NEWS ABOUT ENTER
See Page 2, 'Inside Story'

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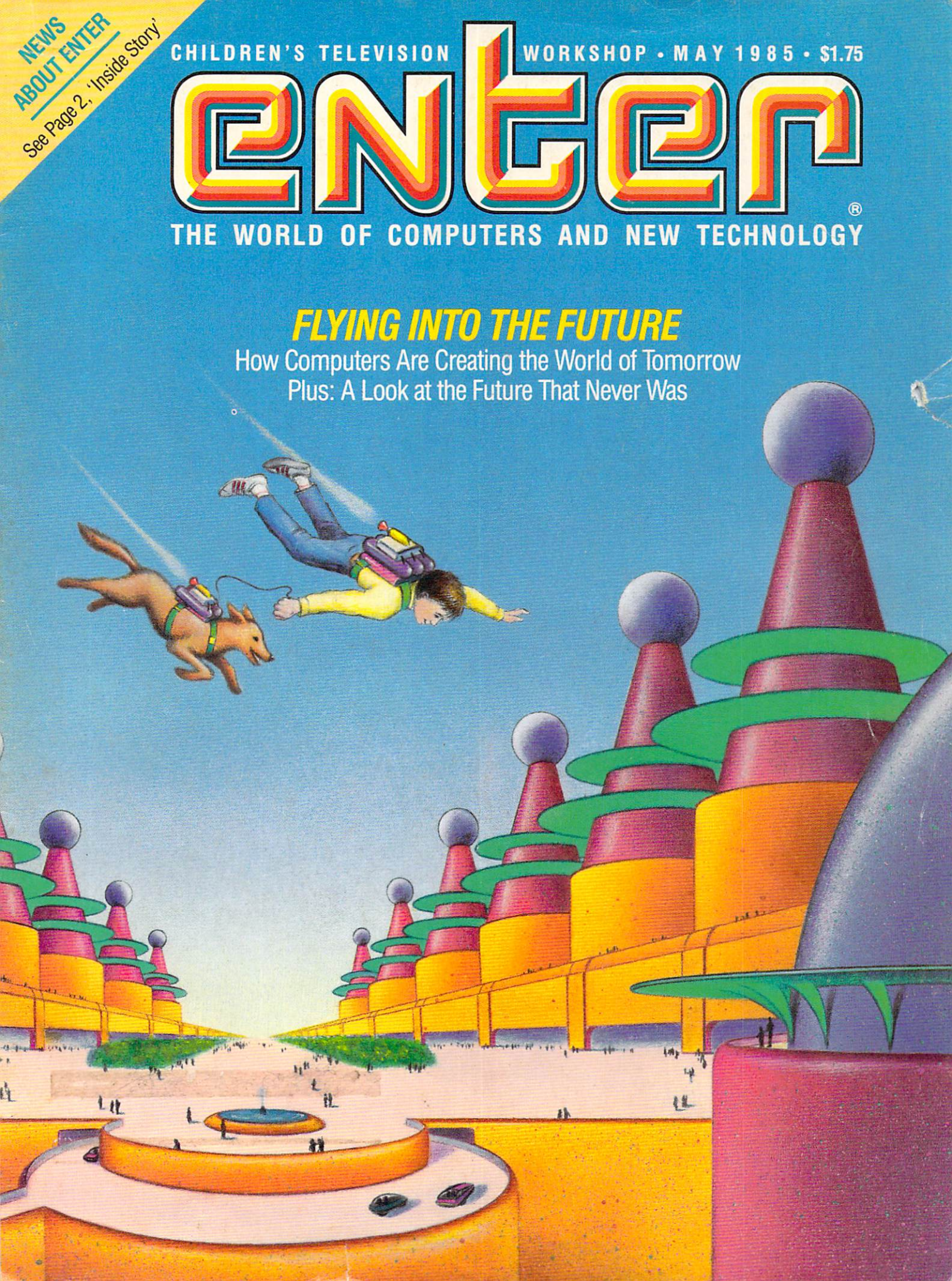

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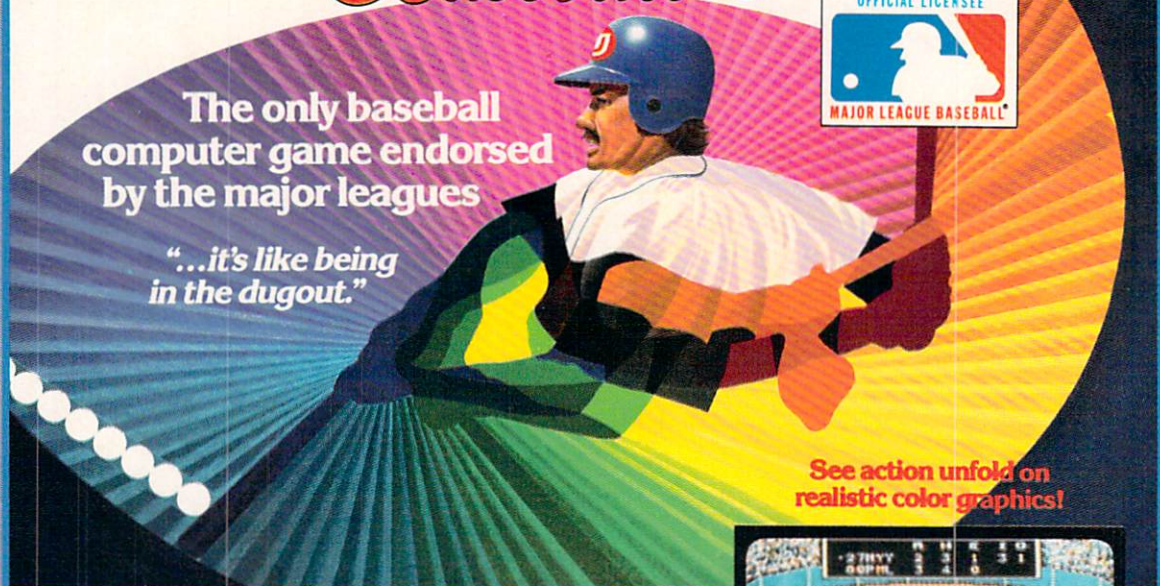

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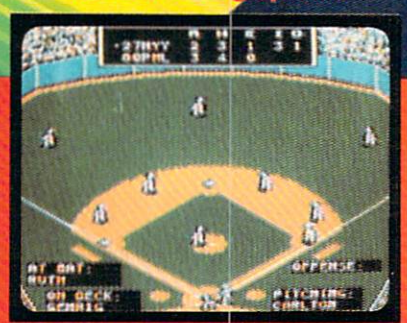

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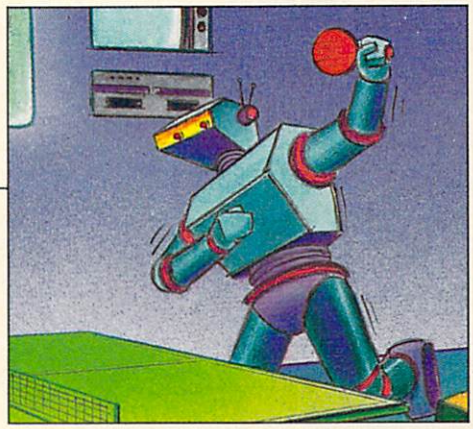

FEATURES

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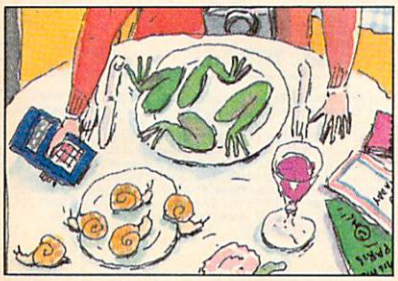

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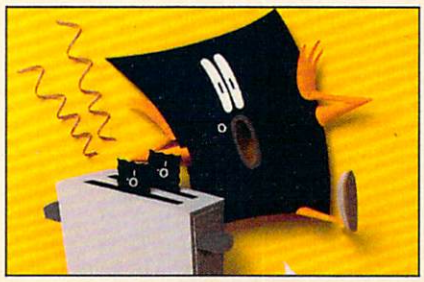

DEPARTMENTS

PROGRAMMING

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INSIDE STORY

COMPUTERS, CHANGES AND 'CONTACT'

Something new is coming.

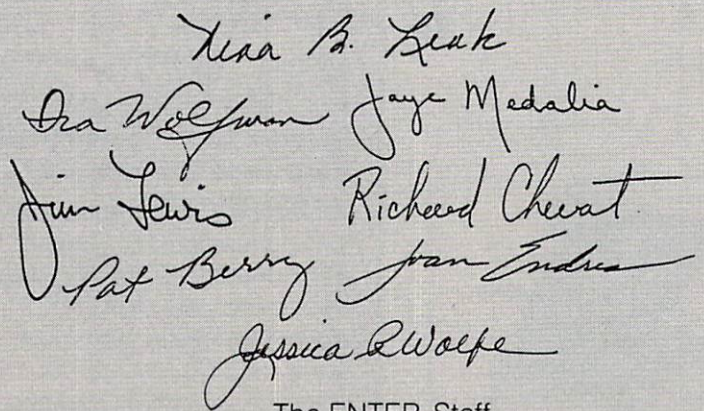
Starting next month, ENTER is being combined with *3-2-1 Contact,* Children's Television Workshop's science and technology magazine. *Contact* with ENTER will be an exciting magazine. It will include many of your favorite departments from ENTER, including BASIC Training, Ask ENTER, game and software reviews, and more.

We think you'll like the new *Contact.* It will cover everything from microchips to magnets, from penguins to peripherals. It will include puzzles, games and quizzes. In the next few issues of *Contact*, you'll see stories like these:

- *Science's Unsolved Mysteries:* There are gigantic drawings of weird animals and humanoids in the deserts of Peru. How did they get there? Why were they made?
- *The Return of the Jetsons:* The high-tech family of the future is back with more 21st century silliness.
- *Travelling through Time:* Will we ever be able to visit the past or future? A sci-fi special makes predictions.
- *Roller Coaster Computing:* Take a trip on an amusement park ride—designed and controlled by computers!

As an ENTER subscriber, you will automatically receive the combined magazine in June. Your subscription will continue as long as your ENTER one would have, on a dollar-for-dollar basis. If you're already a subscriber to *Contact*, we'll simply extend your subscription. And if after a few issues you want a refund on the unused part of your subscription, write to: Subscription Department, Children's Television Workshop, 1 Lincoln Plaza, New York, NY 10023.

If you're an ENTER fan or a *Contact* fan, starting next month you'll be getting the best of both magazines. We hope you enjoy it. *We've* really loved working on ENTER.



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BITS

IN THE KEY OF T

My clothes are alive with the sound of music....

Musical T-shirts, that is. They're the latest high-tech fashion breakthrough made possible by computer sound chips. Kahn/Lucas, a clothing maker from Lancaster, Pennsylvania, has introduced a line of T-shirts that make music when you press a special star on the shirt. Embedded beneath the star is a microthin musical computer chip that plays "When the Saints Go Marching In" or "Let Me Call You Sweetheart." The chip will play its tune up to 15,000 times. It's also completely washable.

Could this be the start of a trend? Imagine an umbrella that played "Singin' In The Rain" or baby's diapers that played "Born in the U.S.A." What a concept!

CHIP OFF THE OLD CHOC

For those who love chocolate as much as they like computers, here's the newest in ultimate microchip candy.

A San Diego, California, company called Chocolatek has created a sweet idea for a new product with a computer confection...er, connection. It's called the Chocolate Chip, a two-ounce bar of Belgian chocolate with microchip-like circuitry etched into it.

This binary bonbon should tempt any chocolate lover. It's good enough to byte....er, bite.

FLYING TYPEWRITERS

The Skytypers have always been high in the sky. Now they're high-tech, too.

Skytypers is a skywriting team based in Flushing, N.Y., and Los Alamitos, California. They use airplanes to spell out messages in smoke across the sky. The messages were getting complicated, so Skytyper pilot Mort Arken programmed a small computer to control the release of smoke. The computer flies along with Arken and his team. With its help, Skytypers can now spell out up to 50 messages in three hours.

This certainly takes word processing to new heights.

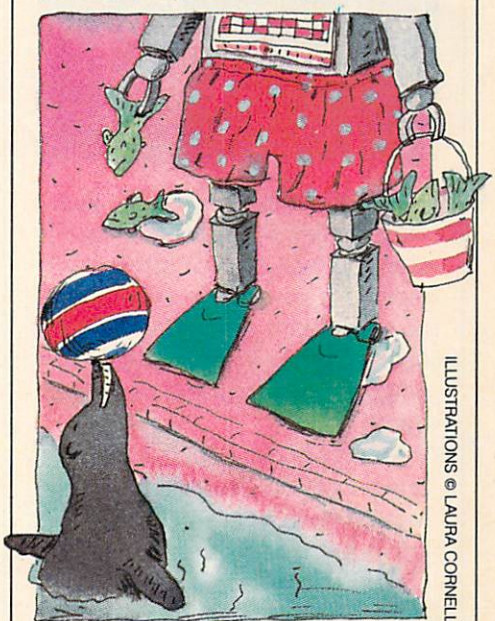
SEALED WITH A DISK?

Robots now have the "seal" of approval. Actually, make that the sea lion of approval.

Robots, you see, are getting into the animal act. At the New York Aquarium in Coney Island, a Comro robot is the new trainer for Gigi, a California sea lion.

This robot may make a better trainer than its human counterpart, according to aquarium spokesman John Scatturo. While humans change a command signal every time they make it, a robot can be programmed to make the exact signal each and every time.

Gigi and Comro seem to be getting along swimmingly.



Scatturo says the Aquarium will continue using their robot assistant for training porpoises...er, purposes.

USER VIEWS

NEW COMPUTER GAMES

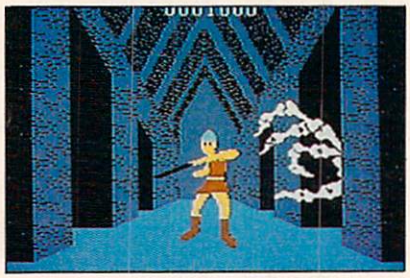
BY PHIL WISWELL AND BILLY GILLETTE

This issue *User Views* welcomes Billy Gillette, a new review partner for Phil Wiswell. Billy, 14, is an avid game player and programmer. And, after working for several years at a local computer store, he knows his way around the latest hardware and software.

Welcome, Billy, and good luck!

DRAGON'S LAIR

Coleco; Adam, around $39



Adam owners may still be reeling from news that Coleco has stopped making their computer. Well, here's a glimmer of good news for those embattled Adam users: *Dragon's Lair,* available only for Adam, is a very, very good game.

The graphics, sound effects and variety of scenes in this home version cannot be compared to the laser disc arcade game. But Coleco *has* taken advantage of every capability of their system to imitate the flavor of the arcade game.

This *Dragon's Lair* has nine individual scenes on four skill levels. All action is controlled by joystick and two action buttons. As in the original, Dirk the Daring faces obstacles like skeleton hands, bats, slime, tentacles, animated weapons, other knights and, of course, the dreaded dragon. Some threats must be avoided by moving or jumping. Others must be handled with a well-timed swing of your sword. In each challenge, there is only one correct response that will keep Dirk alive. Learning what to do is a matter of memorizing what you've done wrong before. At least it doesn't cost you 50 cents every time you make a mistake.

WRAP-UP

PHIL: Even with only nine scenes, there was a lot of variety. And I loved the different music.

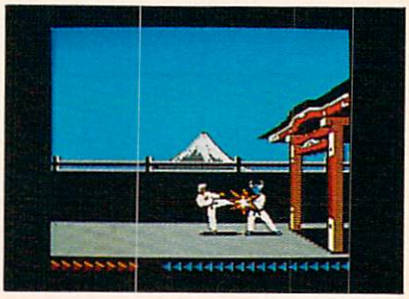
BILLY: It's the quality of the graphics and animation that will sell this game. Compared to other games for the Adam, *Dragon's Lair* is spectacular.

KARATEKA

Brøderbund; Apple, $34.95; Commodore 64, $29.95

Karateka is a game of hand-to-hand martial arts combat. It features beautiful graphics, superb animation and realistic sound effects. (According to Brøderbund, the screams were made by a black belt master, digitized and then transferred to disk!) Even though this is a game for only one player at a time, we think *Karateka* is tops in its class.

The scenario here is typical for



computer games—you must defeat a series of ever-more-invincible opponents to reach and rescue a helpless princess. Yet the gameplay is refreshingly new. The joystick and action button control your fighter's ability to advance, retreat, jump, chop, kick and defend. We were impressed by how smoothly the on-screen action responds to joystick commands.

WRAP-UP

BILLY: This is a four-star game. My only disappointments: you get no score, and you can't leap clear over your opponents.

PHIL: My only complaints are that you must always play against the computer, and never against another player. Plus, the game always begins at level one. Otherwise, wow, what a game!

PITSTOP II

Epyx, Commodore, around $30

Pitstop II is not very different from the original *Pitstop.* But the new version offers a split screen, so each driver can see the action from his or her car. That's a very satisfying way to race competitively.

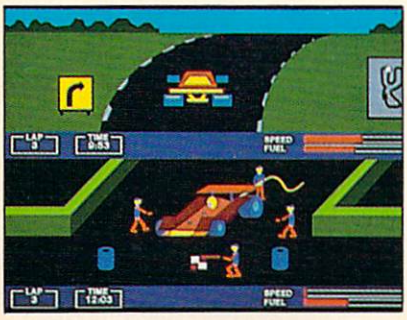
Pitstop II, like the original, is

more challenging than most race games. You must not only master the track and car, but also maintain your tires and fuel by making efficient pitstops. It's tricky trying to move the men in your pit crew. One of them handles the gasoline hose, the other changes the tires, and you can move only one at a time. It's tough and can be frustrating.

WRAP-UP

PHIL: I found the game fun, especially for two players. It's great party entertainment.

BILLY: It's a realistic game. You have to figure in worn-out tires and

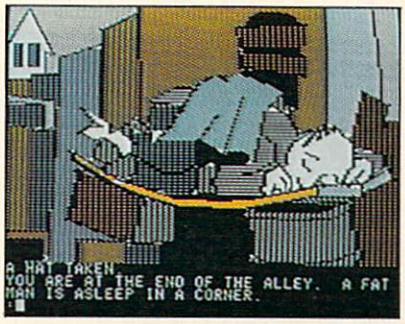


empty fuel tanks! You can go around hairpin turns at 100 mph. It's difficult to steer the car, but that doesn't matter too much. You don't crash into other cars—you bounce off them!

MINDSHADOW

Activision; Commodore 64, $31.95; Apple II and IBM PC and PCjr, $39.95

Game players who have been put off by difficult adventure games will find this new graphics/text adventure from Activision just right. *Mindshadow*'s puzzles are well-constructed—neither absurdly difficult nor too easy. There are 80 different scenes in the game, all shown in high-resolution graphics. There's even a way for players to speed from one scene to another. The whole game loads and runs faster than just about any adventure we have ever played.



We especially enjoyed this game's unique theme: you have lost your memory and must discover who you are. You begin on a deserted island. Just getting yourself on board a passing pirate ship will keep you very busy. Unlike many other adventure games, the clever puzzles in *Mindshadow* have logical solutions. Here's an example: to signal the pirate ship, you must light a fire. To do that you must collect some straw, a piece of steel, and a rock, then ignite the straw with a spark. Nice, huh?

WRAP-UP

BILLY: I'm hooked on this story. Plus, these graphics are as good as those in the adventure games from Penguin Software.

PHIL: And let's not forget the built-in help character that you can consult for hints when you get stuck. That's better than paying an extra $7.95 for a help booklet.

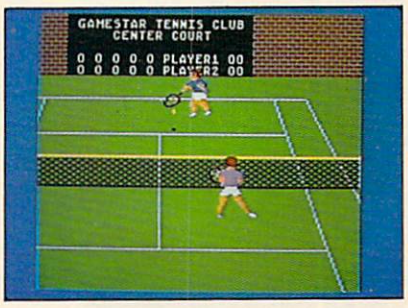
ON-COURT TENNIS

Gamestar, Commodore 64, $31.95

In video tennis games, the key is court position—you *have to* get your player in front of the ball. It rarely matters what shot you take, as long as your player is in the proper place.

On-Court Tennis takes a new approach. You never move your player; instead, the computer automatically moves you to the ball. The strategy lies in picking the right shot at the right time.

Joystick and action buttons give you a choice of a dozen shots. You can lob or smash, add topspin and return at various angles. And while you're planning your shot, you'd better pay close attention to your opponent's shots. If he hits a lob, you must return it with a smash. If he serves the ball with spin, you must adjust your swing. And never, *never* hit the ball right to him. That just increases the likelihood of his



returning a winning shot.

We can't figure out player selection. You must select one of four players whose names mimic those of familiar tennis stars. However, Bjorn, Jimmy and John all play exactly alike.

WRAP-UP

PHIL: This game is very difficult to play well. The strategy is challenging, but I prefer a tennis game that makes you move around and hit different shots.

BILLY: I really liked *On-Court Tennis*. It takes more strategy than most video tennis games. Plus, the screen is sharp and clear. It's easier to follow the ball.

SOFTWARE SCANNER

EDUCATIONAL SOFTWARE REVIEWS

BY HILDE WEISERT

DAZZLE DRAW

Brøderbund; Apple IIc and IIe (with Revision B, 128K and extended 80-column card) disk; $59.95

Dazzle Draw is a terrific high-resolution graphics program. It has just about every feature imaginable. And with its Macintosh-like pull-down menus, *Dazzle Draw* is a real treat to use.

