled up the stairs to our offices here in downtown Menlo Park. He, like so many before him, had dropped by out of simple curiosity. I happened to meet him there at the top of the stairs so I gave him a brief tour, showed him our magazines, mentioned ComputerTown, USA! and the PCNET Project. As he left, several magazines and the latest ComputerTown bulletin under his arm, he looked at me and said in a somewhat startled voice, "You really *are* for the people, aren't you?"

Yes, People's Computer Company is for people. We're for the people still a little anxious about computing, certain that it can be a valuable tool but not yet clear about how to get started. We help people select their first microcomputer. Later on, after some hands-on experience, we develop expertise, we challenge, we lead, we teach! We even graduate people into readers of *Dr. Dobb's Journal* and beyond.

Since 1972, before the microcomputer was born, PCC has been an educational force here on the San Francisco Peninsula. Through our publications we've reached around the world, and if the day is upon us that ordinary people can better manage their lives through use of the computer, we have been major contributors to its arrival.



Michael Madaj

While once we were alone, we are now one of many. Being practical visionaries, our founders knew it would happen. Today, we are supported by an impressive community called the Friends of PCC and through them this little nonprofit company retains its visionary edge.

As the new Executive Director and Publisher of People's Computer Company, I wish here to pay tribute to one particular Friend, Ann Merchberger. Ann has recently left us after three years of being our Bookkeeper, Business Manager, and for the last year, our Executive Director/Publisher. I thank her for bringing together the talented staff that I now direct and for working so hard and so intelligently to bring professionalism to PCC.

Michael Madaj

Michael Madaj
Publisher

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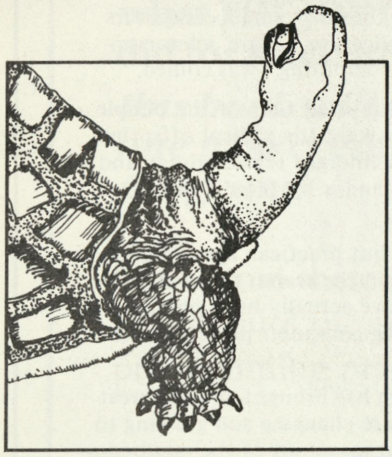

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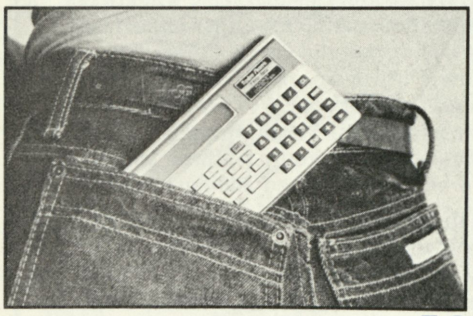

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Recreational COMPUTING

May/June 1981, Volume 9, Number 6, Issue 51

COMPUTERS AND LEARNING

FEATURES

DEPARTMENTS

Cover: Photo courtesy of Sesame Place

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Ordinary People

We are the music makers
and we are the dreamers of dreams . . .
William Arthur O'Shaughnessy

The roots of this magazine are very much those of small computers themselves. Our founders began their publication before microcomputers existed, even before the term "personal computing" was coined.

The evolution of computers has closely paralleled that of the people associated with them. Homebrew computerists were the radical offspring of the creators of giant machines. Hackers soon emerged (closeted day and night with the homebrewers' micro-creations) and a bit later came the computer hobbyists.

Small computers are now not only reliable but practical, and a person far different from any of the above has arrived on the scene: the computer consumer. He is the non-technical person we have actually been preparing for all along. Ten-year-old discussions about putting computer power into the hands of *people* are now bearing fruit.

The very concept of recreational computing has brought about a great change. Because the consumer is here now, we are changing and growing to meet his needs. We are going to show how to get more out of the microcomputer, and how to have fun while doing it!

The one who is having fun will also be the one who is learning the most about what computers can do. For that very reason, this magazine will always be committed to the presentation of leisure-time materials. Other important articles and features will serve even novice computer users. *Computer Anatomy for Beginners* will help the novice brush up on terms and basic concepts. *Programming Problems and Solutions* will appeal to programmers and the puzzle minded. Parents and teachers will be vitally interested in *Classroom Connections* and *ComputerTown, USA!* Youth features, games and applications will help every reader to be both informed and entertained.

The real movers and shakers of this decade are not necessarily going to be those who work for a large corporation, or those who have the largest bank account. It will be those "ordinary people" who gain and keep control of their own lives. They are the ones we aim to serve.

This has been called the information era. A more humanistic viewpoint would see it as the age of the computer consumer.

Marlin Ouverson

Marlin Ouverson
Editor

THE PROGRAMMER'S BOOK OF RULES

by George Ledin Jr. & Victor Ledin

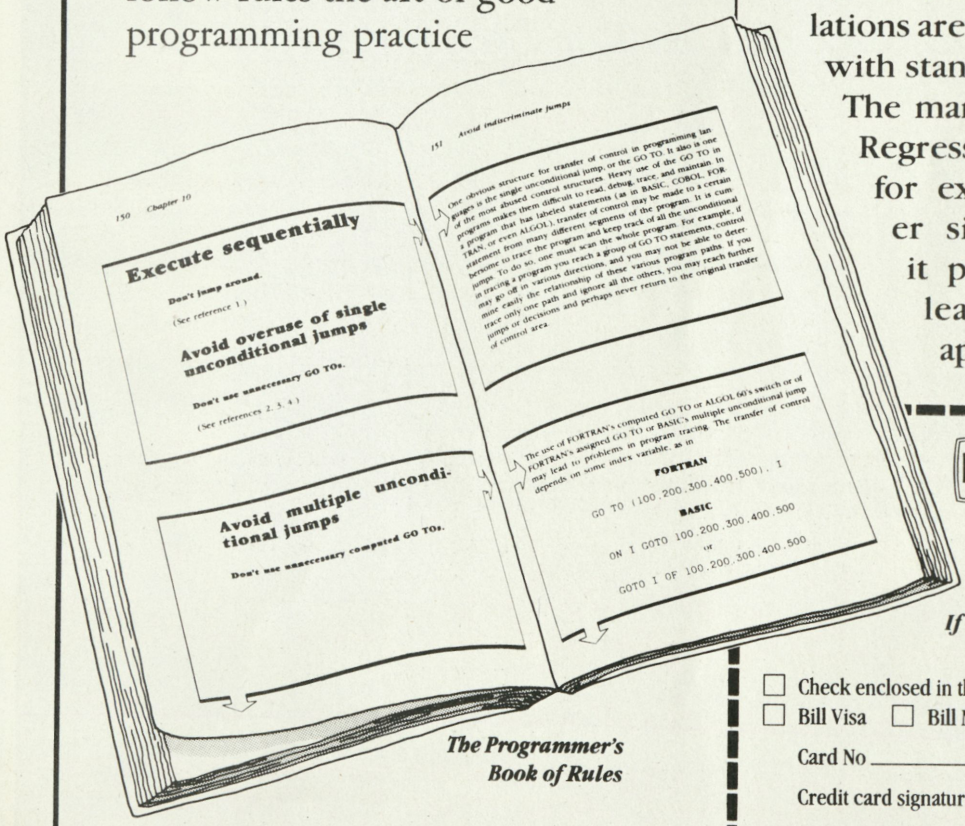
What THE BOOK OF LISTS was to trivia buffs...

what ROGET'S THESAURUS meant to wordsmiths...

what THE JOY OF COOKING did for kitchens everywhere...

this book will mean to anyone who creates a computer program!

Learn from these 272 easy-to-follow rules the art of good programming practice



The Programmer's Book of Rules

"It is hard to think of a programmer, a project or an organization that could not benefit from adhering to these rules." —Computing Reviews

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All photos courtesy of Sesame Place

Sesame Place

Learning, Playing, and Using Computers

by Tony Bove & Cheryl Rhodes

"Play and learn . . ." is a rallying cry for all who see recreation as an important part of any computer literacy project. It is also the slogan of Sesame Place, a family theme park in Bucks County, Pennsylvania.

"What makes Sesame Place so unusual is that it combines a physical playground with a conceptual playground," says Dr. Arthur Luehrmann, computer research director at the Lawrence Hall of Science. "At Sesame Place young people can learn on their own by interacting with the science experiments and computers – hands-on experiences that lead to discovery learning."

Dubbed the "21st Century Playground," Sesame Place combines the exhibits of a science museum, the activities of a playground, and the learning aspects of an electronic arcade. It is a new concept in family entertainment that is educational and stimulating.

Sesame Place differs from amusement parks in that it is a totally *active* environment with strong educational overtones, whereas amusement parks offer only passive experiences built around thrill rides. The free-flowing outdoor elements are activated by the energy of the children who use them. Kids can take a 120-foot pulley ride through the air, swim in a "pool" of plastic balls, walk on water, push, shove, and dodge their way through a forest of punching bags, and climb on nets high above the park.

Sesame Place also has the largest number of computers ever offered for public access on a daily basis – 55 computers, with over 40 games and educational programs (and many more being tested). Each computer is an Apple linked in a NESTAR network, with a completely new keyboard designed for the park (*see accompanying interview*).

Sesame Street's beloved characters – Big Bird, Oscar, The Count, and the rest of their friends – appear as guides in some computer games, as part of the general design motif, and in specially produced sketches appearing daily on the park's closed-circuit TV. A retail store, Mr. Hooper's Emporium, brings together for the first time all of the Sesame Street educational playthings and products under one roof.

"Any other park can run without people," explains Sandra Hanna. "The rides can run, even if the people aren't there. Here, nothing happens without people. That is what makes this park different from any other park."

A New Approach to Computer Literacy

Until now, kids have found the most exciting computer games in shopping center arcades, much to the chagrin of both parents and educators. As a result, any talk of using computer games as an introduction to computer literacy has been met with negative responses: the games are too "shoot-em-up" violent, the computers are too impersonal, they stunt the child's social growth by preventing the development of social interaction, and the games are not appropriate for pre-schoolers who cannot read the instructions.

"Any other park can run without people. . . . That is what makes this park different. . . ."

The arcade examples remind us of the pin-ball machines that drew large crowds away from after-school learning experiences. It is no wonder that educators and parents alike do not want those types of games in the classroom.

"Shopping center arcades are not meant to be educational," says Sandra Hanna. "We present an educational environment with a Sesame Street theme, and the computer games are designed to fit within this environment and carry on its theme." In fact, some of the educational programs have Muppet characters. The games are grouped in theme clusters that include space and gravity, motion, sports, animals and ecology, art and patterns, and creative writing. There is a special cluster of games for buffs who want tougher challenges.

"The programs are meant to be fun and easily accessible to people who have never been attracted to computer games, as well as to kids who are very much up on them," says Joyce Hakansson, Sesame Place's computer games coordinator.

"We took academic subjects and built games around key concepts," Joyce explains. "The educational content came first. We wanted the computers to teach thinking skills, deductive logic, problem solving – and do it all in an enjoyable way so the learning is fun."

The programs were designed to teach and reinforce concepts that children should learn at various age levels. They are divided into programs for children seven years or under, programs for children over seven, and programs that are more challenging. Here is a sampling:

- *Mup-O-Matic*: Children try to guess the color video patterns forming Oscar, Big Bird, the Cookie Monster, and the rest of the Sesame Street Muppets (recommended for children seven or under).
- *Lemonade*: This well-known game simulates the operation of a lemonade stand, where the player makes the necessary business decisions to stay in business and make a profit (recommended for children seven or older). Rainstorms, hot sunny days, and an unexpected road work crew are some of the arbitrary factors that can influence a day's lemonade sales.

Many hands-on computer exhibits struggle to deal with hundreds of people; Sesame Place has learned to give an estimated *millions* of children and parents experience with computers.

- *Reflect*: The player tries to bounce a beam of light off a mirror at exactly the right angle to illuminate an object such as a rosebud. When illuminated, the flower blossoms. The game provides an opportunity to control mirrors and explore angles of reflection (recommended for children seven or older).
- *Layer Cake*: This is a variation of the Towers of Hanoi, an ancient Oriental puzzle, where the player's logical problem-solving skills are tes ·d in an attempt to move a layer cake to a new plate, one ·er at a time, without ever putting a larger layer on a ·er one (recommended for children seven or older).
- *Mix and Match Muppets*: A chi can create a brand new Muppet by combining parts from some of the familiar Muppet characters (recommended for children seven or under).
- *Tune-In*: Players arrange musical phrases to create their own melodic compositions. The game teaches sequencing, building, and linking of audio patterns (recommended for children of all ages).

There are many other Sesame Place games that are better versions of existing games. For example, players of *Lemon Drop* develop hand-eye coordination by catching lemons in a basket rather than shooting at invaders. *Raise the Flag* develops spelling, vocabulary, and phonic skills yet uses animation and color graphics in a non-violent flag raising ceremony rather than a typical hangman game.

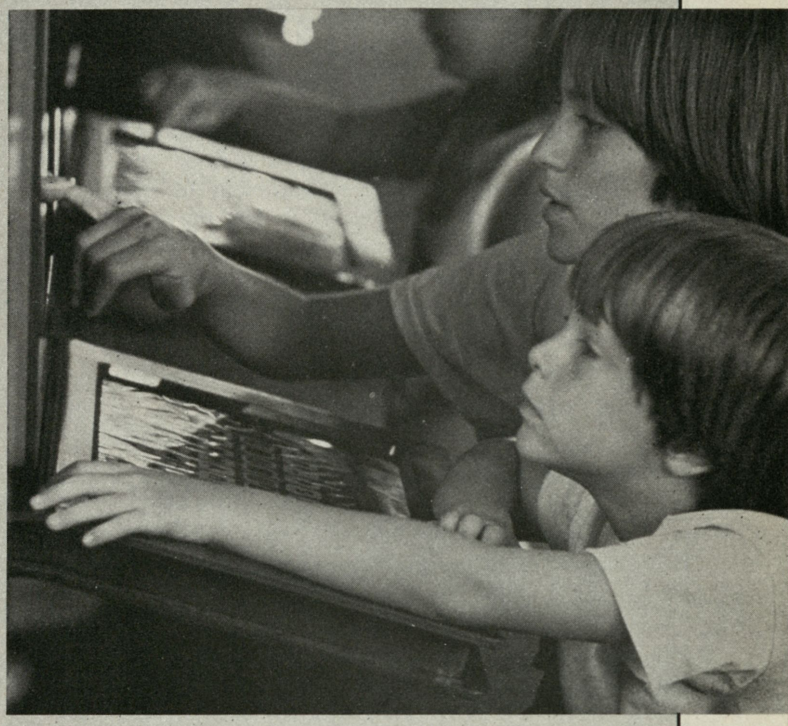
One of our favorite games for children of all ages is the *Animal* game, where the player teaches the computer! The computer only knows the names of animals that have been typed before. When the player types a new name, the computer asks several questions to determine whether the animal lives on land or in water, or whether the animal is like another animal it already knows. As the player answers yes or no, the computer reaches a point where it runs out of questions, and then it asks the player for a statement describing the difference between this animal and one it knows. The computer remembers the difference and uses it as a question in future plays.

In most versions of this game, the computer doesn't know too many animals, and you must type whole sentences describing the difference between your animal and an animal it knows. Sesame Place improved this game tremendously by prompting you with suggestions for the differences: "What does a zebra have . . ." or "What does a zebra do . . ." that is different. Now, younger children can easily fill in the rest of the sentence rather than try to think of a concise way to describe the difference between the animals. The sentence remains grammatically correct so that it is useful as a future question.

Since one of the goals of this center is to de-mystify computers, Sesame Place redesigned the computers themselves to be toy-like, not intimidating. Joyce Hakansson designed a totally new flat keyboard with graphic overlays, and the computers are housed in boxes with holes like swiss cheese. The computers are at wheelchair height, with movable cushioned cubes to sit on. The instructions for the games are not the arcade-type, nor do they require players who know how to read – most of the games introduce and demonstrate themselves.

The keyboard is extremely easy to use – the letters are in alphabetical order, there are color selection keys to use in drawing games, and there is a huge GO key (in green) to use to run a program. The most important feature is the absence of the RESET button. Joyce Hakansson explains, "players should never get out of a program and into an area they don't understand. You can't have the screen go dark – people think they've broken it."

"We wanted the computers to teach thinking skills, deductive logic, problem solving. . . in an enjoyable way. . ."



The interactive nature of Sesame Place's computer programs makes learning a positive experience. Multiple safeguards prevent the needlessly bewildering experience of a system "crash."

De-mystified or not, computers are seen by some as too impersonal and unsympathetic to be used in classrooms where they might hurt the development of interactive behavior and stunt the child's social growth. Joyce contends, "the computer is also *very* personal. The child has control. The computer will not respond until he tells it to. . . . It will call him by name, play games with him, and really pay attention to him. I think kids need that. There are not enough situations where there is that kind of one-to-one relationship."

Sandra Hanna points out that "we have to acquaint our children with the new technology, even if we adults don't know about it." In fact, children love to show off their newfound knowledge by showing others how to use the computers, and in doing so they interact with others and develop useful social attitudes. Joyce adds, "they soon

"...children love to show off their newfound knowledge by showing others how to use the computers..."

learn to use [the computer] as a practical and fundamental intellectual and educational tool."

The computers are token operated. One token buys four minutes of game playing, but a game session is *never* interrupted because time ran out – the session is always allowed to finish. Tokens keep people from monopolizing the computers, which is a real problem during the peak summer months. The tokens fit in with the concept that the computers should be totally accessible. Joyce adds, "we should give children early access to computers so they understand what the equipment can do – and perhaps more important, what computers cannot do."

An Entertaining Approach to Learning

Experts in child development have always acknowledged that play is essential to a child's growth into a balanced individual capable of dealing successfully with a changing world. The challenge is to create an environment that invites and sustains true play, with open and varied choices, instead of an environment that only provides entertainment.

Sesame Place has met this challenge with an imaginative environment energized by kid power, where kids play freely at their own pace. Play areas are tailored to the abilities of different age levels. Younger children can climb and crawl through caves, and jump and walk through foam rubber "swamps." For older children who have greater physical dexterity and strength, there are balance beams, climbing ropes, and hand-over-hand swinging across shallow pools.

Sesame Place is designed for many visits of two to three hours each. "It is important for kids to visit the park more than once, to see how they've improved and to test their limits," Sandra Hanna says. The activities are designed to be safe, enjoyable, and challenging for the newcomer as well as for repeat visitors. In fact, one of the appeals of frequent visits is that a child can readily assess his or her mastery of progressively more demanding play elements.

Most of the play elements were created by Eric McMillan, one of the foremost playground designers in North America. His concepts helped produce the Children's Village for Ontario Place, and he has designed innovative play elements and outdoor courts in several other places in the United States and Canada. His views of play are clear: "The idea is to inspire activity. A child needs play areas he can affect directly with his senses and curiosity. To a child, play and learning are the same process."

Dr. Marilyn Rothenberg, content planner for Sesame Place and a recognized authority on the environmental psychology of classrooms and playgrounds, explains why this environment offers the kind of play that is another form of learning. "The equipment is intended to encourage children to try new activities, master new skills, and cooperate with others. [Sesame Place is] an environment in which youngsters can experiment without fear or failure. We think this kind of play will help them develop a positive and realistic concept of themselves and their abilities."

The Sesame Place science exhibits were developed in collaboration with the San Francisco Exploratorium, the Ontario Science Center, and other centers. They invite playful discovery, and offer children and parents many opportunities to share perceptions. Dr. Rothenberg adds, "children can learn from their parents' knowledge of the world while adults can get a better understanding of their children's views."

For example, a small child will remember the concept of pitch when he or she hears a parent's voice raised to a high, squeaky level or dropped to a growl by the Pitch Switch exhibit. Adults and children can experience exhibits together, such as comparing their voice patterns by talking into microphones or going into the Teleidoscope Temple to see mirrors reflect their images to infinity.

In the Pedal Power exhibit, children can learn firsthand the principle of energy conversion by riding stationary bicycles that generate electricity to light a display. "The youngster is not pushing a button," says Dr. Rothenberg, "but getting on a bike and actually seeing the relationship between the amount of energy he or she exerts and the amount of power being generated."

In another exhibit, visitors can make their own movies in a manner of the early "flicks." They draw images on a length of paper and then watch the sketches or lines "move" on the spinning Zoetrope drum. They also can see their "movie" on a nearby TV monitor. After making such movies, visitors can walk around a corner and onto a working replica of the Sesame Street set, to complete the educational experience.

A particularly dramatic exhibit is Everyone is You and Me. Two members of a family, say, sit on opposite sides of a partially silvered mirror, turn on individual light dimmers, and eventually bring a composite of their faces into view. "The results can be surprising," says Dr. Rothenberg. "They may see similarities they hadn't noticed before, or maybe a blending of facial features that sparks an insight into their identities."

After School and In the Community

As an informal learning center, Sesame Place offers schools a major resource for enriching such curriculum subjects as science, physical education, language arts, and nutrition. In addition, schools can make use of the Sesame Place computers in planned class visits.

"Teachers let me know what they want to focus on," says Sandra Hanna [manager of the educational programs], "and I color-code the computer games as to whether they develop math skills, language art skills, and so on." After a little preparation and a lot of hands-on fun, students are asked to think about designing their own computer programs.

During the winter months when the outdoor exhibits are closed, Sesame Place offers a special curriculum called "Something To Do After School." The six-week sessions

consist of special interest courses for children three to five, five to seven, and eight to twelve years old. The ten classes range from rhythm band and carpentry sessions to computer study and puppetry. Each is limited to twelve children or less to provide individual instruction and a stimulating experience.

"Games Computers Play" is a hands-on workshop for kids eight to twelve that introduces the world of computers and programming. Participants not only use the computer to create colorful space monsters – they also learn a little about BASIC and computer programming.

"The Playful Computer" is one of five classes offered for kids five to seven years old, and it gives youngsters the opportunity to play games, make designs, and solve problems with computers. There are also courses on carpentry, puppetry, old time crafts, storytelling, optical experiments, and the Sesame Place Rhythm Band, where children build their own musical instruments.

Enrollment fees include all materials and range from $30 to $40. With the high chaperone ratio (at least one adult for every six kids), kids are encouraged to do many different things. Sandra Hanna guides teachers in planning class visits in order to meet specific curriculum goals.

Sesame Place also supports a mobile computer exhibit sponsored by the Bucks County Community College (BCCC). The BCCC Artmobile exhibit "RAMs, ROMs and Rainbows" contains three Apple computers that demonstrate computer graphics and sound. The art exhibits show the similarities in the ways a mathematician handles numbers and an artist composes a painting with geometric shapes. The Artmobile travels all over Bucks County, Pennsylvania, and with it goes information about the Sesame Place computers, so that people in the community know they have access to them.

