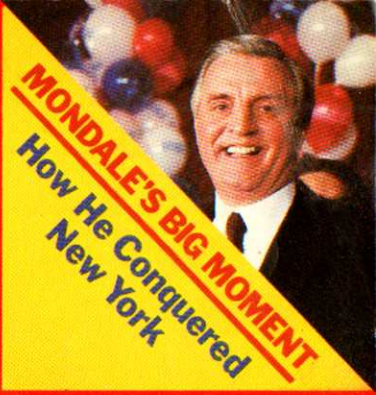


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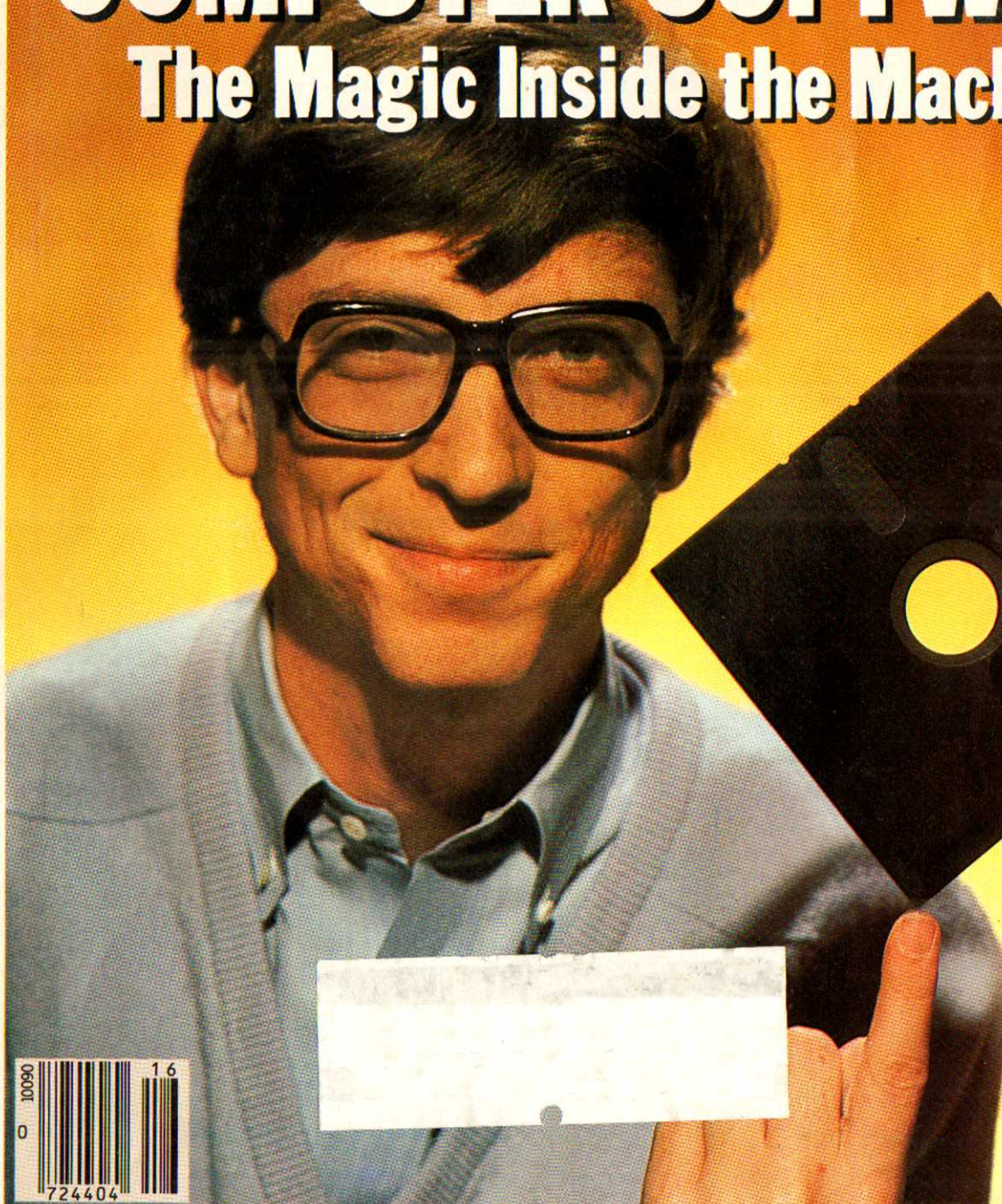
TIME