Here are just a few of the features: solid or pattern colors that can be sprayed into different shapes; colorful "fill" that comes in solids or 30 patterns; a "modify pattern" command that lets you preview your pixel pushing; geometric designs with different border thicknesses, 16 colors and 30 patterns; and four-way mirroring that lets you repeat your design around the screen. There's even a text option that allows you to write in a variety of type styles right on your design.

Dazzle Draw's pull-down menus can be moved around the screen or stacked on the side for ready reference. Border colors highlight the status of each option, letting you know whether you can or can't use it. The well-illustrated manual is outstanding. I especially like the "Getting Started" and "Menus at a Glance" sections.

Now here's the hitch. *Dazzle Draw* was made to work on the IIc. It *will* work on the IIe—but only with extra hardware. You need revision B, 128K, and an extended 80-column card. Otherwise, your screen will look like a TV test pattern.

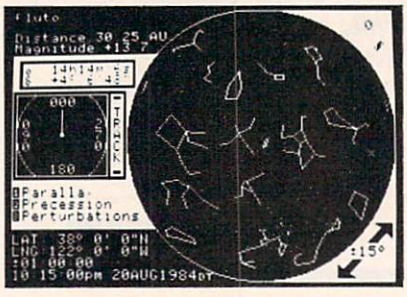
Dazzle Draw works with a joystick or drawing pad, but it's best when used with a mouse. And you really need a color monitor if you want to make the most of this software's truly dazzling pallete of colors. If you have the right equipment, *Dazzle Draw* is state-of-the-art art.

JOURNEY TO THE STARS

Brady; IBM PC and PCjr, disk; $49.95

THE OBSERVATORY

Lightspeed, Apple II; $125.00



These two "software telescopes" turn your computer into a star-filled sky. They can zap you across space and time in an instant, and really test your astronomical knowledge.

Journey to the Stars tracks 1300 stars and 48 of the 88 constellations. Start with the tutor program to get oriented with basic concepts like ascension and declination (which are like longitude and latitude on Earth). The tutor also explains the program's three types of astral journeys.

The first journey includes two menu choices—"Constellations" and "Bright Stars." Here you zero in on one constellation or star. You can trace the boundaries of the constellation, or circle your star. Press another key and you can try to find these constellations or stars on you own. This section of the program also includes games called "Name That Constellation" and "Name That Star."

The second journey includes several menu choices. You can pick sky views of the northern or southern hemisphere. Or you can choose the different skies as seen during the four seasons.

The third type of journey, called "Coordinates," is tough. To play, you must type in the correct sky coordinates to locate the right stars or constellations. Unless you know your way around the celestial territory, this can be confusing.

I liked *Journey to the Stars*, but I couldn't always do what I wanted—like shifting quickly from the constellation to a view of the entire night sky. Oh well, you can't have everything.

I take that back. You can have just about everything with *The Observatory*. But you have to pay almost three times as much to get

it. While *The Observatory* has only 400 celestial objects in memory, it really makes you feel like you're watching things happen. You can see any sky from any location on Earth. And you can see the sky as it will appear in any year—from the year one A.D. to New Year's Eve 9999. You can even see how the stars looked on the night you were born. *Observatory* also includes the solar system. That allows you to do things like watch the eclipse of the sun from Vienna in 1485 or Halley's Comet on its last pass.

The Observatory lets you outline constellations simply by touching a key. You can find out a star's name simply by pressing the "Q" key. There's also a "Search" feature that brings any object in the sky into view. The manual for this software is not simple, but it is clear and sometimes even funny.

With both *The Observatory* and *Journey to the Stars,* it helps to have a good astronomy book on hand. And, don't forget the ultimate goal—to learn about the stars, then go outside to see the real thing.

TUNESMITH/PC

Blackhawk; IBM PC and PC jr; $49.95

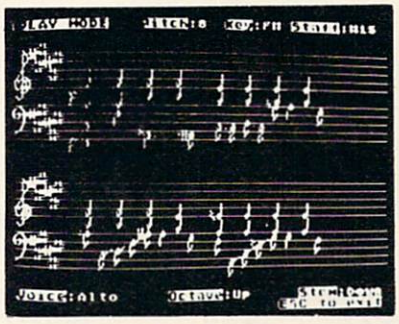
TuneSmith/PC should interest IBM PC owners who are frustrated by their computer's musical limitations. This software actually pulls chords and harmony out of the PC's single voice by fooling the ear. It works! *TuneSmith* can write, edit, save and play your music. It cannot, however, print out your compositions.

TuneSmith is *not* for music or computer beginners. Music entry and editing is almost as tough as programming.

BANK STREET MUSIC WRITER

Mindscape; Commodore 64, Apple II series, IBM PC and PCjr; $49.95

Bank Street Music Writer is almost as friendly to use as its word-processing namesake, *Bank Street Writer.* With this menu-



driven software, you can write a composition up to 70 staffs long, then save, edit, play and print it. There are screens for music entry, edit and playback. These screens include treble and bass staff, colorful note displays, full notation, status lines (pitch, key, octave, etc.), and command prompts. But *Music Writer*'s real strength is its powerful, full-featured music editor. It even gives you commands to copy and insert music.

Bank Street Music Writer does have flaws. For instance, you cannot play music directly through the keyboard. The cursor must place each note on the staff one voice at a time. (There are three voices on the C-64 and four on the Atari.) Then, after the notes are placed, the music will play.

The synthesizer section is also limited. Except for the piano, there are no preset instruments to adapt. You have to start from scratch. Finally, users should pay close attention during the save, load and print operation. The program prompts aren't as foolproof as they should be. You just might lose your masterwork.

MAGIC PIANO

EduSoft; Apple II, disk; $49.95

Magic Piano consists of three programs: the music processor "Magic Piano," a rhythm challenge called "Rhythm Game," and a tune test called "Melody Game."

In the "Magic Piano" section, you can play music. However, your songs can only be 75 notes long. There are no preset tunes to inspire you. You play your tunes on the keyboard by hitting number keys. There are only 10 notes—no flats or sharps. You can enter notes beyond this range, but you must learn the commands. Some of these commands just don't seem to make sense. For instance, "Q" sets an eighth note, not a quarter note, and "W" sets a quarter note, not a whole note. That's just confusing. This program is for beginners, and should be easier to use.

The "Rhythm Game" section is better. The computer plays a short rhythm that you have to match by hitting the spacebar to the beat. The screen then displays your rhythm pattern between the computer's pattern. The "Melody Game," which challenges you to follow a tune, is also well done. But I recommend you memorize the commands before giving it a try.

HILDE WEISERT is a freelance writer and educational consultant.

Welcome to the city of the 21st century—made of plastic, metal and glass. This future vision was drawn by Julian Krupa.

WHATEVER HAPPENED TO THE FUTURE?

Imagine the future.

It's probably filled with computers. These machines will drive our cars, protect our homes, clean up our rooms, help us to learn about life on Earth and to travel to other planets. With computer breakthroughs happening so frequently, it's not surprising that this technology fills our vision of the future. New technology always produces new ideas about the world of tomorrow.

"Every technological breakthrough—from the railroads to the light bulb to the computer—has made people imagine a new kind of future," says Brian Horrigan. Brian should know. He helped put together "Yesterday's Tomorrows: Past Visions of the American Future." This exhibit, which will tour the U.S. during the next two years, shows what past generations thought about the future.

Computers are important, says Brian, but "the future really means a lot more than what machines we'll use...It's an act of imagination."

What did experts from the past imagine today would be like? Some of their predictions were way off—but others were right on the mark.

LOOKING BACK AT YESTERDAY'S PREDICTIONS

A HISTORY OF THE FUTURE

Jules Verne was one of the "experts" who was remarkably on target with his predictions. Verne, whom many consider the father of science fiction, wrote more than 20 novels in the late 1800s. In his books *From the Earth to the Moon* (1865) and *Around the Moon* (1870), he came very close to predicting the way our modern space program would work. He correctly foretold the shape of the space capsule, described weightlessness in space, and even imagined the capsule's splashdown at sea. His most astounding prediction? The blast-off of his space vehicle in *From the Earth to Moon* took place in Florida, very close to the present-day space center at Cape Canaveral!

In other books, Verne created imaginary vehicles like the *Nautilus*, a forerunner of the modern-day submarine, and the *Albatross*, a huge helicopter which needed 75 propellers to get off the ground. Unfortunately, Verne's most imaginative vehicle has not yet been perfected: An airship that could instantly change into a tiny submarine or the world's fastest car.

(Continued on next page)

BY ROBERT CULICOVER

© JEFF PLOSKONKA

Blast-off! A 1952 Space Cadet suit.

Visions of the future also made their way onto movie screens. One of the most famous movies about tomorrow's world was *Metropolis*, filmed in 1926 by director Fritz Lang. The movie featured a city that was run by a giant "heart machine" — moviedom's first computer villain. This "heart machine" forced people to work in dreary underground factories. At the film's end, the people destroy the machine and are free again.

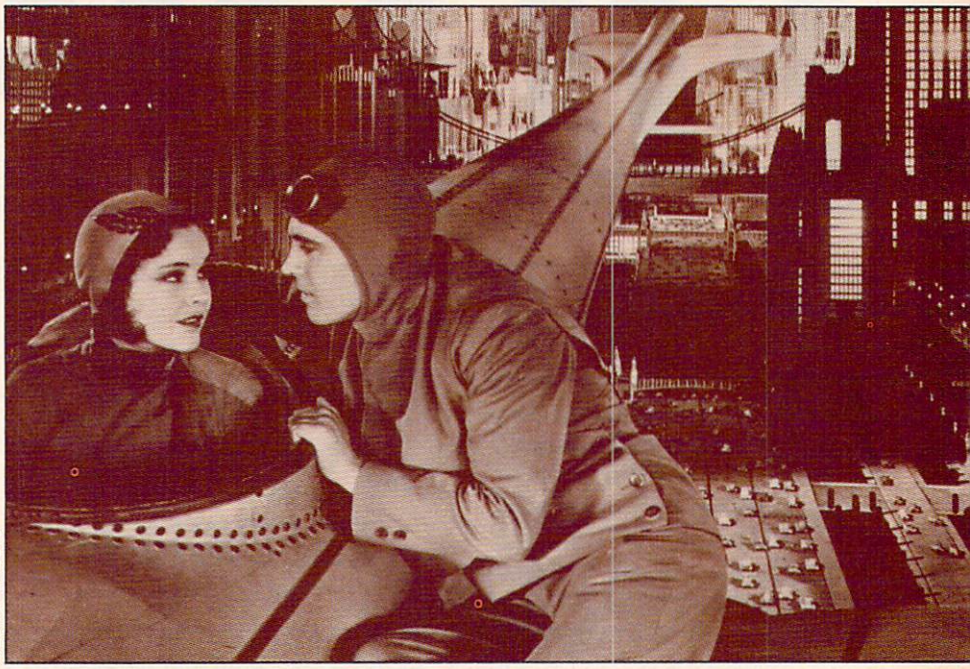
In 1936, the film *Things To Come*, written by H.G. Wells, took viewers through 100 years of prophecies. Wells made a mistake predicting the date of our first moon landing. He thought it would take until 2036 to reach the moon; that's 67 years *after* Neil Armstrong actually took the first "giant step for mankind."

VISIT THE WORLD'S FAIR

Looking into the future became an international pastime in 1939 and 1964–65. That's when people travelled from all over to attend the New York World's Fairs. These exhibits were almost as good as a trip in a time machine.

Let's take a trip back to 1939:

Even from a distance, the World's Fair is magical. The enormous white triangular tower and globe, named Trylon and Perisphere, loom above everything else. After entering the 18-story high Perisphere, you step onto what was then the world's longest escalator and ride up to a revolving balcony. From here, you can look down on Democracity, a model of the perfect city of 2039. As the balcony revolves, you watch the day go by in a miniature city of gleaming sky-



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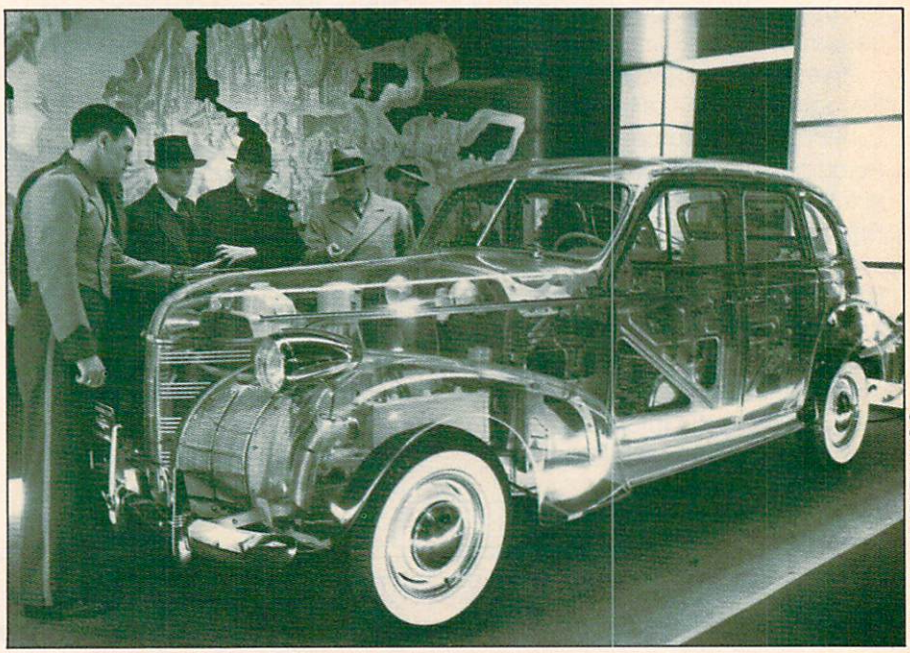
The 1930 movie "Just Imagine" imagined New Yorkers of 1980 jetting around town.



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The 1939 World's Fair was filled with wondrous sights—such as this plastic car.

TO THE FUTURE?

scrapers and traffic-free highways.

Wandering around the rest of the fair, you find other exhibits that focus on the future:

- In the Transportation Pavilion, you learn what it will be like to travel in years to come. Experts predict giant rocketguns will hurl passenger modules all the way across the Atlantic Ocean in a single hour.
- At the Westinghouse Pavilion, enter the "Hall of Electric Living" and meet Elektro, a 7-foot-tall stainless steel robot, and his robot dog, Sparko.
- At the RCA Pavilion, you get a first look at an amazing invention experts predict will have a major impact in a few years. This new invention is called television.
- At the General Motors Pavilion, you enter the most extensive look at the future—Futurama. This is a vision of what the world is supposed to be like in the 1960s. Riding in chairs that move, you see: farms where each tree is protected by a glass covering for more efficient growth, cities with quarter-mile high buildings, and 14-lane cross-country highways where radio-controlled cars zoom along at 100 miles per hour. This exhibit, the most popular at the Fair, is visited by more than 25 million people.

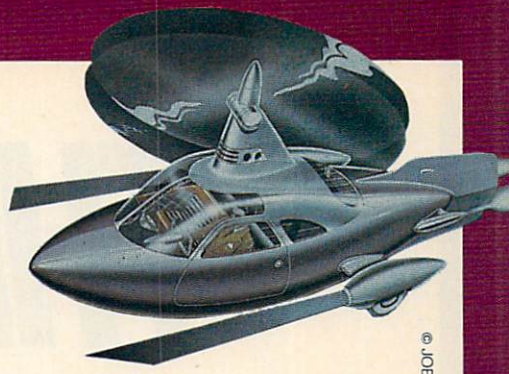
Futurama proved so popular in 1939 that General Motors updated the exhibit for the 1964 New York World's Fair. Riding through Futurama II, you glimpse undersea resort hotels where every guest gets an aqua-scooter to explore the ocean floor. Plastic bubbles cover new cities built in harsh places like the Antarctic and the Sahara desert. Look up at the sky and you see "island cities" floating by in outer space.

While none of *these* predictions have quite come true, at least one invention shown at the 1964–65 World's Fair is now commonplace. Experts in 1964 looked into the future and saw—computers.

In the Hall of Education, the "School of Tomorrow" exhibit showed a teaching machine called the auto-tutor. It was a lot like today's classroom computers. At the NCR Pavilion, a supermarket computer printed out the name and price of every item purchased. At the IBM Pavilion, a special presentation demonstrated a computer that could translate words from Russian to English.

The experts who predicted that the computer would become more and more important were obviously right. But whether experts of the past guessed right or wrong, it's fascinating to listen to their visions of the world to come. In fact, it's almost as much fun as trying to predict the future yourself...

ROBERT CULICOVER wrote "The Making of an Arcade Game" in September's ENTER.



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Future car —as envisioned in 1943.

COURTESY OF NATIONAL MUSEUM OF AMERICAN HISTORY

By 1960, all traffic problems will be solved, says this 1930s ad.

WHAT'S IN YOUR FUTURE?

What do you think the future will be like? What will computers be like? How important will robots be? We'd like to know. Send us a short (200 words or less) article about what life will be like in the year 2050. If you wish, include a drawing or computer graphic. Mail your story to: FUTURE FEATURE, ENTER, 1 Lincoln Plaza, New York, NY 10023. If we print your story, we'll send you an ENTER T-shirt. Be sure to include your name, address, age, phone number and T-shirt size.

THE FUTURE COMES HOME

Welcome to the 21st Century. Like Rip Van Winkle, you've fallen asleep for many years and are about to wake up in the next century. You'll be visiting the high-tech home of a family of the future—Sharon and Sam, and their kids Zilla and Boz. To find out what life might be like 25 years from now, ENTER talked to some of today's top future experts. We then turned their ideas into this story about an average day in the year 2010.

A TYPICAL DAY IN THE 21ST CENTURY

It's morning. A whispering voice says: "Time to get up." There's no one else in the room. That voice comes from speakers in the bed. It's a voice-synthesized "alarm" that gets louder until Sharon opens her eyes and sits up.

Outside her windows is a favorite view—The Rocky Mountains. But Sharon is tired of mountains, so she hits a button. The scene on the windows changes to a view of Earth from outer space. It's beautiful but there's no time for window-gazing now. Sharon turns on her favorite music—Michael Jackson oldies from the 1980's—and gets ready for the day.

A 'THINKING' HOUSE

The house where Sharon and her family live is totally computer-controlled. Even before Sharon got her "wake-up call," the house's central computer was adjusting room temperature, using infrared sensors to guard against intruders, and even baking fresh rolls for breakfast. When Sharon got up, the central computer activated her personal robot—which rolls into the room, carrying a glass of juice.

On the bedroom's computer screen, Sharon checks out the day's appointments. Then she asks the robot to pick up her clothes from the house storage system. Meanwhile, she uses the computer terminal to contact her husband, who is out jogging. Sam uses a wristwatch communicator to talk with Sharon. "Good morning," she says. "I didn't even hear you go out."

"I'm on my way back now," answers Sam, huffing and puffing.

Sharon uses the intercom to tell her kids, Zilla and Boz, that they should end their morning study and come to breakfast. "I just scored 85 on a math quiz, Mom," says Zilla. "I'm smarter than the computer!"

When breakfast—which was, of course, prepared by the kitchen computer—is done, the kids rush off to three hours of school. They aren't getting off easy. These three hours of classroom work are in addition to the hours spent doing

BY ROBERT CULICOVER

computer-run home studies.

Sharon and Sam punch in the family dinner menu. (The kitchen computer will order the day's groceries from the supermarket computer and get started cooking tonight's meal.) Sharon and Sam then head off to their separate offices—right upstairs. Sharon and Sam are telecommuters. They send most of their work to their central offices by computer. Occasionally, they may go to a meeting center to get together with co-workers—but most of the time, they work right at home.