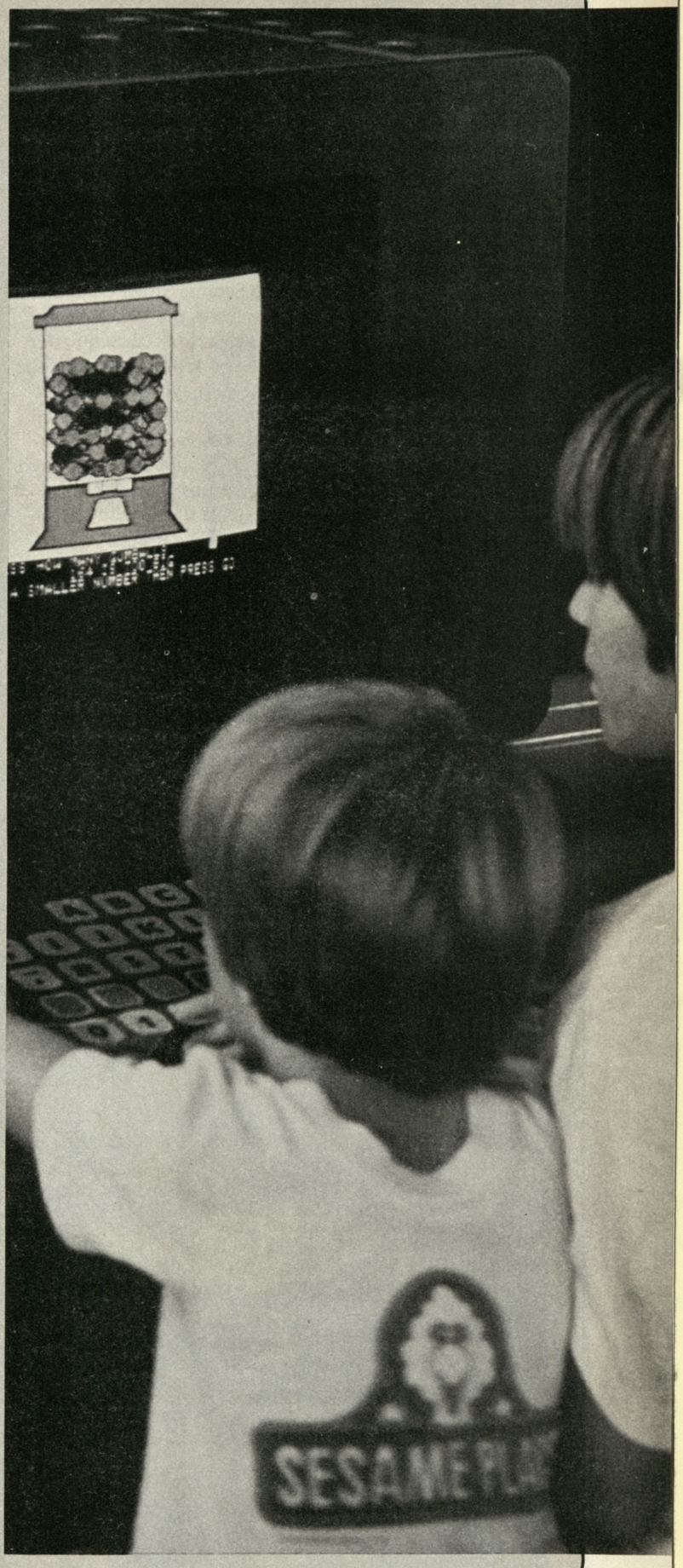
Goals and Future Plans

"At Sesame Place, children are the theatre and parents are the audience," says Eric McMillan. The design for the play elements includes vantage points for adults to watch from. However, adults are encouraged to play with their youngsters, although some of the play elements are not designed to support adult play.

"Some adults have a hard time adjusting to this new form of entertainment," Sandra Hanna states. "They are not yet ready to climb aboard the nets and crawl across them high above the park. They are also not in the frame of mind to play with computers."

The safety issue is no problem with children. There are padded safety bumpers and park assistants on hand to supervise. Sandra adds, "There is, however, this problem: what happens when an adult falls on someone else's child?"

Nevertheless, one of their future plans is to upgrade some of the outdoor elements so that adults can participate as well as watch. They will also provide more take-home materials for souvenirs. "They were taking home brochures and even paid-for computer tokens," Hanna says. "We have no trash problems at Sesame Place!" Children love to create things that they can take home with them. The Arc Art ex-



Even a computer can seem friendly when the colors are warm and the games it plays are fun.

Future plans involve further uses of computers...

hibit, in which a four-foot drawing board is suspended horizontally and set in motion while a fixed pen creates a graphic representation of the movements, provides youngsters with a graphic design as a souvenir.

Future plans involve further uses of computers – as the controllers of automatons for the Sesame Street characters. The Sesame Street characters are always the same actors, not just costumes worn by unknown actors; consequently, the characters cannot appear at the park often enough. The costumed characters at places like Disneyland cannot act and speak exactly like the cartoon characters, and kids are usually disappointed with these costumed characters because they are so obviously not real. Sesame Place wants to avoid this problem by using automatons that not only speak with the same voice and act with the same mannerisms, but also carry on two-way intelligent conversations with the children.

Sesame Place has been so successful in attracting people that it must be improved to accommodate more people. In a survey of visitors to the park (in which less than 2% expected it to be an amusement park), over 50% described the park as a wonderful educational experience.

The key to Sesame Place's success is in its design and implementation which attract children, foster creative activity and healthy play, and invite parents to participate. Children in the greater Philadelphia and New York areas can make repeated visits to develop skills and measure abilities. The play becomes learning when it demonstrates a concept – as a child plays with something involving gravity, the child can learn about gravity. Learning does not have to be an artificial rote process. Sesame Place shows that learning can be a process of experiencing, internalizing, and then understanding and believing in the experience. ■

Sesame Place is a joint venture of the Children's Television Workshop (CTW, creators of Sesame Street, The Electric Company, 3-2-1 Contact, *etc.) and Busch Entertainment Corp., operators of such major theme parks as The Dark Continent, Busch Gardens in Tampa, Florida, and The Old Country Busch Gardens in Williamsburg, Virginia. Sandra Hanna, manager of educational programs, describes the venture as "a 50-50 operation. CTW, with consultants like Eric McMillan, Christopher Cerf, Joyce Hakansson, and Dr. Marilyn Rothenberg, researched and evaluated the educational aspects and designed the park activities; then, Busch Entertainment Corp. provided the implementation expertise." Sesame Place is intended to appeal primarily to residents within its geographical region (Philadelphia and New York areas), so that families can make repeated visits. In keeping with this idea, general admission is moderately priced at $3.95 plus tax.*

Children are as eager to teach as they are to learn. They often demonstrate their newfound knowledge to family and friends.

INTERVIEW:
Joyce Hakansson and Dennis Sullivan

Joyce Hakansson is the computer games coordinator and part of the creative development team for Sesame Place. Dennis Sullivan is the director of computer programming on the administrative staff. The following interview with them was conducted by phone by Tony Bove and Cheryl Rhodes from People's Computer Company in Menlo Park, California.

RC: "Do you want to talk about the games, or about yourself?"

JH (Joyce Hakansson): (laughing) "I'd rather talk about the games!"

RC: "We'd like to know a little about the history of the games – how did you go about gathering together software for Sesame Place? What did you use as criteria?"

JH: "Well, the original premise was that there is a great deal of public domain software waiting to be gathered together into one place. Last year, however, there was very little available, so we created our own software.

"It was the original intent of CTW (Children's Television Workshop) to put together an interactive play environment – an environment in which children could interact with people and concepts and use their imaginations. They looked for different opportunities, and decided on a play park. The outdoor elements (designed by Eric McMillan) formed the basis for Sesame Place – they are so interactive and so full of whimsy and childhood imagination.

"The indoor environment was originally planned as an arcade, but the Dean of Engineering at Princeton suggested that they focus on computers because they have such great potential. So they looked around at different examples of computers in use in public environments, and naturally looked at the Lawrence Hall of Science –"

RC: "Where you were coordinating computer education?"

JH: "Yes, because we [at the Hall] were running the largest public access computer center in the country at that time.

"For Sesame Place we wanted to put together a public access center with computers that are easy for children and their families to approach and easy to use, with no barriers between the user and the machine.

"Originally it was planned that there would be a lot of consultants working on the computer project, but it soon became apparent that it could not be produced by outside consultants; that it had to be produced by an in-house project."

RC: "We heard about the many consultants, but as it actually happened, you and your team put together all of the programs?"

JH: "Yes. We did get some help from some people, but it just didn't work, it had to be done in-house, in order to get the consistency we needed in the computer center. You can't really design by committee. Also, we were under terrible time constraints –"

RC: "You had only a few days to set up the NESTAR and make it work?"

JH: "Actually, each part of the system was well tested – A to B, B to C, and C to A; however, it wasn't until the day we opened that everything was turned on, running everything else. It just went up and worked! It was amazing!"

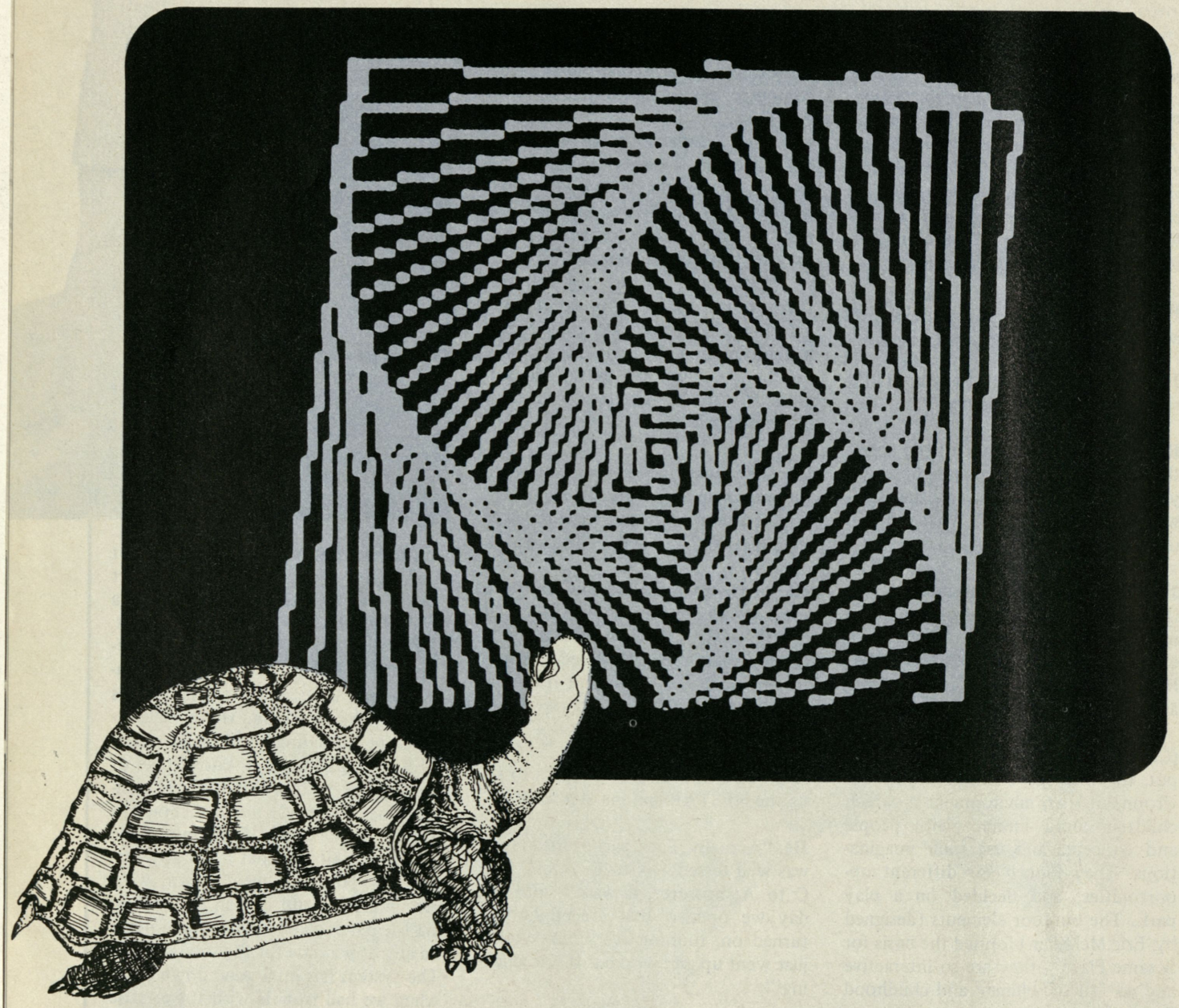
RC: "We'd like to know more about your NESTAR arrangement – do you load the programs from one location into all of the Apple computers, or do you have to load them from each individual computer?"

JH: "No, they're all loaded from one location. There are three NESTAR units in the park. We could do it with less, but we built redundancy into it with a backup NESTAR. We run it with two, and we could theoretically run it with one NESTAR unit, but not well in our configuration. We connect twelve to eighteen computers in a "run" connected to one data bus, which is brought back to a maintenance area that is out of the public environment. We connect the data buses into a patch panel, and the panel connects to the three NESTARs. Each NESTAR has a total knowledge of every game in the center. Each computer has a separate number. You can call up each number from any of the NESTAR units, so that if for any reason any NESTAR went down, we'd just unplug it and plug in the backup via the patch panel. There would never be any down time for the total system. The system has only gone down once, when we had trouble with the electric current coming into the park."

RC: "Why did you design a new keyboard, and what decisions did you make?"

JH: "That was really a long process. I knew from experience that in a public environment, the Apple keyboard was not going to work. First, we had found that it was not difficult to dislodge keys from the Apple keyboards we

(Continued on page 22)



Picture This!

PILOT'S Turtle Graphics for Atari

by David D. Thornburg

One of the most important characteristics of personal computers is that they are being used by people who have had little or no prior exposure to high technology. It is especially important that these users are provided with a computer language which is both easy to understand and extremely powerful.

The Atari version of PILOT is one such language, and the following article – loosely excerpted from a forthcoming book by the author – shows why.

Sometime soon – perhaps by the time you read this – Atari will have released their second high level language cartridge for the Atari 400 and 800 computers. This cartridge (used in place of Atari BASIC) will allow the user to write programs in the language PILOT. Since PILOT is not yet a very popular language, a few words about its capabilities are in order.

PILOT was originally designed as a programming environment for people who prepare instructional materials. Its greatest strengths have been in text analysis and manipulation. To get some feel for how well PILOT performs this type of task, consider the following program segment:

```
T:  DO YOU LIKE YOUR NAME?
A:
M:  YOU BET, YES, YUP, SURE, OK,
    FINE
TY: I'M GLAD TO HEAR THAT YOU
    DO!
TN: PERHAPS YOU'D LIKE TO
    CHANGE YOUR NAME THEN.
```

The first line types (T:) the question DO YOU LIKE YOUR NAME? on the display screen. The second line accepts (A:) a response from the user (e.g., I THINK THAT I LIKE MY NAME JUST FINE, THANK YOU). The third line matches (M:) each of the words or phrases in the list (YOU BET, YES, . . .) against each of the words in the user's response. If a match exists then the fourth line is printed (*T*ype *Y*es:), otherwise the fifth line is printed (*T*ype *N*o:).

Those of you who are familiar with BASIC will notice two things about PILOT. First, this language is quite readable. Second, it is quite powerful. The five line PILOT program segment shown above would take many times that number of lines to implement in BASIC – and the result would not be nearly as legible.

If PILOT's simplicity and excellent computational power were extended to include a good graphics package, it would be a perfect language for the beginner. It is just this extension of the language into the realm of graphics which makes Atari PILOT the perfect language for the neophyte programmer.

PILOT instructions which cause pictures to be created on the display screen make use of what is called a "turtle." This invisible creature is able to respond to the user's request to move, turn, or draw something on the screen.

Turtle graphics had its origins in university and industrial research laboratories.[1 & 2] To the best of my knowledge, the only other "micro-based" turtle graphics environments are provided by the language WSFN[3] (Which Stands For Nothing) and by the Milton Bradley *Big Trak*[4].

The best way to learn about turtle graphics is to experience it. Before reading further, you might want to see if you can find an Atari computer with a PILOT cartridge. If you *can't* find one, then read along and see if you can sense the power and beauty of this graphics tool.

And Now . . . He-e-e-re's Turtle!

There are many ways to show off the power of the turtle's graphics. The rest of this article is devoted to a whirlwind tour of his abilities. We will start with some very simple instructions and move on from there.

First, the graphics screen is cleared by entering the command:

```
GR: CLEAR
```

Each command is completed by pressing RETURN, just as in BASIC; so if you are following along with a computer in front of you, remember to do this at the end of each line. As soon as RETURN is pressed, the screen changes color.

A large black window at the top of the screen is where the turtle will draw the pictures. A smaller blue window is at the bottom, where you see the instructions as they are typed. (If you have a black and white display, the top graphics area will appear black, and the bottom area will appear grey.) When the graphics mode is first entered, the turtle is located near the middle of the screen, is pointed straight up, and is holding a yellow pen.

(Note that in what follows we will use phrases like "tell the turtle to draw a line," and so forth. This kind of language is in no way meant to suggest that we perceive the turtle, or the computer in which "he" resides, as being capable of "understanding" anything. It is not our object to ascribe human capabilities to the computer. Instead, we use this type of language as a convenient shorthand for more cumbersome ways of saying the same thing. The turtle does not really exist – he is just a useful model for describing how the PILOT graphics commands work.)

Having said all this, to have the turtle draw a line twenty-five screen units long, type:

```
GR: DRAW 25
```

Next let's turn the turtle by ninety degrees and have him draw another line:

```
GR: TURN 90
GR: DRAW 25
```

We will demonstrate the turtle's ability to handle more than one instruction per line by having him draw the third side this way:

```
GR: TURN 90; DRAW 25
```

The semicolon (;) is used in Atari PILOT graphics to allow multiple commands per line. Now, to finish the square in a different color (for those of you with color displays):

```
GR: PEN RED
GR: TURN 90; DRAW 25
```

The turtle is now back where he started; but is he pointing in the starting direction? No – he is pointing to the left instead of pointing straight up. You can

Figure 1

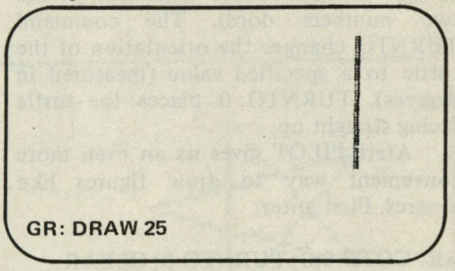


Figure 2

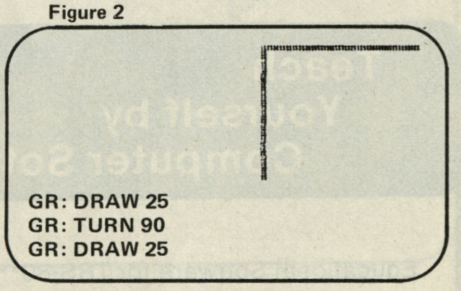


Figure 3

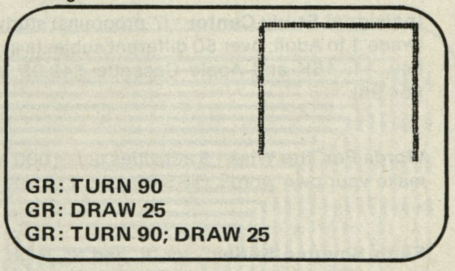
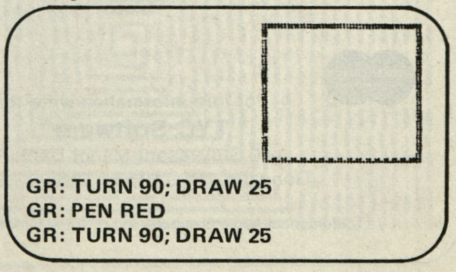


Figure 4



David D. Thornburg, Innovision, P. O. Box 1317, Los Altos, CA 94022.

check this out by "playing turtle" yourself. Try following each of the instructions above while walking around (you might want to take fewer than 25 steps on each side, of course), and see where you end up.

If we now type:

```
GR: CLEAR
```

all that happens is that the lines on the display are erased, but the turtle isn't moved at all. If you aren't sure about this, just type:

```
GR: DRAW 10
```

and notice that the turtle drew a line to the left, rather than one pointing straight up. The turtle can be placed in his starting position with the commands:

```
GR: GOTO 0,0; TURNTO 0
```

This line of instructions contains two *absolute* commands. GOTO picks the turtle up and moves him to a given location on the screen (0,0 is the home location; you should try other combinations such as 7,15 or 12,3 to see what each of the two numbers does). The command TURNTO changes the orientation of the turtle to a specified value (measured in degrees). TURNTO 0 places the turtle facing straight up.

Atari PILOT gives us an even more convenient way to draw figures like squares. First enter:

```
GR: GOTO 0,0; TURNTO 0; CLEAR
```

This gets us started at the right place. Now type:

```
GR: 4(DRAW 25; TURN 90)
```

Wow! One line of instructions can create a complete figure!

Have you figured out what went on when the last command was entered? This command instructed the turtle to do something four times. The things we wanted the turtle to do were placed inside the parentheses "()". In effect, this command says: "Four times you are to both draw a line 25 units long and then turn right by 90 degrees." Not elegant English, but pretty good Turtletalk, none the less.

To see some more figures, type this:

```
GR: PEN YELLOW
GR: 5(DRAW 25; TURN 72)
```

(See Figure 5)

These instructions created a picture of a regular pentagon.

As you can see, the turtle can be made to draw some very nice figures; but there is even more he can do.

Atari PILOT allows the user to build a dictionary of procedures (called *modules*) which the turtle can use. These modules are "saved" to be used when needed, rather than being used as they are being written. To create a module, first leave the graphics mode by typing:

```
GR: QUIT
```

and then type AUTO. As soon as you press RETURN after typing AUTO, the screen changes from blue to yellow. If you are using a black and white display, the AUTO mode will show dark letters on a light background. This color change is PILOT's way of indicating that each line of commands you enter is going to be saved for use later, rather than being used right away. The way that Atari PILOT distinguishes between immediately executed instructions (like those we have been using thus far) and instructions to be executed later (like those we are going to use to create dictionary entries) is by placing line numbers in front of all deferred instructions – just as in BASIC. Since PILOT doesn't use these numbers for anything else (*unlike* BASIC), the user doesn't see the numbers as lines are being entered in the AUTO mode.

Modules have three parts – a name (called a *label*), the instructions the module is to perform, and an *end* command. Here is a simple example to demonstrate how modules work. First, type the name:

```
*STAR
```

All labels and names of modules start with an asterisk (*). Next, type the recipe for a star (trust me):

```
GR: 5(DRAW 35; TURN 144)
```

and, finally, finish the module with the *end* command:

```
E:
```

That is all there is to it! These three lines constitute our first definition. Now, how do we use it?

First we have to leave the AUTO mode. This is done by pressing the RETURN key without pressing anything else first. Once you have done this, you will see the familiar blue screen. If you type LIST at this point you will see the lines you just entered with line numbers in front of them.

To try out our first definition, type:

```
GR: CLEAR
```

to clear the graphics screen, and type:

```
U: *STAR
```

(See Figure 6)

Presto! A yellow star appears at our command. As you can see, PILOT lets you use modules with the *use* (U:) command. There are other ways to execute deferred instructions, but for the purpose of this article, we will use U:.

Now, let's get fancy with our star:

```
GR: PEN RED; TURN 120
U: *STAR
GR: PEN BLUE; TURN 120
U: *STAR
```

(See Figure 7)

Modules can be quite useful in PILOT graphics. For our grand finale, we will show you how to make the PILOT turtle draw special figures called "squirals." To make a squiral we will start by making a square spiral in which each side is longer than the previous one. To do this, we need a *variable* instead of a number in the DRAW command. We will type DRAW #A instead of, for example, DRAW 5. This means that we also have to assign values to the variable #A.

To get started, type:

```
GR: QUIT    [this leaves the graphics mode]
NEW         [this erases any modules we
             already have]
AUTO        [this puts us in the AUTO line
             numbering mode]
```

Next type:

```
*SQUIRAL    [label to name the module]
GR: GOTO 0,0; TURNTO 0; CLEAR
            [put the turtle home]
C: #A=0     [C: does the computation
             of setting #A to 0]
*DRAWLINE [label another point in
             module]
C: #A=#A+1
            [increases #A by 1]
GR: DRAW #A; TURN 90
            [draws line of length #A
             and turns 90 degrees]
J: *DRAWLINE
            [jumps (J:) to the label
             *DRAWLINE]
E:          [ends module]
```

By pressing RETURN twice when the last line is finished, the screen reverts to its normal blue color to indicate that you have left the AUTO mode.