MONDALE'S BIG MOMENT
How He Conquered
New York

COMPUTER SOFTWARE

The Magic Inside the Machine



**Microsoft
Boss
Bill Gates**



A Letter from the Publisher

A TIME reader who was listening to the radio last week while looking at the current issue of the magazine might have experienced the odd shock of hearing the language of some of the stories leap off the page: "The twisters left behind scenes that might have been conceived by a macabre surrealist—in some farming areas the dead bodies of cows were found hanging from trees . . ." or "If the complex mission works, *Challenger* will have shown the world that costly satellites need no longer be allowed to die wastefully in space."

The source of the spoken words was the premier broadcasts of the Time World News Service (TWNS), a new entry in radio journalism that will draw its material from the pages of TIME and its 87 correspondents and 32 news bureaus around the world. It is not TIME's first foray into radio. That distinction belongs to *The March of Time*, heard from 1931 to 1945, probably the best-known of all documentary series. While *The March of Time* dramatized the news, however, TWNS will take a straightforward approach, presenting the actual content and prose style of TIME. Broadcast in more than 100 U.S. cities and more than 20 foreign countries,

the TWNS programming each week will consist of 15 condensed stories that will be aired throughout the day. The subject matter will range from cover articles through features on religion, science, politics, education, law and sports to reviews and an occasional Essay.

The idea for TWNS originated with the director of special projects for Time Inc.'s magazine group, Nathaniel Lande, who heads the new service. Each weekend as TIME goes to press, Lande, his deputy Edward Naylor and their staff will select the stories that best encapsulate the events and tone of the week. "It is a delicate art," says Lande of the alchemy that goes into the editing. "Not everything that is on a printed page works effectively when it is spoken. Nevertheless, it is our charter to honor each story's integrity while adapting it to another medium." The material is recorded at a New York City studio by a team of nine broadcast journalists, including Peter Thomas, Mike Baker and Fran Brill. Says Lande:

"With the revival of interest in radio, especially news radio, we think this kind of programming will extend TIME's presence not only around the country but around the world."



TWNS's Lande, right, with staff announcer

John A. Meyers

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Cover: Photograph by Dan Wynn



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AND PC_{jr} AT YOUR HOUSE,
YOU CAN TAKE WORK HOME
ON YOUR LITTLE FINGER.

Many business people already know about the IBM® Personal Computer family.

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And while you're at the office, your family will find plenty to do with PCjr.



THE BRIGHT LITTLE FAMILY ADDITION THAT CAN GROW UP FAST

PCjr is a powerful tool for modern times. With easy-to-follow new IBM Personal Computer programs, and with options like a printer and an internal modem for telecommunications, it can handle a great variety of jobs.

Children can learn new ways of learning, and make short work of homework. Adults can keep track of household expenses, write letters, file tax data, plug into information networks. And everyone can enjoy challenging new cartridge games.

IBM designed PCjr with lots of bright ideas to make computing easier.

The "Freeboard"—a keyboard that doesn't need a connecting cord—is easy to get comfortable with.

Built-in picture instructions can help the first-time user get started.

Diskette-drive systems include a program that allows users to explore computer fundamentals at their own pace. And to get

PCjr up and running from the very first day, a sample diskette with eleven useful mini-programs is also included.