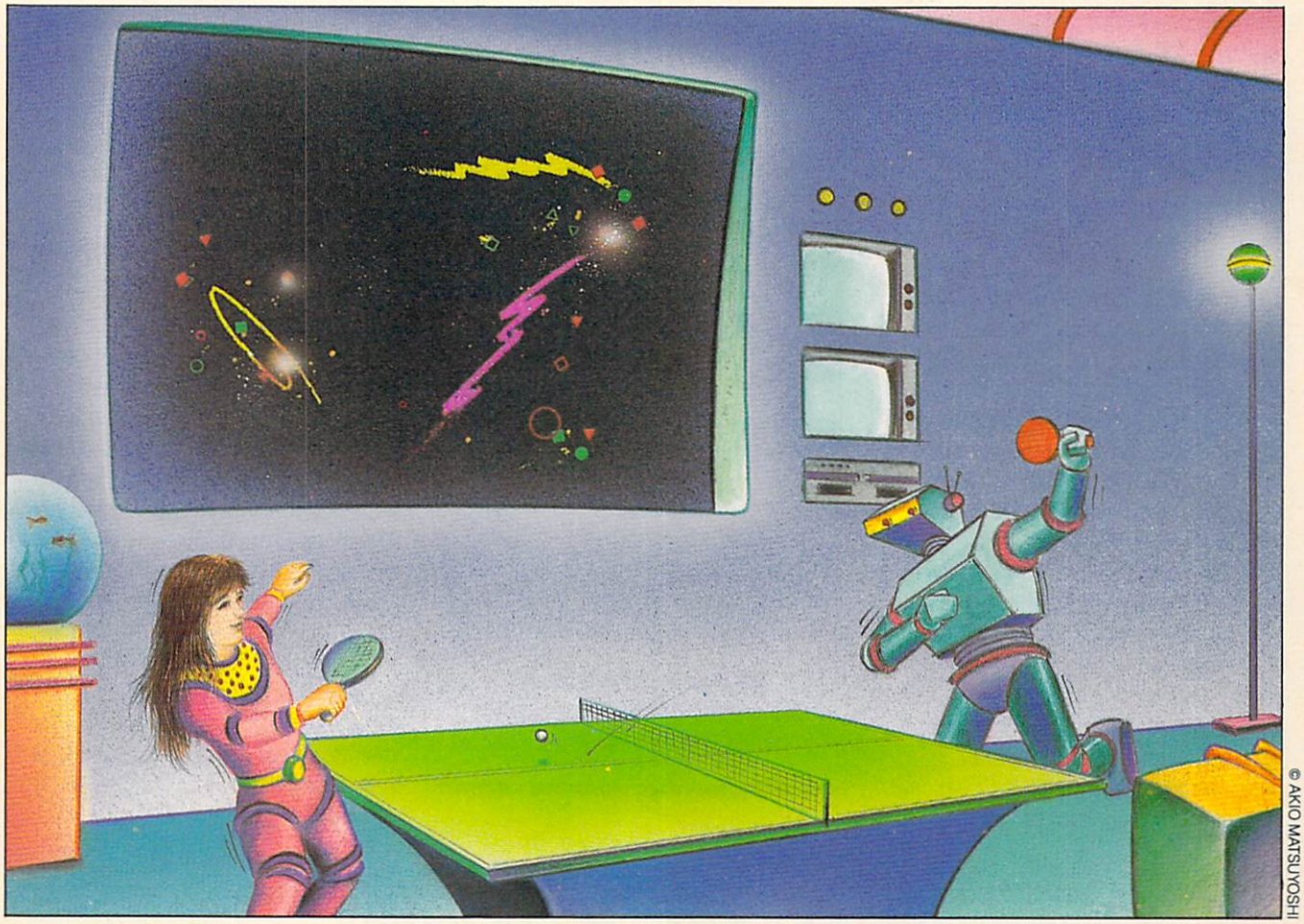
As Sharon and Sam work away, the house's central computer conserves energy by turning off lights and lowering the heat in unoccupied parts of the house. At 11 A.M., Sharon "attends" a teleconference meeting. A wall-sized video screen makes it seem that her co-workers are right in the room with her. If she has to send any documents, she simply presses the transmit button on her computer.

When Zilla and Boz return from school, they can zoom around the backyard on jet scooters or play inside with room-sized 3-D video games that seem almost too real. But just when the game is getting good, the computer interrupts: "Now, it's time to begin reviewing this morning's geography lesson... Boz, what's the capital of Brazil?"

In a few hours, the family sits down to their computer-cooked dinner. "We're having Italian food tonight," guesses Zilla, as the video wall shows views of Rome and plays Italian music. "I recognized the Coliseum from geography class."

After dinner, the family retires to the media room, while the kitchen cleans itself up. In the media room, they watch a video tour of Mexico, then read a book together from one of the room's computer screens. When Sharon, Sam, Zilla and Boz have gone to bed, the house computer adjusts the temperature, shuts off the lights and makes sure the doors are locked.

The family of the future may rest, but in the year 2010, the computer never sleeps.



HOMING IN ON THE FUTURE

Maybe *your* average day in the future will be different from our tale about the 21st Century. But this ENTER prediction *is* based on some of the best expert advice. The experts we consulted are known as futurologists. They have studied today's trends to try to forecast the future.

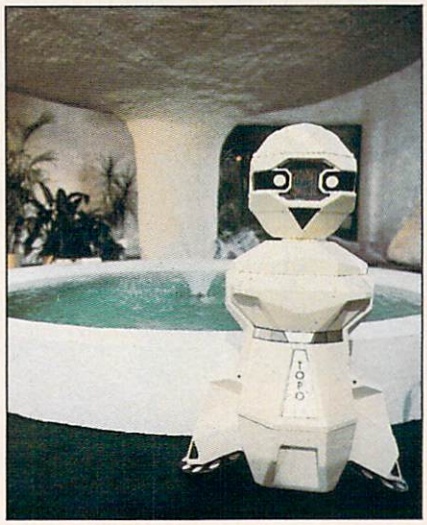
Here's some of what we learned from them about the next century:

Computers will handle most of the "grunt work," according to Christopher Evans, a computer scientist and author of *The Micro Millenium*. They will process more information faster than ever. This, he says, will lead to shorter workdays and more opportunity for people to be creative.

Evans also believes that by the year 2000, we'll have talking appliances, teaching machines that can adapt to an individual's skill level, and wristwatch supercomputers that are as common as pocket calculators are today.

The "electronic cottage" will become common. The type of home that Sharon, Sam, Zilla and Boz lived in is based on futurologist Alvin Toffler's predictions. Toffler, who wrote the books *Future Shock* and *The Third Wave*, thinks people will be able to work at home on terminals connected to large computer networks. Even today, he claims, workers in many businesses could be "phoning in" their work using a computer and modem.

WHAT TODAY'S EXPERTS ARE PREDICTING



It's nice to have a robot around the house—especially when it does your chores.

THE SMART HOUSE

Many futurologists have predicted what the future will be like. Roy Mason is one of the few who has tried to create that future. His creation is called Xanadu, a computerized home of the future near Orlando, Florida. Xanadu is a fully automated, computer-controlled house. No one lives there, but it's open to visitors who want to see what life in the future might be like. This Xanadu "smart house," says Roy, was built to experiment with creative new ways for using electronic technology.

In order to make Xanadu a

BY ROBERT CULICOVER

"smart house," Roy and his partner, Bob Masters, hooked up hundreds of electronic gadgets to the house's central computer. "With a central computer, or 'house brain,' all the different things that go on inside can be linked together," says Mason. "That way, everything works together smoothly as a single unit."

Like the computer in our 21st century story, Xanadu's central home computer doesn't just take charge of cleaning and cooking. It also supervises routine household repairs and maintenance. The computer will be able to order groceries from a supermarket computer—when the local supermarket is equipped with such a system. The house computer even controls a robot, named Robutler. This robot can carry out all kinds of tasks around the house.

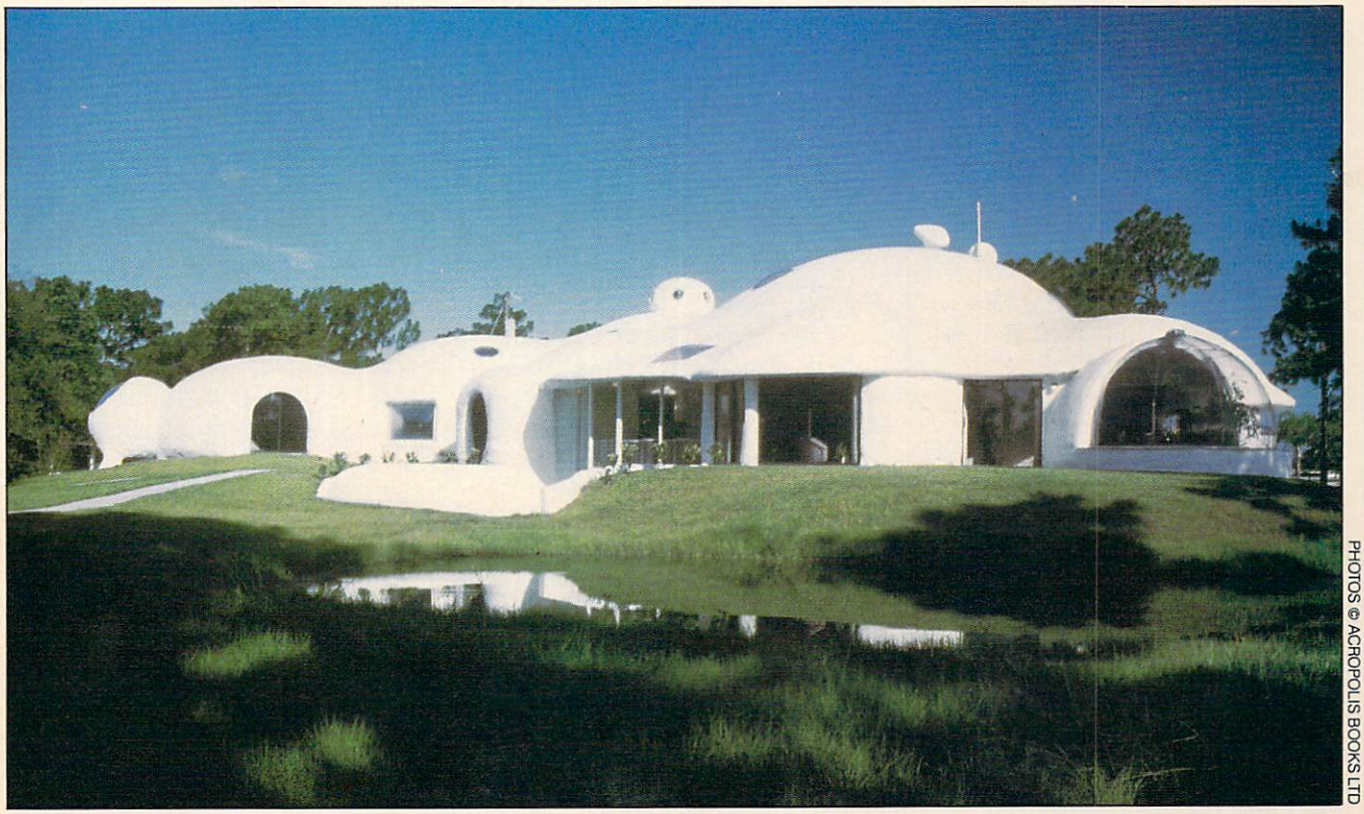
But Mason believes that a central home computer can do more than just control robots and appliances within the house. In the neighborhood of the future, he explains, central home computers will "talk" to each other. They will be able to warn of emergencies, plan block parties, even borrow a cup of sugar. Right now, Xanadu's house brain is the only one on the block. There aren't any other houses to talk to—yet.

Still, there's plenty going on inside. The central living area, for instance, is a computer-controlled, state-of-the-art home entertainment center. Mason calls this the electronic hearth. In it, a computer connects a network of stereo, video and other media equipment.

Xanadu's electronic hearth also provides two-way communication with the outside world. It contains enough hardware and software to keep everyone in the family entertained and informed.

All these high-tech comforts sound great. But will they turn us into "electronic hermits," who never need or want to set foot outside? Not according to Roy Mason. He thinks computers will actually help us keep better track of what's going on around the world and in our own communities.

"The house brain can be a bridge to connect families with others who share similar interests," says Roy. In the home of the future, the computer will be a high-tech "welcome mat" that helps bring the world to your door.



Xanadu, the computer-controlled home of tomorrow, is filled with amazing high-tech gadgets.

CONNECTIONS

EDITED BY JESSICA WOLFE

Computer Camp Scholarship

July must have been Kevin Seeley's lucky month. Last year, the teenager from Seattle, Washington, entered the Computer Tutor Camp contest mentioned in the July-August issue of ENTER. When his name was randomly drawn, Kevin won a two-week camp scholarship.

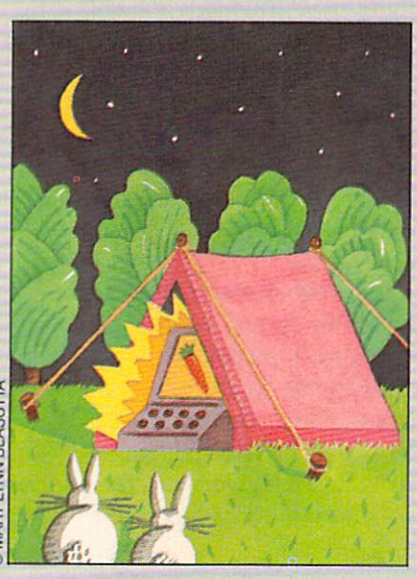
Computer Tutor is running the contest again—and this year, the winner could be you!

Any ENTER reader between the ages of 10 and 17 is eligible. All you have to do is send your name, address and phone number to Computer Tutor Camps, 980 Magnolia Avenue, Larkspur, California 94939. All entries must be postmarked by May 15, 1985.

The winner will get two free weeks of hands-on computer instruction at Computer Tutor's Stanford, California, sleep-away camp. The winner, picked at random, will be notified by June 15.

Computer Careers

Interested in finding out what kinds of careers there are in the computer field? *Putting the World at Your Fingertips* is a 16-page booklet published by the Computer and Business Equipment Manufacturers Association that could help. The booklet fills you in on job descriptions, educational requirements, salaries and includes comments from several computer professionals. Send $2.50 (check or money order)



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for each booklet to Computer Careers, Dept. E, CBEMA, 311 First St., N.W., Suite 500, Washington, DC 20001, or write for more information.

Augmenting Your Adam

If you have an Adam computer, you've officially joined the ranks of "disappearing computer" owners. Coleco Industries says it will help Adam users out when possible (see "Newsbeat," April 1985). However, there are steps *you* can take to help you get the most from your Adam.

One way is to join a users' group. According to Al Gerson, president of the 4,000-member Adam Users' Group (AUG), "We're very much in business. Since Coleco dropped the Adam, new memberships have been coming in at the rate of about 100 a day."

For $12 a year, AUG will send members *AUGment*, a bi-monthly newsletter containing programs, tips, reviews, and sources of software and hardware. Also included in your membership is access to a public domain library of games, business, and applications software. All this software is available in either DataPack or disk formats. The cost is $10 per program. In addition, AUG has an exchange arrangement that lets you choose a program from the library in exchange for one you send in.

A free booklet with tips on starting a local AUG chapter is available by sending a self-addressed, stamped envelope to the address below. For more information on the group and a membership application, write to AUG, P.O. Box P, Lynbrook, New York, 11563.

Coast-to-Coast Gaming

Want to participate in an unusual new communications network? All you need is a modem and an Apple, Commodore 64, or IBM-PC. The service is called Playnet, and it lets you take part in a variety of activities against subscribers around the country—just by dialing a local number.

Playnet has national game tournaments, daily contests and trivia quizzes. There is a monthly service fee of $6, plus $2 for each hour of use. The one-time start-up fee of $34.95 includes telecommunications software, 13 games and 90 minutes of access time. For more information, write Playnet, 200 Jordan Road, Troy, NY, 12180. You can also call 1-800-PLAYNET.

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C·E·N·T·E·R

THE COMPUTER-USER'S HANDS-ON HANDBOOK

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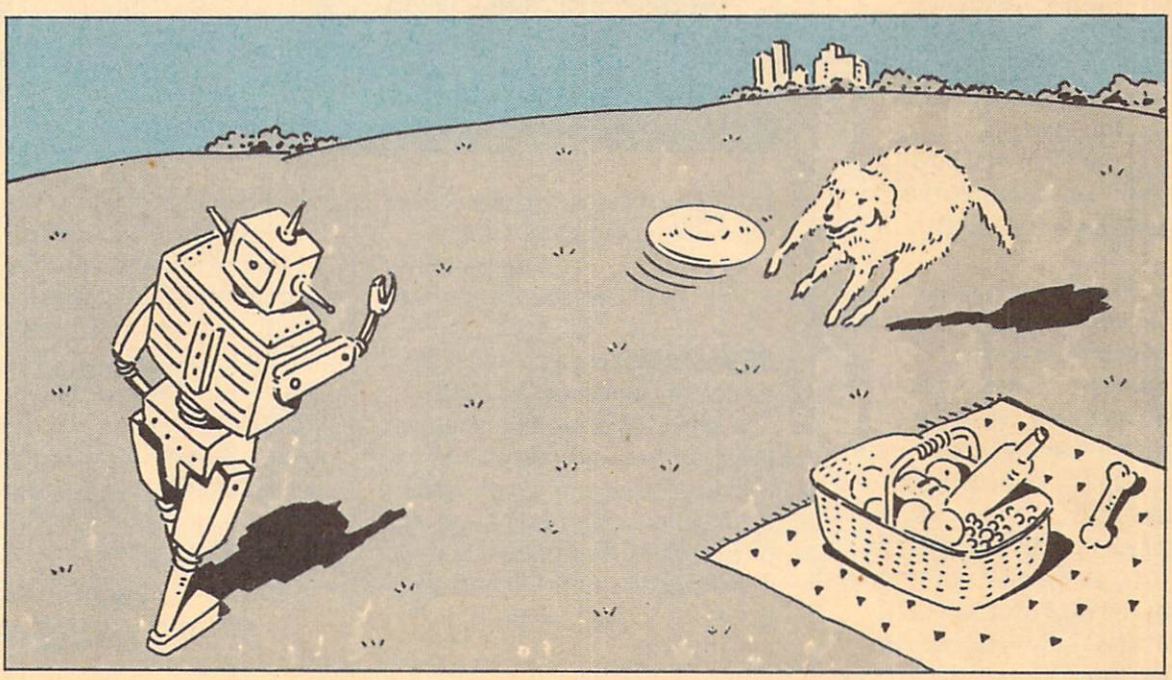

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• FEATURING •

ASK ENTER

BY RICHARD CHEVAT

SECRET FILES?

DEAR ENTER: Is there any way you can fix a program so nobody can list it unless they do something like type in a password or a POKE statement?

—Jeff York
Kokomo, Indiana

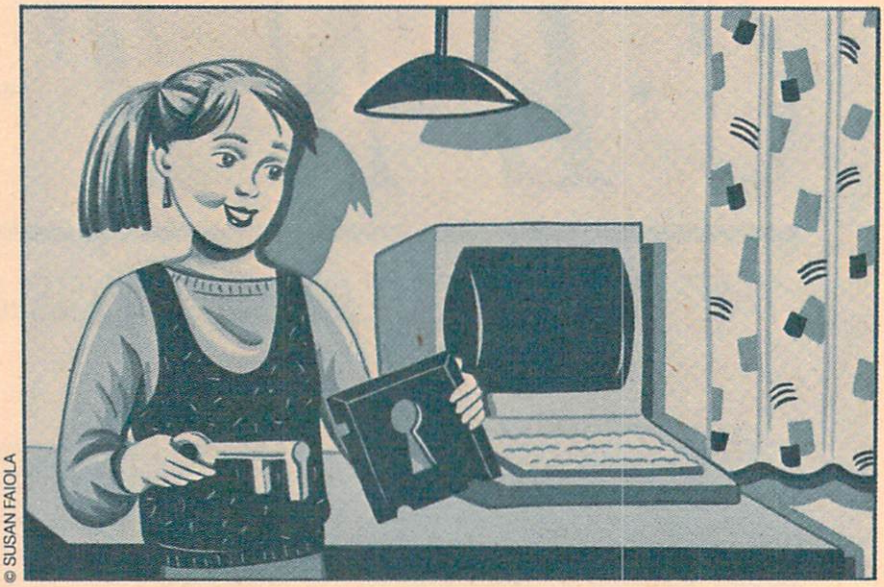
DEAR JEFF: It is possible to protect computer systems with passwords and other security measures (though hackers seem to be able to get into these systems anyway). But it's almost impossible to protect information on a floppy disk from being read by anyone with a compatible computer.

When you save a program or a file on a disk, the location or *address* of that file is stored in the disk's directory. This is done by the *disk operating system,* the program that handles file storage. Anyone with the same type of computer and the same disk operating system can read that file. To hide a file on a disk, you'd have to write your own disk operating system. Then only you could retrieve the files.

Of course, there's a much easier way to protect files on a floppy disk. When you're finished computing, just take your disk out and lock it up.

LIGHT PEN PIXELS

DEAR ENTER: I was thinking of buying a light pen for my VIC-20.



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Do I need a monitor to use one, or can I use a plain old TV set?

—Shawn Barat
Palm Beach Gardens, FL

DEAR SHAWN: No, you don't need a special monitor to use a light pen with your computer. A regular television will work just as well.

Every TV set or monitor sends out electronic signals that can be picked up by the light pen. From these signals, the light pen can tell your computer where it is on the screen.

PILOT: A LOGO CLONE

DEAR ENTER: What is the computer language PILOT? Is it easy to learn?

—Michael Cryer,
Aurora, CO

DEAR MICHAEL: PILOT is a language similar to Logo that is designed to run on Atari computers.

Like Logo, PILOT was designed to help beginners learn the basics of programming. It uses simple graphics commands to move a cursor (called a turtle) around the screen and to draw pictures. PILOT, like Logo, enables you to create libraries of custom programming commands. These can be strung together to build more complex programs.

MODERN MODEMS

DEAR ENTER: Are modems available for push-button phones?

—Melissa Rieckenberg
Steeleville, IL

DEAR MELISSA: Most modems will work with any kind of phone or phone line. The only time you might have a problem is if you own a modem with an *auto-dial* feature. That means your modem

does the dialing for you.

The difference between a push-button phone and an old rotary phone is the type of signal that they send to phone company switching machines. A push-button phone sends out a "touch-tone" signal. This is the same type of signal sent out by an auto-dial modem. Old rotary phones send out a series of clicks, called a "pulse" signal. Most inexpensive modems also send out pulse signals.

Most phone companies accept either kind of signal for basic phone service. Modems that send out pulse signals will work in most cases. However, certain phone companies may require you to use touch-tone signals for their service. If that is the case with your local phone company, you can buy a modem that sends out touch-tone signals. If necessary, you can even buy a modem that sends out either kind of signal.

BORN TO SYSOP

DEAR ENTER: I would like to know the name of a book that will help me start a bulletin board on my Commodore 64.

—Rasheed Hall
Brooklyn, NY

DEAR RASHEED: The best way to learn how to start your own electronic bulletin board (BBS) is by dialing a board already set up in your area. You can learn a lot about how EBBs work by using one.

When you're ready to set up your own board, you'll need a program that will turn your computer into a bulletin board. There are many "public domain" programs available for this. (Public domain software is not protected by copyright—anyone can use it.) Again, a local bulletin board will be your best source for these programs. Leave a message for the sysop (system operator) telling him or her what you'd like to do. Most sysops will be glad to help you get started.