Now the fun begins:

```
GR: CLEAR
U: *SQUIRAL
```

(See Figure 8)

Figure 5

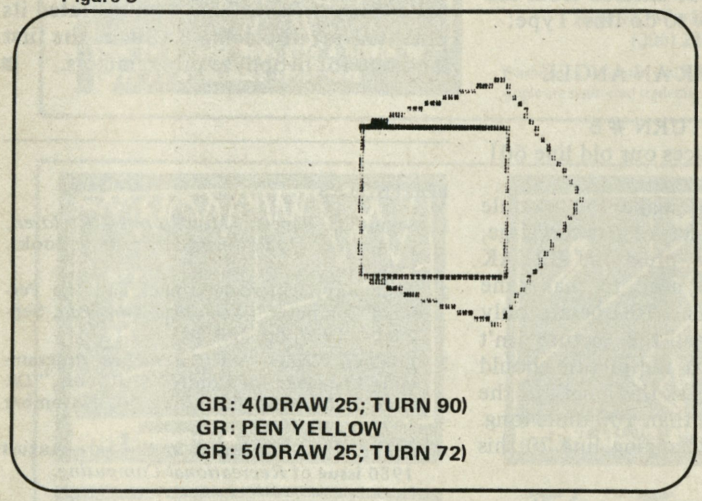


Figure 6

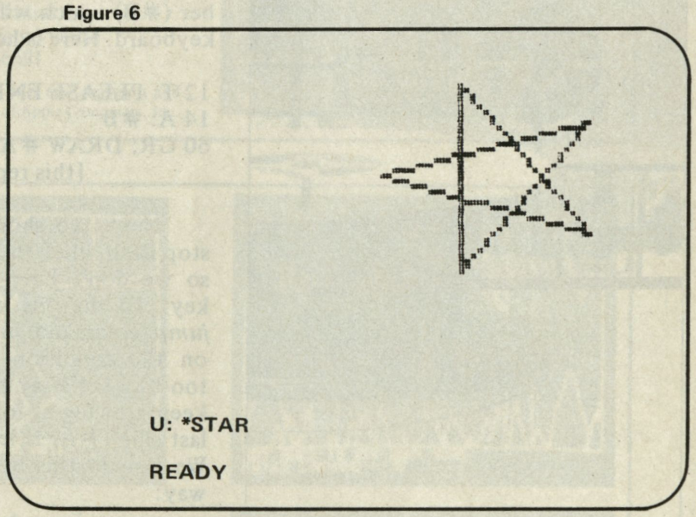


Figure 7

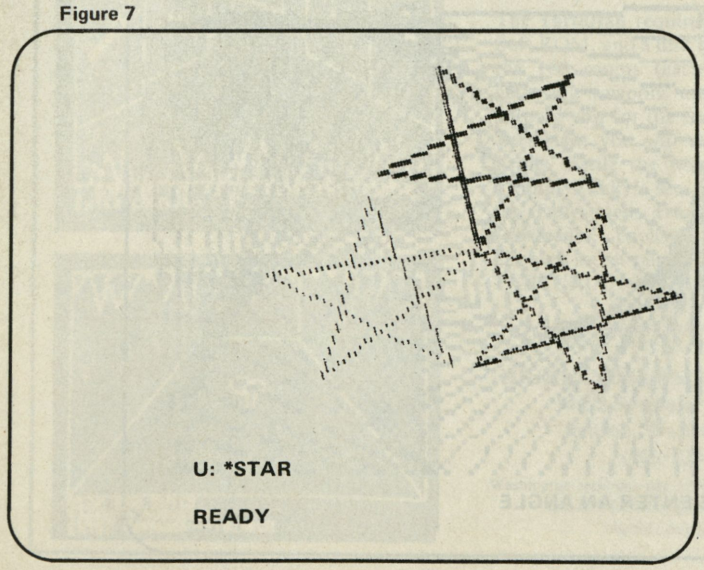
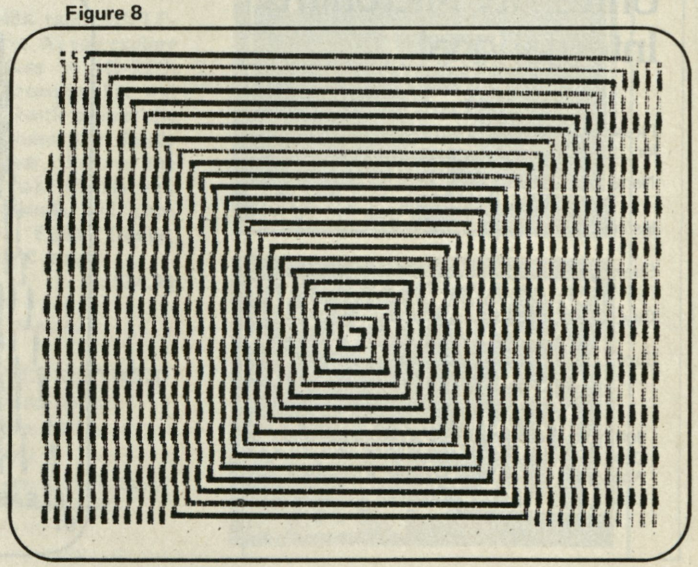


Figure 8



When these commands are entered, the screen shows a square spiral growing out from the center. The reason the squiral keeps growing is that each time the jump (J:) command is used, the length of the next side (#A) is increased by one screen unit and a new side is drawn. To stop this program (we have put it into an endless loop), just press the break key on the computer.

By making a few changes to *SQUIRAL, we can have the computer create lots of pretty figures. First type:

GR: QUIT

and

LIST

Here is what you should see on the screen:

```
10 *SQUIRAL
20 GR: GOTO 0,0; TURNTO 0; CLEAR
30 C: #A= 0
40 *DRAWLINE
50 C: #A=#A+1
60 GR: DRAW #A; TURN 90
70 J: *DRAWLINE
80 E:
```

What we are going to do next is modify *SQUIRAL to allow different angles to be chosen when drawing each figure. This means that we will have to replace the fixed value of 90 degrees (see line 60 in the listing) with another number (#B) which will be entered from the keyboard. Here is how to do this. Type:

```
12 T: PLEASE ENTER AN ANGLE
14 A: #B
60 GR: DRAW #A; TURN #B
          [this replaces our old line 60]
```

Next, we should make the module stop itself when the picture gets too large, so we don't have to press the BREAK key. To do this we need to make the *jump* command in line 70 operate only on the condition that the picture isn't too big. Let's say that the picture should keep growing as long as the length of the last side (#A) is less than 100 units long. We can do this by changing line 70 this way:

```
70 J (#A<100): *DRAWLINE
```

Finally, it would be nice to have *SQUIRAL start all over again when a picture is finished. To do this type the following line:

```
75 J: *SQUIRAL
```

Now we are ready for some more pretty pictures. Enter:

U: *SQUIRAL

Now, instead of drawing anything, there is a message in the blue area which says

PLEASE ENTER AN ANGLE

Just for fun, enter 91 and press RETURN

(See Figure 9)

When the longest side of this squiral equals 99 screen units, the module will stop drawing the figure and the display will ask for a new angle to be entered. The module can be stopped at any time by pressing the BREAK or the SYSTEM RESET key.

It is impossible in this short space to do more than hint at the utility of the graphics on Atari PILOT. I hope that this brief tour of PILOT has demonstrated its potential for displacing BASIC as the first language for neophyte programmers. ■

FOOTNOTES

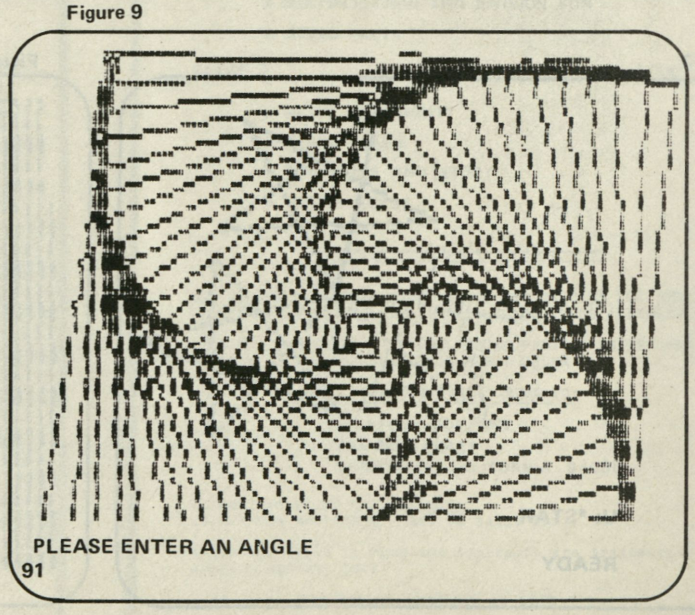
1 Seymour Papert, *Mindstorms – Children, Computers and Powerful Ideas*, Basic Books, 1980.

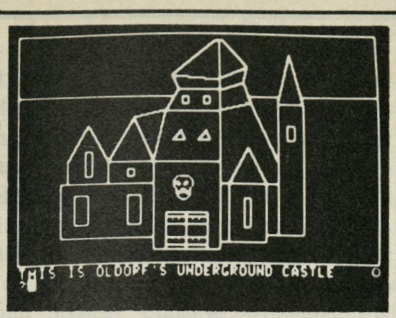
2 Alan Kay, "Microelectronics and the Personal Computer," *Scientific American*, September 1977, pp. 230-244.

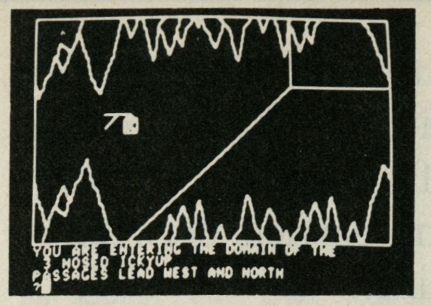
3 Li-Chen Wang, "An Interactive Programming Language for Control of Robots," *Dr. Dobb's Journal*, V. 2, No. 10, November 1977, p. 10, ff. ago).

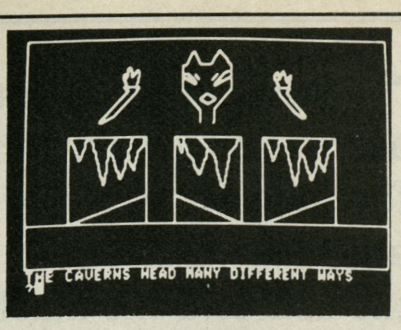
4 Big Trak was reviewed in the July-August 1980 issue of *Recreational Computing.*

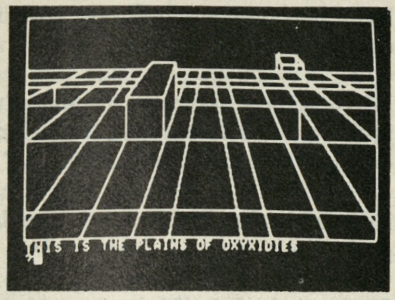
Figure 9











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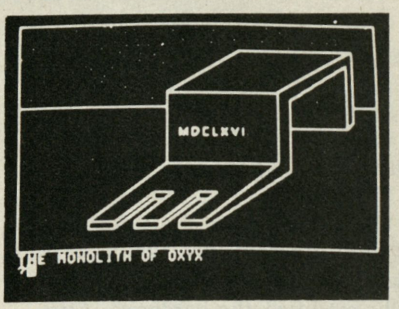

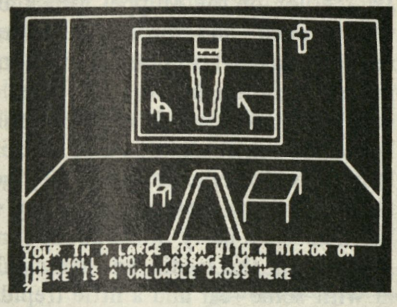

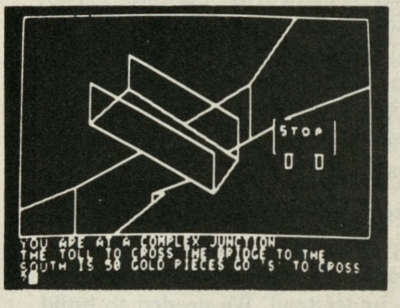

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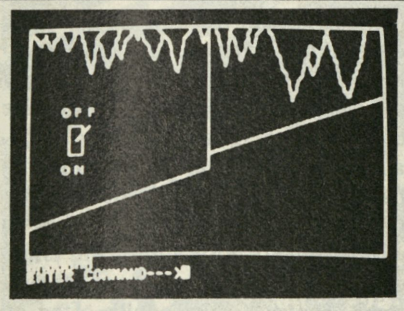

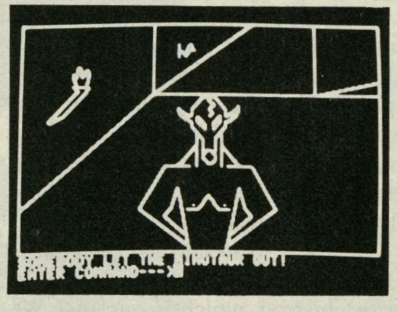

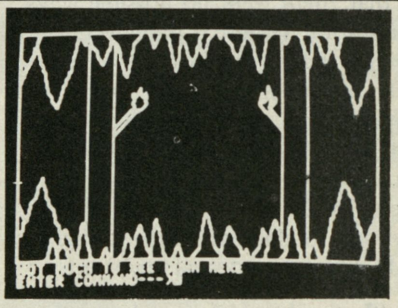

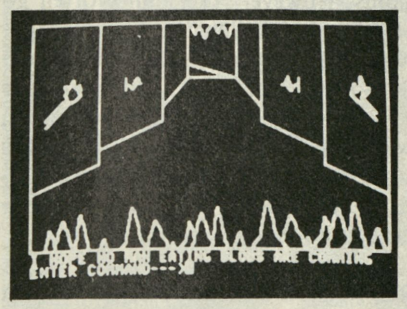

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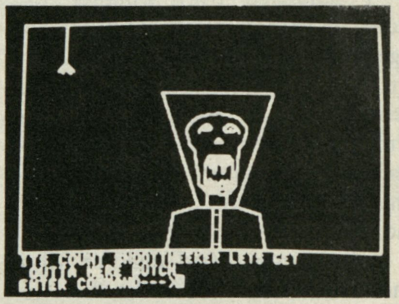

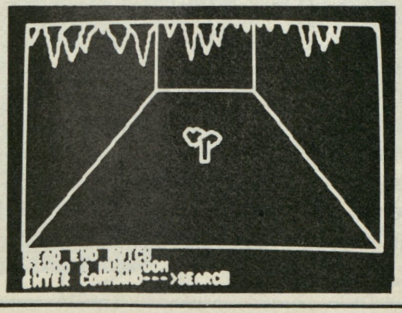

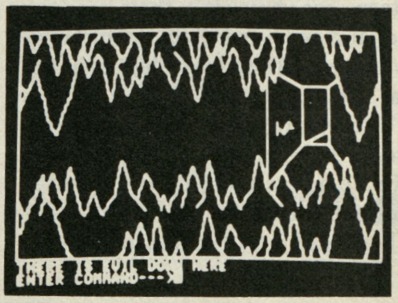

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"...we wanted to put together a public access center with computers that are easy for children and their families to approach and easy to use, with no barriers between the user and the machine."

(Continued from page 15)

used at the Lawrence Hall. Second, we realized that having the RESET key was not going to work unless we actually modified the hardware. Also, we found that recognition of the ASCII Control-C is designed into the Apple. A child randomly hitting on the Apple keyboard could actually generate a Control-C and abort the program.

"One very important premise was that players should never get out of a program and into an area that they don't understand. We needed to build an environment that was really safe and that there were no possible ways to break out, because if there were any possible ways, invariably someone would find them. We didn't want the computers to frighten people; we wanted the people to feel comfortable. You can't have the screen go dark – people think they've broken it. The only way to eliminate these problems was to design an external keyboard.

"I pondered over whether we needed to keep the QWERTY key arrangement. On one hand, in an educational sense, it made sense to keep it. The child could then transfer the learning that went on with that keyboard to typewriter and traditional computer keyboards. On the other hand, we were not trying to teach typing at the center. Most children who came to the park were in the three to thirteen age bracket – they are our target audience, and they do not know how to type. They know letters in the linear arrangement of A through Z – that's the pattern they know best. We decided that we wanted to make the ability to access the program the most important reason. We wanted to make the keyboard a tool and make it as accessible as possible, so therefore we used the linear alphabetic configuration that children would know best.

"We went to the totally flat keyboard for two reasons: first, if drinks were spilled, it wouldn't matter – it was easy to clean and easy to protect. The second reason is that we can use overlays. I really want to put more graphic representations on the keyboard that would help children who are younger than reading age.

"In fact, we have a new program called *Dial-A-Muppet* that gives the child the opportunity to dial and call up a muppet, with a big telephone pictured on the keyboard with four muppet characters. The child presses on the muppet character he or she wants to talk to – the muppet speaks with the child, and a low-resolution graphics character appears on the screen. We are thinking more of those programs that use keyboards that are specially made and the graphics specially attuned to the program itself.

"I think specialized keyboards will make the computers more accessible to children, which is our goal. We have now on our keyboard A through Z, a big space called ERASE, and a big two-by-three inch key, which is the GO key."

RC: "The GO key is green!"

JH: "We also have color selection keys for our drawing programs, where the child can pick the red color by touching the red key. The color keys provide a concrete representation of what you want the screen to do.

"The keyboard was designed by our group with the help of Milton Glazer, who is the Park's designer. The production of it went very quickly once we got over the roadblocks to using it. Once we decided to use the flat keyboard approach, everything seemed to fall into place. Different keyboards can have different graphics – the whole beauty of the keyboard is that you can put any overlay you want on it."

RC: "Have you reached your goals in computer education?"

JH: (laughing) "Basically, I think we've just begun, we've only just begun, and our goals are really quite ambitious."

RC: "What are the most popular games?"

JH: "A lot of the Muppet games are very popular, and the reason is that many people who come to the computer center might be intimidated – remember, there aren't any other public access centers in this area. People know it's "computers" and they get their bills from computers and they've heard all these nasty things about computers from the media, and they walk in with some fear and a little trepidation.

"We've tried to overcome that with our design, which is very playful, colorful, and toylike . . . that seems to work. On the other hand, when they see the Muppet characters on the screen, I think it even helps more, because the characters are familiar – they know Burt and Ernie and Big Bird; those characters are not going to hurt them! So both adults and children very often gravitate to those programs. However, the adults often go on to more challenging programs that require some kind of logical scheme for solving a problem. If the center is very crowded, like it was this summer, people just grab the first thing that is available. There were no free computers – they were constantly in use during the summer months."

RC: "That's a measure of how much you've met your goals!"

JH: "I think we have met our goals for Sesame Place. However, in software, there is so much to learn and so much to do. We're trying to build programs that are complete within themselves, with a beginning, a middle, and an end, in which someone feels a sense

of accomplishment. We're trying to develop programs that are fun and amusing and joyful, but also are educational in content, in much the same way that Sesame Street has developed educational television. We're trying to build environments in which people can explore, build hypotheses, and build logical solution strategies for solving problems, then test those strategies: see if they are specific to that individual environment by changing the environment to see if they can be general strategies.

"We're trying to show people the use of the computer in what I consider to be the most effective way possible: in environments that they can explore and do problem-solving in. There should not be the illusion of a right answer or a wrong answer – one should get the feeling that there are many solutions to a problem, and that some solutions are stronger and better than others. We don't give any kind of good or smiley face or frowny face, or anything like that, to any individual for achieving their goals, whatever they set as their goals, as the outcome of their interaction with the environment. The computer is a dynamic environment and that's its strength.

"We will try never to use a program to illustrate a concept that is better shown in some other medium. We try to use all of the strengths of the interaction of the computer and the dynamic qualities of it as the basis of our program. We're trying very hard not to develop static programs, or programs just for the sake of using a computer."

> "...the adults often go on to more challenging programs that require some kind of logical scheme for solving a problem."

RC: "What about your background? How did you get involved with computers and education?"

JH: "Actually, I come from the education background, and I knew of computers in college. I had an opportunity to see them and play with them a little, and that overcame any fear I had of them, but I did not pursue that; I did graduate work in history. It was only when my own child was in elementary school that I decided that I didn't like the way math was being taught. I thought it was being taught as a separate subject away from the mainstream of living. I thought it was building 'math-o-phobia'; at least it did for me.

"I decided to help put a math lab in my son's school and the principal

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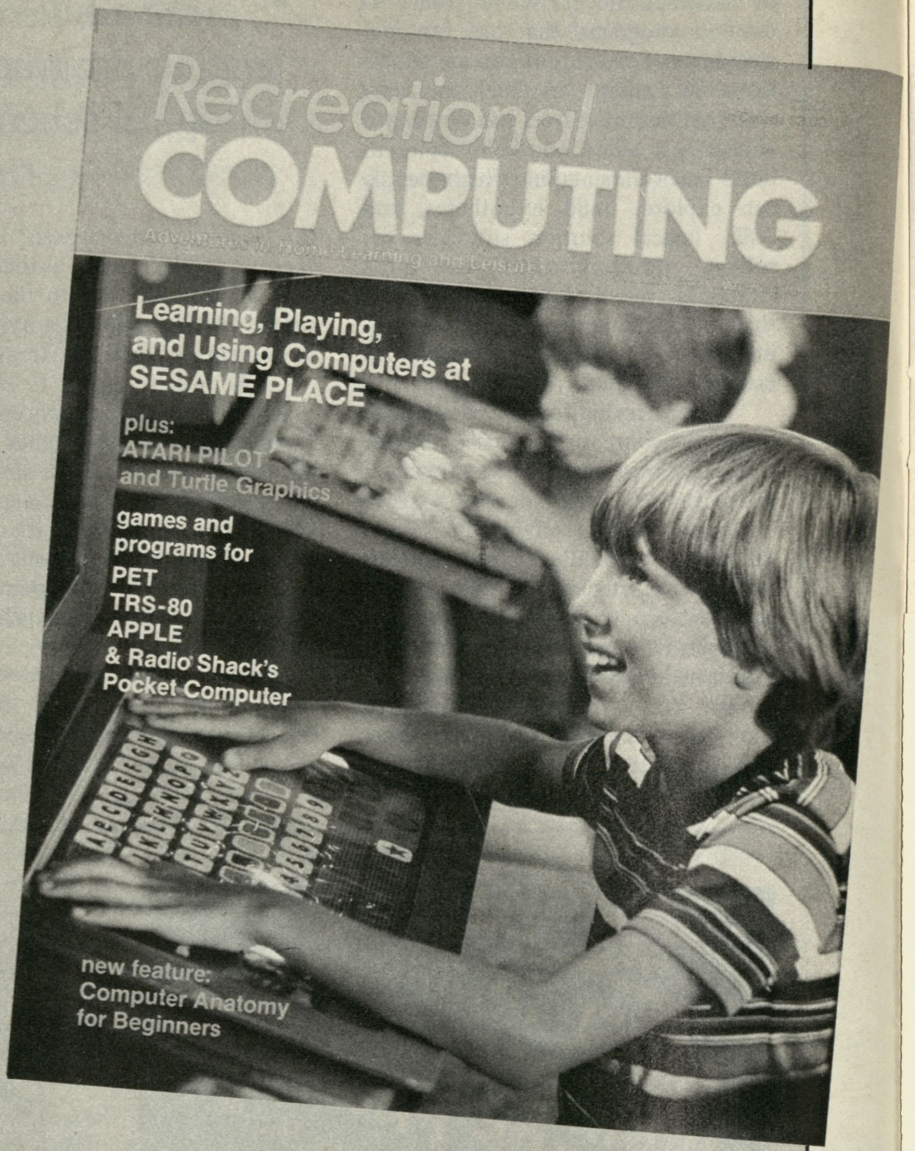

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"The goal of Sesame Street was to use television as an educational experience...and we wanted to use computers in the same way..."

agreed. We raised the money for it and with a friend I started the math lab. I thought, what we really needed was a computer. At that time I called the IBM representative in the area and invited him over to sell me a computer! Poor guy, I don't think he had ever been invited to lunch with brownies in some suburban household. He gave us a lot of information and was very helpful. He told us where to find educational computing facilities, one of them being the Lawrence Hall of Science. I visited the Hall and got very excited about their time-sharing system. We in fact did hook up with the Hall, and I started learning and got involved there. They asked me to come and teach some classes for them and I did, and started working there. I took courses at Berkeley at the same time, and it was a wonderful experience.