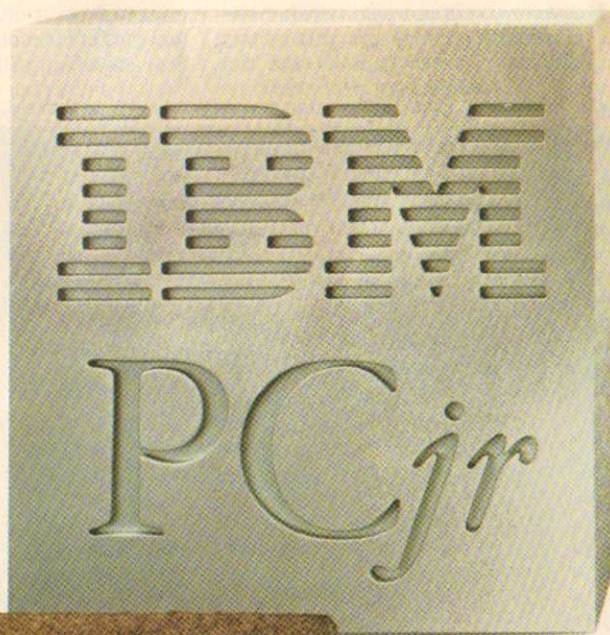


HOME ECONOMICS: IBM DISKETTE COMPUTING FOR ABOUT \$1300

PCjr is the most affordable of the IBM personal computers.

A diskette-drive model with a 128KB user memory is about \$1300. An expandable 64KB cassette/cartridge model is about \$700. (Prices apply at IBM Product Centers. Prices may vary at other stores.)

For a demonstration, visit an authorized IBM PCjr dealer or an IBM Product Center. And you can find the store nearest you with your little finger. Just dial 1-800-IBM-PCJR. In Alaska and Hawaii, 1-800-447-0890.



COVER STORY

The Wizard Inside The Machines

Software is the magic carpet to the future

*Simple Simon met a pieman
Going to the fair;
Says Simple Simon to the pieman,
"Let me taste your ware."*

Hardware or software? the child of today's computer age might ask. His world is divided into two parts: hardware, the machinery that makes up a computer, and software, the programs of instructions that tell computers what to do. And while the hardware is visible and tangible, the child knows that software is the soul of the machine. Without software, a computer is little more than a hunk of plastic and silicon that might as well be used as a doorstop. A computer without software is like a car without gasoline, a camera without film, a stereo without records. This year Americans will spend an estimated \$65 billion on computers of all kinds. They will lay down an additional \$16.2 billion for the software that makes the machines do their magic.

Until a few years ago, software was used almost exclusively to operate the big, impersonal mainframe computers, which were isolated in air-conditioned rooms behind glass partitions. The software for these giant machines is still in place, keeping track of long-distance telephone calls, calculating interest on bank accounts, and sending out fund-raising letters for presidential candidates. But the rapid spread of personal computers has put software directly into people's hands. In fact, savvy specialists tell computer buyers first to find the software they want to use and only then to buy the machine that runs the software.

Today computer buffs are using software in more innovative ways. In addition to doing such mundane tasks as sorting, cataloging and calculating, a host of new programs are helping make people's lives easier. Some examples:

The Rev. David Nicholas, pastor of the Spanish River Presbyterian Church in Boca Raton, Fla., writes the outlines of his sermons with the help of a program called Super SCRIPSIT on one of his parish's two Radio Shack computers. Thomas Birr, the church's business administrator, uses two titles from the CompuChurch line, the Gift Program to record donations and the Shepherd's

Program to keep track of the talents and special interests of every member in the church's congregation. Says Birr: "If I need a soccer-league coach, all I have to do is ask the computer to give me a list of all male members between the ages of 18 and 50 with an interest in sports."

Amateur Astronomer George Litsios of Closter, N.J., owns a telescope that he keeps pointed toward the heavens from under a skylight in his attic. But these days he spends more time watching a computer screen displaying a TellStar program, made by Scharf Software Systems of Boulder, Colo. With the help of the software, Litsios, 52, created a graphic representation of the heavens just the way they appear from his backyard by simply typing in the time, date and geographic coordinates of his suburban home. Now he can ask the program to identify a heavenly body that he has seen in the sky. Says Litsios: "This has really expanded my field of vision. I saw more in the six weeks after I got TellStar than I had in the six years before that."