Contact local computer bulletin boards before you start your own.

A book that has listings of many electronic bulletin boards around the country is the *Computer Phone Book* (Plume Books; $9.95) by Mike Cane. There's also a version of this book especially for Commodore owners called *Online Guide For Commodore Computers*, also by Mike Cane, and also for $9.95.

Both of these books should be available through your local bookstore.

MYSTERY KEY

DEAR ENTER: I am the owner of a Commodore 64 and I'd like to know what the backward arrow on the upper-left-hand side of the keyboard is used for. I haven't found any information about it in the User's Guide.

—Marc Sandlhauser
Penns Grove, NJ

DEAR MARC: The key you refer to has no built-in function. It is just an extra key. It can be programmed for input, or you can just ignore it. If you want to program this key, it has a character code of 95.

C-64 JOYSTICKS: NO JOY

DEAR ENTER: Could you tell me how to read [get input from] the joystick on the Commodore 64?

—Christian Polizzi,
Newtown, PA

DEAR CHRISTIAN: Unfortunately, getting input from a joystick on the Commodore 64 is not very easy. The input from the joysticks is stored at memory location 56320 (for joystick #1) and 56321 (for joystick #2). You can read these locations with a PEEK.

But before you can use the information stored there, you will want to translate it. Use these lines of BASIC programming from the Commodore Programmer's Reference Guide:

```
JV = PEEK(56320)
FR = JV AND 16
JV = -(JV AND 15)
```

You can put these lines anywhere in your program. After they are executed, the variable JV will be a number. Here is what each number represents: 0 = no direction, 1 = up, 2 = down, 4 = left, 5 = up and left, 6 = down and left, 8 = right, 9 = up and right, 10 = down and right.

The value of variable FR will tell you if the fire button has been pushed. If FR equals 16, then the button was not pushed.

If you have a question about computers or video games we'd like to help. Just send your questions to: ASK ENTER, CTW, 1 Lincoln Pl., NY, NY, 10023.

BASIC TRAINING

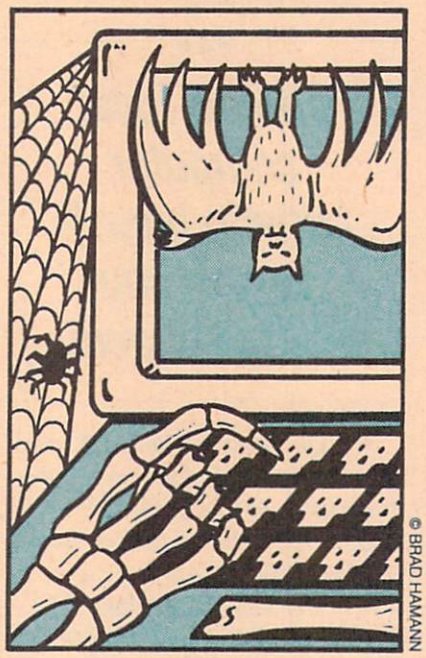
PROGRAMS FOR YOUR COMPUTER

Apple, Adam, Atari, Commodore 16 and 64, IBM, Kaypro, TI 99/4A, Timex-Sinclair, TRS-80, VIC-20

It was a dark and stormy night. My computer was wrapped in a dense fog, so thick I could barely see the full moon reflected in the dusty old TV screen.

From the shelves of my study, rows of obsolete cartridges for long-dead video game machines stared down at me. The click, click, click of my keyboard echoed inside my fevered brain. Would I ever find the solution?

With quivering fingers, I brushed the cobwebs off my printer and picked up the latest copy of ENTER magazine. Slowly, I turned the pages to BASIC Training. There they were, just as I had suspected. Pages of computer programs, waiting patiently to be typed in and used by each and every ENTER reader.



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A mouse scrambled by, disappearing into a joystick port. But I was hypnotized by the magazine. In a trance, I looked over the many features, like the BASIC Glossary and BASIC Recommends, with the best in programming software and books. Frantically, I pored over the latest programming Challenge, and the tips for programmers in BASIC Plus.

I watched helplessly as my fingers typed in the lines to my program. Then suddenly, a demonic scream pierced the night! With a last desperate effort, I leapt to unplug the binary beast. But it was too late.

My disk drive had died.

—Richard Chevat, Technical Editor

BOUNCE! TIMEX-SINCLAIR

Here's a short program for Timex-Sinclair computers. It displays a bouncing ball that leaves a trail behind it. When you run the program, you pick the number of bounces you want to see. The ball then starts its journey from a randomly chosen spot on the screen.

If you don't want the ball to leave a trail, add this line:

```
135 UNPLOT X,Y
```

With a little work, you could make a simple ping-pong game based on this program.

```
 5  REM BOUNCE
10  SLOW
20  LET X = INT (RND*50) + 1
30  LET Y = INT (RND*50) + 1
40  LET C = 1
50  LET D = 1
60  LET T = 0
70  PRINT "HOW MANY
    BOUNCES";
80  INPUT B
85  CLS
89  REM BOUNCE LOGIC
90  IF X + D >63 THEN GOSUB
    200
100 IF X + D < 0 THEN GOSUB
    200
110 IF Y + C > 43 THEN GOSUB
    230
120 IF Y + C < 0 THEN GOSUB
    230
130 LET X = X + D
140 LET Y = Y + C
150 PLOT X,Y
160 IF T < B THEN GOTO 90
170 STOP
200 LET D = - D
210 LET T = T + 1
220 RETURN
230 LET C = - C
240 LET T = T + 1
250 RETURN
```

—Michael Feldman

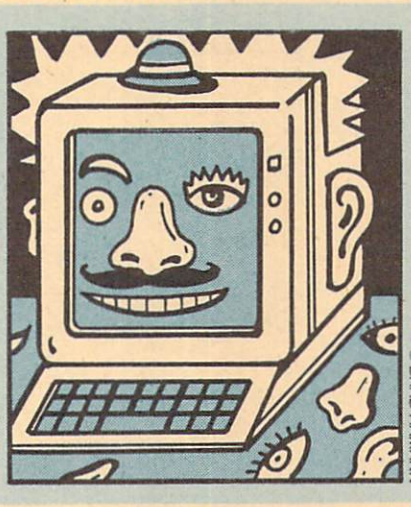
ABOUT FACE: TI 99 4/A

You could call this program a face construction set. It contains everything you need to build the face of your choice—ears, eyes and noses.

The program gives you a menu of facial parts and a blank head to stick them on. The parts must go where the numbers appear on the head. You will be asked for a number where you want the part to be placed, then for the letter of the nose, ear or whatever. You can invent your own eyes, ears, etc. by changing the CHAR statements in lines 410-530.

"About Face" was written by Enter's technical assistant, 17-year-old Doug Krehbiel.

```
10   REM ABOUT FACE
20   DIM F(6)
30   FOR D = 1 TO 6
40   F(D) = D+48
50   NEXT D
60   GOSUB 400
70   CALL CLEAR
80   PRINT "FACEMAKER"
90   FOR H = 1 TO 500
100  NEXT H
110  CALL CLEAR
120  Z = 128
130  FOR T = 7 TO 13
140  CALL HCHAR (6,T,127,1)
150  CALL HCHART(T,6,127,1)
160  CALL HCHAR(14,T,127,1)
170  CALL HCHAR(T,14,127,1)
180  NEXT T
190  CALL HCHAR(12,10,F(6),1)
200  CALL HCHAR(10,10,F(3),1)
210  CALL HCHAR(10,6,F(4),1)
220  CALL HCHAR(10,14,F(5),1)
230  CALL HCHAR(8,8,F(1),1)
240  CALL HCHAR(8,12,F(2),1)
250  FOR U = 3 TO 15 STEP 4
260  FOR X = 24 TO 28 STEP 2
270  CALL HCHAR(U,X,Z,1)
280  CALL
     HCHAR(U+1,X,Z-63,1)
290  Z = Z+1
300  NEXT X
310  NEXT U
320  PRINT "CHANGE WHICH
     FEATURE";
330  INPUT A
340  IF (A < 1) + (A > 6) THEN
     110
350  PRINT "WHICH ORGAN";
360  INPUT Y$
370  G = ASC(Y$)
380  F(A) = G+63
```



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```
390  GOTO 110
400  REM REDEFINE
     CHARACTERS
410  CALL CHAR(128,
     "003C421818000000")
420  CALL CHAR(129,
     "00183C7E7E3C1800")
430  CAL CHAR(130,
     "7E0018181818")
440  CALL CHAR(131,
     "000081422418")
450  CALL CHAR(132,
     "001818187E7E")
460  CALL CHAR (133,
     "00202020201C")
470  CALL CHAR(134,
     "003C664242663C")
480  CALL CHAR(135,
     "0018183C24667E")
490  CALL CHAR (136,
     "FF818199998181FF")
500  CALL CHAR(137,
     "818181FFFF7E")
510  CALL CHAR(138,
     "00003C7E42818181")
520  CALL CHAR(139,
     "1824425A5A422418")
530  CALL CHAR(127,
     "0000001818")
540  RETURN
```

—Douglas Krehbiel

DIGITAL DIAMOND:

APPLE, ADAM, COMMODORE 16 AND 64, IBM, KAYPRO, TRS-80, TI 99/4A, VIC-20

Yes, it's baseball time again. But this year you won't need a glove, or bat to play the game. You won't even need a baseball. All you need is a computer and the baseball program below.

In this game, you're playing against the computer. You're the manager, and you have to set your team's line-up. You choose from a roster of nine players.

Take a look at the players' statistics in DATA statements in lines 1730–1810. You'll notice that each player has a batting average, is either right- or left-handed, and is rated as either a 1,2, or 3. A 1 player tends to hit singles, 2's hit doubles, and 3's tend to hit triples or home runs.

You pick the order in which players bat. You *must* go through the entire roster once, however, before you can use any player again. A batter with a higher batting average has a better chance of getting a hit. And as in real baseball, a right-handed batter will generally do better against a left-handed pitcher, and vice-versa.

Here's how the game works. Each time a player comes to bat, the results are figured in subroutine 1030. The computer takes the player's average and multiplies it by 1000. We have it automatically add 100 points to make it easier to get a hit (we like to win).

In line 1050, the program checks if the player and pitcher are both right-handed or both left-handed. If they aren't, it adds another 150 points to the player's

(Program continues on next page)

(BASIC Training cont. from previous page)

score in line 1060.

Then in line 1070, it picks a random number between 1 and 1000. If the player's score is higher than the random number, the player gets a hit. If not, he's out.

If it's a hit, the program decides whether it's a single, double or triple in lines 1200–1230.

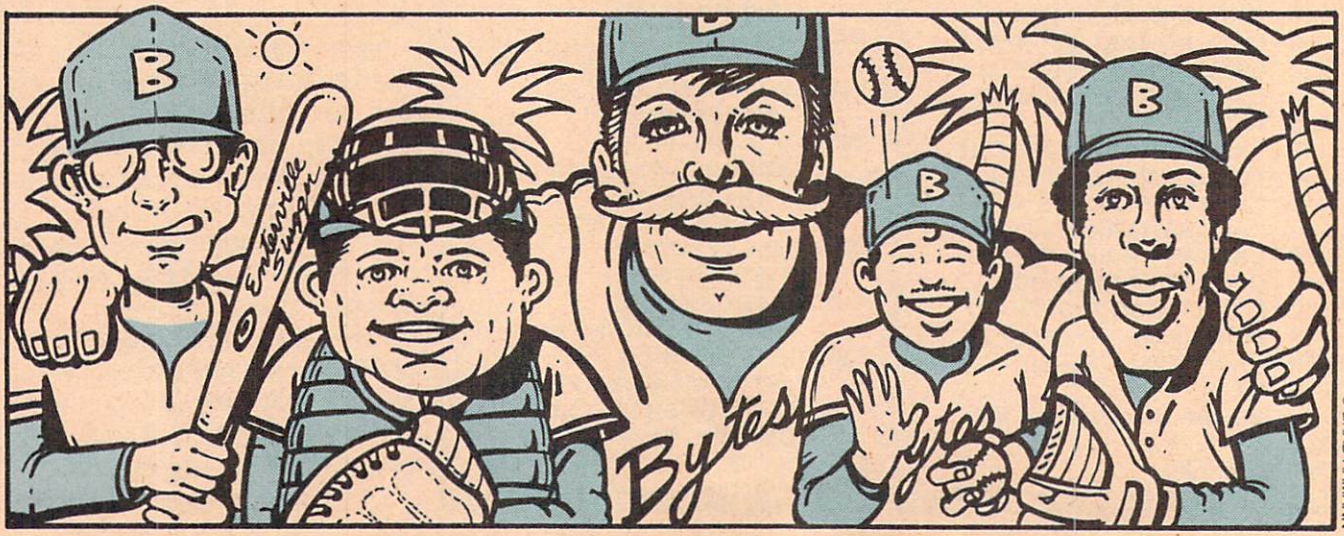
The computer's team randomly scores between zero and three runs every inning. The computer has only two pitchers—Larry Lefty and Rick Righty. It picks one at random to start the game. But if the computer's team falls behind by more than three runs, it will switch pitchers.

Below is the program for Apple and Adam computers. Following that are instructions for adapting to other machines.

APPLE, ADAM:

```
10   REM BASEBALL
20   HOME
30   PRINT "PLEASE RISE FOR
     THE SINGING OF OUR
     NATIONAL ANTHEM"
40   PRINT : PRINT
50   FOR D = 1 TO 2000: NEXT D
60   PRINT "...O'ER THE LAND OF
     THE FREE ,"
70   FOR D = 1 TO 2000: NEXT D
80   PRINT "AND THE HOME, OF
     THE BRAVE!!"
90   FOR D = 1 TO 2000: NEXT D
100  PRINT "PLAY BALL!!!"
110  FOR D = 1 TO 2000: NEXT D
120  GOSUB 340
130  REM START OF LOOP
140  GOSUB 500
150  GOSUB 640
160  GOSUB 790
170  GOSUB 860
180  IF BR = 0 THEN 200
190  GOSUB 1350
200  IF OUT > = 3 THEN GOSUB
     1450
210  IF IN > 9 THEN 230
220  GOTO 130
230  IF C = H THEN 130
240  HOME
250  PRINT "GAME
     OVER – FINAL SCORE IS:"
260  PRINT "COMPUTER – ";C;"
     HUMAN – ";H
270  IF H < C THEN 300
280  PRINT "YOU WON !"
290  GOTO 310
300  PRINT "THE COMPUTER
     WON !"
310  END
330  REM LOAD PLAYERS
340  DIM PL$(9), AVG(9), LR$(9),
     PI$(2), PH$(2), BA(4), R(9)
350  FOR X = 1 TO 9
360  READ A$:PL$(X) = A$
370  READ A:AVG(X) = A
380  READ A$:LR$(X) = A$
390  READ A:T(X) = A
400  NEXT X
410  REM LOAD PITCHERS
420  FOR X = 1 TO 2
430  READ A$:PI$(X) = A$
440  READ A$:PH$(X) = A$
450  NEXT X
460  IN = 1
470  REM CHOOSE PITCHER
480  P = INT ( RND (1) * 2) + 1
490  RETURN
500  REM STATUS
510  HOME
520  PRINT "IT IS INNING
     NUMBER ";IN
530  PRINT "THE SCORE IS
     HUMAN – ";H;"
     COMPUTER – ";C
540  PRINT "THERE ARE ";OUT;"
     OUTS"
550  PRINT "WITH MEN AT:"
560  IF BA(1) < > 1 THEN 580
570  PRINT "FIRST"
580  IF BA(2) < > 1 THEN 600
590  PRINT "SECOND"
600  IF BA(3) < > 1 THEN 620
610  PRINT "THIRD"
620  PRINT PI$(P);" IS PITCHING"
630  RETURN
640  REM REPORT
650  RF = 0
660  PRINT "HERE ARE YOUR
     AVAILABLE PLAYERS"
670  PRINT
680  FOR X = 1 TO 9
690  IF R(X) = 1 THEN 720
700  PRINT PL$(X); TAB(
     2);AVG(X); TAB( 2);LR$(X)
710  RF = 1
720  NEXT X
730  IF RF < > 0 THEN 780
740  FOR X = 1 TO 9
750  R(X) = 0
760  NEXT X
```

(Program continues on next page)



(BASIC Training cont. from previous page)

```
770  GOTO 680
780  RETURN
790  REM CHOOSE BATTER
800  PRINT
810  PRINT "CHOOSE THE NEXT
     BATTER BY NUMBER"
820  INPUT B
830  IF R(B) = 1 THEN 820
840  R(B) = 1
850  RETURN
860  REM BATTING
870  HOME
880  BA(0) = 1
890  PRINT PL$(B);" STEPS UP TO
     THE PLATE"
900  PRINT
910  X = INT ( RND (1) * 3) + 1
920  ON X GOTO 930,950,970
930  PRINT "THE CROWD GOES
     WILD"
940  GOTO 980
950  PRINT "A HUSH FALLS OVER
     THE STADIUM"
960  GOTO 980
970  PRINT "HE POINTS TO THE
     LEFT FIELD FENCE"
980  FOR DE = 1 TO 600: NEXT
     DE
990  PRINT "THE PITCHER GOES
     INTO HIS WIND UP"
1000 FOR DE = 1 TO 1000: NEXT
     DE
1010 GOSUB 1030
1020 RETURN
1030 REM THE SWING
1040 X = AVG(B) * 1000 + 100
1050 IF LR$(B) = PH$(P) THEN
     1070
1060 X = X + 150
1070 Y = INT ( RND (1) * 1000) + 1
1080 IF Y < = X THEN 1190
1090 OUT = OUT + 1
1100 BR = 0
1110 X = INT ( RND (1) * 3) + 1
1120 ON X GOTO 1130,1150,1170
1130 PRINT "STRIKES OUT!"
1140 GOTO 1330
1150 PRINT "HITS A FLY
     BALL – AN OUT!"
1160 GOTO 1330
1170 PRINT "GROUNDS OUT TO
     FIRST!"
1180 GOTO 1330
1190 REM A HIT
1200 X = INT ( RND (1) * 1 + .5)
1210 X = X + T(B)
1220 PRINT PL$(B);" HIT A ";
1230 ON X GOTO
     1240,1260,1280,1300
1240 PRINT "SINGLE!"
1250 BR = 1: GOTO 1320
1260 PRINT "DOUBLE!"
1270 BR = 2: GOTO 1320
1280 PRINT "TRIPLE!"
1290 BR = 3: GOTO 1320
1300 PRINT "HOME RUN!!!"
1310 BR = 4
1320 REM
1330 FOR DE = 1 TO 2000: NEXT
     DE
1340 RETURN
1350 REM BASE RUNNING
1360 FOR X = 1 TO BR
1370 FOR Y = 4 TO 1 STEP – 1
1380 BA(Y) = BA(Y – 1)
1390 NEXT Y
1400 BA(0) = 0
1410 IF BA(4) = 1 THEN RN = RN
     + 1
1420 NEXT X
1430 H = H + RN:RN = 0
1440 RETURN
1450 REM COMPUTER AT BAT
1460 IF IN < > 7 THEN 1490
1470 PRINT "SEVENTH INNING
     STRETCH – STAND AND
     SING ' TAKE ME OUT TO THE
     BALLGAME"
1480 FOR DE = 1 TO 4000: NEXT
     DE
1490 IF IN < > 9 THEN 1510
1500 IF C > H THEN 1630
1510 HOME
1520 IF H – C > 3 THEN PF = 1
1530 PRINT "THE COMPUTER'S
     TEAM IS AT BAT"
1540 FOR DE = 1 TO 1500: NEXT
     DE
1550 FOR X = 1 TO 4
1560 BA(X) = 0: NEXT X
1570 X = INT ( RND (1) * 4)
1580 PRINT "THE COMPUTER
     SCORED ";X;" RUNS!
1590 FOR DE = 1 TO 1000: NEXT
     DE
1600 C = C + X
1610 OUT = 0:IN = IN + 1
1620 IF PF = 1 THEN GOSUB 1640
1630 RETURN
1640 REM CHANGE PITCHERS
1650 PF = 0
1660 PRINT "THE COMPUTER
     CHANGES PITCHERS"
1670 IF P = 1 THEN 1690
1680 P = 1: GOTO 1700
1690 P = 2
1700 PRINT PI$(P);" WALKS TO
     THE MOUND"
1710 FOR DE = 1 TO 1500: NEXT
     DE
1720 RETURN
1730 DATA "1) LOUIE
     LONGBALL",.325,"R",3
1740 DATA "2) BOBBY
     BAT",.387,"R",1
1750 DATA "3) PABLO
     PITCHER",.221,"L",1
1760 DATA "4) MICKEY
     MUSCLE",.315,"R",3
1770 DATA "5) SAM
     STEALER",.354,"R",1
1780 DATA "6) HARRY
     HOMER",.292,"L",3
1790 DATA "7) JOHNNY
     JUMP",.346,"L",2
1800 DATA "8) WALLY
     WALKER",.272,"R",1
1810 DATA "9) DANNY
     DOUBLES",.361,"R",2
1820 DATA "LARRY
     LEFTY","L","RICK
     RIGHTY","R"
```

COMMODORE, VIC-20 and KAYPRO: Change all HOME statements to PRINT CHR$(147)

IBM and TRS-80: Change all HOME statements to CLS

Change all RND functions from RND(1) to RND(0).

TI 99/4A: Change all HOME statements to CALL CLEAR

If you don't have extended BASIC, break up all multiple statement lines. Also add or change these lines:

```
200  IF OUT < 3 THEN 210
205  GOSUB 1450
480  P = INT (RND*2) + 1
700  PRINT PL$(X); AVG(X);
     LR$(X)
910  X = INT (RND*3) + 1
1070 Y = INT (RND*1000) + 1
1110 X = INT (RND*3) + 1
1200 Y = INT (RND*1 + .5)
1410 IF BA(4) <> 1 THEN 1420
1415 RN = RN + 1
1520 IF H – C < = 3 THEN 1530
1525 PF = 1
1570 X = INT (RND*4)
1620 IF PF <> 1 THEN 1630
1625 GOSUB 1640
```

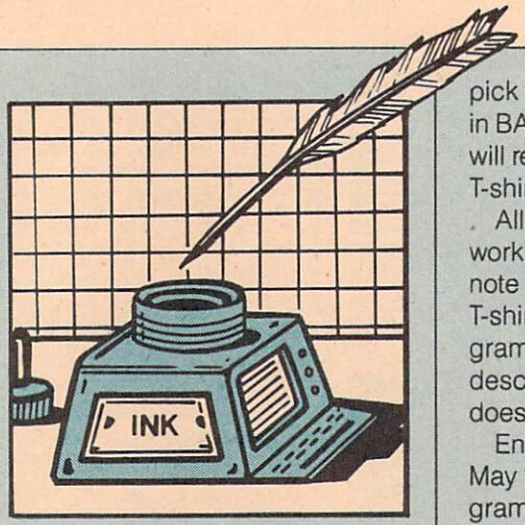
—Richard Chevat

(BASIC Training continues on next page)

CHALLENGE #14: WORDS, WORDS, WORDS

Even if you spend more time in front of a computer than reading books, words are still very important. In fact, computers are often used to make words easier to read and write.

So for this month's Challenge, we want you to write a program that has something to do with words. You might write a vocabulary quizzer, or a word jumble game. Maybe you can come up with a program that helps you write stories, or one that writes poetry to suit the mood of the user. Or maybe you can come up



with a program that will produce crosswords, word hunts, or some other kind of word puzzle.

When you've finished your program, send it to CHALLENGE #14, ENTER, 1 Lincoln Plaza, New York, NY. 10023. We'll pick the best ones and print them in BASIC Training. The winners will receive $25 and an ENTER T-shirt.

All entries must be your original work. Remember to enclose a note telling us your name, age, T-shirt size, the computer the program was written for, and brief description of what the program does.

Entries must be postmarked by May 1, 1985. We read every program that is sent in, but we cannot reply to the hundreds we get each month.

And remember, if you've written any other programs you think belong in ENTER, send them to BASIC Training at the address above. We pay between $25 and $50 for programs we publish.

WINNERS OF CHALLENGE #11: TREBLE CLEF: ATARI

In Challenge # 11, we asked you to send in programs that made sound effects, played music, or were just plain noisy. One of the best was this program for Atari computers by Chris North, age 15, of Allentown, Pennsylvania.

The program doesn't just play music. It also displays "notes" on a musical staff. You use your joystick to move a red cursor up and down across a treble clef and the top half of a bass clef. When you reach the line you want, press the fire button. The longer you hold down the button, the longer the note will play. If you want a rest or pause, place the cursor in the green line at the top or bottom of the screen. When you are done, press start and the song will be played back to you.