"After we did some consulting for CTW (Lawrence Hall was a consultant), they realized that the project could not be built by consultants. They asked me if I would come and manage the production of the computer aspects of the park, and I laughed, thinking, that's ridiculous with a family in Walnut Creek, California. However, it was such an opportunity! At the Lawrence Hall we were teaching 20,000 to 30,000 people a year, teaching them some aspect of computing. At Sesame Place there was going to be over a million people a year going through! I couldn't turn it down, so I commuted for a year – I stayed in New York for two weeks, and returned to California for a week, and so on. It worked out very well, because we decided to use Apples in the computer center, and the commuting meant that I could spend time at Apple Computer Company in Cupertino, California, and spend time in New York. Many of the people I called on for programming aid and hardware aid were in the San Francisco area."

RC: "Why did you pick Apples for the center?"

JH: "We picked Apples for a few reasons. At the time, somewhere in early September of 1979, they were the only ones on the market that could deliver a full-fledged color system. We also looked at the Intercolor system, but there were some problems with it. I had used Apples at the Lawrence Hall in the Apple Van Project; I knew they were reliable, I knew there was software already developed for them, and more important, there were people who had worked on them and could give us help if we needed it. There wasn't really a viable choice."

RC: "What's really inside those cheese boxes – Apples with their own enclosures?"

JH: "No, we used the motherboard and power supply. We did not buy them with their enclosures. We didn't need the boxes or the keyboards. We have a technician on the site to fix them, and we have contracted with an electronics house in the Philadelphia area that assembled the units for us."

RC: "Are you using the center as a community computing center, with school groups?"

JH: Definitely. In fact that's going on during the winter – there are after-school courses that introduce computers and programming."

RC: "As the kids in the community get more access, perhaps they can help build more exhibits –"

JH: "I hope so. Kid power is wonderful. Even with the kids that work in the park, we've developed some real talent."

RC: "Will there be any more Sesame Places?"

JH: "Yes! There is another one planned for Dallas, Texas, and then I hope there will be one in California. The Dallas park will open in Spring of 1982. The next one will follow this one, since this was a prototype that was very successful. There will be some minor design changes, but the technical system will follow quite faithfully.

"Our goal is to promote computer literacy and promote the use of computers. The goal of Sesame Street was to use television as an educational experience for young children, and we want to use computers in the same way, as well as prepare children and everyone for the uses of computers."

RC: "Did you use the Applesoft Toolkit?"

DS (Dennis Sullivan): "We had a beta test version of the toolkit. We used the High Resolution Generator and the Anamatrix package for one program, *Raise the Flag*. Almost all of the software is written in BASIC; two-thirds of that is in Integer BASIC. The rest were written in Applesoft BASIC.

"The only code not written in BASIC are the routines in assembly language to control the keyboard, the token mechanism, and the software clock. There is also a monitoring program that keeps the token mechanism active unless the computer goes down. If the computer goes down, it automatically shuts off the token mechanism. The monitoring program maintains the software clock, but it's the game's responsibility to use the clock. The game also has to poke a value into a memory location every fifteen seconds, to tell the NESTAR system that the computer is still running; otherwise, the monitoring program would take over, assuming that the computer has crashed.

"In the event of a crash, the monitoring program displays the amount of time used, in order to grant refunds. The monitoring program also displays some diagnostic information, and informs the player that the computer has malfunctioned, so that the player doesn't think he or she broke it.

"We also have a low-resolution animation package that we developed, written entirely in assembly language. The token control routine, the timing routine, and the keyboard routine we contracted out for development. The animation package was developed in-house."

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RC: "Why do you do a lot of your graphics in low resolution?"

JH: "Believe it or not, low-resolution graphics are more appealing to kids because it looks more like the way they draw."

RC: "Did you have to do anything special to use the NESTAR arrangement?"

DS: "NESTAR is set up to look like an Apple disk drive to an Apple. As far as the Apple is concerned, it is just talking to another disk drive. Most of the computers have a menu of two or three games to choose from. When a person selects a game, the system downloads the program into that Apple.

"There is a slight change we made: if you load a BASIC program, loading 30K to 35K of code and files into the Apple through the disk operating system is rather slow. We didn't want the 30-second delay while people were spending money and feeling that their time was being used up. We bypassed the disk operating system by using a feature of NESTAR to load binary files into direct memory locations. We make the Apples think that our BASIC programs were just large binary files, in order to load them more quickly. The binary file magically changes itself back into a BASIC program."

RC: "Each computer is running either the monitoring routine, or the game."

DS: "Right. The timing routine is called once every tenth of a second by a processor interrupt on one of the cards. The routine maintains a software clock."

RC: "Is all of the hardware typically Apple hardware, or is there any of your own?"

DS: "There is the NESTAR card, and our interface card for our keyboard, which is Sesame Place hardware; there's also a very small card for the token mechanism, which the timing routine talks to. The only specialized hardware for Sesame Place is the card that controls the keyboard. The keyboard has seven rows of fifteen keys, and when the hardware receives two bytes from the Apple, the bits in those two bytes correspond to the fifteen rows."

RC: "You can handle any new graphic character keys using this card controller?"

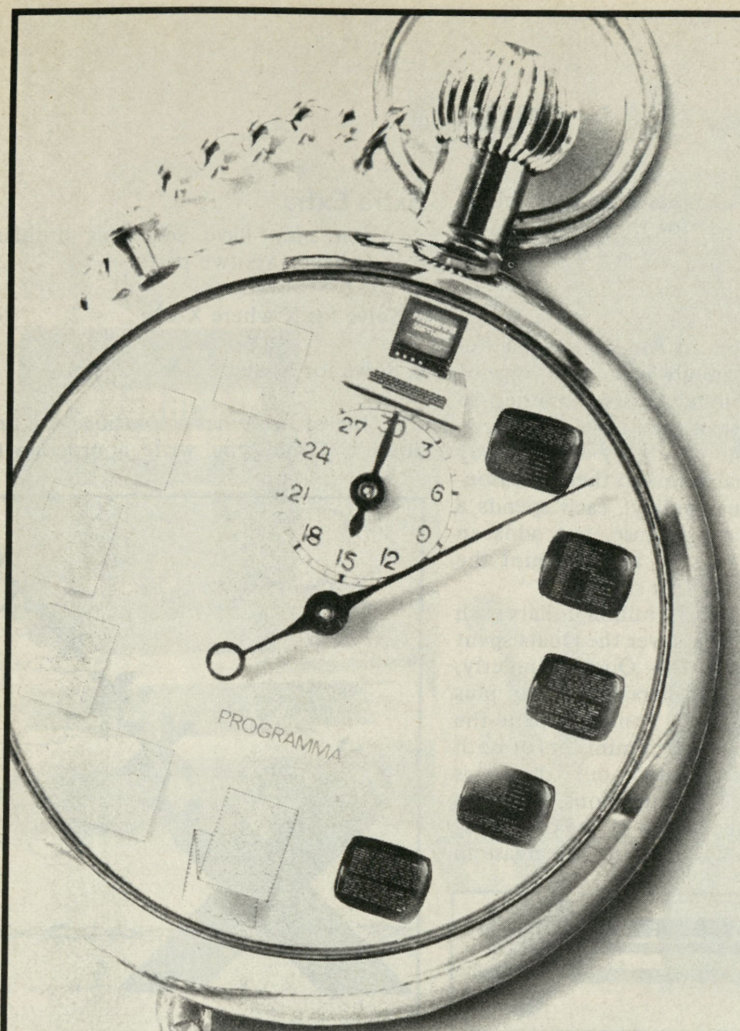
DS: "It can handle anything we want. The card determines the coordinates for any key pressed, and the games read the keyboard by checking individual key positions."

RC: "Are there any plans to offer for sale to the public the programs that you use at the park?"

JH: "In the very near future, I hope. We're talking to publishers right now, and we hope to work out some arrangement to publish and distribute them. We really want to see them get out. We've received the reaction that they represent a model for people to look at, learn from, and strive for."

RC: "Thank you very much!"

JH-DS: "Thank you for letting us tell our story!" ■



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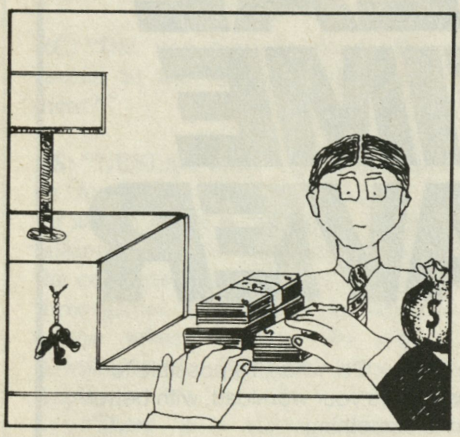
Programming Problems & Solutions

by Jim Conlan

Solutions on page 50.



The Multiplier Effect

Have you ever wondered why banks so rarely run out of money? There is a very good reason. Bankers are clever devils and know how to make money multiply.

Here is how it works: Suppose, after a hard month's work, you find an extra $100 stashed in your sock. Off you go to deposit the money in the bank. Your friendly banker puts $20 in the vault and loans out the remaining $80 to one of your neighbors. That's reasonable. No use letting that money lie around getting moldy. The jolly banker collects a bit of interest for his trouble.

Actually, things get even better for the banker. When that $80 is loaned out, it goes to someone else in town. What does one do with money? Put in the bank, of course. Your neighbor deposits the loan in the bank. The joyful banker gets a new deposit of $80. How nice! You know what the clever banker will do. He will put 20% ($16) in the vault and loan out 80% ($64) to someone else. Where does the $64 go? You guessed it. Right back to the bank. The process is repeated again and again. The question is this: after each transaction, how much will be in the vault and how much will be loaned out?

Hint To The Multiplier Effect

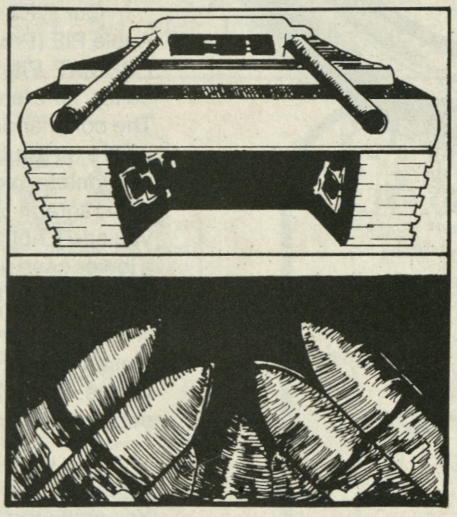
There are three numbers that will need to be stored: the amount of the deposit, the total amount in the vault, and the total amount loaned out. We need to decide where to store these numbers. Let's store the initial deposit in D, the vault total in V and the loan total in L.

At each step in the process, the banker takes 20% of the deposit D and adds it to the vault total V. He takes 80% of the deposit D and adds that to the loan total L. The borrower gets that 80% of the deposit D and deposits it in the bank to become the new D for the next round of calculations.

War Game

The Kingdom of Pandab and the Republic of Quat are always on the verge of war. Neither country trusts the other, so they spend most of their time and energy preparing for the possibility of war. They both follow what seems to them a reasonable and rational policy: each spends a basic amount on defense, but adds an extra amount to take into account the armaments of the other side.

Pandab spends 10 billion dollars each year plus 1/2 of whatever the Quats spent the year before. The Quats, similarly, spend 11 billion dollars each year plus 1/3 of whatever the Pandabs spent the year before. The foreign ministers of both countries have pointed out that this shows their peaceful intentions, since any decrease in expenditures by the other side will automatically result in a decrease in



their own expenditures. This year Pandab spent 10 billion and Quat spent 11 billion. What will be the result of this common policy?

Hint to War Game

We will need to store the initial defense budgets. Let's have P1 be the initial budget of Pandab, and Q1 be the initial budget of Quat. We will compute a new budget for the following year for each of the countries. Let's use P2 and Q2 to hold these new numbers. P2 will be 10 billion plus 1/2 of Q1. Q2 will be 11 billion plus 1/3 of P1. The next year this same calculation will be repeated with the numbers in P2 and Q2 in place of P1 and Q1.

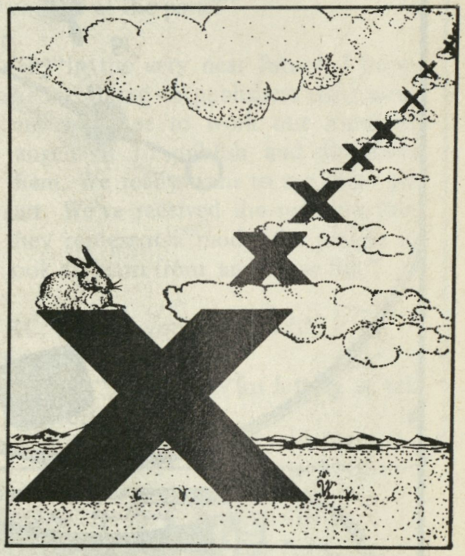
Extra Extra

You may have seen this problem before. There are two parts.

a. Solve for X where $X^{X^{X^{\cdots}}} = 2$

b. Solve for X where $X^{X^{X^{\cdots}}} = 4$

One of these has a solution, and one doesn't. Could you write a program to



compute the values of the function

$$Y=X^{X^{X^{\cdots}}}$$

for various values of X? Determine which of these problems has a solution.

(These problems are adapted from the book *Programming Problems for the TRS-80 Pocket Computer* by Don Inman and Jim Conlan, Wiley, 1981.)

Hint To Extra Extra

How are we going to find a value for

$$X^{X^{X^{\cdots}}}$$

We could at least start with some special case and see what sort of calculations are necessary. Let's let X=2.

2↑2=4
2↑(2↑2)=2↑4=16
2↑(2↑(2↑2))=2↑16=65536

This is clearly going to get larger and larger when X=2, but we can see how the calculations go. Let's see how we might deal with some input variable X.

Y=X
Y=X↑Y(=X↑X)
Y=X↑Y(=X↑(X↑X))
Y=X↑Y(=X↑(X↑(X↑X)))
Could we use this in a program?

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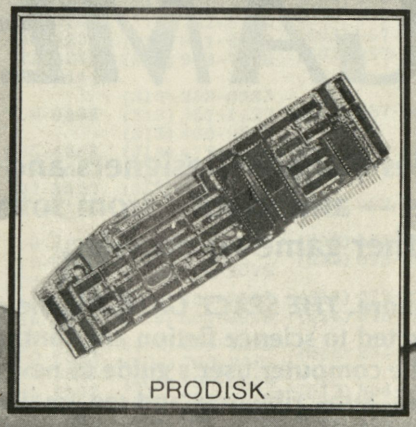
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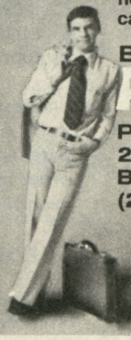

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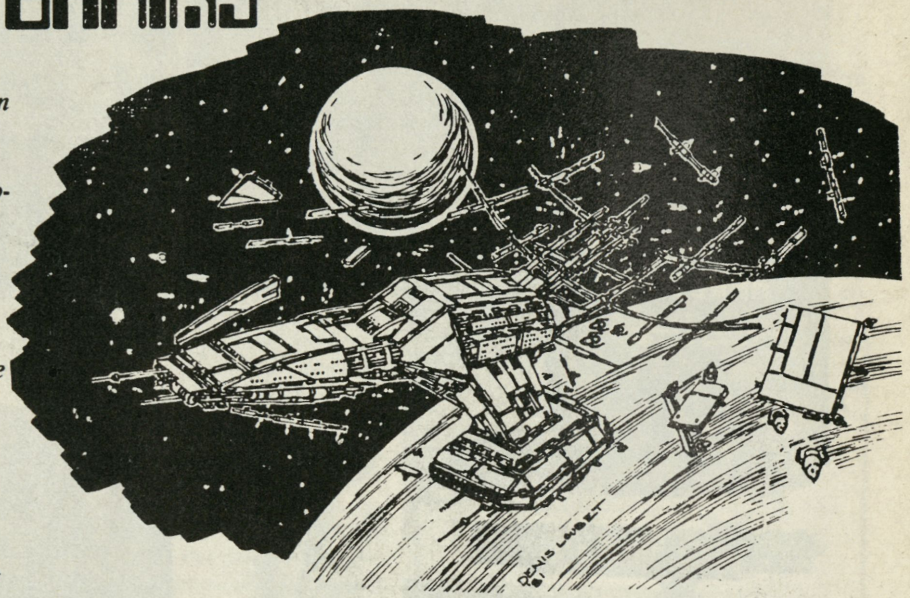

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Electric Phone Book

A computerized bulletin board works just like an ordinary bulletin board system except that instead of paper and thumbtacks it uses a terminal, a computer, and the dial-up telephone network.

The list below was developed from several sources including the Peripheral People in Mercer Island, Washington, and the People's Message System in Santee, California. It is being maintained by People's Computer Company's PCNET project, our effort to bring computers and telecommunications into the hands of everyone. While this is the most complete listing we have as of this writing, we would appreciate additions and corrections. Send them to PCNET, PCC, P. O. Box E, Menlo Park, CA 94025.

All the bulletin board systems listed here can be accessed by telephone using a 300-baud ASCII terminal and a Bell 103 modem. Most use carriage-return as a speed recognition character, after which they are self-teaching. All are free to anyone who calls, unlike Arpanet, which is restricted, and The Source and MicroNet, which cost money. The list has been sorted by area code; consult your local telephone directory for geographical correspondence. (Also printed in *Dr. Dobb's Journal*, April 1981.)

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■

by Susan Bowers

The Impact of Micros

Ready or not . . . microcomputers are here! The blossoming profusion of micros promises to impact significantly on our small computer center and its instructional timesharing network. We are already feeling the impact in requests for classes and seminars on running and programming microcomputers, in the need for information on several kinds of micros, inquiries for advice on configurations and costs as well as on textbooks and course materials, and in repeated requests for good software.

The Academic Computer Center at the University of Wisconsin in River Falls serves the on-campus instructional computing needs of a student population of around 5500, as well as 65 off-campus users, most of whom are school districts in northern Wisconsin. In seven years, the Center has grown from an IBM 1130 and two terminals linked to the Minnesota educational network, to three Hewlett Packard 3000 Series III timesharing computers with five disk drives. The rapid growth has caused many growing pains, and presented an ever-changing environment for the Center staff.

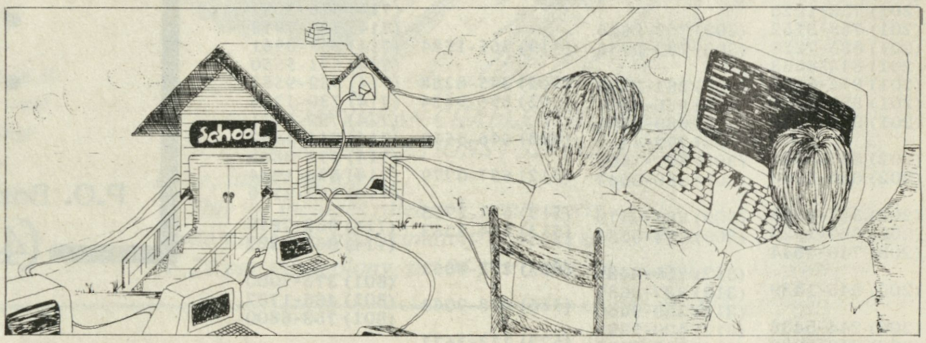
WACC (western Wisconsin Academic Computing Consortium) was formed seven years ago when some of the schools first became computer users, and is composed of our off-campus network members and the university. For the first few years, WACC members were using their computer access predominantly in classroom situations, such as simulations in science classes and in physics experiments, for dietary analysis in home economics, career information retrieval, and teaching BASIC programming classes to high school students. Several factors have now come together which change the focus of computer usage within the network. One of those factors is the microcomputer, specifically the TRS-80 and the Apple II.

As WACC members begin to utilize their computer access to do some of their own administrative reports and functions on-line, in order to meet new requirements by the Wisconsin Department of Public Instruction, their schools have less terminal time available for the classroom. At the same time, many more teachers are becoming computer experienced and are finding additional uses for a classroom computer. Some of the schools are purchasing a second port, one for administrative use and one for instructional use. However, not all of them can afford to do this. The districts range in size from 200 students to 5000 students (K-12), and many of the medium-to-small schools cannot afford a second access. Microcomputers are one way of dealing with the access-time constraint.

Beginning in the 1978-79 school year, a few TRS-80's began to pop up within the network. They were being experimented with, not as replacements for access to our computers, but as supplementary tools. One of the benefits of a consortium is the easy availability and dissemination of information. As a few of the schools tried a mix of micro and HP 3000, they passed the word to others in the network. Many of the terminal supervisors are now writing or have written grants with surprisingly good results, and are getting federal monies for the purchase of computer equipment. In a large number of instances, the equipment includes one or more TRS-80's. The projected usage as a vehicle for teaching BASIC programming will free the terminals connected to our HP 3000 for other classroom uses such as SPSS (statistical analysis), computer assisted instruction (CAI), textbook readability analysis, career counseling information, and the simulations.

The TRS-80 is not the only microcomputer found within our network, and at the present time it runs a close second to the Apple II. The ready availability of TRS-80 information, due to the great number of Radio Shack stores, even in small towns, may have played a large part in this. The decision was made nearly two years ago that our computer center would use the TRS-80 as we developed materials for the microcomputers. This year we have decided to support the Apple II as well. Our TRS-80 was purchased in 1977 and was an early Level I. It was upgraded to Level II in 1978 and configured to run with diskette in 1979. At that time it was also adapted so it can be a terminal for the HP 3000 computer, though it is rarely used that way.

We are a small computer center, with five staff members employed by the University. In addition, we work closely with five employees of a Cooperative Educational Service Agency (CESA). Our growth has been so rapid that there has never been slack time to devote to projects not yet urgent. This has allowed us little chance to learn the TRS-80 and to develop enough expertise to begin to build the kind of resource that will be needed by our consortium members very soon – is needed now, in fact.



During the 1979-80 school year, one of the computer science teachers had a special interest in TRS-80's and kept ours running well. At the same time, a short-term employee learned the machine thoroughly and had started converting some of our HP 3000 library programs to run on the TRS-80. Unfortunately that teacher is not back this school year and the funding was abruptly withdrawn for the short-term employee. One of our staff has been working with the TRS-80 extensively but is still in the learning stage. Our users are pressuring for help in programming techniques and know-how on the micros, as well as already converted programs. As new teachers are hired, microcomputer interest and experience ought to be one of the considerations in choosing who will fill the positions.