The Bide-a-Wee animal shelter in New York City is using a program called Choose-a-Pooch, which helps match potential owners with homeless mongrels. Devised by Randy Lockwood, 35, an assistant psychology professor at the Stony Brook campus of the State University of New York, Choose-a-Pooch catalogues the temperaments and needs of 120 breeds, to indicate how a particular dog would fit with a prospective owner.

At the six restaurants and bars in Washington's Watergate Hotel, microCELLARMASTER monitors the supply of 80,000 bottles of wine, liquor and soft drinks. The result: more efficient inventory management. Explains Susan Conti, a secretary who uses the software: "It makes it easier to change wine lists because we can look up prices at a touch on the computer."

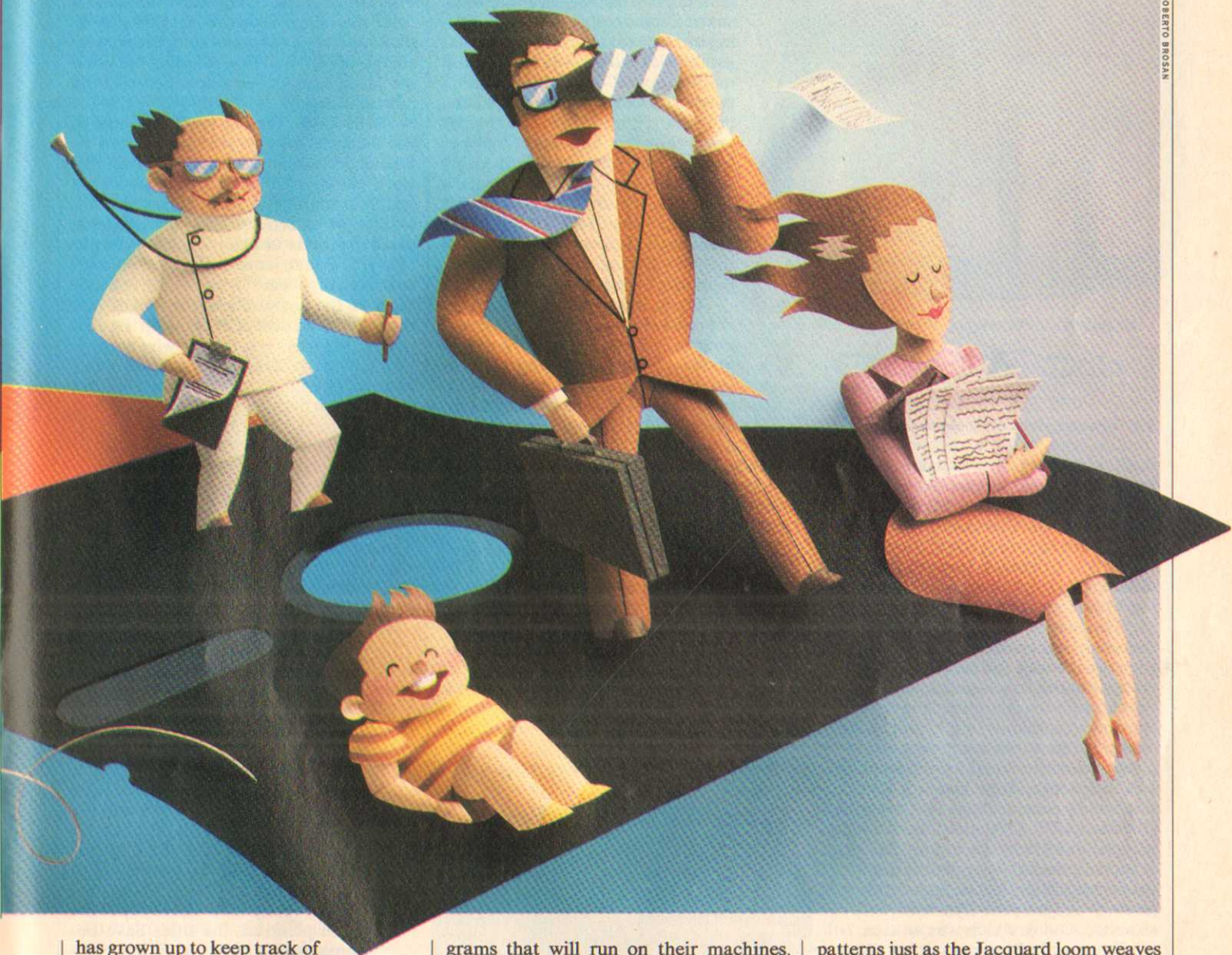
Most of the software being sold today still goes into mainframe computers used by corporations or the Government. Banks, airlines and other major data processors last year purchased or leased \$11.6 billion worth of programs, according to Input, a market-research firm in Mountain View, Calif. Traditionally,