```
5   REM COMPUTER
    COMPOSER
10  X=1:Y=1
20  GRAPHICS 3+16
30  COLOR 2:PLOT 0,0:DRAWTO
    39,0
40  COLOR 3
50  FOR Z=5 TO 13 STEP 2
60  PLOT 0,Z:DRAWTO 39,Z
70  NEXT Z
80  FOR Z=17 TO 23 STEP 2
90  IF Z=23 THEN COLOR 2
100 PLOT 0,Z
105 DRAWTO 39, Z
110 NEXT Z
120 COLOR 1:PLOT X,Y
130 A=STICK(0)
140 IF STRIG(0)=0 THEN
    X=X+1:GOTO 230
150 IF PEEK (53279)=6 THEN 300
160 IF A=15 THEN 130
170 IF Q=3 THEN COLOR 3:
    GOTO 190
180 COLOR 0
190 PLOT X,Y
200 IF A=13 THEN Y=Y+1
210 IF A=14 THEN Y=Y-1
220 IF A=11 THEN X=X-1
230 IF Y<0 THEN Y=0
240 IF Y>23 THEN Y=23
250 IF X>39 THEN X=39
260 IF X<1 THEN X=1
270 LOCATE X,Y,Q
280 FOR L=1 TO 60
290 NEXT L:GOTO 120
300 FOR S=1 TO X
310 FOR T=0 TO 23
320 LOCATE S,T,B
330 IF B<>1 THEN NEXT T
340 READ C,D
350 IF C<>T THEN 340
360 SOUND 0,D,10,10
365 RESTORE 380
370 FOR I=1 TO 50:NEXT I:
    NEXT S
380 DATA 11,81,12,91,13,96,10,
    72,9,64
390 DATA 8,60,14,108,15,120,7,
    53,6,47
400 DATA 16,128,17,144,5,45,4,
    40,3,35
410 DATA 18,162,19,182,20,
    193,2,33
420 DATA 1,31,21,217,22,251,
    23,0,0,0
430 SOUND 0,0,0,0:GOTO 130
```

JOYSTICK PIANO
TRS-80 COLOR COMPUTER

This music program works a little differently than most. It displays an entire octave of notes and lets you choose one by moving your joystick right or left. You change the length of the note by moving the joystick up and down. You can also switch to another octave by pushing the up and down arrow keys on your keyboard.

Thanks to Eric Wood, age 12, of Atwood, Illinois, for sending this in.

```
10   CLS
20   PRINT "JOYSTICK PIANO"
30   G = 3
40   PRINT@132, "C C D D E F F G
     G A A B";
50   PRINT@100, "# # # # #";
60   X = JOYSTK(0)
70   P = X/2.85+164
80   Y = JOYSTK(1)
90   IF Y<12 THEN L = 32:L1 = 1
     ELSE IF Y<25 THEN L = 16:
     L1 = 2 ELSE IF Y<38 THEN L
     = 8:L1 = 3:ELSE IF Y<51
     THEN L = 4 ELSE L = 2:L1
     = 5
100  PRINT@256, "NOTE
     LENGTH ";L1
110  IF PEEK(342) = 247 THEN G
     = G - 1 : IF G<1 THEN G = 1
120  IF PEEK(341) = 247 THEN G
     = G + 1 : IF G>5 THEN G = 5
130  POKE 341,255
140  POKE 342,255
150  PRINT@320," OCTAVE "; G
160  N =X/5.7+1
170  N = INT(N)
180  P = INT(P/2)*2
190  PRINT@164,STRING
     $(24,143);
200  PRINT@P,CHR$(191);
210  PE = PEEK(65280)
220  IF PE = 126 OR PE = 254
     THEN 230 ELSE 60
230  PLAY "O"+STR$(G)+"L"
     +STR$(L)+";"+STR$(N)
240  GOTO 60
```

NEON: VIC 20

Did you ever want your name in lights? This short program for the VIC-20 won't get you on Broadway, but it *will* flash your name or any other message you want. Just type in your name where it says "your name here."

Neon was sent to us by Scott Hamilton of Sand Springs, Oklahoma.

```
10   A=36879
20   PRINT CHR $(147)
30   POKE A,41
40   PRINT "YOUR NAME HERE"
50   POKE A,158
60   FOR DE=1 TO 300
65   NEXT
70   POKE A,213
80   FOR DE=1 TO 300: NEXT
90   POKE A,136:POKE A,C
100  POKE A,69
110  FOR DE=1 TO 500: NEXT
120  POKE A,14
130  PRINT
140  POKE A,203
145  POKE A,27
150  POKE A,173
160  FOR C=8 TO 255 STEP 17
170  GOTO 200
```

CORRECTIONS

The program called "Bar Battle" in our December issue should have included this line:

```
5045 IF YY < 1 THEN YY = 1
```

In Sketchman in our Jan/Feb issue, line 30 should have read:

```
30 X = X+DX/4
```

In Mouse Maze for the Commodore 64 in our March issue, lines 90 and 370 should have read:

```
90  PRINT "CTRL 9 19 SPACES
    CTRL 0 1 SPACE"
370 GET C$:IF C$=" " THEN 370
```

(BASIC Training continues on next page)

BASIC RECOMMENDS

There are books that tell you how to program a computer, buy software for it, even how to buy the computer itself. But there are very few books that explain *what* a personal computer is, and how it works.

Now there's a book that does just that, and does it in a way that's original and fun. It's called *Inside the Personal Computer* by Sharon Gallagher, and it's a pop-up book. That's right, a *pop-up* book. Each time you turn one of the pages, you get a full-color, three-dimensional paper model of a piece of computer technology.

There are six pop-up constructions in all. The first is a model of the entire computer. You also see pop-up models of a keyboard, circuit board, disk drive, monitor and printer. Each model has moving parts that help illustrate how the hardware works. (We especially liked the little disk in the computer model.)

Best of all, the pages are full of easy-to-understand descriptions of the hardware and essential computer terms like bus and pixel. Many of these are cleverly illustrated. For example, the binary system is explained with a movable wheel that gives the values of different numbers.

Inside the Personal Computer is a great introduction to computers and it's fun to look at, too. It is published by Abbeville Press and sells for $19.95.

WALLBUILDER: COMMODORE 64

This version of a popular computer game was sent in by Kevin Park, 14, of Corbin, Kentucky. The game begins with a white line which appears near the bottom of your screen and starts to move up. Use your joystick to keep from touching anything, including the walls or the line itself. As long as you don't hit anything, you keep playing. Don't try to go backwards—that counts as a hit. Another popular version of this, called *Surround*, lets two people play at once.

NOTE: You can also use the cursor keys to maneuver.

```
5   REM WALLBUILDER
10  DIM D(4)
20  PRINT CHR$(147)
30  POKE 53280,0
40  D(0)= -40:D(1)= -1:
    D(2)= -1
50  D(3)=40:Z=0
60  PRINT CHR$(147)
70  FOR X=55296 TO 56295
80  POKE X,1:NEXT X
90  FOR X=1024 TO 1063:POKE
    X,42
100 POKE X+960,42:NEXT X
110 FOR X=1064 TO 1944 STEP 40
120 POKE X,42:POKE X+39,42:
    NEXT X
130 L=1924:D=-40:EL=1124
140 ED=4:S=54272:N=100
150 FOR X=S TO S+24
160 POKE S,0:NEXT X
170 POKE S+24,15:POKE S+1,19
180 POKE S+4,29:POKE S+5,19
190 POKE S+15,18:POKE S+
    24,15
200 K=PEEK(197):J=PEEK(653)
210 JY=PEEK(56321):FI=JY
    AND 16
220 JY=15-(JY AND 15)
230 IF JY=1 OR (K=7 AND J=1)
    THEN D=-40
240 IF JY=2 OR (K=7 AND J=0)
    THEN D=40
250 IF JY=4 OR (K=2 AND J=1)
    THEN D=-1
260 IF JY=8 OR (K=2 AND J=0)
    THEN D=1
270 IF PEEK(L+D)<>32 THEN
    350
280 L=L+D:POKE L,160
290 IF RND(2)>.95 THEN ED=
    INT(RND(3)*4)
300 POKE S+24,0
310 FOR X=0 TO 3:IF PEEK
    (EL+D(X))=32 THEN ED=X
320 NEXT X
330 Z=Z+1
340 GOTO 170
350 POKE 53280,9:PRINT
    CHR$(147); TAB(13)"YOU
    CRASHED!"
360 FOR T=1 TO 2000:NEXT T
370 PRINT CHR$(147):POKE
    53280,6
380 PRINT "YOUR SCORE
    WAS";Z
390 POKE 198,0:INPUT"PLAY
    AGAIN(Y OR N)";A$
400 IF A$="Y" THEN 20
410 PRINT CHR$(147)
```

—Kevin Park

HILBERT'S CURVE: APPLE

Are you the kind of person who fills in all the letters on a printed page? Do you like to doodle in every corner of a piece of paper? If so, this program is for you.

To be exact, our "Hilbert's Curve" program fills in squares. It draws a line that fills every space in a square without crossing itself.

The program will first ask for the size of the square, then the level. (Level controls how complex the line will be, how many twists and turns it will take.) Numbers under seven work best.

"Hilbert's Curve" will draw interesting lines, but it's also an interesting *program*. Take a close look at subroutine 110. Notice how it uses *itself* as a subroutine? That's because each level of complexity is built on the level below it. For example, a level 3 line is made up of two level 2 lines. The principle of a program using itself as a subroutine is called *recursion*.