In November of 1979, our extension office sent out a questionnaire to survey what interest there might be in some extension seminars on programming for

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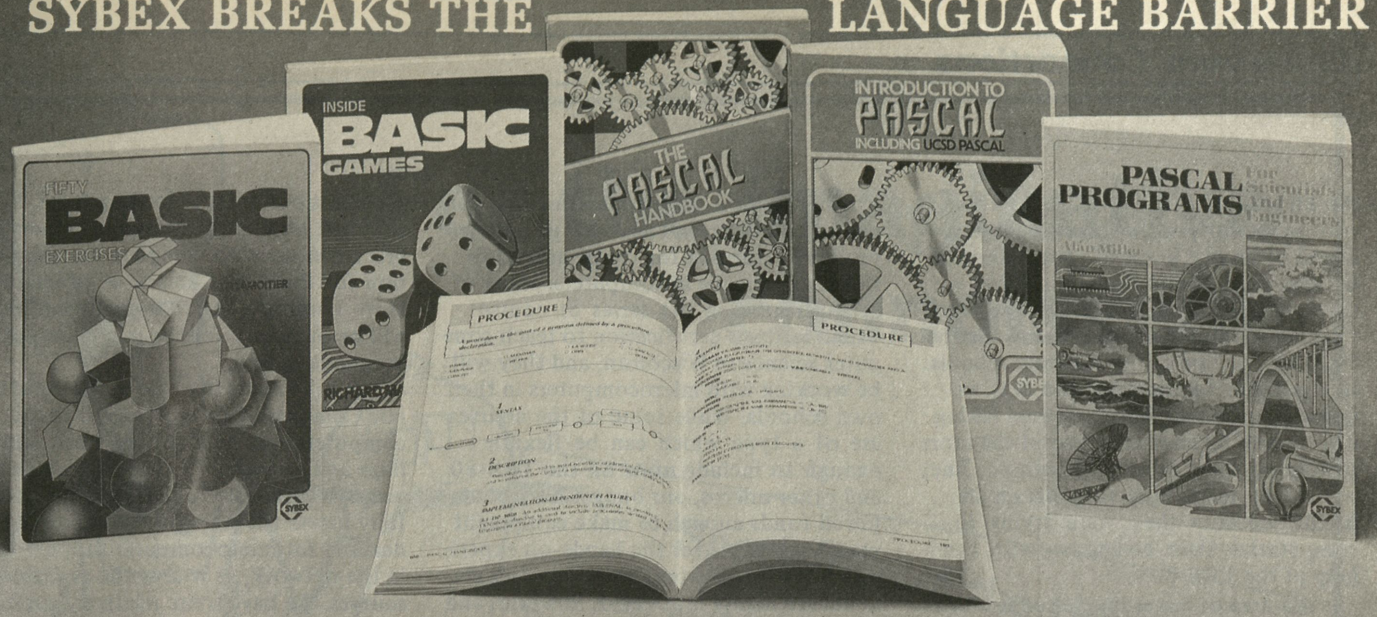

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the TRS-80. The response was startling, with over 100 people showing interest in one or several levels of programming. Because of staff and time limitations we have only been able to offer one seminar, "Beginning BASIC Programming for the TRS-80," at one of our member schools. It was filled to capacity and was extremely successful. Most of those taking it had small businesses in one of the more remote northern areas of Wisconsin. They wanted to learn how to program in BASIC because they were trying to computerize their businesses with the help of the TRS-80's.

An area of larger impact on our center is software. At present we have extensive libraries of HP 3000 programs available to any of our users at any time. One of our goals is to convert these programs to a form usable by the micros. They would then be stored on the HP 3000 and members could use their micros as terminals to retrieve the programs and store them on disk or cassette for later use. The users are ready for these now, however, and we have not had the staff resources available to do the conversions or to develop the down-loading program. It is hoped that some of the WACC members will begin to do some conversion themselves and share the results with other consortium members. Until recently, educational software for the TRS-80 was not readily available. The thrust seemed to be more toward small-business uses. However, educational applications are beginning to appear on the market now, bringing more questions. Is it more cost-effective to do our own conversions, develop new programs, or buy them commercially where available? Do the commercial programs fit our needs and the needs of the consortium members? How do we evaluate cost versus effort? We have not yet found the answers.

There has always been an easy exchange of [non-proprietary] programs among the users. We expect this to continue in the case of microcomputers. One of the problems in regard to software, however, is the copyright laws. We cannot reproduce commercial software for our network but can only inform the users of good programs when we find them, unless they have been developed within our center or within the network if the developer chooses to share. Rather than each school purchasing a copy of many pieces of commercial software, perhaps they will choose to set up a central library via their CESA district and purchase programs jointly. Each school could then check out software as they now do other resource materials.*

More and more of our university summer session students are looking for courses on micros. These are primarily teachers returning for credit and additional experience in computers. Many of them are taking the series of courses which leads to certification to teach computer science in Wisconsin, and they will be working with microcomputers in their own schools. While some of the courses are of a type which can be flexible enough to include units on the TRS-80 and other micros, our budget has not allowed funds enough to make equipment readily available for the hands-on experience they are seeking. These summer students are highly motivated, however, and perhaps they will also write some good microcomputer programs when they return to their districts.

Several years ago a series of BASIC Learning Programs were developed in our computer science department. These were tested and revised by summer session students over several summers and are now stored on the HP 3000. They form the backbone of the materials used for teaching beginning BASIC programming, both on our campus and in many of the schools on the network. The 1979 summer students revised the first group of LP's to run on the TRS-80. Those should be available for use by the consortium members by fall 1981. Modification of the more advanced ones will have to wait until there is available staff time in the future.

> *". . . microcomputer interest and experience ought to be one of the considerations of choosing who will fill the [teaching] positions."*

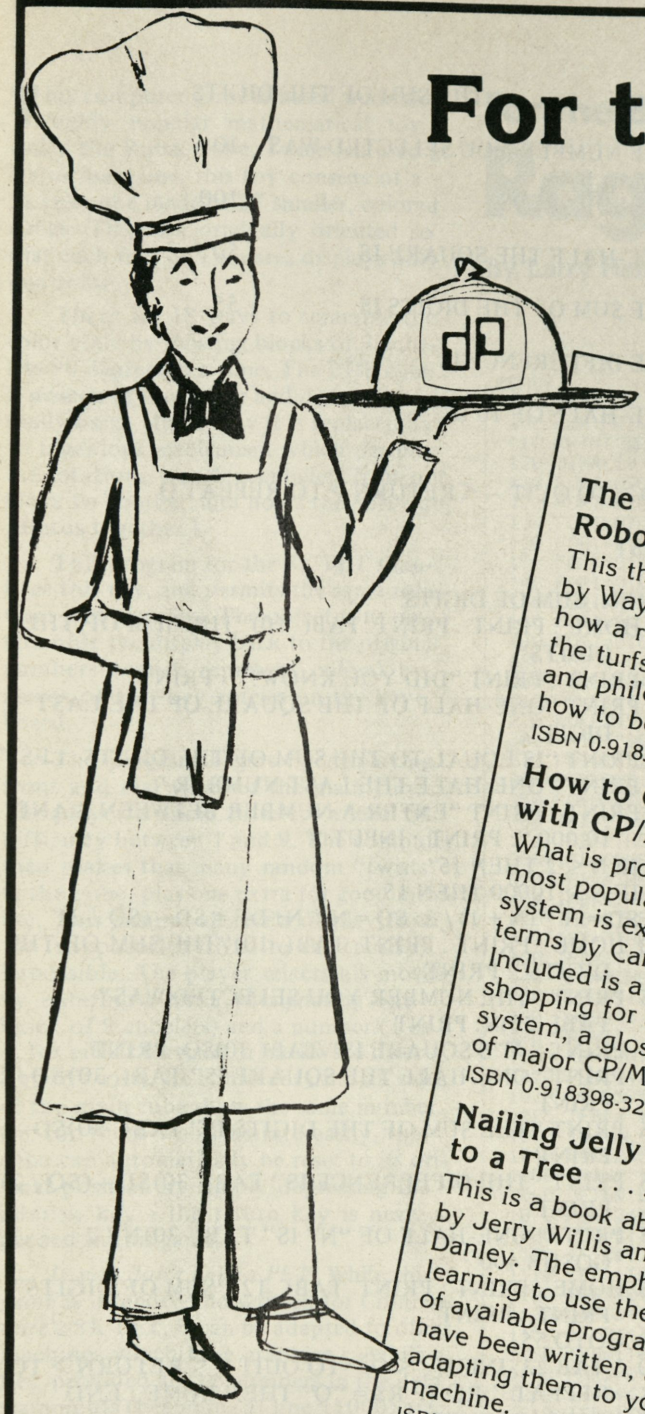
New documentation guidelines are necessary for programs being developed for the microcomputers. A library manual containing a minimum of information for running the HP 3000 is usually sufficient for network users since the programs are already on the computer and available simply by calling them up. If there are questions, the users phone or ask the computer operator via the console. The TRS-80 user is more isolated and it is necessary to have complete instructions available on-site, not just for running the programs but also for loading them. Each user will now have to develop a new library manual with complete documentation for their own library of programs. More complete internal documentation will be necessary for the microcomputer programs as well.

What then is the role of the Academic Computer Center in regard to microcomputers and how can we both minimize and optimize their impact on us and our network? First of all, we must carefully assess the need and evaluate the demand for microcomputer support within the network, as well as the available resources. We have some relatively sophisticated users with a good deal of expertise. If we can tap their know-how it will lessen the drain on our staff. We must then decide what level of support we are able to give our users. How can we serve them best?

We can make available information on microcomputer costs and configurations, include information on micros in our classes, hold extension classes and seminars on microcomputer programming and use the curriculum, as well as provide a partial bibliography of software currently available commercially. Many of our users have asked about *good* BASIC programming texts available for microcomputers. These are scarce, but as we become aware of them they will be added to the bibliography and we can let our members know about them through our newsletter. Conversion of our HP 3000 library should proceed as rapidly as possible. Here some of the network members can help us by sharing any programs they have converted. Speedy development of our own library of software for the micros is very important, as well as testing and evaluation of commercial programs so we can advise our users. We need to develop more expertise ourselves in order to be of service at whatever level of help we can offer. The character of our in-service presentations to users may change, moving more toward help with the microcomputers and making teachers aware of what information and applications are available and where.

If we are to continue to support the level of service to our consortium that we have in the past, we must absorb the impact of the microcomputer while still maintaining the established level of service to our HP 3000 users. At the same time, development of new facets of usage for the HP 3000 must also continue. To keep pace with all of this will require new levels of flexibility and growth on the part of the Academic Computer Center and its staff. We are hurrying to meet the challenge! ■

**Editor's note: Upcoming issues will feature such libraries and show how you can set up your own software exchange program.*



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Apple Fun

by Louis K. Bell

Sketch Pad

I wrote this program for my granddaughter. Although from a programming viewpoint it is relatively simple, it does provide wholesome recreation and entertainment. At the same time, a young user develops greater skill in hand-and-eye coordination.

The variables V and H in the program listing represent, as one might imagine, horizontal and vertical plot positions.

```
]LIST

5  REM SKETCH PAD KEYBOARD
15  HOME : VTAB 21: PRINT  TAB(  15)"SKETCH PAD";
25  HTAB 1: VTAB 22: PRINT "E=ERASE P=PLOT";
35  HTAB 1: VTAB 23: PRINT "U=UP D=DOWN L=LEFT
      R=RIGHT"
45  X = 140:Y = 80:C = 3
55  REM DRAW BORDER
65  HGR : HCOLOR= 3: HPLOT 0,0 TO 279,0 TO 279,159 TO
      0,159 TO 0,0
75  REM PLOTTING CONTROL
85  GET A$:A = ASC(A$)
95  IF A = 69 THEN C = 0: REM COLOR = BLACK
105  IF A = 80 THEN C = 3: REM COLOR = WHITE
115  IF A = 82 THEN H = 2: GOTO 165
125  IF A = 76 THEN H = -2: GOTO 165
135  IF A = 68 THEN V = 2: GOTO 165
145  IF A = 85 THEN V = -2: GOTO 165
155  GOTO 85
165  IF A <> 76 AND A <> 82 THEN H = 0
175  IF A <> 68 AND A <> 85 THEN V = 0
185  REM PLOTS POINTS
195  HCOLOR= C: HPLOT X + H,Y + V: X = X + H: Y = Y + V
205  GOTO 85
```

Sum of the Digits

This program will be of interest to those who enjoy mathematical oddities and playing with numbers. It is based on a fact that is explained in the following sample run.

```
7
]RUN

                THE SUM OF THE DIGITS

DID YOU KNOW?

ONE-HALF OF THE SQUARE OF THE LAST DIGIT IS
EQUAL TO THE SUM OF THE DIGITS LESS ONE-HALF
THE LAST NUMBER.

ENTER A NUMBER BETWEEN 2 AND 10,000.

                THE SUM OF THE DIGITS

THE NUMBER YOU SELECTED WAS     10

IT'S SQUARE IS                  100

ONE-HALF THE SQUARE IS          50

THE SUM OF THE DIGITS IS        55

THE DIFFERENCE IS               5

ONE-HALF OF 10 IS               5

<Q> TO QUIT - <RETURN> TO REPEAT Q

]LIST

5  REM  SUM OF DIGITS
15  HOME : PRINT : PRINT  TAB(  10)"THE SUM OF THE
      DIGITS"
20  PRINT : PRINT "DID YOU KNOW?" : PRINT
30  PRINT "ONE-HALF OF THE SQUARE OF THE LAST
      DIGIT";
40  PRINT "IS EQUAL TO THE SUM OF THE DIGITS  LESS"
45  PRINT "ONE-HALF THE LAST NUMBER."
55  PRINT : PRINT "ENTER A NUMBER BETWEEN 2 AND
      10,000.": PRINT : INPUT N
65  IF N < 2 THEN 15
70  IF N > 10000 THEN 15
75  SD = N * (N + 1) / 2: SQ = N * N: DF = SD - (SQ / 2)
100  HOME : PRINT : PRINT  TAB(  10)"THE SUM OF THE
      DIGITS": PRINT
115  PRINT "THE NUMBER YOU SELECTED WAS"
      TAB(  30)N: PRINT
125  PRINT " IT'S SQUARE IS" TAB( 30)SQ: PRINT
135  PRINT "ONE-HALF THE SQUARE IS" TAB(  30)SQ / 2:
      PRINT
145  PRINT "THE SUM OF THE DIGITS IS" TAB(  30)SD:
      PRINT
155  PRINT "THE DIFFERENCE IS" TAB(  30)SD - (SQ / 2):
      PRINT
165  PRINT "ONE-HALF OF "N" IS" TAB(  30)N / 2:
      GOSUB 400
176  HOME : PRINT : PRINT  TAB(  12)"SUM OF DIGITS":
      PRINT : PRINT
180  GOTO 55
400  VTAB 23: INPUT "<Q> TO QUIT - <RETURN> TO
      REPEAT ";R$: IF R$ = "Q" THEN HOME : END
401  HOME : RETURN
```

Louis K. Bell, 2310 Savannah Road, Augusta, GA 30903.

For the 8K PET

Raging Rubikube

by Larry Hatch

This computer game is based upon the highly popular mathematical toy called the Rubik Cube. Twice featured in *Omni* magazine, this toy consists of a 3x3x3 cube made of 27 smaller, colored cubes. They are originally oriented so that each face of 9 squares displays only one color.

There are 18 ways to scramble the color code by twisting blocks of 9 cubelets 90 degrees at a time. The 27th cube is unseen in the center and does not actually exist. (In the toy it is replaced by an ingenious mechanism which permits the rotations, transfers cubelets from one block to another, and holds the entire apparatus together.)

This program for the 8K PET simulates this toy, and permits the same rotations and transfers. The object is to unscramble the display back to the original numbers (which represent colors) by means of two-key entries on the keyboard.

The program begins by displaying front and rear views of the main cube. The player is asked to select a level of difficulty between 1 and 9. The computer then makes that many random "twists" in the cube, plus one extra for good measure. This ensures all levels of play from the (supposedly) trivial to the (nearly) impossible. The player selects his moves by entering a letter (designating one block of 9 cubelets) and a number (1 or 2, for either forward or backward direction of twist). He continues until all sides of the main cube show the same number. Or, for those who frustrate easily, the cube can automatically be reset to its original position by simply depressing the asterisk key – the return key is never needed in this game.

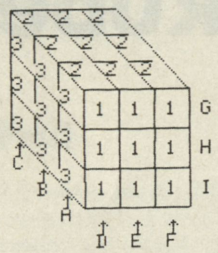
If you don't have a PET: While this game is intended and written for Commodore's 8K PET, it can be adapted to other machines which have graphics capabilities, provided all the numbers in the data statements (beginning at line 11000) are altered to match screen POKE locations on the CRT. POKEs into locations 525 and 545 are for keyboard count and cursor line locations, and should only be used on the 8K PET; different locations will be used on other machines. INPUT statements can be substituted, as well as cursor down instructions, to make these corrections. Computers, such as the Apple, with color graphics should be able to generate striking displays if the correct screen locations are found.

Larry Hatch, 22 Coleman Place #14, Menlo Park, CA 94025.

```
READY.

 100 CLR:PRINT"■R":POKE245,19:PRINT
 110 PRINT"■RAGING RUBIKUBE■S";
 120 DIMA(20),C(20),D(20),F(20),I(20),G(20),B(12),E(12),H(12),R(20)
 130 FORI=0TO20:READA(I):NEXTI
 132 FORI=0TO20:READC(I):NEXTI
 134 FORI=0TO20:READD(I):NEXTI
 136 FORI=0TO20:READF(I):NEXTI
 138 FORI=0TO20:READG(I):NEXTI
 140 FORI=0TO20:READI(I):NEXTI
 150 FORI=0TO11:READB(I):NEXTI
 155 FORI=0TO11:READE(I):NEXTI
 160 FORI=0TO11:READH(I):NEXTI
 180 GOSUB 5400:SC=32768
 200 FORI=12TO20:POKEA(I),49:POKEC(I),54:POKED(I),51:POKEF(I),52:POKEG(I),50
 210 POKEI(I),53:NEXTI
 220 POKE245,20:PRINT
 300 PRINT"SELECT LEVEL OF"
 310 PRINT"DIFFICULTY (1-9) ◆■";
 320 POKE525,0:WAIT525,1:GETZ$:Z=VAL(Z$):PRINTZ$
 350 FORU=0TOZ:D=INT(2*RND(1)+1):B=INT(9*RND(2)+1)
 360 IFB=1THENB$="A"
 370 IFB=2THENB$="B"
 380 IFB=3THENB$="C"
 390 IFB=4THENB$="D"
 400 IFB=5THENB$="E"
 410 IFB=6THENB$="F"
 420 IFB=7THENB$="G"
 430 IFB=8THENB$="H"
 440 IFB=9THENB$="I"
 450 GOSUB1100:NEXTU
 460 POKE245,19:PRINT
 480 PRINT"                ":PRINT"                "
1000 REM*ROTATION SELECT
1010 POKE245,19:PRINT:PRINT"ROTATION ":PRINT"BLOCK? (A-I) ◆■";
1020 POKE525,0:WAIT525,1:GETB$:PRINTB$
1025 IFB$="*"THENPRINT"■S";:GOTO180
1030 IF VAL(B$)<>0THEN1010
1040 POKE245,19:PRINT:PRINT"DIRECTION"
1050 PRINT"1=FWD 2=RVS ◆■";:POKE525,0:WAIT525,1
1060 GETD$:D=VAL(D$):PRINTD$:IFD<1ORD>2THEN1040
1070 POKE245,21:PRINT:PRINT"                    ";
1080 GOSUB1100:GOTO1000
1100 IF B$<>"A"THEN1150
1110 IFD=1THEN FORI=0TO19:R(I)=A(I):NEXTI:GOSUB4000:RETURN
1120 FORI=0TO11:R(I)=A(11-I):NEXTI:FORI=0TO7:R(I+12)=A(19-I):NEXTI
1130 GOSUB4000:RETURN
1150 IF B$<>"B"THEN1200
1160 IFD=1THEN FORI=0TO11:R(I)=B(I):NEXTI:GOSUB4100:RETURN
1170 FORI=0TO11:R(I)=B(11-I):NEXTI:GOSUB4100:RETURN
1200 IF B$<>"C"THEN1300
1210 IFD=1THEN FORI=0TO19:R(I)=C(I):NEXTI:GOSUB4000:RETURN
1220 FORI=0TO11:R(I)=C(11-I):NEXTI:FORI=0TO7:R(I+12)=C(19-I):NEXTI
1230 GOSUB4000:RETURN
1300 IF B$<>"D"THEN1350
1310 IFD=1THEN FORI=0TO19:R(I)=D(I):NEXTI:GOSUB4000:RETURN
1320 FORI=0TO11:R(I)=D(11-I):NEXTI:FORI=0TO7:R(I+12)=D(19-I):NEXTI
1330 GOSUB4000:RETURN
1350 IF B$<>"E"THEN1400
1360 IFD=1THEN FORI=0TO11:R(I)=E(I):NEXTI:GOSUB4100:RETURN
1370 FORI=0TO11:R(I)=E(11-I):NEXTI:GOSUB4100:RETURN
1400 IF B$<>"F"THEN1500
1410 IFD=1THEN FORI=0TO19:R(I)=F(I):NEXTI:GOSUB4000:RETURN
1420 FORI=0TO11:R(I)=F(11-I):NEXTI:FORI=0TO7:R(I+12)=F(19-I):NEXTI
1430 GOSUB4000:RETURN
1500 IF B$<>"G"THEN1550
1510 IFD=1THEN FORI=0TO19:R(I)=G(I):NEXTI:GOSUB4000:RETURN
1520 FORI=0TO11:R(I)=G(11-I):NEXTI:FORI=0TO7:R(I+12)=G(19-I):NEXTI
1530 GOSUB4000:RETURN
```

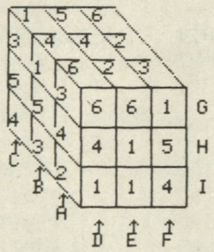
(Continued on next page)



```
READY.
```

This is the front view (unscrambled). A rear view is also displayed on the CRT screen.

```
READY.
```



```
READY.
```