mainframe software is leased, not sold, so the company that developed it can maintain control. The lease of a single program to keep track of banking transactions, for example, can cost as much as \$200,000 a year.

But the real excitement in the industry is software for personal computers. While only \$260 million worth was sold as recently as 1980, sales this year are expected to reach \$1.5 billion. And by 1989 revenues could exceed \$6 billion. At least 1,000 companies are making programs. Microsoft, located in Bellevue, Wash. (pop. 75,000), near Seattle, is the largest. In 1980 it sold \$4 million worth of software; projected 1984 revenues are \$100 million. William Gates, 28, Microsoft's chairman and co-founder, has amassed a personal fortune estimated at \$100 million.

No one knows for sure how many programs actually exist; estimates range from 8,000 to 40,000. In fact, a mini-industry



has grown up to keep track of the titles. Stewart Brand, the counterculture publisher of the *Whole Earth Catalog*, will come out with the *Whole Earth Software Catalog* this fall. *Billboard* magazine charts the progress of hot-selling software just the way it does that of Michael Jackson records.

Indeed, the software field has taken on many of the characteristics of the pop-music business. If a new product flops, manufacturers can quickly go from boom to bust. Programmers, the people who write software, can find themselves millionaires at 20 but has-beens at 30. So-called pirates are stealing millions of dollars' worth of programs by copying them illegally.

Manufacturers of popular software are becoming industry superstars. The heads of software companies, like Microsoft's Gates, Lotus Development's Mitchell Kapor and Software Publishing's Fred Gibbons are wooed by hardware companies, which want them to produce pro-

grams that will run on their machines. Says Gibbons: "Control of the personal-computer industry is shifting from the hardware manufacturers to the software suppliers."

Primitive forms of software first appeared 150 years ago. Charles Babbage, a mathematics professor at Cambridge University who also invented the speedometer and the locomotive cowcatcher, in 1834 designed a machine called the analytical engine to solve mathematical equations; it is generally considered the forerunner of today's computers. Augusta Ada, the Countess of Lovelace, daughter of the poet Lord Byron, helped finance the project. Credited with being the world's first programmer, she used punched cards to tell the machine what to do. The idea was inspired by the cards used on Jacquard looms to determine the designs in cloth. Said she: "The analytical engine weaves algebraic

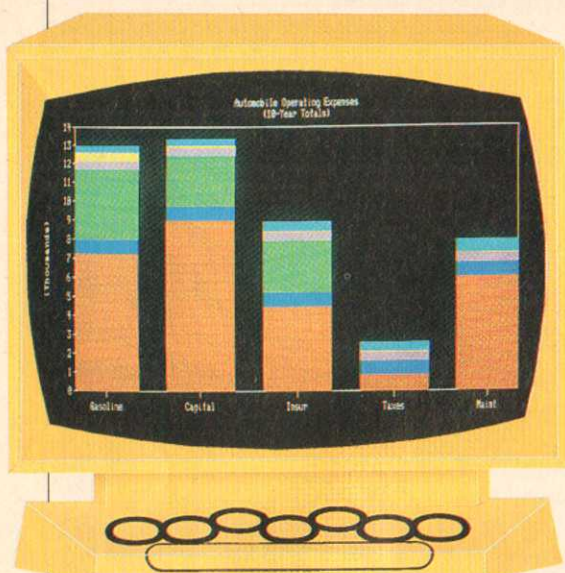
patterns just as the Jacquard loom weaves flowers and leaves."