```
10  PI = 3.14159265:
    HCOLOR= 3
20  HOME : VTAB 21
30  PRINT "HILBERT'S CURVE."
40  INPUT "WHAT SIZE? ":F1
50  INPUT "WHAT LEVEL? ":L
60  HGR
70  PX = 0:PY = -60
80  H = 0:P = 1
90  GOSUB 110
100 GOTO 20
110 IF L = 0 THEN RETURN
120 L = L-1:L1 = P * 90
130 H = H + L1:P = (-P)
140 GOSUB 110
150 P = (-P)
160 GOSUB 280
170 R1 = P * 90:H = H-R1
180 GOSUB 110
190 GOSUB 280
200 GOSUB 110
210 R1 = P * 90:H = H-R1
220 GOSUB 280
230 P = (-P)
240 GOSUB 110
250 P = (-P):L1 = P * 90
260 H = H + L1:L = L + 1
270 RETURN
280 HX = COS (H * PI / 180)
290 HY = SIN (H * PI / 180)
300 NX = PX + HX * F1
310 NY = PY + HY * F1
320 IF NX > 139 OR NY > 79
    THEN GOTO 370
330 HPLOT 140+ PX,80-PY TO
    140+ NX,80- NY
340 PX = NX:PY = NY
350 PY = NY
360 RETURN
370 PRINT "DESIGN TOO
    LARGE"
380 FOR I = 1 TO 1000: NEXT I
390 GOTO 20
```

—David Lewis

BASIC PLUS

A Programmer's Major Discovery

BY MARK SUTTON-SMITH

What would happen if every night you forgot everything you knew? In the morning, you wouldn't be able to find your socks (which is hard enough as it is), much less remember how to eat breakfast. Each day, you'd have to relearn *everything* from the beginning.

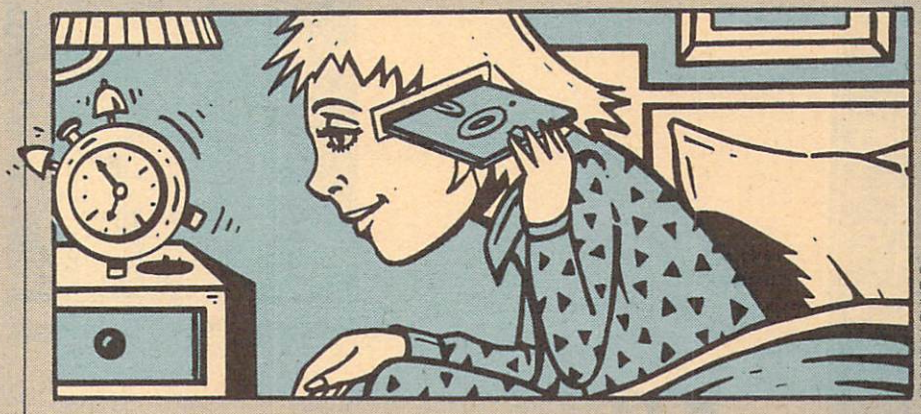
That's sort of what you do when you write a program that doesn't use any memory device (disk or tape). When you turn off the computer, everything in random access memory (RAM) disappears. Whatever you were working on, or playing, is gone forever.

Unlike your computer's RAM, a disk or tape holds its memory even when the computer is off. A week later, you can reload your program and pick up where you left off.

LEARNING TO REMEMBER

To use your computer's full potential, you should learn to write programs that use disk storage. (Some computers let you write programs that use tape. The process is similar.)

Suppose you want to write a program that helps you keep a diary. You'd want that program to automatically save your daily entries. That means recording them on a disk. On most computers, this means learning three new commands.



© BRAD HAMANN

First, you must open a file. You'll need to learn a command that instructs your computer to set up a file on the disk. In this case, let's be original: we'll call the file "Diary." Your computer will store the "Diary" file address in the disk directory. If there's *already* a file by that name, the computer finds out its address, so you can add to or change that file.

You'll also need a "write" command. That tells the computer when to start sending your daily entry to the disk. Finally, you'll need to learn your computer's "close" command. That tells the computer to *stop* sending information to the disk.

You'll also want to learn how to "append" information to a file. You usually indicate this somewhere in the open command. This instructs your program to add information to the end of a file, rather than start over at the beginning. Otherwise, every time you run your diary program, it will write over all the previous entries.

Remember, your program doesn't *have to* write on the disk every time you type in a word. Instead, you can save your entry in an array as you go along. Then at the end of the program, you can send it all to the disk.

You can use disk memory for any program that you'll be coming back to over and over. For example, any database will need to use a disk—whether you're cataloging your record collection, keeping a computerized phone list, or indexing notes for a term paper.

Many games will be much more fun if you add disk features, like saving your place in them or recording your high scores. You can also learn how to save graphics and artwork you create.

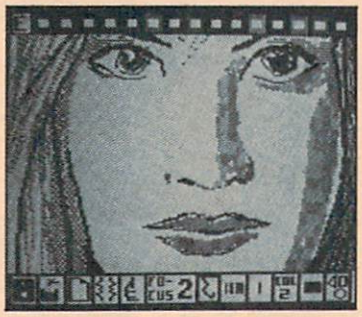
Learn how to use your disk drive and you'll find your programs look more professional and are much more useful. You may even find your socks.

MARK SUTTON-SMITH is an ENTER Contributing Editor.

A LIGHT TOUCH

LOOKING AT THE LEADING LIGHT PENS

BY MICHAEL HART, 14



Peripheral Vision: *Pixel portrait.*

If you draw on the computer screen with a pen, you'll probably get in trouble. Unless, that is, you are using a light pen.

Light pens let you draw, select menu options, and control other computer functions without touching the keyboard or joystick. Just point at an on-screen symbol and you're on your way.

To throw some light on these popular peripherals, I plugged in several of the top light pen systems. I looked at both the light pens *and* their software, testing to see how well they worked together. I checked out the functions each package could perform, and how well it responded to the pen's commands.

After all this I must admit, I do like drawing on the computer screen. But only, of course, with a light pen.

EDUMATE PEN AND PERIPHERAL VISION SOFTWARE, *Futurehouse. Commodore 64, $59.95; Software also available by itself for $39.95*

This light pen and software is a good drawing tool. It wasn't the best system I tried, but it seemed well worth its reasonable price.

Peripheral Vision software lets you draw freehand on the screen, as well as choose from a menu of squares, circles, triangles and other geometric shapes. You can use the 16 colors to fill in shapes with patterns and/or colors. Unfortunately, there's a limit to this: you can only fill in shapes, and not the background around these objects.

I liked the variety of eight brush sizes offered by this software, but was disappointed that there was only one brush shape. I also liked the way it lets you put letters on the screen. I *didn't* like the fact that you can't add text to your pictures.

My favorite feature was the mirror effect, which lets you create several identical images of what you're drawing. This should be a favorite effect of all abstract art fans. I also appreciated the easy-to-use zoom effect, which lets you zoom in for close touch-ups on your artwork.

The Peripheral Vision software and Edumate Pen *will* take some time to learn to use. But with practice, you'll be drawing with the best.

FLEXIDRAW 3.0, *Inkwell Systems. Com. 64, $149.95*

Skip this software package if you're mainly interested in multi-color artwork. You can't create color graphics with it. But if you need something for technical and precision drawings, *Flexidraw* should interest you.

I liked the way this software gave me two work areas instead of the usual one. I was able to develop a design in one area, then bring it over to the second area.

An on-screen grid feature lets you draw

© KEVIN HORAN

Drawing comparisons: Michael Hart put light pens to the test.

freehand straight lines and helps you keep lines level with each other. All of these features make it easy to produce graphs and charts. You can also fill your designs with 12 different patterns, zoom in for touch-up work, and title your works by typing at the keyboard.

At first, *Flexidraw* might seem complicated. But don't let the user's manual fool you. It's very easy to use once you work with it.

GIBSON LIGHT PEN SYSTEM *Koala Technologies. Apple IIe, with four software programs, $249.95; (A scaled-down Commodore version comes with only animation and paint programs, $99.95)*

This light pen and software system is expensive, but for a good reason: It's very good.

Drawing geometric shapes is as easy as can be. You actually see the shape you want to draw right on the screen, then simply expand it with your pen. There is a disadvantage: You lose half the resolution of your picture when you fill in shapes with color or patterns. (The manual never explains why this happens.) Also, the programs get impatient at times and go on before you have a chance to stick the right disk in the drive.

But I think that Gibson System has several advantages that make up for this. Included in the system is a music program, an animator program, a chart and technical drawing program, and a programming language you can control with the light pen. I also like the fact you don't have to hold down a button while drawing with this pen.

This pen-and-software package doesn't offer as many colors as some other programs, but it beats anything when it comes to good drawing.

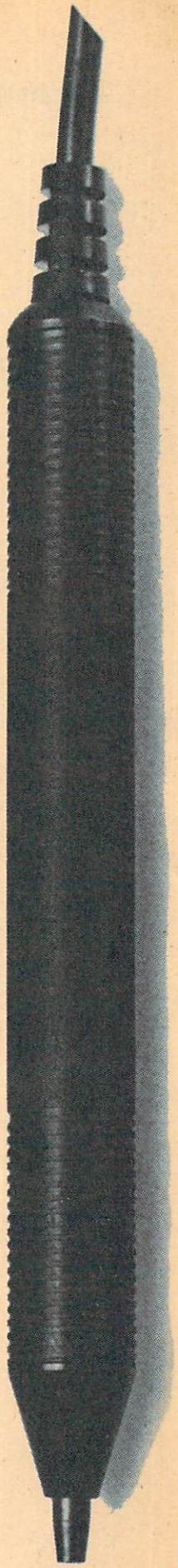
TECH SKETCH LIGHT PEN WITH MICRO ILLUSTRATOR SOFTWARE

Commodore 64 and Atari, $49.95; IBM PC and PCjr, $69.95; Apple II, II+ and IIe (includes special interface card), $149.95

This is the best *color* graphics light pen system I tested. It has all the features found in other systems. You can make boxes, circles and lines. You can create mirror effects, fill shapes with color and patterns and, of course, draw freehand. *Micro Illustrator* has eight different brush shapes. You can draw multiple lines with one pen. The software even lets you change a picture, then bring it back to original state. This is good for all of us who make an occasional mistake.

Generally, I thought *Micro Illustrator* was very easy to operate. Only the zoom feature—that lets you do detail work—seems difficult to control. Otherwise, I think you'll find this is an easy-to-learn, easy-to-use light pen system.

MICHAEL HART computes and lives in Chicago, Illinois.

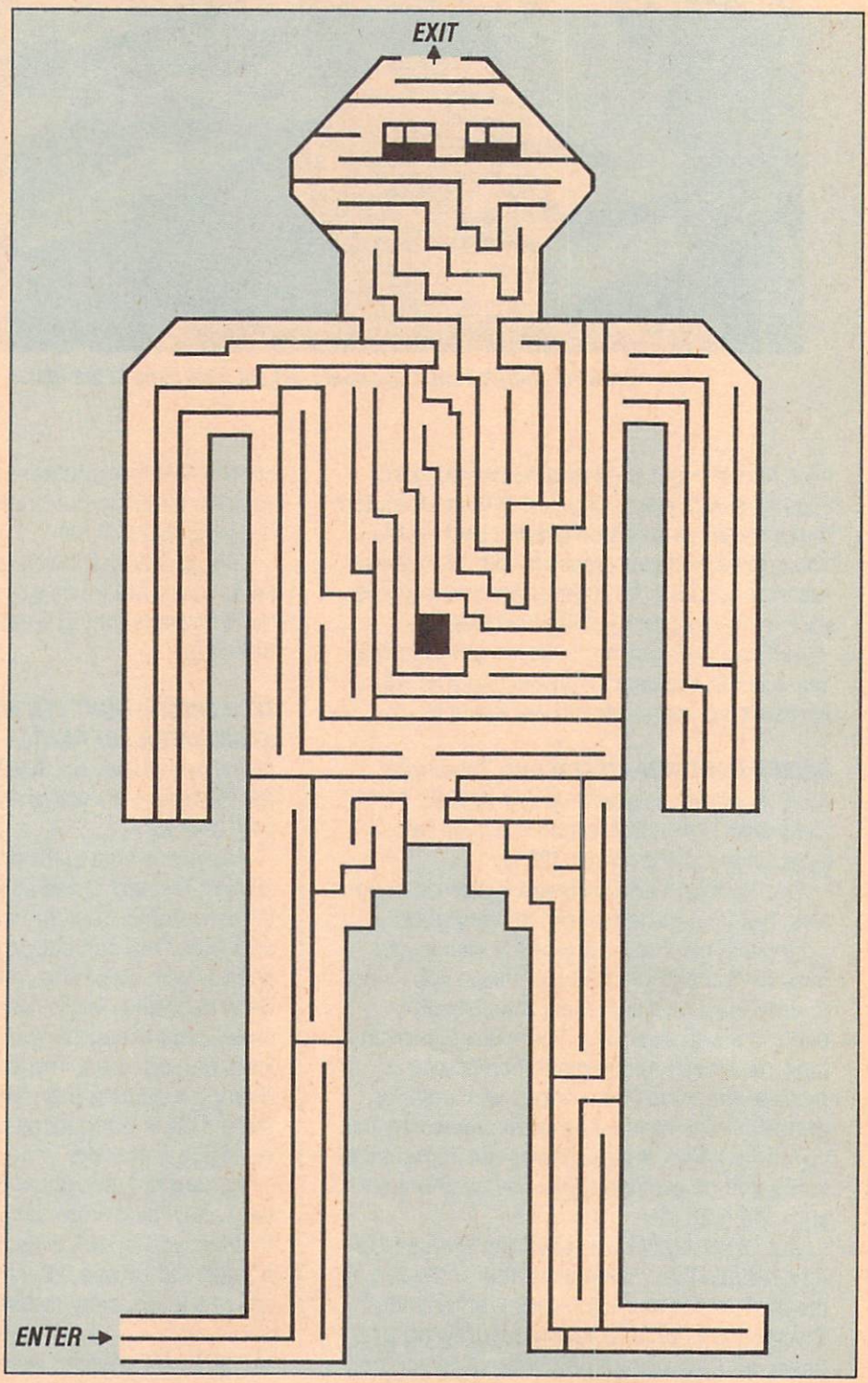


PENCIL CRUNCHERS

MAZE CRAZE

Seventeen-year-old Scott Robinson first touched a computer when he was in second grade. He was one user who became very friendly with his machine. Among other activities, Scott now writes programs for his father's label company, teaches computing at his high school and helps a California company protect its computerized files from break-ins.

Here's one of Scott's lighter projects: a maze he created on his Apple IIe. Grab a pencil and find your way from ENTER to EXIT.



PENCIL CRUNCHERS

PHIL'S CROSSWORD CHALLENGE

WIN AN ENTER T-SHIRT!

There are two ways to do a crossword puzzle: the normal way, with across and down clues; and the way we're about to show you...backwards.

We're giving you 26 computer terms you already know, and six 10 by 10 square grids. How many of the computer words can you fit in one grid? In meeting this ENTER challenge, you've *got to* follow crossword puzzle rules. You can only put two letters directly next to (above, below or beside) another letter *if* those letters are part of a word.

Score yourself by the number of boxes you fill with letters. Fifty-three was the highest score ENTER contributing editor (and author of Crossword Challenge) Phil Wiswell could get. Can you beat Phil? We'll send ENTER T-shirts to any ENTER reader 16 or under who sends us a grid that tops Phil's score. If you create a winner—BEFORE May 1—send it to: Crossword Challenge, ENTER, 1 Lincoln Plaza, New York, NY 10023.

If you run out of room here, make your own grids. For an extra challenge, create a *real* crossword puzzle by making up clues for each word. Then you can test your friends' computer savvy.

G	E	T		R	E	T	U	R	N
R				E					E
A				S		D			X
P	R	I	N	T		A			T
H		F		O		T			
I				R	E	A	D		C
C		G		E					L
S	T	O	P		L				O
		T			E				S
	L	O	C	A	T	E			E

IF
GET
LET
END
OPEN
READ
POKE
DATA
NEXT
INPUT
SOUND
LOCATE
RESTORE

AND
FOR
REM
STEP
STOP
THEN
PEEK
GOTO
PRINT
GOSUB
CLOSE
RETURN
GRAPHICS

NEWS BEAT

EDITED BY JIM LEWIS AND RICHARD CHEVAT

NEW TANDY PORTABLE

A handy-dandy Tandy? The new Model 200 has a tilt-up screen and more RAM.

Tandy, maker of the Model 100 lap computer, recently introduced a new version of this very popular portable. But is the Model 200 *twice* as good as the 100?

Well, the 200's tilt-up screen, with 16 lines by 40 characters of text, *is* twice as big as the 100's. And it *can* be expanded to 72K RAM—twice as much as the Model 100. The 200 also features more built-in software and can make use of all Model 100 accessories. But all this power doesn't come cheaply: the basic 24K Model 200 costs $999.

FLYING HIGH: With the help of modern-day computer science, it is now possible to print out a paper flying machine.

The Great International Paper Airplane Construction Kit ($39.95) from Simon & Schuster Electronic Publishing lets you design and decorate your ultimate airplane on the Macintosh computer. The software includes a library of airplane insignias and art to customize your plane. Once your flying machine is printed out, you fold along the dotted lines and toss it in the air. After all, even a "computerized" paper airplane can't fold and fly all by itself.

MICRO MONEYSAVING: Waveform is cutting the price of its music-making software for the Commodore 64. The company announced that the *Colortone Keyboard*, formerly $79.95, will now sell for $39.95. *Musicalc I* will sell for $29.95, *Musicalc II* and *III* will each sell for $19.95.

Microlab is also lowering its software prices. This Illinois-based company has dropped the price of two new games—*Short Circuit* and *Station Five*—to $19.95. The company plans to announce other low-priced software soon.

SOFTWARE ROUND-UP: If you want to use your computer to direct a "movie" or play harmonica, there's new software for you. *Show Director* ($39.95; Commodore 64) from Mindscape lets you write a script and then produce it as a computer story. If you want to play the harmonica on your computer, you can't. But you *can* get a free Hohner harmonica if you buy *The Music Shop* ($44.95; Commodore 64) from Brøderbund. This software turns a C-64 into a hot music maker.

GO TEAM!: Gimme an "I!"...Gimme a "P!"...Gimme an "S!" That spells IPS. And that stands for Interactive Picture Systems.

We held this pep rally to let you know that IPS, a software design group, is "a real team effort," according to design chief Guy Nouri. In the past, the IPS team has created such software as *Movie Maker*, an animation program, and *Trains*, an economics simulation game. Coming soon, you'll be seeing *Operation: Frog*, a biology class simulation that lets you dissect a frog without a mess, and *Dance Studio*, an animation program that lets you choreograph your own dances.

SHOW BEAT

EDITED BY PATRICIA BERRY

COMPUTER CONCERT

When Herbie Hancock *Rockit*-ed into The Ritz in New York City, the king of computer-music classics had a surprise in store. Part of the way into his live concert, he was visited by fellow rock star and computer-user Stevie Wonder. The pair performed a duet of Herbie's 1973 hit (yes, this high-tech tune-maker has been around a *long* time) "Chameleon."

DON'T TOUCH THAT DIAL

Been watching *Twilight Zone* reruns lately? Notice anything *funny* about them? Like suddenly they're in color, instead of black and white?

Well, you haven't entered another dimension. You're just seeing a new use for computers. It's called color conversion, and it's a computerized process developed by Colorization, Inc. of Toronto, Ontario.

COURTESY OF COLUMBIA RECORDS

Digital duet: Herbie and Stevie.

According to Colorization president Wilson Markle, about 20 percent of the world's television footage is in black and white. Many stations don't want to show reruns, even classics, if they're not in color.

The Colorization process might change all that. The process goes something like this: an electronic scanner breaks each frame of film into about half a million dots. These dots are then stored on a computer. There, each dot or group of dots is assigned a color by an artist. A computer completes the job by coloring the same dots in the frames that follow—sort of like painting by numbers.

The newly colorful film footage is then transferred to video for future airing on television. (Unfortunately, this coloring process won't yet work on movie screens, where the color-filled dots are too obvious.)

Even with the computer, this is a long and expensive process. It can take about four hours to color one minute of film at a cost of $2,000 per minute. Still, some TV shows are being colorized.

"We've just finished adding color to a Laurel and Hardy film and to some episodes of *Sea Hunt* and the *Twilight Zone* TV shows," says Colorization president Markle.

"We can make a show or movie that was filmed in black and white look like it was filmed in color," he claims. Some critics disagree.

They claim the Colorization process adds a distracting shimmer effect to the film. But if colorization means we'll get to see more TV classics, what's a little shimmer?

COURTESY OF PARAMOUNT PICTURES

'EXPLORERS': This sci-fi film, due in July, turns a discovery by three 14-year-olds into a computer-filled adventure. PICTURED LEFT TO RIGHT: Ethan Hawke, River Phoenix, Jason Presson — and one of the film's Apple computers.

RHODES SHOW

Duran Duran keyboardist Nick Rhodes is now part-time computer artist Nick Rhodes. A collection of Polaroid shots of Rhodes' computer graphics, entitled "Interferences," was displayed in a London gallery recently. And *Interferences* is now a book in the U.K., too.

No one said a hit maker couldn't also create a best-seller.

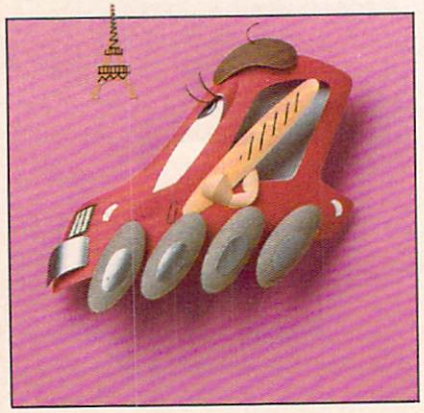
Hysterical History

BY MEGAN STINE AND H. WILLIAM STINE

AN ENTER COMPUTER QUIZ

Ahhh... the history of the computer. It's long, impressive, and you've probably heard it a million times—right? Well, if you're so sure you know what's what and who's who in computer history, prove it! Take this quiz, then check the answers on the following pages. See if you can separate the silicon from the silly:

1. ***In 1642, a French writer and philosopher named Blaise Pascal invented the first adding machine. It used eight wheels and a set of gears. In honor of his achievement:***



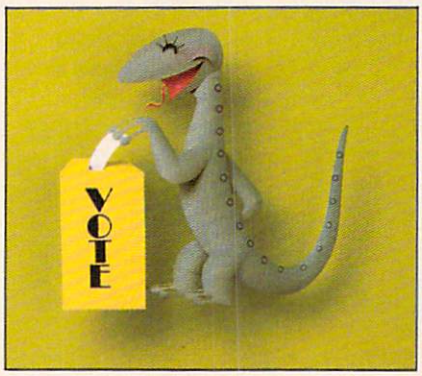
ILLUSTRATIONS © AJIN

A. All French cars have eight wheels and a set of gears.
B. A modern high-level computer language was named after him.
C. An adding machine was named after him.
D. The number 247,552 was named after him.

2. ***The forerunner of modern computers was invented in 1835 by English mathematician Charles Babbage. This machine used punch cards he borrowed from:***

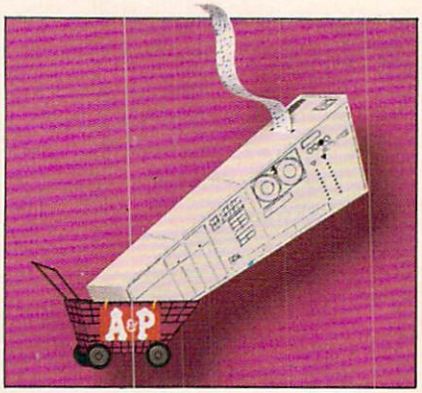
A. His aunt.
B. A punch bowl.
C. A weaving machine.
D. The library.

3. ***Using Herman Hollerith's Punch Card Calculator, the 1890 U.S. Census was counted by machine rather than by hand for the first time. As a result:***



A. The Census Bureau completed its enormous counting task job in three years instead of nine years.
B. U.S. Census employees got a six-year vacation.
C. Herman Hollerith was elected to the Computer Hall of Fame.
D. Census figures showed a million lizards of voting age in Iowa.

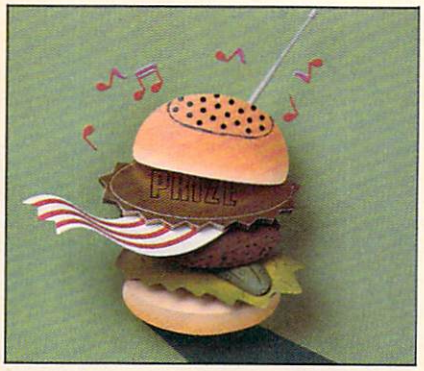
4. ***Scientists at the University of Pennsylvania spent the early 1940's perfecting ENIAC, the world's first all-electronic computer. But the glory went to their competitor, whose first product was the Mark I. This 50-foot-long computer could only add, subtract, multiply and divide. The company that built Mark I was:***



A. NBC.
B. AT&T.
C. IBM.
D. A & P.

5.

In 1948, three scientists at Bell Labs—Walter Brattain, John Bardeen, and William Shockley—



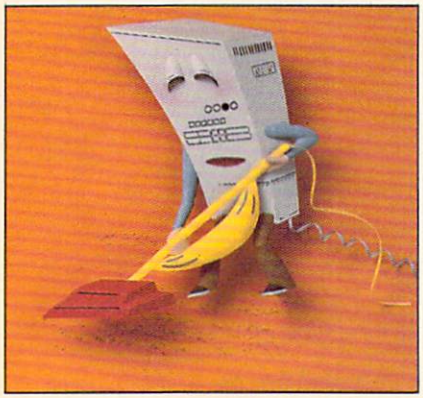
came up with one of the century's most important inventions. In the 1950s, the Japanese used it to revolutionize radio. The invention was:

A. Two all-beef patties, special sauce, lettuce, cheese, pickles, onions on a sesame seed bun.
B. The transistor.
C. The silicon chip.
D. The joystick.

6.

In 1951, the Remington Rand typewriter company made a big mark on the computer industry by introducing:

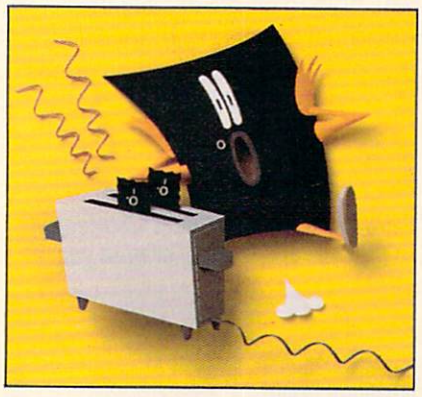
A. DATAVAC, the first computer that could take its own dictation.
B. CARPETVAC, the first computer that could handle ground-in dirt.
C. UNIVAC, the first computer that could handle numbers *and* letters.
D. HACKENSACK-ACK-ACK, the first computer built for Billy Joel.



7.

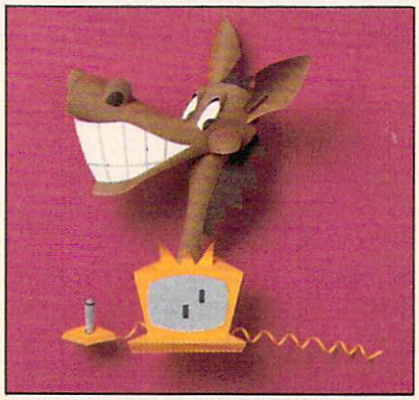
The real electronic revolution began in the 1960s, when computers got small. A computer with the power of huge early computers could now fit into a case not much larger than a toaster oven. The development which made this possible was:

A. The toaster oven.
B. The integrated circuit etched on a silicon chip.
C. The disk drive.
D. Laser holography.



8.

No color, no fancy graphics, and only two tiny

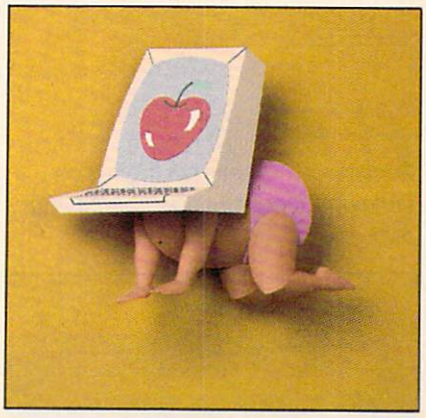


blips of sound—but in 1972, **Pong** ***arrived. Created by Nolan Bushnell, this was the first popular video arcade game. It helped Bushnell launch a company called:***

A. CTW.
B. Commodore.
C. Atari.
D. Donkey Pong Industries.

9.

The first popular home computer had a homegrown name—the Apple II. It was introduced in 1977 by:



A. The Thompson Twins.
B. Steve Jobs and Steve Wozniak.
C. Megan Stine and H. William Stine.
D. Lisa Macintosh and Adam Osborne.

10.

In 1984, IBM announced a big breakthrough—the development of the 1000K RAM chip. With all that memory, you could:

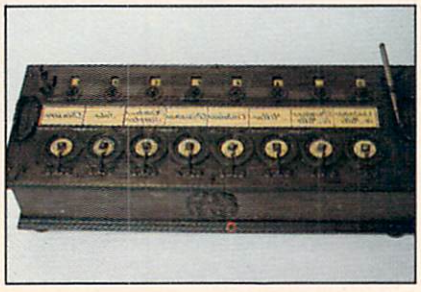
A. Become a world champion at *Trivial Pursuit*.
B. Store a million characters, enough to write the next 200 *ENTER* quizzes.
C. Write your name so many times it would stretch all the way to the moon.
D. Do better on this quiz next time!

(Answers on next page)

Hysterical History

ANSWERS TO THE QUIZ

1.B ***A modern high-level computer language was named after him.***



COURTESY THE COMPUTER MUSEUM, BOSTON

Pascaline: the first calculator.

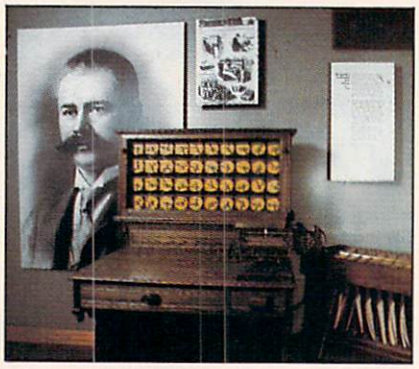
The computer language Pascal was named to honor Blaise Pascal for his contributions to mathematics and computers.

2.C ***A weaving machine.***

Babbage took a close look at the electrical weaving machine, and was impressed by the fact that hole-punched cards could be used to give it instructions. He decided to try and adapt the idea. Babbage believed his so-called "analytical engine" would be able to handle difficult math problems and "remember information" it had been given.

Babbage spent 40 years trying to perfect his machine. He never was able to create it—but the design of later computers owes much to Babbage's original ideas.

3.A ***The Census Bureau completed its enormous counting job in three years instead of nine years.***



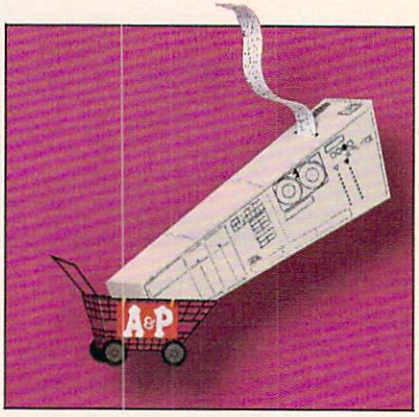
COURTESY THE COMPUTER MUSEUM, BOSTON

Hollerith's counting machine.

It took only three years to count the 1890 census. The 1880 census had taken nine years to count by hand. The U.S. Census Bureau had turned for help to Herman Hollerith and his punch card calculator (also known as Hollerith card). The company that manufactured Hollerith's machine went on to do pretty well for itself. It later merged with the company that became IBM!

4.C ***IBM.***

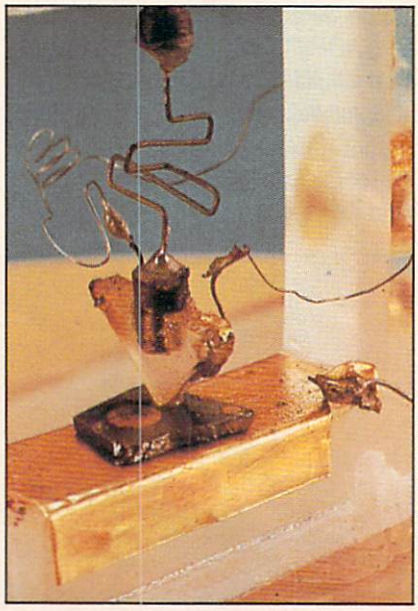
Weighing in at 5 tons(!), the Mark I was IBM's first "heavy"-weight computer. It was used until 1959.



Even though the Mark I was 50 feet long, it could have become the first desk-top computer—if only someone had invented the 50-foot desk!

5.B ***The transistor.***

The transistor not only revolutionized the radio business, it also made the first small computers possible. Before Brattain, Bardeen and Shockley invented the



COURTESY AT&T/BELL LABS

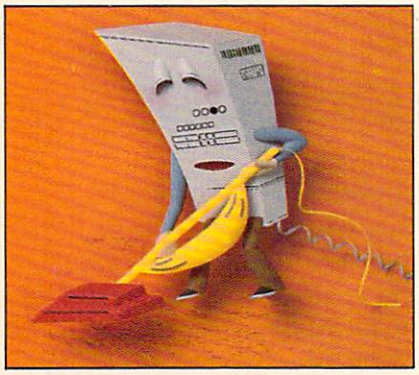
Get small: the first transistor.

transistor, huge computers like ENIAC needed 18,000 vacuum tubes to operate. Those tubes took up a lot of space, generated a lot of heat, and blew out about once every seven minutes.

6. C

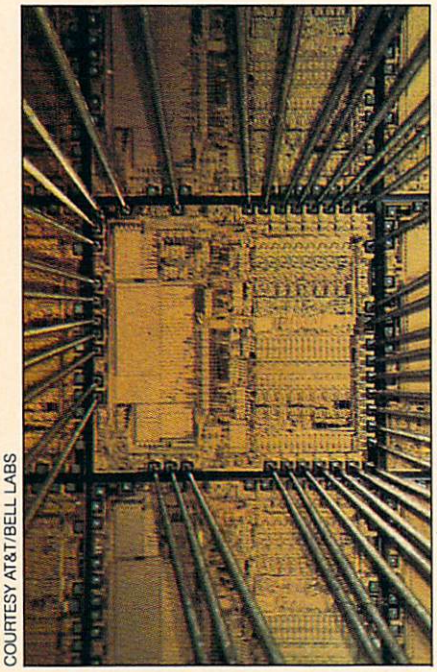
UNIVAC, the first computer that could handle numbers and letters.

UNIVAC was Remington Rand's entry into the computer market. Because it could handle letters as well as numbers, UNIVAC was the first computer able to "read" and count.



7. B

The integrated circuit etched on a silicon chip.



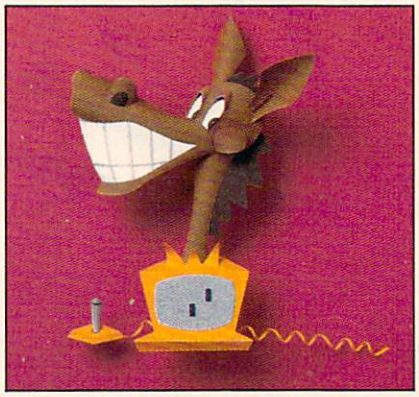
COURTESY AT&T/BELL LABS

Get smaller: the silicon chip.

Computer technology had a big breakthrough in the 1960s with the development of silicon chips. It's possible to store and process an enormous amount of data on a chip the size of a caterpillar's mattress.

8. C

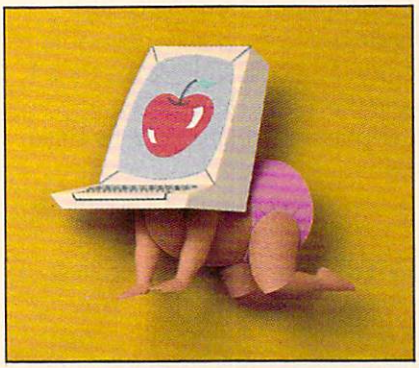
Atari.



Nolan Bushnell founded Atari and went on to become one of the first computer-geniuses-turned-millionaire. He later founded the Androbot robot company and Pizza Time Theatres.

9. B

Steve Jobs and Steve Wozniak.

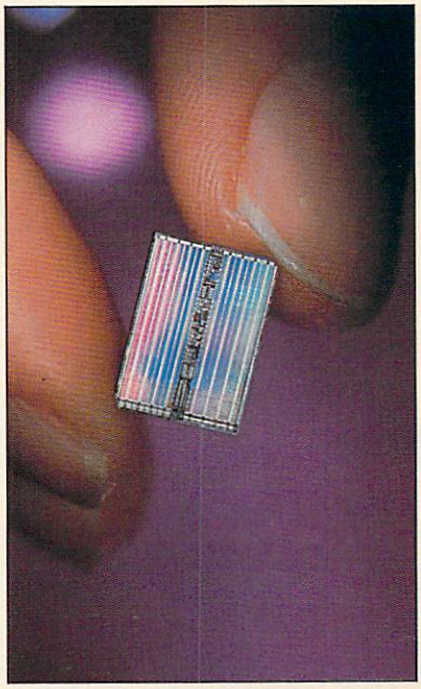


These two young men planted the seeds for the Apple computer while working in their Silicon Valley garage. The fruit of their labor was the first popular home computer. These two Steves weren't satisfied to rest on their laurels. Steve Jobs went on to mastermind the Macintosh (named after his favorite variety of apple) and Steve Wozniak ran a series of rock concerts called the US Festival.

10. A, B, C & D

All of the above.

1000K is a lot of memory. Enough to help you become a champ at *Trivial Pursuits*, make up the next 200 ENTER quizzes, write your name so many times it would stretch to the moon and do better at this quiz next time.



COURTESY IBM

Incredible memory: 1000K chip.

RATE YOURSELF

Give yourself 10 points for each correct answer, then check to see how you rate on historic dates.

100: An historical score!
60–90: Your HAM (Historic Access Memory) is well-done.
30–50: Your data on dates is deficient.
0–20: Do you remember where you left your toothbrush?

MEGAN STINE and H. WILLIAM STINE write books, quizzes and other strange articles on their Columbia computer, an IBM-PC compatible.

Play Ball

How Henry & Holly's Micro Helps Move The Major Leagues

BY JIM LEWIS

The 1985 baseball season is about to begin for players, teams and fans. But for Henry and Holly Stephenson of Staten Island, N.Y., the '85 season is already over.

Henry and Holly, you see, are the people who make up the season schedule for every team in baseball. With help from a computer and a special computer program that they wrote themselves, the Stephensons were finished with the 1985 season way back in August of 1984. (Right now, in fact, they're busy getting the 1986 season schedule ready.) Thanks to their schedule-making talents—and the number-crunching abilities of an IMS-8000 computer—every team in baseball will know where to go and who to play every day of the season.

ENTER talked with Henry and Holly Stephenson about how a computer is helping major league baseball teams to play ball.

ENTER: How did you get started scheduling baseball games?
HENRY & HOLLY: Actually, we didn't start with baseball. In 1978, we began putting together a schedule for the National Basketball Association. Since then, we've also been drawing up schedules for the North American Soccer League and the Major Indoor Soccer League. But scheduling the baseball season is different from scheduling these other sports.

ENTER: What makes baseball so different?
H & H: Well, to begin with, those other sports are scheduled one game at a time. In baseball, the teams usually play a two, three or four game series. That means when you make schedule changes in baseball, you have to move blocks of games and not just a single game.

Also, baseball is a game with a lot of traditions and rules—such as the length of road trips and number of games a team can play without a break. When you're trying to get 26 teams to each play 162 games [for a total of 2,106 games a season], you have to make sure you're not breaking any of these rules.

ENTER: Would it be possible to schedule all of these games without using a computer?
H & H: Sure. Until we started in 1980, the baseball schedule was always done by hand. A man named Harry Simmons did it for 30 years.

But the computer definitely helps. It lets us experiment with schedule changes quickly, and get results immediately. To do this, we've written a string of programs that make sure we get the right teams playing each other at the right time. These programs check such things as the distance a team travels during road trips, the monthly balance between a team's home and away games, and the number of games a team plays

without a day off.

Once these rules are programmed into the computer, we can make schedule changes and ask the computer if the changes break any of the rules or create any other problems.

ENTER: What kind of computer do you use? Can it handle all the calculations?
H & H: It's an IMS [Industrial Micro Systems] 8000 with 64K memory. It's a small business computer with about as much memory as the average home computer. We've had it since 1978.

If we had a machine with more memory, we could integrate the scheduling programs better. But the IMS-8000 does have enough computing power for our needs.

ENTER: Once you input the team names and the program with scheduling rules, can you just sit back and let the computer do the work?
H & H: Not at all. Our computer is a great help, and we couldn't imagine working without it. But the computer couldn't put together a schedule without us. It takes a lot of fine tuning to get things just right.

Even though the IMS-8000 computer can work quickly, it still takes us more than six months to draw up a schedule all the teams can agree to. We listen to what the league and the teams want and make a lot of adjustments along the way.

ENTER: The computer program can follow some general scheduling rules. What kind of fine-tuning do you have to do on your own?
H & H: There's quite a bit. For instance, the Chicago Cubs had better not play any night games at home or they won't be able to see the ball. Their home ballpark, Wrigley Field, has no lights for night games. This also means you have to be careful about who they'll be playing at home. For instance, you can't expect the visiting team to play a night game in Los Angeles, then fly all through the night to Chicago for a day game against the Cubs.

Also, many teams make special scheduling requests. For instance, the Boston Red Sox always want to play at home during Patriot's Day, a local holiday in Massachusetts. And down in Maryland, the Baltimore Orioles want to make sure they are not in town during the Preakness horse race.

Each year presents its own special problems. During 1985, the St. Louis Cardinals have asked to be out of town during the city's Circus Week celebration in July. And we have to make sure that the Houston Astros are out of town towards the end of April, or they might run into derricks during the Annual Oil Drillers Convention that's held at the Astrodome.

During the 1984 season, we had a unique scheduling conflict. We had to make certain the Los Angeles Dodgers were out of town for two weeks during the Olympics—or they'd have been dodging the Olympians using their stadium.

ENTER: Through all this, are you still baseball fans?
H & H: Sure, we go to games. Sometimes, we'll sit there and try to remember problems we had scheduling the particular game we're at.

ENTER: The computer may not play favorites, but do you two have a favorite team?
H & H: Not really. But when we're at a game, we mostly root for the home team to win—it seems to make the fans at the stadium a whole lot happier.

JIM LEWIS is Senior Editor of ENTER.

PLAY COMPUTER BALL!

Today's top computer baseball games let you hit a home run at home.

Micro League Baseball (Micro League Sports Association)—Real major league players from 20 different teams can take the field. Performances are based on career statistics. For Apple II, Commodore 64, IBM PC and PC*jr*, Atari 800 and XL series. $39.35.
World's Greatest Baseball Game (Epyx)—You put a team together from a list of two dozen real players. You control the action. For Commodore 64, around $40.
Star League Baseball (Gamestar)—Good graphics and sound add to the action. The Star-Spangled Banner is even played before the game. For Apple II series, Commodore 64 and 128, Atari, $31.95.
Grand Slam Baseball (Imagic)—The scene on the screen changes from infield to outfield to follow the ball. The scoreboard even flashes baseball trivia quizzes. For IBM PC*jr* with 128K, $34.95.
Computer Baseball (Strategic Simulations)—This is a strategy game. First you select a team from current major league team rosters. Then the computer analyzes the data and tells you who should win. For Apple, Atari and Commodore 64, $39.95.

ONE STEP AT A TIME

BY TIMOTHY R. GAFFNEY

DR. PETROFSKY'S COMPUTERS ARE HELPING NAN DAVIS WALK AGAIN

COURTESY CBS

First Steps, *a TV movie about Nan Davis and Dr. Petrofsky, starred Judd Hirsch and Amy Steel.*

The night after she graduated from high school in June, 1978, Nan Davis was driving through the country with her boyfriend. Suddenly, he lost control on a curve. The car skidded off the road and into a ditch.

Lying in the wreck, Nan was aware that her legs were limp. In the hospital, Nan found out she had broken her back and neck. Her spinal cord was damaged, and she was paralyzed in both legs. Doctors told 18-year-old Nan that she would never walk again.

But on November 10, 1982, Nan entered Dr. Jerrold Petrofsky's laboratory. Electronic sensors, wired to an Apple II computer, were taped to her leg muscles.

Holding onto handrails, Nan rose from her wheelchair. "Right leg coming up," said Dr. Petrofsky, using the computer to control the electronic sensors. Nan's right leg bent, rose and moved forward a step. "Left leg coming up," Dr. Petrofsky said. Her left leg moved forward.

For the first time in four years, Nan Davis was walking.

A LONG JOURNEY

Nan's inspiring story was recently portrayed in a CBS-TV movie called *First Steps*. But her first halting steps marked more than just a dramatic story. They also were a real breakthrough in efforts to help paralyzed people walk again. Computers played an important role in that breakthrough.

Today, more than two years after Nan Davis took her first steps, computer-controlled walking research is going on around the world. Some of the most important work is done at Dr. Petrofsky's lab on the Dayton, Ohio, campus of Wright State University.

It was a long series of events that

"I KNEW I'D WALK AGAIN," SAYS NAN. A COMPUTERIZED WALKING SYSTEM HELPED MAKE HER DREAM HAPPEN.

A parachute harness took pressure off Nan's fragile bones as she took her first computer-aided steps.

COURTESY WRIGHT STATE UNIVERSITY

brought Nan to Dr. Petrofsky's experimental program. Petrofsky had spent years studying biomedicine—a field that combines biology, medicine and engineering. In the late 1970s, he began experimenting with computer control of muscles. In 1981, Dr. Petrofsky came to Wright State.

Meanwhile, Nan Davis was growing up in St. Marys, Ohio. She was an active student, involved in swimming, gymnastics, basketball and track. Then, in 1978, the tragic accident changed Nan's life. At first, she kept to herself. But, before long, her old determination came back.

"You have to go on with your life," she says. "You find there are an awful lot of ordinary things you can do. As a matter of fact, being confined to a wheelchair, there's only *one* thing I can't do. I can't go up steps—at least not in my chair."

Nan decided to go to college, and was admitted to Wright State. When she arrived there, Nan had never heard of Dr. Petrofsky's work. But since her accident, she'd been reading everything she could about spinal cord research. In the spring of 1982, she learned that Dr. Petrofsky was seeking test subjects for his experimental program. Nan volunteered immediately.

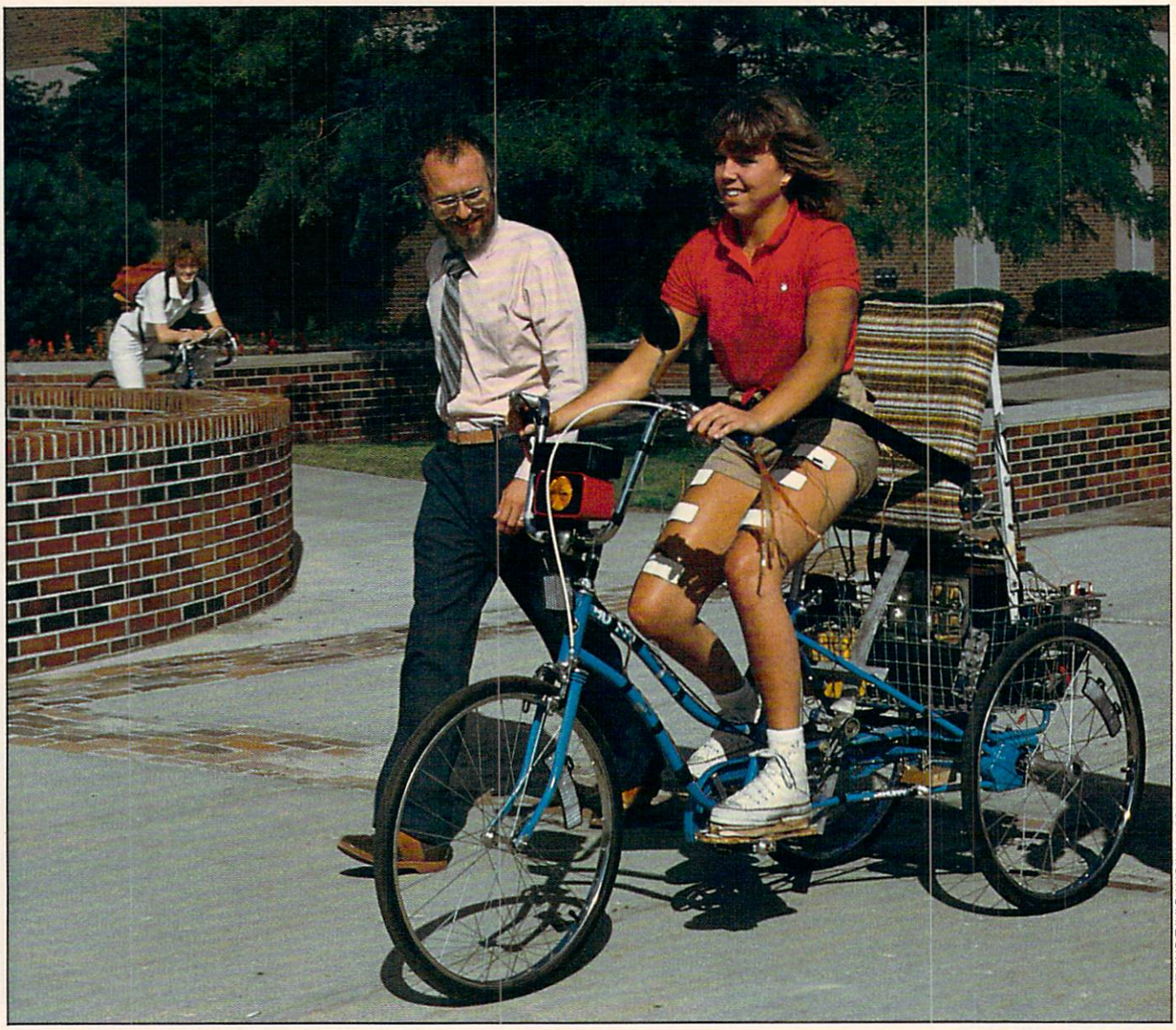
USING COMPUTERS TO HELP

Dr. Petrofsky knew that Nan's *muscles* had not been damaged. The problem was that the damage to her spinal cord prevented Nan's brain from sending nerve signals to her muscles.

Dr. Petrofsky believed that electrical impulses, controlled by computer, could substitute for blocked nerve signals. In a limited way, he thought, the computer could do the brain's job.

"The computer puts electrical impulses into the muscles to make the muscles move," he explains. "There are sensors on the leg that tell the computer how much the muscles are moving. The computer can change the impulses it sends to produce nice, smooth movement."

Dr. Petrofsky knew that muscles lose their strength when they are



PHOTOS COURTESY WRIGHT STATE UNIVERSITY

"YOU CAN'T GET DISCOURAGED," SAYS NAN. "DR. PETROFSKY NEVER GIVES UP."

For the first time in four years, Nan can ride a bike and do exercises to strengthen her legs.

not used for a long time. He began teaching Nan how to exercise in a new way. He used the computer to stimulate her leg muscles. This enabled Nan to lift weights and pedal a stationary bicycle.

Nan began taking part in an experimental fitness program in the doctor's lab. She was one of a number of volunteers in the program. Technicians would tape three rectangular electrode pads to her legs. The electrodes were wired to the Apple II. A special program, written by Petrofsky and his research partner, medical doctor Chandler Phillips, was started. Slowly but surely, Nan's legs began moving.

Her progress was dramatic. Thanks to this fitness program, Nan's leg muscles began growing again. "You can't get discouraged with [Dr. Petrofsky], because he never gives up," says Nan.

Dr. Petrofsky's experiments showed that computers could help people exercise paralyzed muscles. The freedom this brought meant a lot to Nan: "I could go in, get on the bicycle and work out, and get the same feeling that you would," she says. "I feel like I have more energy."

THE WALKING SYSTEM ISN'T A CURE. BUT IT HAS *MADE A DIFFERENCE IN NAN'S LIFE.*

Nan's first steps were just the start. Dr. Petrofsky is now at work on a more efficient walking system.

While Nan and the other test subjects worked on strengthening their muscles, Dr. Petrofsky and his research team were developing a walking system. The hardware for this system filled shelves and sprouted wires and cables. The heart of it, however, was a Z-80 microchip—the kind of chip used in TRS-80 computers.

After her months of work in the fitness program, Dr. Petrofsky decided that Nan was the best candidate to try the experimental device. On a November night in 1982, he gathered Nan and his team in the lab. The university had announced a press conference for the next day to demonstrate the walking system—and Nan had yet to take her first step.

She parked her wheelchair between a pair of handrails. She slipped into a special parachute harness that would pull some weight off her feet, easing the stress on her still-fragile bones. At the other end of the platform, Dr. Petrofsky stood before the equipment that was supposed to make her walk.

"Power up," he called. Nan leaned forward and rose from the wheelchair. With the computer controlling electronic sensors on her legs, Nan moved forward—step by halting step. The next day, in front of reporters from around the world, Nan walked again.

THE NEXT STEP

Nan's first steps showed that Dr. Petrofsky's system worked. Now it was time to make the equipment more portable and responsive. By June 11, 1983, the day of Nan's college graduation, Dr. Petrofsky had developed a walking system small enough to fit inside a camera bag. With most of the wires hidden by her graduation gown, Nan walked up to receive her diploma. Her steps were awkward, but they were the first steps she'd taken outside the laboratory in five years.

"That meant more to me than anything I'd done in the lab," she said. "I was walking without the aid of parallel bars. But more than anything else, I was walking."

Today, Dr. Petrofsky continues working on more advanced and portable walking systems. He knows that a practical walking system will have to allow a person to walk over uneven surfaces, up and down stairs, and to stand, turn and sit. He admits that electrical stimulation doesn't work with some cases, such as cerebral palsy and muscular dystrophy. And he knows that computer-controlled walking is not the final answer for victims of paralysis. "The human body has about 600 muscles," he explains. "At the most, we'll be stimulating 30 or 40 muscles."

Yet, despite these obstacles, Dr. Petrofsky's work with computer-controlled walking systems already has made a difference.

Nan, who now works as a lab technician with Dr. Petrofsky, is one of four people helping to test new equipment. She understands the limitations: "We stress that right now our research program is just that—research. We don't want to get anyone's hopes up. This is not a cure. This is a band-aid. But let me tell you—it's a magnificent band-aid."

It's changed her life, giving her new strength and hope: "I always knew I'd walk again," says Nan. "And I will."

TIMOTHY R. GAFFNEY, a newspaper reporter in Dayton, Ohio, has written a book about Dr. Petrofsky's work.

BEYOND

BASIC

A GUIDE TO COMPUTER LANGUAGES

BY DAVID POWELL

Back 40 years ago, computers existed—but computer languages didn't. When the first electronic computers were built in the 1940s, this is what their programs looked like:

```
11011101110110000010
10001010010010010
10100000111111100100
10001111011010100001110
11010101000101010 1...and so on.
```

Can you figure out what this program does? It would be a long, tiresome job, even for computer scientists. That's why computer languages were invented.

BEGINNING WITH BINARY

Zeroes and ones are *binary numbers*. A program made up of these numbers is known as binary code. Computers were designed to use binary numbers because zeroes and ones are easy to represent electronically. For example, the early computer ENIAC was made up of thousands of vacuum tubes. Each tube could be used to represent a zero or one, depending on whether it was "on" or "off." To put it another way, each tube represented one binary digit (a *bit*).

Today, computers still use binary code internally, or to talk to each other. But we can communicate with computers in languages like BASIC, FORTRAN and Logo. Some of these languages (BASIC, for example) even use English words. But whatever is written in a programming language still *must* be translated into binary code (also known as machine code) before a computer can use it.

ASSEMBLY LANGUAGE

One step away from machine code is Assembly language. Assembly is very close to machine code, so it translates very quickly. It also takes up less room in the computer's memory. For these reasons, most computer games and software are written in Assembly.

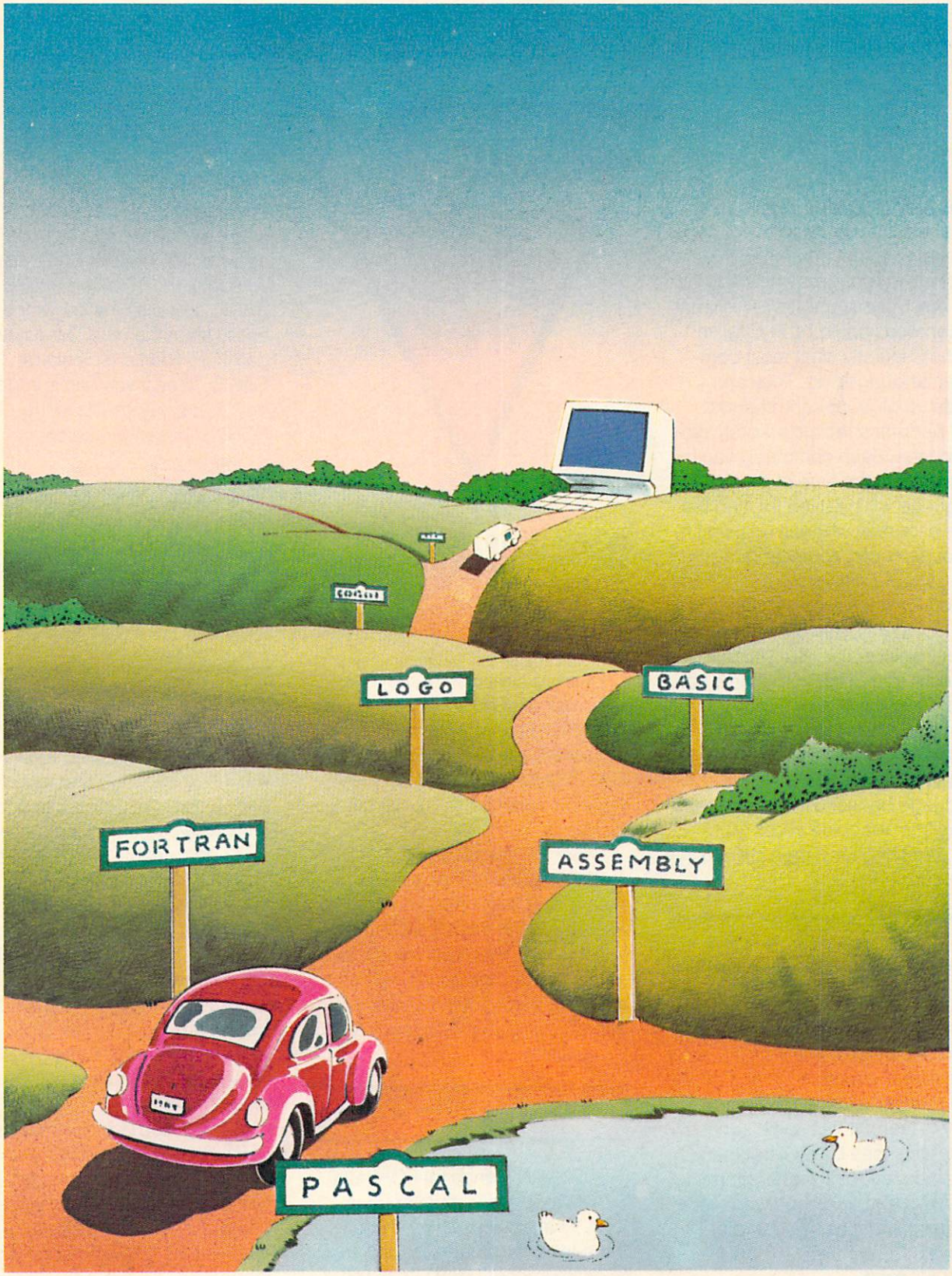
Here is a piece of programming from an Assembly language program:

```
LD B, (I) ;LOAD I INTO B
LD C, (I+1) ;LOAD I+1 INTO C
CP C ;COMPARE B AND C
JR Z,RIS02Ø ;IF B = C, GOTO RIS02Ø
```

Most Assembly commands are two or three letters long and stand for a word or phrase. For example, "LD" means "load." It's not English, but LD is easier to understand than string of zeros and ones.

Assembly is a lot easier to understand than machine code. It has, however, one big disadvantage. For every machine code command you want the computer to perform, you must write one of Assembly. That means Assembly programs are going to be very, very long.

(Continued)


LOGO
BASIC
FORTRAN
ASSEMBLY
PASCAL
© MIN JAE HONG

Whatever language you choose to use—computers read it as binary codes.

(Continued from previous page)

But what if you could have "super commands" that combined several machine language commands into just one word or phrase? And what if each word could be in English?

That's exactly what most computer languages do. They are made up of "super commands" that perform specialized programming jobs. Each command can be tailored to fit the type of job that the language will be used for, and the type of person who will be using it.

For example, some languages, like COBOL, are very good at printing out business reports. Others, like FORTRAN, make it easy to use scientific formulas. But you wouldn't use COBOL to plan a scientific experiment, or FORTRAN to print a business report.

This type of programming language is called a "high-level" language because it is a few steps away from machine code. Most programming languages fit into this category.

BASIC

BASIC is the language that comes with most home computers. It stands for *B*eginner's *A*ll-purpose *S*ymbolic Instruction *C*ode. BASIC was designed to be simple and easy to learn. It has some serious limitations (see below), but BASIC is a good language for beginners.

BASIC was designed with many English words, as this sample shows:

```
10  LET A=0
20  FOR I=1 TO 100
30  PRINT "HELLO, MY NAME IS
    HAL 9000"
40  NEXT I
50  LET A= A+1
```

One big disadvantage of BASIC is its lack of speed. Most versions of BASIC are *interpreted*. This means that every time you run a BASIC program, each statement must be translated into machine language.

There are some versions of BASIC that are *compiled*. This means that the entire program is translated into machine code before it is run. This machine code is then stored in memory. Every time you want to run the program, it is already translated and ready for you to use.

FORTRAN

FORTRAN stands for FORmula TRANslator. It was developed in 1954. That makes it the oldest "high-level" language around. As its name implies, FORTRAN was designed to solve scientific or mathematical problems expressed as formulas. But don't let that scare you away. FORTRAN is similar to BASIC. People who know one can easily learn the other. Many even call FORTRAN a "scientist's BASIC." See if you can recognize any of the statements in the FORTRAN sample below.

```
      PRINT 10
10    FORMAT (1x, 'COUNTING')
      LET AMT =1
      DO 30 I = 1, 10
      PRINT, AMT
      AMT=AMT+1
30    CONTINUE
      STOP
      END
```

LOGO

Logo was created in 1967. It was designed to be fun and easy to use. Today, it is growing in popularity as a beginning language.

"Logo" means "word" in Greek. The language is a series of word commands. Each command moves the cursor on your screen around, leaving a "trail" or line behind it. When it was first developed, Logo was used to move a mechanical device around the floor. This device was nicknamed a "turtle." That's what Logo cursors are still called today.

In Logo, you use commands like LEFT, RIGHT, FORWARD, PLAY and CIRCLE to draw pictures on a computer's screen. Even without a computer, you can probably figure out what the following Logo commands do.

Once you know BASIC, learning a second computer language is easier.

```
TO SQUARE
FORWARD 10
RIGHT 90
FORWARD 10
RIGHT 90
FORWARD 10
RIGHT 90
FORWARD 10
RIGHT 90
END
```

If you guessed "draw a square," you are ready to program in LOGO.

Logo gives you the ability to build your own programming commands. For example, in the program above, the command "TO SQUARE" tells the computer that what follows is a routine called "SQUARE." Now, when it sees the word SQUARE, the computer will carry out all the commands listed under TO SQUARE.

PASCAL

Pascal was named for Blaise Pascal, a 17th century mathematician and inventor. In 1653, Pascal invented the first mechanical calculator. This invention actually caused riots in France! Because it could do the work of six accountants, people were afraid Pascal's calculator would cause unemployment.

The computer language Pascal was designed to force programmers to write "structured programs." These are programs written as a string of smaller programs, each containing series of even smaller routines. This style makes it easier to write, change, and keep track of large programs. It is especially useful when several programmers are working on different sections.

To enforce this straight-ahead program flow, Pascal avoids BASIC commands—such as GOTO and GOSUB—which can be used to jump around inside a program.

Like a school report, Pascal programs consist of three segments—head, declaration section, and body. The head consists of the word PROGRAM followed by the program's name. In the declaration section, the programmer must list and define the types of data, variables and subprograms used in the main program. The program's body includes actual commands and subprograms.

See if you can identify those sections in the short addition program below.

```
PROGRAM ADDITION
VAR a,b,c,d: INTEGER;
BEGIN;
WRITEln('INPUT TWO NUMBERS');
READln(a,b);
WHILE c 1t 10 DO
BEGIN;
d:=d+a+b;
c:=c+1;
END;
WRITELN('SUM IS',d);
END.
```

Pascal is growing in popularity. It is now being taught in many universities. And last year, the College Entrance Examination Board chose Pascal as the language it will use to test high school computer science students for college advanced placement credit.

COBOL

COBOL is shorthand for COmmon Business-Oriented Language. It is excellent for arranging text and handling large files of data. It became *the* language for business use in the 1960s. It is estimated that 80 percent of all programs are written in COBOL.

COBOL looks more like English than any other language. Commands and variable names can be up to 30 characters long. Operations such as "add" or "is greater than" can be spelled out. For example, a COBOL program to calculate a student's average might look like this:

```
PERFORM GRADE-READ-ROUTINE;
PERFORM GRADE-AVERAGING-
ROUTINE;
IF AVERAGE-GRADE IS LESS THAN
65,
PERFORM FAILING-GRADE-ROU-
TINE, ELSE
PERFORM PASSING-GRADE-ROU-
TINE;
PERFORM STUDENT-RECORD-UP-
DATE-ROUTINE.
```

(Continued on next page)

Some languages take up less space in computer memory. Some are fast.

FORTH

Forth was originally designed by astronomer Charles Moore for his own use. Moore simply wanted to write programs faster, and with more flexibility, than FORTRAN allowed. Forth is now used in most of the world's astronomical observatories. It is also important in both business and the military.

Like Logo, Forth is one of several computer languages that lets programmers change the language itself. To do this, they define as many of their own commands as they like. For example, a game programmer could write a complete program to display a maze. This program could be called "MAZE" and stored in the Forth command library. Then, anytime a program encounted the MAZE command, that maze would appear on the screen. In fact, Forth was used to write much of Forth.

One interesting feature of Forth is that arithmetic statements are written in something called *reverse Polish notation*. For example, here's a BASIC statement: `A = 4 * B`. That means variable A equals four times variable B. In Forth, that statement would be written: `A = 4 B *`.

Here's a sample Forth program that finds the square root of some numbers.

```
01 :ROOT   SQR(X) SWAP;
02 :BEEP   42 EMIT;
03 :INTRO   ."Welcome to square
            roots";
04  CLR BEEP INTRO
05  100   90 75 60 12
06  UNTIL = 0 DO ROOT
07  ."Square root of".."is".
08  DROP DROP
09   ENDIT
```

LISP

LISP stands for LISt Processor. It was created to help solve problems in mathematics. LISP works with lists of information, rather than just characters or numbers.

LISP lists can include almost anything—words in a sentence, sentences in a document, positions in a game, sections of a picture. However, a list can also include commands in a computer program. So, LISP programs can alter themselves or — can automatically write and run other programs.

Here's an example or part of a LISP program that defines a graphics character or *sprite*:

```
(HORIZ -POS SPRITE) = (SPRITE 1),
(VERT -POS SPRITE) = (SPRITE 2),
(DIRECTION SPRITE) = (SPRITE 3),
(SHAPE SPRITE) = (SPRITE 4),
(COLOR SPRITE) = (SPRITE 5),
```

TO FIND OUT MORE

With the right help, learning a computer language is not difficult. If you know BASIC, learning a second language is even easier.

What will you need? Remember, every computer language is really a piece of software—a program that takes the commands you type in and translates them into machine code. So before you can program in any language besides BASIC, you'll have to buy a disk, cassette or cartridge for your computer. (BASIC is also a program—but in most home computers, it is built in.)

Before you invest in software, you might want to read up on the languages that you're interested in. Here are just a few of the books on languages that are available:

Learning Logo by Daniel Watt, McGraw-Hill, $19.95.

Elementary Pascal: Learning to Program Your Computer in Pascal with Sherlock Holmes by Henry Ledgard, Vintage Books, $12.95.

FORTRAN—Getting Started by William Davis, Addison-Wesley, $8.50.

Starting Forth by Leo Brodie, Prentice Hall, $17.50.

The Alfred Handy Guides ($2.95 each) are a collection of short booklets on computer topics. There is one for each language described in this article, as well as many others. ◻

DAVID B. POWELL is an ENTER contributing editor.

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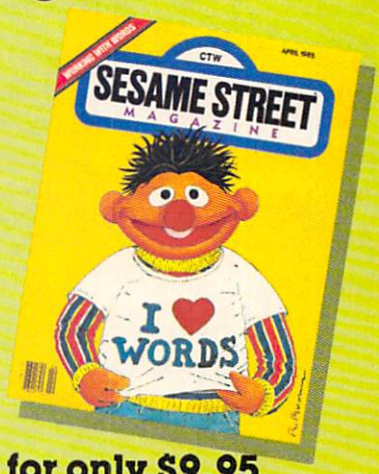

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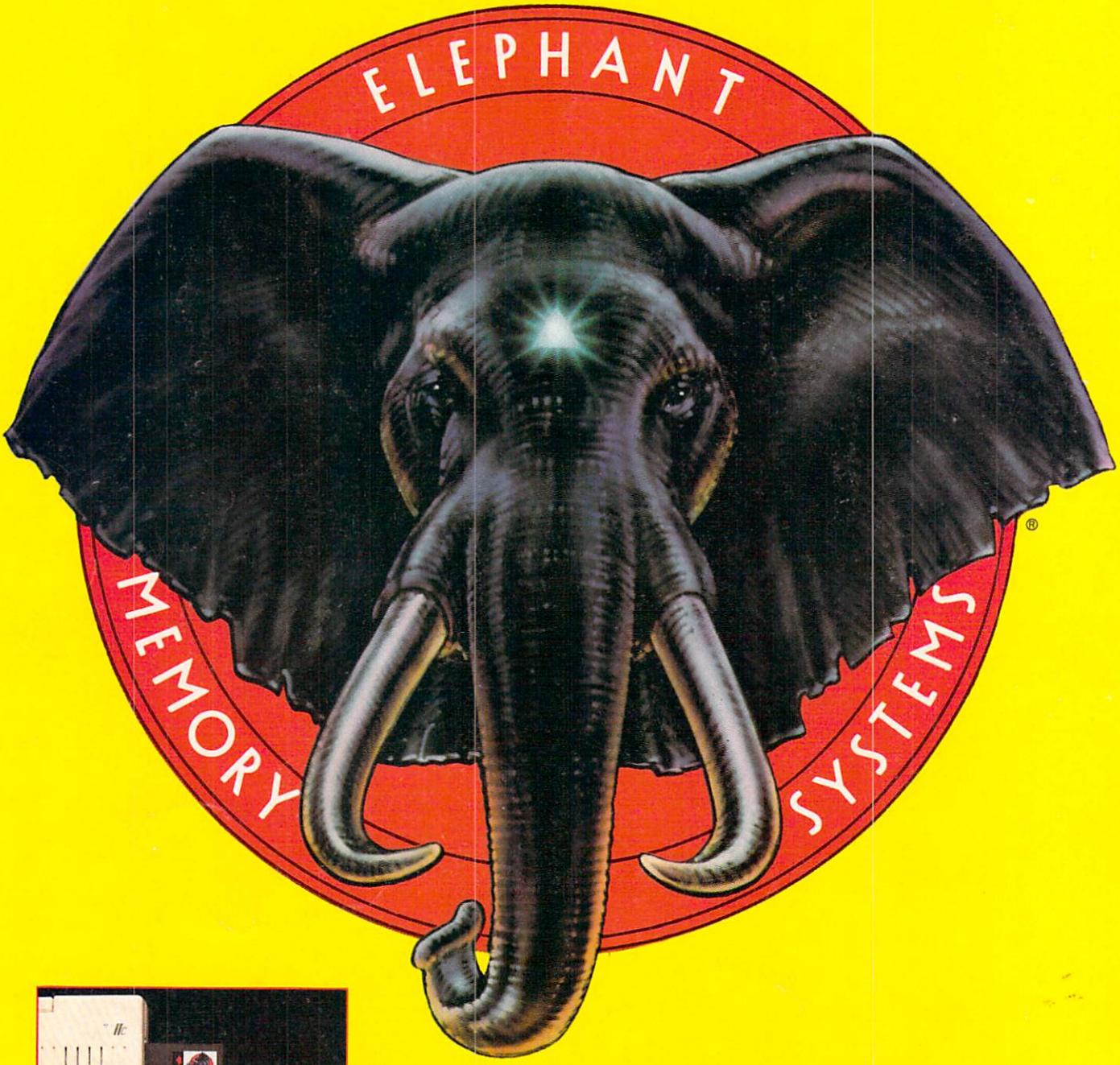

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