This is the front view scrambled.

```
1550 IF B$<>"H"THEN1600
1560 IFD=1THEN FORI=0TO11:R(I)=H(I):NEXTI:GOSUB4100:RETURN
1570 FORI=0TO11:R(I)=H(11-I):NEXTI:GOSUB4100:RETURN
1600 IF B$<>"I"THENRETURN
1610 IFD=1THEN FORI=0TO19:R(I)=I(I):NEXTI:GOSUB4000:RETURN
1620 FORI=0TO11:R(I)=I(11-I):NEXTI:FORI=0TO7:R(I+12)=I(19-I):NEXTI
1630 GOSUB4000:RETURN
4000 REM* ROTATION
4010 FORJ=1TO3:Q=PEEK(R(11)):FORI=10TO0STEP-1:P=PEEK(R(I)):POKER(I+1),P
4020 NEXTI:POKER(0),Q:NEXTJ:FORJ=1TO2
4030 Q=PEEK(R(19)):FORI=18TO12STEP-1:P=PEEK(R(I)):POKER(I+1),P
4040 NEXTI:POKE(R(12)),Q:NEXTJ:RETURN
4100 REM* CTR ROT
4110 FORJ=1TO3:Q=PEEK(R(11)):FORI=10TO0STEP-1:P=PEEK(R(I)):POKER(I+1),P
4120 NEXTI:POKER(0),Q:NEXTJ:RETURN
5000 END
```

```
5400 PRINT"■";
5480 TB=0
5490 PRINT"   ┌─┬─┬─┐
5500 PRINT"  ┌┼─┼─┼─┤
5510 PRINT"  │└─┴─┴─┘ FRONT
5520 PRINT"  ├┼─┼─┼─┐
5530 PRINT"  ┌┤ └─┴─┴─┘
5540 PRINT"  │└┼─┼─┼─┐
5550 PRINT"  ├┼┐└┐ └┐ └┐
5560 PRINT"  ┌┤ └┼──┴──┴──┐
5570 PRINT"  │└┼─┐│  ♦  │  ♦  │  ♦  │←G
5580 PRINT"  ├┼┐└┤└┐ │     │     │     │
5590 PRINT"  └┤ └┼──┴──┴──┴──┴──┴──┴──┘
5600 PRINT"  ↑└┼─┐│  ♦  │  ♦  │  ♦  │←H
5610 PRINT"  C └┤ └┐ │     │     │     │
5620 PRINT"     ↑└┼──┴──┴──┴──┴──┴──┴──┘
5630 PRINT"     B └┐│  ♦  │  ♦  │  ♦  │←I
5640 PRINT"       ↑└┐ │     │     │     │
5650 PRINT"       A └──┴─────┴─────┴─────┘"
5660 PRINT"           ↑     ↑     ↑
5670 PRINT"           D     E     F"
5690 PRINT"■";
5790 TB=20
5800 PRINTTAB(TB)"           F     E     D
5810 PRINTTAB(TB)"        C┌──┬──┬──┬──┐
5820 PRINTTAB(TB)"         /│  ♦  │  ♦  │  ♦  │G
5830 PRINTTAB(TB)"      B┌┼──┼──┼──┼──┤
5840 PRINTTAB(TB)"       /│ /│     │     │     │
5850 PRINTTAB(TB)"    A┌┼──┼──┼──┼──┼──┼──┼──┐
5860 PRINTTAB(TB)"     /│ /│  ♦  │  ♦  │  ♦  │H
5870 PRINTTAB(TB)"    ├┼──┼──┼──┼──┼──┼──┼──┤
5880 PRINTTAB(TB)"    │ /│ /│     │     │     │
5890 PRINTTAB(TB)"    └┼──┼──┼──┼──┼──┼──┼──┘
5900 PRINTTAB(TB)"     │ /│ /  ♦  /  ♦  /  ♦  /
5910 PRINTTAB(TB)"     └┼──┼──┼──┼──┼──┼──┼──┐
5920 PRINTTAB(TB)"      │ /  /  /  /  /  /  /
5930 PRINTTAB(TB)"      └┼──┼──┼──┼──┼──┼──┘ REAR
5940 PRINTTAB(TB)"       │ /  /  /  /  /  /
5950 PRINTTAB(TB)"       └┼──┼──┼──┼──┼──┘
5960 PRINTTAB(TB)"        └──┴──┴──┴──┴──┘"
5990 RETURN
11000 DATA 33294,33174,33054,32975,32978,32981,33110,33230,33350,33432,33435
11010 DATA 33438,33337,33217,33097,33100,33103,33223,33343,33340,33220:REM*A
11020 DATA 33130,33010,32890,32811,32814,32817,32954,33074,33194,33276,33279
11030 DATA 33282,33163,33043,32923,32920,32917,33037,33157,33160,33040:REM*C
11040 DATA 33337,33217,33097,32975,32893,32811,32923,33043,33163,33282,33360
11050 DATA 33438,33294,33174,33054,32972,32890,33010,33130,33212,33092:REM*D
11060 DATA 33343,33223,33103,32981,32899,32817,32917,33037,33157,33276,33354
11070 DATA 33432,33350,33230,33110,33032,32954,33074,33194,33272,33152:REM*F
11080 DATA 33103,33100,33097,33054,32972,32890,32923,32920,32917,32954,33032
11090 DATA 33110,32981,32978,32975,32893,32811,32814,32817,32899,32896:REM*G
11100 DATA 33343,33340,33337,33294,33212,33130,33163,33160,33157,33194,33272
11110 DATA 33350,33432,33435,33438,33360,33282,33279,33276,33354,33357:REM*I
11200 DATA 33212,33092,32972,32893,32896,32899
11210 DATA 33032,33152,33272,33354,33357,33360:REM*B
11220 DATA 33340,33220,33100,32978,32896,32814
11230 DATA 32920,33040,33160,33279,33357,33435:REM*E
11240 DATA 33223,33220,33217,33174,33092,33010
11250 DATA 33043,33040,33037,33074,33152,33230:REM*H
READY.
```

Are you ready to take the next step?

Then read
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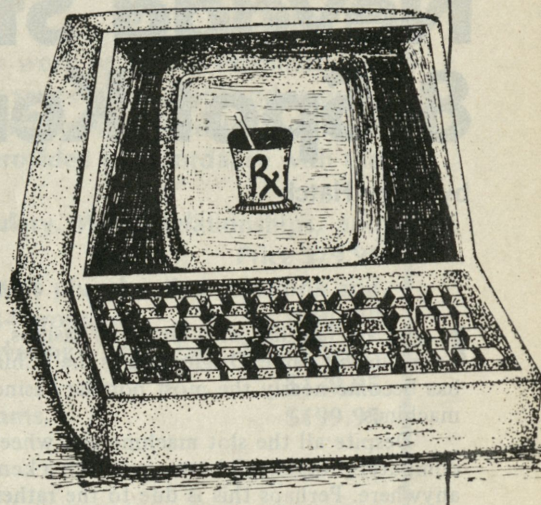

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For the 8K PET

Nevada Style 8~Spot Keno

by Larry Hatch

If you are familiar with Nevada's casinos, I do not need to explain this game. Originating as the "Chinese lottery," keno has become nearly the most popular casino game, after slot machines.

Despite all the slot machine and wheel-of-fortune type computer programs, I have never seen a keno program published anywhere. Perhaps this is due to the rather difficult mathematics and organization problems that exist in the game. (Keno is an example of hypergeometric distribution, or sampling without replacement.)

The program which follows has a very nice screen display which mimics the big keno boards used in actual casinos, even to the point of lighting up, in reverse field, the lucky numbers as they are drawn.

Due to the heavy use of PEEKs and POKEs used to create this effect, the use of this program will, for the most part, be limited to the 8K PET. The more adventuresome, however, who own a 16K PET, should find the program adaptable by changing the constant SC=32768 to the first screen location of their machine.

Keno, anyone?

```
READY.

 10 CLR:PRINT"□":SC=32768
 20 DIM A(8),B(2,80),C(8),D(20)
 30 PRINT"####■ENO■%%&%■KENO■$&&$■ENO■++++"
 40 SC=32768:FORI=0TO13:READY:POKESC+980+I,Y:NEXTI:I=0:Y=0
 50 PRINT"■■INSTRUCTIONS? ";:POKE525,0:WAIT525,1:GETI$:PRINTI$
 60 IFI$="N"THENPRINT"□":GOTO160
 70 PRINT"■■■■THIS $1.00 8-SPOT KENO GAME IS PLAYED"
 80 PRINT" HEAVILY IN NEVADA CASINOS TODAY."
 90 PRINT:PRINT"YOU PICK 8 NUMBERS BETWEEN 1 AND 80."
100 PRINT:PRINT"[FOR ONE DIGIT NUMBERS, PRESS RETURN]"
110 PRINT:PRINT"20 NUMBERS APPEAR AT RANDOM."
115 PRINT"IF FIVE OR MORE MATCH YOURS YOU WIN:"
120 PRINT:PRINT"       MATCH 5 ------- 15.00"
130 PRINT"       MATCH 6------- 100.00"
140 PRINT"       MATCH 7------- 2000.00"
150 PRINT"       MATCH 8----- 25000.00":PRINT
160 PRINT:PRINT"□  NOW ENTER YOUR 8 LUCKY NUMBERS":QI=TI:U=0
170 POKE245,21:PRINT:PRINT" (TO ERASE ERRORS HIT THE 'E' KEY)"
180 PRINT"■■■      ~ 34 SPACES ~                ":FORI=1TO8
190 PRINT"■◆◆":IFU>0THEN310
200 POKE525,0:PRINT"■";:WAIT525,1:GETA$:PRINT"◆";A$;
210 POKE525,0:WAIT525,1:IFA$="E"ANDI=1THEN190
220 IFA$="E"THENI=I-2:PRINT"■■":PRINTTAB(I*3+1)"XX":GOTO310
230 GETB$:IFB$="0"THENA(I)=10*VAL(A$):PRINT"■";A(I):GOTO270
240 IFB$="E"THENPRINT"■◆◆":GOTO200
250 IFVAL(B$)=0THENA(I)=VAL(A$):GOTO270
260 A(I)=10*VAL(A$)+VAL(B$)
270 PRINT"■";A(I)
280 IF A(I)<1 OR A(I)>80 THEN U=2
290 PRINT"■■":PRINTTAB(I*3-3)A(I)"■ "
310 PRINT"■   ":NEXT I:I=0
320 QQ=INT(TI-QI)
330 REM -RIPPLE SORT AND DISALLOW-
340 FOR S=1TO7:P=0:FORQ=1TO(8-S)
370 IF A(Q)<A(Q+1) GOTO 440
380 IF A(Q)=A(Q+1) THEN U=1
390 IF A(Q)<1 OR A(Q)>80 THEN U=2
400 X=A(Q):A(Q)=A(Q+1):A(Q+1)=X:P=1
440 NEXT Q:IF P=0 THEN 480
460 NEXT S
480 IFU=1THENPRINT"□   DONT USE SAME NUMBER TWICE":GOTO160
490 IFU=2THENPRINT"□   NUMBERS FROM 1 TO 80 ONLY!":GOTO160
510 PRINT"□";
540 H=F:FOR I=1TO8:PRINTA(I);:NEXT I:G=INT(G+1)
550 J=INT(J-.99):GOSUB1800:GOSUB2000
580 REM -BALLS REPLACED IN DRUM-
590 FOR E=1TO80:B(1,E)=E:NEXT E:F3=1
600 PRINT"■■■GAME #■"G;" YOUR BANK =$"J"■■ "
610 REM* RANDOM BALLS CHOSEN
630 F=0: H=0: V=0
640 SC=32768:SD=32926
650 FOR T=1TO20
660 F=INT((800*RND(F3)+F2)+2)
670 IF F<81 GOTO 690
680 F=F-80:GOTO670
690 W=F:F3=INT(VAL(TI$)/119)+QQ
700 F2=W:IF B(1,W) = 0 GOTO 660
710 H=B(1,W):D(T)=H:B(1,W)=0:B(2,W)=B(2,W)+1
720 TN=INT((H-1)/10):UN=H-10*TN:SE=SD+UN*4+TN*80
730 LF=PEEK(SE-1):RT=PEEK(SE):POKESE-1,LF+128
780 POKESE,RT+128:POKE 245,19:PRINT:PRINTH"■■□"
790 NEXT T
800 C=0:I=0:K=0:REM*COMPARATOR
850 POKE245,19:PRINT:PRINT"MATCHES ";
860 FOR I=1TO8:K=A(I)
870 IFK=0THEN NEXTI
880 FOR L = 1 TO 20
890 IF K=D(L) THEN C=C+1:PRINTK;
900 NEXT L,I:GOTO1000
1000 M=0:REM*PAYOUT
1010 POKE245,20:PRINT:IF C>0 THEN 1030
1020 PRINT"** NONE **";:GOTO1410
1030 N=C-4:IF C<5 GOTO 1130
1040 ON N GOTO 1220,1240,1260,1290,1330
1130 PRINT"FOR"C"NUMBERS":M=0:GOTO1410
1220 PRINT"■WINNER!■ -$15.00- ":M=15:GOTO1360
1240 PRINT"■WINNER!■ -$100.00- ":M=100:GOTO1360
1260 PRINT"■WINNER !■ -$2000.00- !":M=2000:GOTO1360
1290 PRINT"■WINNER !■ -$25,000- !!":M=25000:GOTO1360
1330 PRINT"□AME IS VOID: $1.00 CREDIT"
1340 J=J+1:GOTO 1410
1350 REM* PAYOUT AND BRANCHING
1360 J=J+M:PRINT"■■■GAME #■"G;" YOUR BANK =$"J"■■ "
1410 POKE245,21:PRINT:IF N$="W"THEN 1500
1430 PRINT"■F■ = REPLAY; ■C■= CLEAN CARD; ■■=WHEEL."
1440 PRINT"ENTER CHOICE ◆■■";:POKE525,0:WAIT525,1
1450 GETN$:PRINTN$;:IF N$="R"THEN1590
1455 IF N$="W"THEN1570
1460 IF N$="C"THENPRINT"■";:GOTO160
1470 PRINT"?";:GOTO1430
1500 REM -TIME DELAY-
1510 IF T1=0 THEN 1590
1520 FOR Y1=1TO(T1*150):Y=1:Y=0:NEXTY1
1540 IFN$="W"THEN1590
1570 PRINT:PRINT"ENTER READING TIME DELAY (0-9) ◆■■";
1580 POKE525,0:WAIT525,1:GET T1:PRINTT1;
1590 PRINT"■";:GOTO540:REM*REPLAY
1800 REM*BOARD SETUP
1810 PRINT"■■■■  1   2   3   4   5   6   7   8   9  10"
1820 PRINT:A=1:AB=2:B=10:FORI=ATO7:FORK=ATOB
1830 PRINT K+B*I;TAB(K+AB):NEXTK:PRINT:NEXTI
1840 FORI=33567TO33767:POKEI,32:NEXTI:RETURN:END
1850 RETURN
1910 DATA 2,25,32,12,1,18,18,25,32,8,1,20,3,8,32,32
2000 REM* 8 CHOSEN NUMBER MARKERS
2010 SC=32768:SD=32966:FORI=1TO8:H=A(I)
2020 TN=INT((H-1)/10):UN=H-10*TN:SE=SD+UN*4+TN*80
2120 POKESE-1,69:POKESE,69:NEXTI:RETURN
READY.


READY.

 1 SOME NOTES ON CURSOR CONTROL GRAPHICS
 2 ..................................
 3 "■ EQUALS CURSOR DOWN
 4 "■ EQUALS CURSOR HOME (UPPER LEFT, NO ERASING
 5 "□ EQUALS CURSOR HOME + SCREEN CLEAR
 6 "■ EQUALS PRINT IN REVERSE FIELD
 7 "■ EQUALS BACKSPACE ← TO LEFT
 8 "■ EQUALS END OF REVERSE FIELD, BACK TO REGULAR
 9 "□ EQUALS CURSOR UP ↑ ONE SPACE.
```

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J. DiMaggio	H. Greenberg	W. Mays	L. Brock
J. Jackson	R. Hornsby	P. Rose	R. Carew
G. Sisler	H. Wilson	O. Cepeda	H. Killebrew
S. Musial	B. Terry	C. Yazstremski	R. Allen
T. Cobb	M. Mantle	W. McCovey	R. Leflore
W. Mays	H. Aaron	R. Jackson	R. Zisk
C. Young-P	W. Johnson-p	G. Brett	B. Madlock
		R. Guidry-P	T. Seaver-p

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Computer Anatomy for Beginners

Taking the First Step

by Mike Gabrielson and Marlin Ouverson

Three types of people are found near computers: users, operators and programmers. *Users* are people who don't necessarily come into contact with the computer, especially the large machines used in science, government and big business. They just need to use the results that a computer can provide. We've all been computer users at one time or another. If you get a statement from the bank, it is typically printed by a computer. If you make a phone call, there's a computer somewhere in the phone network keeping track of where the call is going, how long it is, and what the charges are. We are using those computers even if we aren't aware of it.

A computer *operator* is what you are when you first sit down at your home computer. An operator sits in front of the machine, presses buttons, types thing on it, reads the monitor, and so on. Operators don't need to understand what goes on inside the machine, they just take care of it – keep it fed with electricity, paper, that sort of thing.

On very small computers, users and operators are the same people. The person who needs the results is the one who sits down and runs the machine. Users of microcomputers can have complete control of what the machine does. Huge, room-size computers are often never seen by the users at all, and only a handful of operators actually touch them.

Programmers are interesting people. They provide the necessary instructions for the computer so it will do the right thing. After you have begun to feel comfortable sitting at the keyboard, you can turn into a programmer. You will start out operating, and in a few days you can be programming. It is a very easy transition. Once operators get a taste of programming, they frequently turn into full-time programmers. The pay is good. And as computers become more and more involved with our daily lives, programmers will have a special advantage in dealing with them, because of their insight into how computers actually work.

If you want to learn about computers, then as soon as possible you should actually *use* one as much as possible. If you don't have your own and aren't ready to buy one yet, then borrow one from a friend, a school, or use one at the library. Hands-on experience has got to be your emphasis. Simply talking about computers – or reading about them – is boring. It's uninteresting. But exploring the machines themselves and learning what you can do with them is exciting!

Experiment with your computer. Play with it as much as possible. The machine isn't sacred. Sit down at it, punch all the buttons, type things in and see what happens. It won't hurt anything! Computer novices should work in teams of two. Get a friend, or someone from work, or your husband or wife who wants to learn with you. Two heads are better than one, and you will have fun together. Select a programming problem out of a textbook, try to solve it individually, then compare your solutions.

Articles and books can describe a lot of things and they might make sense. But it's more important that you gain experience firsthand. Then you will really understand what all the books and lecturers are talking about.

Computer people often talk about "hardware" and "software." What is hardware and software? *Hardware* is the nuts, bolts and electronics that make up a piece of equipment. Hardware is the kind of stuff that breaks when you drop it on the floor. *Software* is programs. Software is the instructions programmers write down on paper (or type in the computer's keyboard) and feed into the machine. If you drop software on the floor, it doesn't break. That's the difference between hardware and software.

Programmers who know both hardware and software (that is, they can write programs and also build and fix electronics) are very valuable people – they make more money than other programmers, are in the greatest demand, and are very hard to find. But you can program a computer and not know much about hardware. In fact, you can be completely ignorant about how the electronics work, and many programmers, even the best, are. If you can operate a typewriter and flip power switches on and off, you can start programming a computer.

If you are getting tired of reading all this, it's because you haven't been experimenting enough with your computer! Don't say I didn't warn you . . . Type something on the computer and see what happens. Did the computer send you a message? Did the screen go blank? The computer probably thought that what you typed was some sort of instruction, and it tried to understand and act upon what you typed.

A list of instructions to the computer is a program. A computer is very dumb. It doesn't know a thing, it is just an obedient servant. It asks what to do, you tell it, it does it. If you don't tell it exactly what to do, it usually ends up doing the wrong thing. Programmers simply make lists of instructions to tell the computer what to do. Your mother "programmed" you when you were a child. She'd say, "Take this dollar bill, go down the block to the grocery store, buy a quart of milk and a loaf of bread, bring back the change." You would then accept the instructions, store them in your memory, then follow the instructions. And that's exactly what a computer does (except the computer doesn't get mad if it would rather watch television, and it won't complain if it's a long walk to the store).

Executing is what the computer is doing as it follows the list of instructions. You can hide from the computer, in a different room or a different building, and write a list of instructions on paper. You've written a program! But the computer cannot actually follow the instructions, or "execute" the program, until you type the program into the computer so that it is in the computer's memory.

Now you know some jargon. To surprise your friends, just say, "I executed some software today."

Adapted from The Pascal Papers, *an unpublished, introductory text by Mike Gabrielson for would-be computer programmers.* ■

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For Your TRS-80

Property Management Program

by Milan D. Chepko, M.D.

Recently, a friend asked me for a program to keep records of his rental properties using his TRS-80 Level II. A brief search of the literature turned up several very comprehensive programs, all written for 1 or 2 disk systems with line printer, and ranging in price from $50 to $495.

Finally, I asked just what he wanted the program to do, and he came up with the following:

1) Keep track (on tape) of each financial transaction for any property, including the date, the amount involved, and a brief explanantion.

2) Total all income and expenses, and print out a net balance for each property on request.

3) Include mortgage payments (figures supplied by the bank at the end of the year).

Needless to say, I was shocked at the starkness of his request! All of the expensive commercial programs include various ways of cross-referencing and comparing the data, as well as calculating depreciation and other factors. He assured me that while those features are probably nice for a large business, they really aren't necessary.

After pondering for a few days, I came up with this simple program, which does what he requested. REM statements explain each section, so modifications should be easy. Each property is handled separately, although you could add a routine to keep running totals of income and expenses. The file for a property is read in from tape, updated as necessary, and stored back on another tape . . . that way you always have a recent backup copy on hand. These routines could be easily modified to use sequential disk data files, as well as directing program output to a line printer.

You've probably noticed that there is no provision to go back and change an entry once it is established in the array (although it can be changed if you spot an error while creating the entry). I felt that adding this feature would be unnecessarily complex, and that if any error were found (or a check bounced), it would make better business sense to have a separate entry negating the original, with dates for documentation.

Using this program is relatively straightforward . . . just follow the instructions as they appear on the screen. I suggest using two tapes to store each property, providing backup. At the end of the fiscal year, store the final printout with the receipts and cancelled checks for that property, and you should be ready for any audit that comes along. (Don't forget to depreciate your computer as a business expense if possible!)