The analytical engine was hopelessly complicated for its time and was never completed. But 117 years later, punched cards that were not to be folded, spindled or mutilated became the heart of software technology. In 1951 the U.S. Census Bureau used punched cards for UNIVAC I, the first commercial computer.

The cards, though, are virtually gone. Various kinds of software now give instructions to computers. Systems software controls the parts of a computer, including the video screen, the central processing unit and the disc drives, and makes them work together. Though sold under obscure brand names like CP/M, MS-DOS and UNIX, systems software for personal computers can be highly profitable, and last year sales totaled \$500 million.

A heated competition is currently going on among systems-software producers. Digital Research of Pacific Grove,

Computers



1-2-3 turns a stack of numbers into a chart

Calif., created the first popular one, CP/M, but it has been supplanted by MS-DOS, which was developed by Microsoft for the IBM Personal Computer. In addition, AT&T is promoting UNIX, a system particularly efficient at performing several different tasks at once and communicating with other computers.

The machines can receive instructions only in a series of 1s and 0s. In order to make it easier for people to communicate with the machines, scientists have developed programming languages that translate commands into 1s and 0s. There are more than a dozen software languages, each designed for different kinds of users and applications. The first widely accepted one, FORTRAN (FORMula TRANslation), was developed in 1956 by a team at IBM. It is used primarily on scientific and mathematical problems. BASIC (Beginner's All-purpose Symbolic Instruction Code), which was written by Dartmouth Professors John G. Kemeny and Thomas E. Kurtz, is well suited for relatively simple personal-computer programs. It is widely taught in high schools and colleges, and even in some elementary schools, because it is easy to learn and use. More difficult to master, but more precise, is Pascal, named for the 17th century French mathematician. The language Ada, after the Countess of Lovelace, is the standard of the U.S. Department of Defense. Grace Hopper, one of the pioneer programmers, created COBOL (COmmon Business-Oriented Language), which is the most widely used programming language for mainframe computers.

Now 77, Hopper works at the U.S. Navy's computer center in Washington. Since the 1982 retirement of Admiral Hyman Rickover at 82, Commodore Hopper is the Navy's oldest officer on active duty.

She gets credit for coining the name of a ubiquitous computer phenomenon: the bug. In August 1945, while she and some associates were working at Harvard on an experimental machine called the Mark I, a circuit malfunctioned. A researcher using tweezers located and removed the problem: a 2-in.-long moth. Hopper taped the offending insect into her logbook. Says she: "From then on, when anything went wrong with a computer, we said it had bugs in it." (The moth is still under tape along with records of the experiment at the U.S. Naval Surface Weapons Center in Dahlgren, Va.)

Users of personal computers are more concerned with a different kind of software: applications programs, which keep the family budget, help with students' homework, play computer games or do financial planning. These programs usually come on a so-called floppy disc, a piece of plastic about the size of a 45-r.p.m. record. They can also be on magnetic tape or a silicon chip inside a cartridge. Sales of applications software for personal computers last year totaled \$560 million.

The most popular programs are used by individuals to improve the speed and quality of their work. Example: text-editing software, which allows someone to write and correct manuscripts without needless retyping. Products for business uses, like accounting software, are second in sales, followed by entertainment and

which already includes nearly 3,000 titles. Says Chairman David Wagman: "The demand is colossal." Anyone who visits a computer store, looks in a catalogue or picks up one of the many computer magazines is confronted by a stunning but often confusing array of products. Some of the newest titles:

Wills (\$49). One of four programs in the Personal Lawyer series produced by Lassen Software of Chico, Calif., this software package offers individuals with a simple estate a quick way to draw up a will without an attorney's help. The program poses questions in plain English (sample: "Do you wish to leave any part of your estate to your college?"), waits until the user types in the answers and then leads him through the process of drawing up the document. Written by a lawyer who specializes in wills, the program satisfies the probate requirements of every state except Louisiana, which has a legal system based on the ancient Napoleonic Code.