While programming is both fun and challenging, it sometimes pays to ask the program's end user just what he (or she) expects the program to accomplish. You might be pleasantly surprised! ■

Milan D. Chepko, M.D., 119 Belleville Crt., Thief River Falls, MN 56701.

```
100 CLS:'  PROPERTY MANAGEMENT PROGRAM
110 ' BY MILAN CHEPKO   (THIEF RIVER FALLS, MN   17 SEP 80)
120 CLEAR4000:DIM D$(200),C$(200),A(200)
130 'CLEAR ARRAY FOR NEXT PROPERTY
140 CLS:N=0:Z$="":FOR I=1TO200:D$(I)="":C$(I)="":A(I)=0:NEXT
150 'MENU
160 CLS:PRINT"SELECT FUNCTION BY ENTERING NUMBER...":PRINT
170 PRINT"  1 - LOAD OLD DATA FROM TAPE
180 PRINT"  2 - START OR UPDATE DATA FILE FROM KEYBOARD
190 PRINT"  3 - LIST OR PRINT DATA FILE
200 PRINT"  4 - SAVE DATA FILE ON TAPE  (BETTER MAKE 2 COPIES !)
210 PRINT"  5 - MOVE ON TO NEXT PROPERTY
220 PRINT:INPUT"YOUR CHOICE = ";X
230 IF X<1 OR X>5 THEN GOTO160
240 ON X GOTO 670,260,390,740,140
250 'UPDATE OR START DATA FILES
260 CLS:X=0:N=N+1:IF N=1 THEN INPUT"PROPERTY =";Z$
270 PRINT:INPUT"DATE OF TRANSACTION (NO COMMAS !) = ";D$(N)
280 PRINT:PRINT"COMMENT (NO LONGER THAN THIS LINE !!)
290 PRINT"  --------------------
300 INPUT C$(N):IF LEN(C$(N))>20 THEN C$(N)=LEFT$(C$(N),20)
310 PRINT:INPUT"ENTER 1 IF INCOME, 0 IF LOSS OR EXPENSE ";T
320 PRINT:INPUT"AMOUNT INVOLVED (NO COMMAS!) = $";A(N)
330 IF T=0 THEN A(N)=(-1)*A(N)
340 X=0:J=N:CLS:GOSUB480:GOSUB520
350 PRINT:PRINT"IF ENTRY IS CORRECT, HIT 'ENTER' TO CONTINUE...
360 PRINT"IF INCORRECT, ENTER '1' TO REDO DATA...
370 PRINT:INPUTX:IF X=0 THEN GOTO 160 ELSE CLS:GOTO270
380 ' LIST DATA TO SCREEN
390 IF N=0 GOTO 160
400 CLS:X=0:TL=0:TG=0:P=0:IN=0
410 INPUT"TOTAL MORTGAGE PRINCIPLE PAID TO DATE = $";P
420 PRINT:INPUT"TOTAL MORTGAGE INTEREST PAID TO DATE = $";IN
430 I=0:GOSUB480:FOR J=1 TO N
440 I=I+1:IF I>12 GOSUB650:GOSUB480
450 GOSUB520:NEXT
460 GOSUB650:GOSUB570:GOSUB650:GOTO160
470 ' HEADING SUBROUTINE
480 CLS:PRINTTAB(10)"DATA FOR PROPERTY =";Z$
490 PRINT"DATE";TAB(15)"REASON FOR ENTRY";TAB(45)"EXPENSE";TAB(55)"INCOME"
500 RETURN
510 ' DATA PRINT SUBROUTINE
520 PRINTD$(J);TAB(15)C$(J);
530 IF A(J)<0 THEN PRINTTAB(45)A(J):TL=TL+A(J)
540 IF A(J)>0 THEN PRINTTAB(55)A(J):TG=TG+A(J)
550 RETURN
560 ' SUMMARY SUBROUTINE
570 CLS:PRINT:PRINT"FOR PROPERTY =";Z$
580 PRINT:PRINT"MORTGAGE PRINCIPLE =";P
590 PRINT"MORTGAGE INTEREST =";IN
600 PRINT:PRINT"TOTAL EXPENSES =";TL
610 PRINT"TOTAL INCOME =";TG
620 PRINT:PRINT"NET GAIN OR LOSS (INCLUDING MORTGAGE) =";TG+TL-IN-P
630 PRINT:RETURN
640 ' PAUSE SUBROUTINE
650 I=0:INPUT"HIT 'ENTER' TO CONTINUE";Y:RETURN
660 'DATA LOAD FROM TAPE
670 CLS:PRINT"PLACE THE DATA TAPE IN RECORDER AND PRESS
680 PRINT"THE 'PLAY' BUTTON....
690 PRINT:GOSUB650
700 INPUT#-1,N,Z$
710 FOR I=1TON:INPUT#-1,D$(I),C$(I),A(I):NEXT
720 GOTO160
730 'DATA SAVE TO TAPE
740 CLS:PRINT"PLACE YOUR DATA TAPE IN RECORDER WITH TAPE
750 PRINT"IN FRONT OF HEAD (NO LEADER !!)....
760 PRINT:PRINT"PRESS 'RECORD' AND 'PLAY' KEYS....
770 PRINT:GOSUB650
780 PRINT#-1,N,Z$
790 FOR I=1TON:PRINT#-1,D$(I),C$(I),A(I):NEXT
800 GOTO160
```

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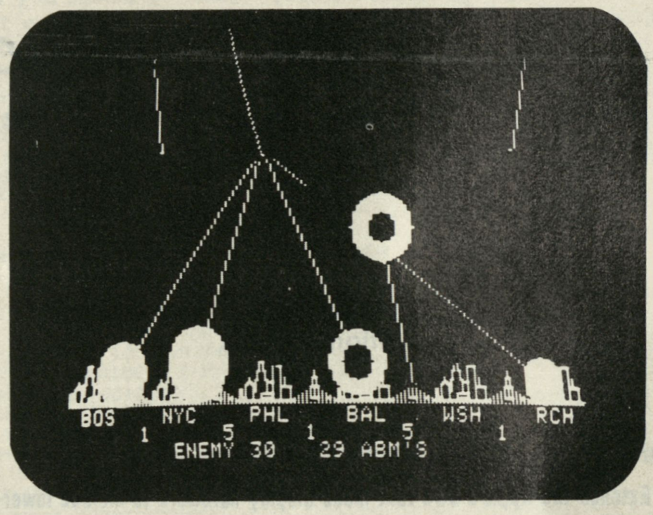

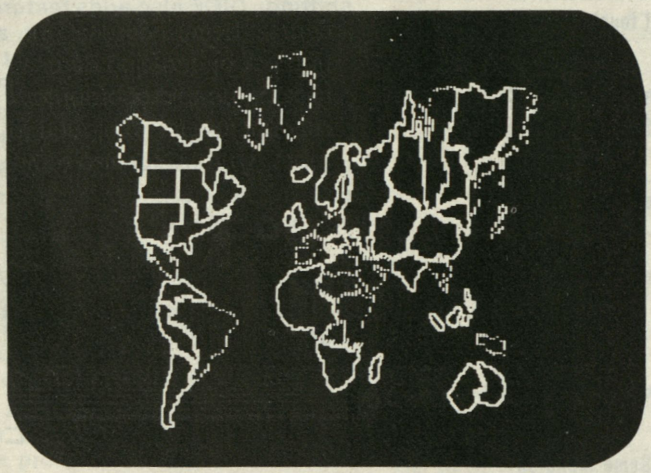

GLOBAL WAR by alan boyd

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The PAN software and user's manual sell for $18; a user's manual is available separately for $3. If you would like more information on PAN, send a business size, stamped (28¢) self-addressed envelope to PCNET, People's Computer Company, P. O. Box E, Menlo Park, CA 94025.

Programming Problems & Solutions

(Continued from page 28)

Here are some answers to the problems. If you came up with a solution that was more elegant, ingenious, fun or efficient than these, please send them to us. We'd like to publish the best ones.

Solution to Extra Extra

Here is a quick and dirty solution:

```
10 INPUT X
20 Y=X
30 Y=X↑Y
40 PRINT Y
50 GOTO 30
```

This routine will not stop. It keeps going back to line 30 where X is raised to a yet higher power. A number of things might happen, depending on what value you initially input for X. If X is too big, then output Y will grow quickly out of bound.

We found that the biggest value of X, for which Y approaches some limiting value, is X= 1.444667861 . . . This just happens to be EXP(1/EXP(1)). When X takes this value, then Y has the value EXP(1)=2.718281828 . . . Y never gets as big as 4. The first problem (a) has a solution, but problem (b) does not have a solution. Did you find the solution to problem 1? See what happens when you plug X=SQR(2) =1.414213562 into the routine above. Can you see how to easily get that answer without using a computer?

Solution to Multiplier Effect

```
10 REM THE INITIAL AMOUNT IN
   THE VAULT
20 V=0

30 REM THE INITIAL LOAN TOTAL
40 L=0

50 REM THE INITIAL DEPOSIT
60 D=100

70 REM 20% OF D GOES TO THE
   VAULT
80 V = V + .20*D

90 REM 80% OF D IS LOANED OUT
100 L = L + .80*D

110 REM 80% OF D IS THE NEW
    DEPOSIT
120 D = .80*D

130 PRINT V,L

140 REM GO REPEAT THE PROCESS
150 GOTO 80

160 END
```

Here is the program without the REMs:

```
20 V=0
40 L=0
60 D=100
80 V=V+0.2*D
100 L=L+0.8*D
120 D=0.8*D
130 LPRINT V,L
150 GOTO 80
```

After 50 repeats the bank will have $100 in the vault and $400 total loans. Monetary Magic!

Solution to War Game

```
10 REM PANDAB'S INITIAL BUDGET
20 P1 = 10

30 REM QUAT'S INITIAL BUDGET
40 Q1=11

50 PRINT P1,Q1

60 REM COMPUTE PANDAB'S NEXT
   BUDGET
70 P2=10 + (1/2)*Q1

80 REM COMPUTE QUAT'S NEXT
   BUDGET
90 Q2=11 + (1/3)*P1

100 REM TAKE THE NEW BUDGETS
    AS INITIAL
110 P1=P2
120 Q1=Q2

130 REM GO PRINT AND REPEAT
140 GOTO 50

150 END
```

Here is the program without REMs:

```
20 P1=10
40 Q1=11
50 PRINT P1,Q1
70 P2=10+Q1/2
90 Q2=11+P1/3
110 P1=P2
120 Q1=Q2
140 GOTO 50
```

After nine years, Pandab will spend $18.6 and Quat will spend $17.2. Spending will stay stable. ■

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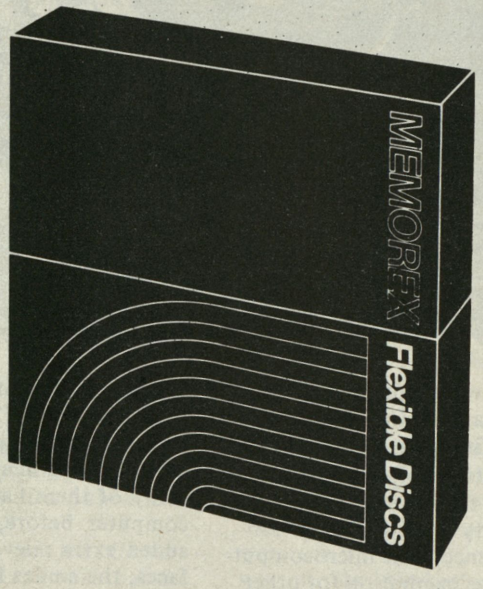

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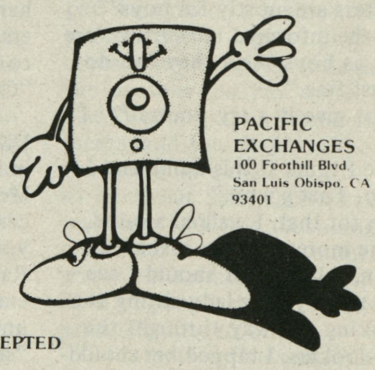

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by Julie Anton

Magic at the Boys' Club

Small heads bent intently over ready terminals; chunky fingers stabbing at keyboards; shouts of triumph, shrieks of defeat . . . the room was a space lab of young explorers probing the depths of a new frontier.

My mission was to talk to these kids about computers. Simple enough at the outset – but I was soon to encounter a startling snag: intent as any Lewis or Clark on the business at hand, everyone was far too absorbed to stop for idle chatter.

I asked one boy what he thought about computers. He said they were "fun" and went promptly back to work. A young lady told me she would take a break if someone was going to take her picture. I offered to fetch the photographer as soon as I could, but my subject shrugged me off and peered darkly at the puzzle displayed across her screen.

This all makes quite a statement. It was clear that these kids were nuts for computers – and *that* would make a story, quotes or no quotes. I would leave early, nurse my winter flu, and come up with something by deadline.

I was almost at the door when I spied a girl standing off by herself. "Excuse me." I donned my best non-threatening smile. "What do you think of computers?"

"Nothing."

"Have you been playing any games today?"

Long dark curls bobbed a silent no.

Now I would hit her with the big one. Sure to get a rise every time. "Why not?" I tried to look thoughtful. "Do you think computers are mostly for boys?"

"Girls," she informed me curtly, "are just as smart as boys. And they can do computers just fine."

"Why not give it a try yourself?" I challenged.

"Because I think this is dumb and I don't want to. That's why."

So much for that. I walked around, watched some more, and was just about to leave again, when what should I see but this very same young lady sitting at a terminal. Making my way throught the crowd of on-lookers, I tapped her shoulder. "What do you think now? About computers, I mean . . ."

"Fun." She did not even bother to look up. There was a Wumpus on the move, and no time for chit-chat.

This is the magic of ComputerTown, USA! a non-profit group of computer aficionados with two simple goals: to provide everyone in their Menlo Park, California, community with a chance for hands-on experience with microcomputers, and to serve as inspiration for other communities and groups to establish "ComputerTown" projects of their own.

Each presentation ComputerTown, USA! brings to the community is special in its way. Dropping into one event at the Menlo Park Recreation Center, I sensed a certain precociousness about some of the young people busy at the terminals. Raised by fathers in software and mothers in computer graphics, it is not all that unusual in the San Francisco Bay Area's "silicon valley" to find a fourth grader who plays a mean game of Space Invaders, or a teen who writes elaborate programs.

But the forty youngsters buzzing in the game room of the Herbert Hoover Memorial Boys' Club that winter afternoon were not sophisticated silicon valley kids. Ranging in age from seven to teens, many of them had never seen a microcomputer before, and somehow that added extra relevance to the thoughtful faces, the smiles lit with discovery, the frustrated yelps of those who sought the elusive Wumpus.

Project Director Ramon Zamora was especially pleased at the turn-out. "We found that the Boys' Club is not just for boys," he noted. "Girls are encouraged to use the facilities and participate in the club-sponsored recreational and vocational activities.

"In fact, soon after we arrived, two young ladies sat down in front of a new color computer, on loan to the project for the day, and they didn't move for over two hours." Some of the older boys tried several times to get the girls to relinquish the machine. The young ladies re-

fused to budge.

ComputerTown staff found this group especially interested in fully exploring the computers. They wanted to know what it was like to type their names into the machines and see them appear on the screen, or how a buddy would react if they typed him a message. In short, the Boys' Club group preferred constructing their own simple programs to playing with the packaged software provided by ComputerTown staff – but when they did explore the software games these kids probed the full extent of a given activity, rather than switching from program to program, as others sometimes do.

"The role of ComputerTown facilitators is not to teach," stresses Pat Cleland, Project Coordinator. "It is to offer a creative environment in which kids can explore the world of microcomputers in their own time and in their own way.

"Kids are naturals at this," she goes on. "They are not the least bit afraid or intimidated by the machines, whether they have ever seen a microcomputer before or not. And that's a good thing. People need to understand computers. In this day and age, the computer is going to play a role in everyone's lives in some way, whether they like it or not."

The folks at ComputerTown, USA! think that young people need a chance early on to discover what sort of role computers will play in their futures. To do that, they need the kind of information and access provided by groups like ComputerTown, USA!

Sure as dominoes, one ComputerTown, USA! event leads to the next. This time it was a representative of the Girls' Club who invited facilitators to work with the Girls' Club career development program.

"Community networking is a vital part of a program like ComputerTown, USA!" Pat Cleland told me. "We're hoping that groups in other areas will use our project as a model, pick up on what we are doing, tailor it to their own needs, and get out there and do it!"

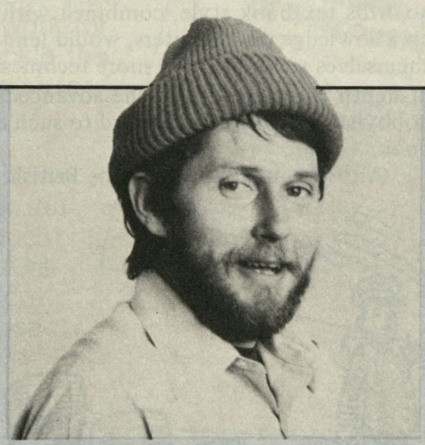
Pat Cleland, Ramon Zamora, Cheryl Rhodes, and the rest of the devoted ComputerTown, USA! staff are obviously people who approach their work with energy, enthusiasm, and love. In fact, nabbing them long enough for a comment was a job in itself. They were every bit as absorbed as the young people who swarmed around them at the Boys' Club event, and the time slipped by all too quickly. During one hectic moment, Pat paused for a final remark. "We depend on volunteers, and believe me, we use them!"

She added that a young man named Tom Hatcher had read about the project and come all the way from Michigan to lend a hand. I tried to reach him for comment, but the volunteer already had his hands full. Instead, I turned toward the small hand tugging at my skirt and did my best to answer a question.

I am not sure if anyone actually caught a Wumpus at either ComputerTown, USA! event which I attended that week, but something far more important was captured each time: the minds, imaginations, and perhaps the future lives of a great many kids and a handful of grown-ups.

Nothing could put it more eloquently than the words of one of the older boys: "If we had computers like this when I was in school, I would probably still be there." ■

"If you're going to San Francisco, be sure to wear some flowers in your hair . . ."



So went that clarion song, and though I missed "The Summer of Love," I kept an eye and an ear cocked for another such call.

Then after reading the baptismal book, *My Computer Likes Me When I Speak BASIC*, and continuing on to *TRS-80 BASIC*, a letter from Bob Albrecht and a copy of the first *Dymax Gazette*, I was pretty sure something was and still is bubbling in Menlo Park.

That first issue of the *Gazette* rang bells, stating for example that the personal computer is "a much more friendly fellow than the Big Mother that spawned it." From the *Gazette* and the books, it was clear that here the emphasis is on exposing people, especially young ones, to computers in such a way that friendship rather than fear is most likely.

So, fleeing the ice and snow of a Superior winter, came a TRS-80 (imaginary flower in its imaginary hair) first to San Francisco and then to Menlo Park, bringing me along as a sidekick.

My high hopes have been sustained. In the few weeks since arriving, I've had the opportunity to engage in various computer-related activities.

There have been two "happenings" where up to ten microcomputers were set up for kids to play on. One was at the Herbert Hoover Center Boys' Club where the young boys, and even a few girls, took time out from basketball, pool and horsing around to sit glued to PET's, TRS-80's, and Atari's. The other was at the Menlo Park Rec Center, where hundreds of grade schoolers played Olympic Decathlon, Space Invaders, Match Me, and other computer games.

I've had, for me, the greatest opportunity of working with Cheryl in her kids' class at the Menlo Park Public Library and with Bill in his adult class there. In Ramon and Barb's office, I've spent many pleasant hours "reviewing and evaluating software," i.e., playing games. So far my favorite is Taipan, although Project Omega and Olympic Decathlon follow closely.

At Pat's encouragement, I've played Space Invaders on the Atari. which has impressive graphics, and have been introduced to PILOT, which is a neat language. I've met lots of friendly people, and since the atmosphere is one of high energy, I've been inspired to write a few simple programs of my own.

And Leah has even given me a flower!

A cautious prediction: the computer will have as great an impact on the world as all the inventions of the past combined. But since, as yet, computers don't write programs, the course they take will be determined by the reasons people write programs. The IRS's, the "Defense" departments, and the titanic corporations of the world have their reasons. However, to give what Schumacher called a "human face" to this technology will require the writing of numerous programs by thousands, perhaps by millions of people simply because of their joy and utility to others.

From what I've seen, PCC is planting seeds of future programmers and is doing its part to make the personal computer a bona fide "People's Computer." – *Tom Hatcher*

The Personal Computer Book
By **Robin Bradbeer**
Published by **Input Two-Nine/Gower Publishing**
220 pages illustrated, $15.00, $5.25 paperback
Reviewed by **Joey Robichaux**

"One if by land, two if by sea . . . the British are coming!"

Robin Bradbeer is regarded as one of England's foremost experts in the microcomputer field. His new book, *The Personal Computer Book* which is targeted for the beginner, presents us colonists with an interesting picture of personal computing in the United Kingdom.

The book consists of two logical parts. The first is seven chapters which introduce and explain computer concepts; the second part is eight informative appendices. Throughout the book are many pictures of machines and applications.

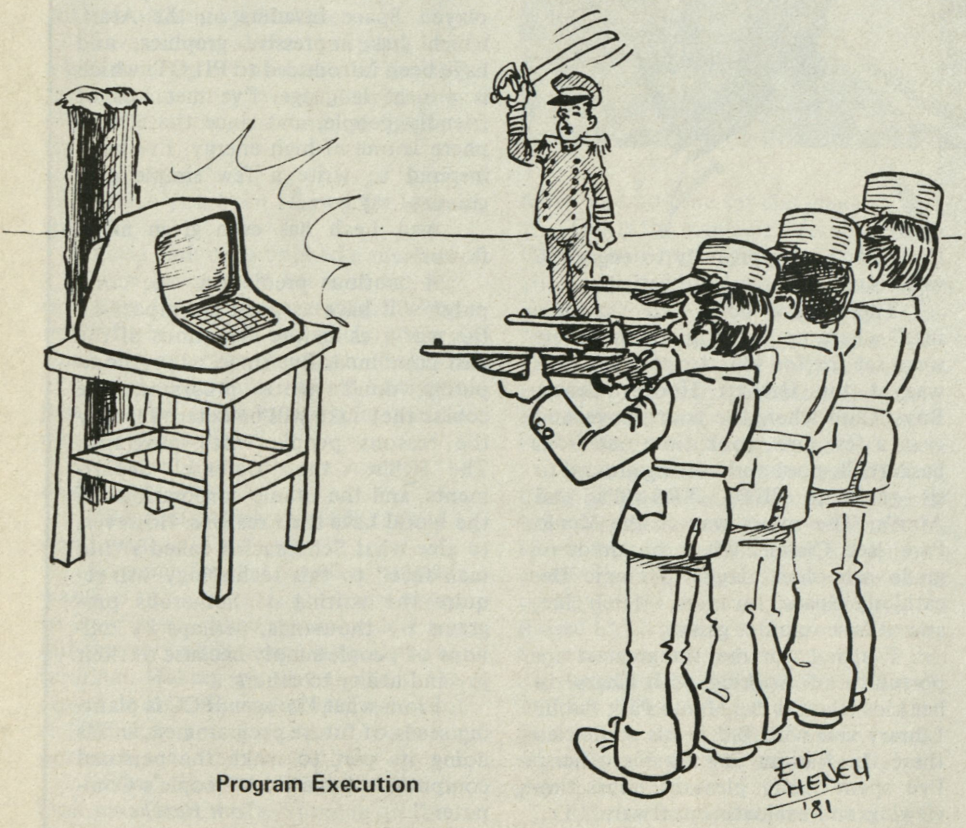
I enjoyed the second part of the book, the appendices. Lists and descriptions of magazines, British computer clubs, bibliographies of selected microcomputer books and manufacturers are combined with the normal glossary, ASCII tables and bus standards to provide a useful set of information. I also consider Chapter 6 to be an appendix; it contains over 50 pages of specs, pictures and prices of various computers, terminals, printers and other components.

While I was very pleased with the second part of the book, I was disappointed with the first part. I cannot argue with the material presented; it is all technically correct and is presented in a straightforward, no-nonsense manner. *The Personal Computer Book* does not contain reams of material over a beginner's head; however, it does not lead the beginner easily and painlessly from one point to the next.

Some of the material in the book could be deleted without harm to the beginner. Some of it could be expanded with several more examples. All in all, I received the impression that this book would make a good textbook. "Go home and study Chapter 3, then come back to class tomorrow and ask questions on what you didn't understand." But most beginners will not have an instructor to clarify hazy points; beginners are hoping for a book which will not leave them with hazy areas.

While I cannot recommend this book for a beginner, I believe Robin Bradbeer's no-frills textbook style, combined with his knowledge of computers, would lend themselves well towards a more technical, in-depth piece geared for the advanced hobbyist. I am looking forward to such a book.

Anyway, if we can't say the British have arrived yet, hold on, 'cause they're on their way!



Program Execution

Owning Your Home Computer
By **Robert L. Perry**
Published by **Everest House**
224 pages, $10.95
Reviewed by **Joey Robichaux**

Robert Perry, author of the first *Mechanix Illustrated Guide to Personal Computers*, strikes again with *Owning Your Home Computer*. One of the blurbs on the back cover of this 7 x 9 inch (approx.) paperback states, "Clearly and generously illustrated, full of vital information, *Owning Your Home Computer* is the definitive reference book for the new age of computers!"

Now, of course, you and I both know everyone says that on the back of his book. This time, however, they're telling the truth.

It's big, it's attractive, it's well put together with plenty of pictures and lots of good information. The person who knows nothing about computers will find this book a painless and enjoyable way of learning. Even the more knowledgeable person will find a good bit of interesting material between the covers.

What does this book do? Well, in 15 chapters, Mr. Perry succeeds in introducing and explaining the entire field of personal computers; past, present and future. Instead of saying "A personal computer can be used for many useful applications," Perry presents and examines many of these applications.

This alone is worth the price of the book. Ask any computerite just what a computer can do. Chances are, he'll look at you funny, stammer a little, then blurt out, "Why, it can do anything!" Perry really tells you *what a home computer can do*. If you have to justify a purchase to a spouse or parent (or even to yourself), this book can provide a Dale Carnegie heap of reasons.

There are also lots of background and behind-the-scenes stories for many existing and future microcomputer applications. Many of the stories explaining why a certain market or application works the way it does were very entertaining and interesting. If you've got a young child in school, there's lots of science report material here.

Owning Your Home Computer is the sort of book you give someone to whet their appetite and get them excited about microcomputers. Whether you put it in your office, your workroom, or your coffeetable, Robert Perry's latest effort definitely belongs in your home. ■

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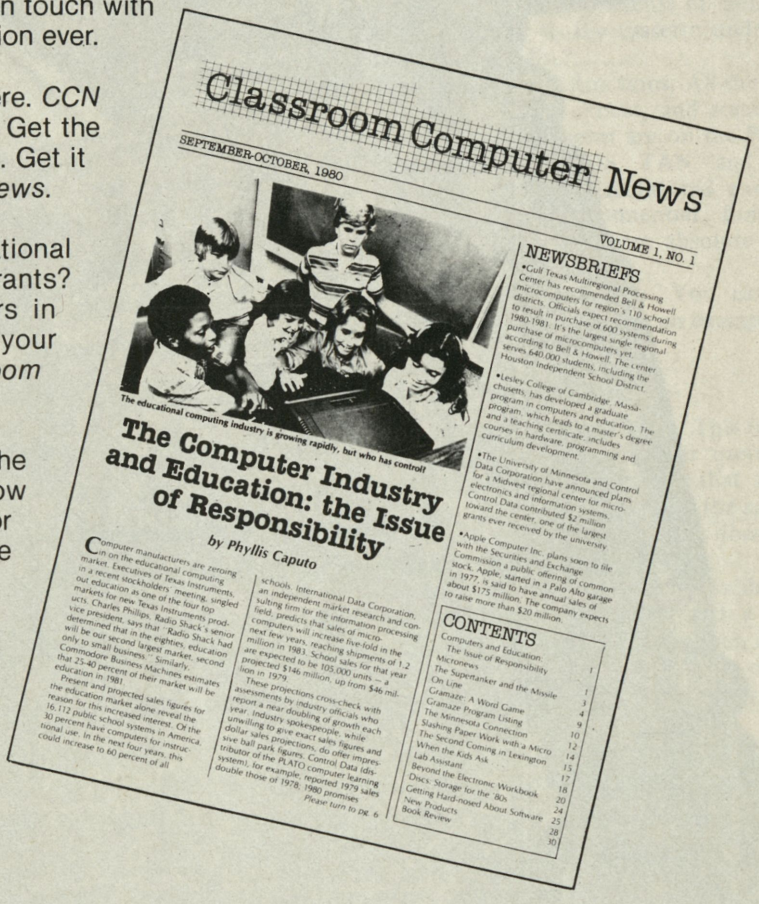

Classroom Computer News

SEPTEMBER-OCTOBER, 1980

VOLUME 1, NO. 1

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The Computer Industry and Education: the Issue of Responsibility

by Phyllis Caputo

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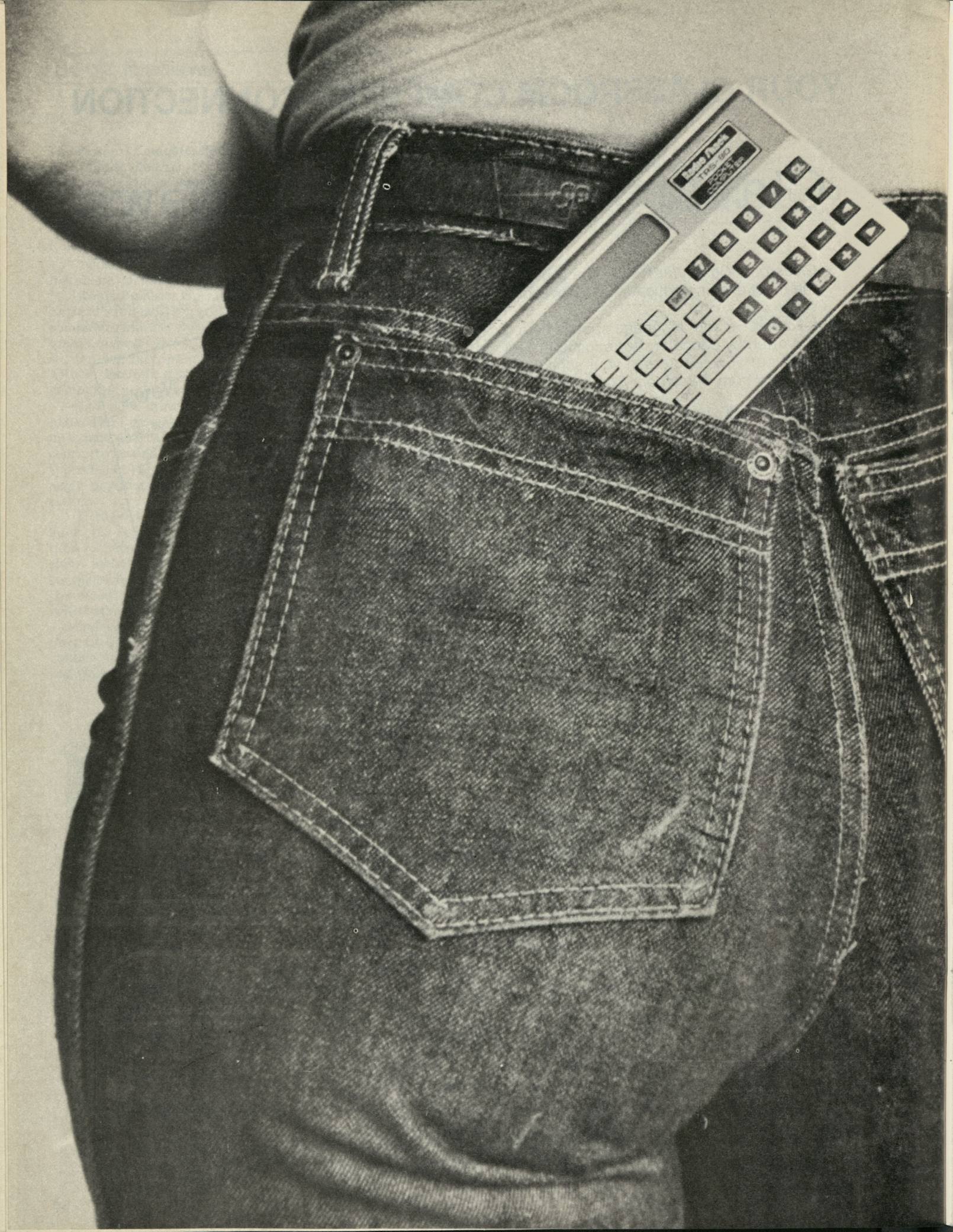

Photo by Kent Safford

The Pocket Corner

by Jim Conlan

The new Pocket Computer from Radio Shack is a surprise. You might expect a primitive form of BASIC on a machine that slips into your pocket. You certainly wouldn't be foolish enough to expect a BASIC stronger than many forms running on the big name, superstar mainframes. Guess again! The TRS-80 Pocket Computer is a surprise. This is what it's got:

1. (The big surprise) Line labels. This is a feature that is so important, every other version of BASIC seems archaic without it. The development of structured programs in BASIC comes closer to reality. Subroutines can be called by name! How wonderful, how natural. Why hasn't this been done before?

Here is an example of a program using line labels:

```
10 GOSUB "BABBLE"
20 GOSUB "DRIBBLE"
30 END

100 "BABBLE"
110 PRINT "BLA BLA BLA"
120 RETURN

200 "DRIBBLE"
210 PRINT "DRIP, DRIP"
220 RETURN
```

Your BASIC programming style changes when you have this capability.

2. Multiple statements on a line. Who would have expected this bit of sophistication on a small computer? Here is an example:

```
10 PRINT "HI":INPUT X:PRINT 2*X
```

3. Multiple statements after IF . . . THEN. How nice. Here is an example:

```
10 IF X>2 PRINT X:GOTO 50
```

4. Number format command. Here is an example:

```
10 X=34.5678
20 PRINT USING ###.##;X
```

This prints

```
34.56
```

5. Editing of the display. You can move the cursor through the program line and insert and delete at will. It is remarkably easy to write and edit lines on the pocket computer.

6. Abbreviations of commands. Nearly all the commands can be called with a single letter if desired. This greatly speeds the input of code. Here is an example:

```
10 I.X:P.X:G.30
```

When the program is listed it becomes:

```
10 INPUT X:PRINT X:GOTO 30
```

This not only saves the programmer a lot of work, it also saves space, since each command requires only one character of program memory.

7. Debug command. This allows you to single step through program execution. This is a great help in finding the inevitable gremlins that hide in programs.

8. FOR . . . NEXT . . . STEP command. Here is an example:

```
10 FOR X=1 TO 2 STEP .1
```

9. BEEP command. This is a dandy. You can guess what this does. Here is an example:

```
10 BEEP(20)
```

What a feeling of power! Now let's try 1000 beeps.

10. Named programs on cassette. This allows you to find programs by name. Let your computer do the walking. Here is an example:

```
10 CLOAD "MYPROG"
```

The computer will search down the tape until it finds and loads the file labeled "MYPROG". Another nice thing about the CLOAD command is that it doesn't erase the program in memory. This allows you to merge and append programs. Very useful!

11. Data storage on cassette. The contents of the data memories can be stored on cassette. Just what you need: a program and some data for the program to eat.

Here is an example. Suppose there are numbers stored in data memories A(20) onward.

```
10 PRINT #"MYDATA";A(20)
```

This will store the contents of memories A(20) onward to the cassette under the name "MYDATA".

12. Standard functions. All the functions you would expect, and some that you might not expect are on the Pocket Computer. SIN, COS, TAN, and their inverses are there. Natural and common logarithms, the exponential function, square root, integer part absolute value and signum are there.

13. Indexed strings. You can call strings by number. Here is an example:

```
10 Z$(1)="ADAM"
20 Z$(2)="BAKER"
30 Z$(3)="CHARLES"
```

14. Permanent memory. This feature makes the Pocket Computer useful for data collection, and insures that it is a versatile tool which can meet the specialized needs of its user. It always does what you want it to do.

15. Definable keys. This facility allows you to call a program with a single keystroke. Programs can be given a keyboard character as a label, then can be run by pushing the appropriate key. Here is an example:

```
100 "S" : REM SUM OF SQUARES
110 INPUT X:INPUT Y
120 PRINT X*X+Y*Y
130 END
```

If you type shift S, while in DEF mode, this program will run. Is there anything this machine can't do? There are some limitations. String variables can only be seven characters long, although long strings can be used in print statements. Here is an example:

```
10 A$="SMALLER"
20 PRINT "MUCH MUCH MUCH
   BIGGER"
```

The use of arrays is somewhat limited. It is closest to the truth to say that there is only one large array which consists of the whole of data memory:

A(1), A(2), A(3), . . .

You could refer to the first 26 by the alternate names A, B, C, ...

The machine just might revolutionize the way we learn programming. No more trips to the computer room to type in programs. Now the student can carry the computer home, on the bus, in the car, to the mountains and to the beach. A lot of people are going to learn to program on this machine. ■

Product News

by Dave Cortesi

The first two months of the year brought a pile of product announcements. There were notices of magazines, of software catalogs, of lots of new programs, and of new products from makers of personal computers. We've selected the best of them for you. Don't forget, the note **experiences wanted** means that we want to hear from you if you've tried that product out. Drop us a line, and include a phone number.

Last issue, we gave some space to a checkbook program named "Check-Mate." Now we've received a press release from the **Check-Mate^{tm}** company, makers of continuous forms for computers. They've a line of custom-printed checks for the TRS-80 printers. Although they didn't ask, we offer our apologies for making an unwitting contribution to the misuse of their trademark.

A Cryptic Quarterly

Interested in cryptography? It's a branch of recreational math that's especially well suited to personal computers. **Cryptologia** is a quarterly journal dedicated to cryptology and such related subjects as military history and ancient languages. A year's subscription is $20 domestic, $24 abroad. The magazine is sponsoring a contest for the best undergraduate paper in its subject area, with a prize of $300 at stake.

Magazines for Machines

There are a lot of machine-specific journals on the market. Any computer owner should subscribe to at least one, if only for the ads from small companies that can't afford to buy space in the major publications. **99'er Magazine** is a new publication devoted to revelations concerning the Texas Instruments 99/4 Home Computer and other TI products. A U.S. subscription is $15/year. PPC is an international, independent organization of users of Hewlett-Packard personal calculators and computers. Its monthly newsletter is the **PPC Calculator Journal**. The December issue includes a program in HP bar code, but fails to state the membership price. Users of Heathkit machinery are served by at least two publications: **REMark** is the official Heath User's Group publication (membership fee of $18) while **BUSS** encourages the use of plug-compatible hardware ($17.97 a year).

Catalogs of Software

The independent software market is beginning to resemble an oriental bazaar, so crowded and confusing has it become. Even after the stringent application of Sturgeon's Law ("90% of everything is crap") there must remain hundreds of solid, useful programs for sale – if one could only find out about them. Four companies have written to tell us of their solutions: catalogs of selected software. Perhaps a new phenomenon, the software middleman, is emerging?

The **Microcomputers Corporation** has assembled what it claims to be the longest list of software for the TI 99/4 ever made. Their free catalog names "hundreds" of programs and an assortment of accessories.

The **Marck** company's catalog is primarily devoted to educational software; it contains 67 pages of listings, each a paragraph long, ordered by computer type and indexed by subject and publisher. The catalog, which appears to be free, contains smaller sections on games and on books.

Another free catalog of educational software comes from **MicroMedia**. This one is said to list "over 400 K-12 instructional programs, games, packages, and books." It is organized by subject and grade level, and the publisher claims to have reviewed, or consulted a published review, for "nearly" every program listed.

School MicroWare is a directory of educational software published in September, with update issues in the other three quarters of the year. The most recent issue covered "over 500" products for Apple, TRS-80, and PET; Atari coverage and a couple of hundred more products were added in the updates. The publication aims to begin carrying reviews and an index to reviews published elsewhere. This catalog costs $20 per year ($25 outside the USA).

A Smattering of Educational Programs

Schools that are licensed to use the Educational Testing Service's SIGI computer-based career guidance system should get in touch with ETS. That organization has agreed to let the Tandy corporation convert SIGI to run on the TRS-80. We can't tell whether the guidance data base will be completely local to each school's TRS-80, or whether the local computer will be used as a terminal. Either way, it deserves a look (**experiences wanted**).

School administrators with access to an Apple II might investigate a new package from **Charles Mann & Associates**. The Attendance Program is said to keep detailed records of classroom attendance, generate those tedious reports for funding agencies, and maintain an audit trail to back them up. The program costs $249; it can tie in with the same company's class scheduling and grade reporting packages (**experiences wanted**).

TYC Software makes Teach Yourself by Computer, their name for a package of programs for the TRS-80 or Apple. The package creates an "individual learning center," which we gather comprises a variety of drill programs with graphics, into which can be plugged any of "over 50" subject data files. The package includes programs that allow you to create new subject files (**experiences wanted**).

A Splash from Atari

Atari sprayed releases all over us in January as they announced a batch of improvements for the 400 and 800 machines. Their big news was about software. In the unlikely event that Star Raiders has begun to pall, you can now play Asteroids or Missile Command. There is an inventive Personal Fitness package that customizes an exercise program for you, displays the moves you should make, counts cadence, and tracks your progress (**experiences wanted**). A home course in Conversational Spanish spells the words on the screen, pronounces them, and drills you (**experiences wanted** – what does the computer add to language study?).

For the educational market, Atari has implemented SCRAM, a simulation of a nuclear reactor, and an implementation of PILOT, a simple programming language for writing courses. The Computer-Town, USA! group down the hall previewed these and seemed impressed. Finally, the company announced a word processor and an accounting package with documentation by Arthur Young and Co. To back up their machines, the company plans to establish a number of authorized service centers and to offer a hotline for consumer calls.

Atari weren't the only ones to announce software for the 800; **LJK Enterprises** sent us the specs of what appears to be a very comprehensive word processing package, at what strikes us as a reasonable price: $150. The program requires an Atari 800, the 825 printer, and a disk drive. It is said to support proportional spacing and other printer features (**experiences wanted**).

Pascal Spreads Out

Users of UCSD Pascal probably know by now that **Softech Microsystems** have announced version four of that popular operating system. The system has, it seems, been considerably enhanced; it handles larger programs, supports concurrent processes, and has relaxed a number of former restrictions. A BASIC compiler and a compiler for FORTRAN 77 have

been added to the product line.

If your machine is too small for UCSD Pascal, or lacks disks, take a look at Tiny Pascal Plus from **Abacus Software**. It runs on 32K PETs and on Apple IIs. It has a line editor, a compiler, and a number of intrinsic functions to drive the graphics hardware of each machine. The diskette price is $50; a cassette version for the PET is $55.

A Gaggle of Home Software

GB Associates have come forth with the Audiophile Library System, a package for the TRS-80 Models I or III with TRS-DOS. Serious music collectors can catalog their records and tapes by composer, title, artist, conductor and orchestra (what, not by label and record number?), scanning the collection at will. The price is right at $19.95 plus $1.00 for postage.

This writer's first use of an interactive terminal (in 1969) was to attempt a checkbook program. There is something about the apparent simplicity and regularity of check records that attracts the beginner (although in truth the application is loaded with booby traps). It isn't any surprise that announcements of new checkbook programs show up here every month. Microcheck-80 from **Suma Microware** is definitely the last one we'll give ink to, unless something really inventive crops up. It's written in machine language, stores checks on a TRS-80 Mod I disk by expense category (only one?) and does "automatic" statement reconciliation, all for $39.95.

Tracking a stock portfolio is a much more difficult problem. Radio Shack has hooked up with Standard & Poor to offer STOCKPAK, a "complete stock analysis and portfolio management package." You can have up to 100 stocks in your portfolio, analyze any of 900 other stocks, make hypothetical purchases and study their results. The program package is $49.95 from a Radio Shack dealer, but a subscription to S & P's updating service for the 900-stock data base costs $200 **(experiences wanted)**.

Muse wants you to know they have rewritten their Three Mile Island reactor simulator for the Apple II. It's now in machine language, producing much faster response time. You can have it for your 48K machine for $39.95.

If you own both an Apple II and an apartment house you might welcome the news that **Min Microcomputer Software** have announced The Landlord, a software package to help you manage your rental property. You need two disk drives, a printer, and $750 (which, as any renter can tell you, is peanuts to a landlord).

If you are a businessman with a Heath (or Zenith) system, you might like to know of two new sources of business software. **Zenith** has reached an agreement that will allow them to market Peachtree/5, the well-known set of business accounting packages, for use on the Zenith (or Heath) Z89 (or H89). On the other hand, **XtraSoft** has produced an Inventory Management system to go with their existing Point of Sale system, both written in BASIC for the Heath (and Zenith) systems.

And all us bad spellers with CP/M systems need to know about MicroSpell, a spelling-checker that will go through every word in a text file, strip the suffixes from the roots as needed, check the spelling, and humiliate you with its erudition. There are other spelling checkers, but **Lifeboat** claims this is the only one that does the correction on the fly, removing the need for an editing pass afterward **(experiences wanted** on this and others like it).

A Plethora of Hardware

There were a couple of trade shows in January. At them, makers of personal computers sprang forth with a lot of new hardware. **Texas Instruments** introduced five new modules for their Speak & Read talking box. All are aimed at grades 1-3 and stress vocabulary, sentence comprehension and (of course) phonics and auditory memory.

Hewlett-Packard produced a new top-line calculator, the HP-41CV. It costs $325, can hold up to 2000 lines in its continuous memory, has an alpha display and 130 separate and distinct functions. The mind boggles; how many shift keys has it? Be that as it may, HP are also ready to build custom programs into the normal HP-41, making a dedicated application machine of it. Your program is cast into a custom plug-in module, and HP provides a problem-oriented keyboard overlay.

Atari, as noted above, really spread themselves. They have decided to raise the standard memory size of the Atari 400 from 8K to 16K at no increase in list price. Our office gurus nodded wisely when they heard that, saying the move was forced by the competition. The 8K Atari 400 will be available at a cut price, and 16K upgrade kits will be available for present owners.

We aren't a bit surprised at this announcement, either: **Percom**, who've made a lot of plug-compatible disk drives for the TRS-80 Mod I, announce that they are ready to ship drives for the new Model III. Their drives can be had for 40- and 80-track operation in single- or double-density. Prices vary depending on features.

The TRS-80 Model I has its faults, and **Personal Micro Computers** thought to correct them in their PMC-80, a "TRS-80 work-alike" machine. They've now produced an expansion box. It adds 32K of memory, disk controller, etc. to the basic machine. The Expander costs $410, plus $295 for the 32K memory expansion.

Finally, word has come from **Interactive Microware** of their APPLAB system. It is a package of hardware and software that make it easy to build an Apple into a data collection system for a scientific laboratory. They also sell several related software packages: a graphic data display program, a curve-fitting program, and a program called Visichart that eases the job of analyzing raw data, even as it is collected. ■

Contact Points

Abacus Software, P.O.B. 7211, Grand Rapids, MI 49510.

Atari Consumer Division, 1265 Borregas Avenue, P.O.B. 427, Sunnyvale, CA 94086.

BUSS, 325B Pennsylvania Avenue SE, Washington, DC 20003.

Charles Mann Associates, 7594 San Remo Trail, Yucca Valley, CA 92284, (714) 365-9718.

Check-Mate, P.O.B. 103, Randolph, MA 02368, (617) 963-2112.

Cryptologia, Albion College, Albion, MI 49224.

GB Associates, P.O.B. 3322, Granada Hills, CA 91344.

Inquiries Manager, **Hewlett-Packard**, 1507 Page Mill Road, Palo Alto, CA 94304.

Interactive Microware, P.O.B. 771, State College, PA 16801, (814) 238-8294.

Lifeboat Associates, 1651 Third Avenue, New York, NY 10028, (212) 860-0300.

LJK Enterprises, P.O.B. 10827, St. Louis, MO 63129.

Marck, 280 Linden Avenue, Branford, CT 06082.

Microcomputers Corporation, P.O.B. 191, Rye, NY 10580, (914) 967-8370.

MicroMedia, 686 Sierra Vista Lane, Valley Cottage, NY 10989, (914) 358-2582.

MIN Microcomputer Software, Inc., 5835-A Peachtree Corners East, Norcross, GA 30092, (404) 447-4322.

Muse, 330 N. Charles Street, Baltimore, MD 21201, (301) 659-7212.

PPC Calculator Journal, 2541 W. Camden Place, Santa Ana, CA 92704, (714) 754-6226.

(Continued on next page)

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(Contact Points continued)

Percom Data Company, 211 N. Kirby, Garland, TX 75042, (214) 272-3421.

Personal Micro Computers, 475 Ellis Street, Mountain View, CA 94043, (415) 962-0220.

REMark, c/o Heath User's Group, Hilltop Road, St. Joseph, MI 49085.

School MicroWare, c/o Dresden Associates, P.O.B. 246, Dresden, ME 04342, (207) 737-4466.

Softech Microsystems, 9494 Black Mountain Road, San Diego, CA 92126, (714) 578-6105.

Suma Microware, 1110 West 41st Street, La Grange, IL 60525.

Texas Instruments Customer Relations, P.O.B. 53, (Attn. S&R Modules), Lubbock, TX 79408.

TYC Software, 40 Stuyvesant Manor, Genesco, NY 14454, (716) 343-3005.

XtraSoft, P.O.B. 91063, Louisville, KY 40291, (502) 499-1533.

Zenith Data Systems, 1000 Milwaukee Avenue, Glenview, Illinois 60025, (312) 391-8181.

99'er Magazine, Emerald Valley Publishing, 2715 Terrace View Drive, Eugene, OR 97405, (503) 485-8796.

Pernau Advertising Arts
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Advertising Index

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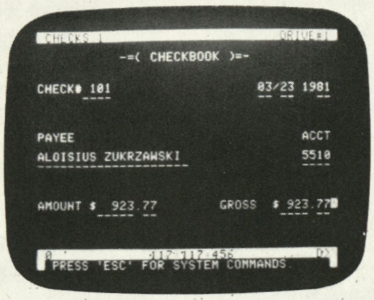
You can do the same with phone lists, mailing lists, dealer names or inventories. They all enter Datadex and form your own personal **data base.**

Want to find a company but don't know how to spell its name? Try something that sounds close, and our **Soundex** routine will find it. It is very forgiving on typos and extra spaces.



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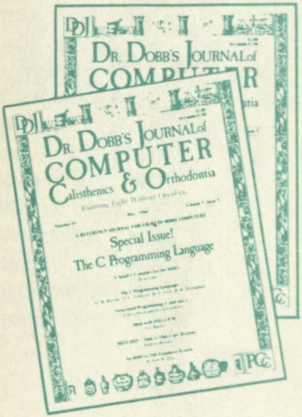

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