Millionaire (\$69.95). Marketed by Blue Chip Software of Woodland Hills, Calif., this program is used in a dozen colleges and high schools to teach students how the stock market works. At the start of each game, a player is given \$10,000 and is then required to make investment decisions based on a continuous stream of financial information, such as market changes and other business developments. The player wins by amassing \$1 million in theoretical profits; he loses when he goes broke.

Math Maze (\$39.95). This program by Designware of San Francisco drills children ages 6 to 11 on basic mathematical skills. A player is given a problem and then must guide a fly through a maze until he finds the right answer. If the player hesitates in making a decision, the number-seeking fly will be eaten by a hungry spider.

As programs have become more plentiful, the titles have become more specialized. Flight Simulator helps train would-be pilots to land an airplane; Pole Position lets living-room auto racers drive a road course; Stallion keeps the bloodlines of horses straight by tracking their ancestry; Beefup helps breeders fatten their cattle by keeping track of their weight and breeding; Sex-O-Scope gives astrological predictions; Relax attacks stress while monitoring muscle tension through electric sensors in a headband; Bearings helps ham radio operators plot transmission distances; Hurricane aids meteorologists in tracking storms.

To computer buffs, this vast selection represents the fulfillment of the computer age's promise. Says Ernest Baxter, managing editor of *Personal Software* magazine: "Put the right kind of software into a computer, and it will do whatever you want it to. There may be limits on what



Beefup tracks a herd's feeding and breeding

education programs. While hardware manufacturers such as IBM, Tandy and Apple are the biggest sellers of applications software, Microsoft, Lotus Development of Cambridge, Mass., and other independent companies are increasing their share of the market.

About 7,000 stores in the U.S. sell applications software. Softsel, the largest distributor to retail stores, adds about 200 new products a month to its catalogue,

you can do with the machines themselves, but there are no limits on what you can do with software."

Despite the multiplying uses, software is sometimes forbidding to the novice computer operator. Instructions can be so complicated that they require hours of study and practice before the programs can be operated with ease. Says Alfred Glossbrenner, author of *How to Buy Software*: "If there is any single factor that could kill off the computer boom, it is the lack of complete, easily understood instructions."

Martin Dean, 43, president of Select Information Systems of Kentfield, Calif., has drawn up a consumer's bill of rights to combat hard-to-use software. "The only conclusion I can draw from the way some software packages operate," he argues, "is that their designers really think that you

themselves as "computer nerds."

A few are as reclusive as Garbo or J.D. Salinger. Paul Lutus, 38, lived in a cabin high on Oregon's Eight Dollar Mountain when he wrote Apple Writer, an early word-processing program. Lutus, the author of several other bestsellers, was forced to rig up a 1,200-ft. extension cord in order to get enough power for his Apple computer.

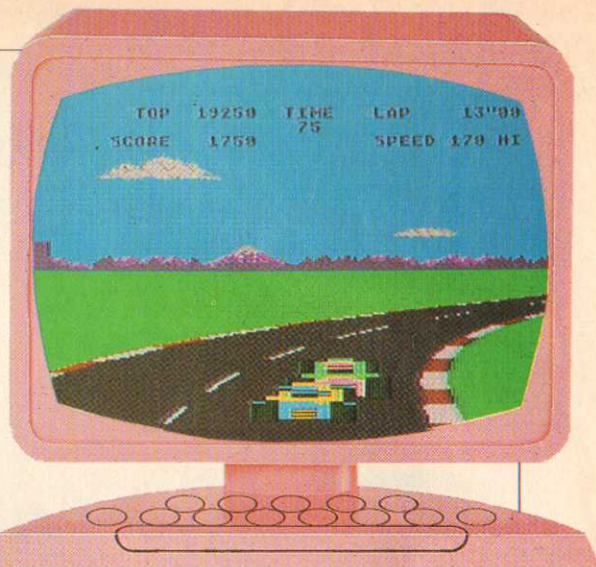
The earliest application programs were developed by personal-computer hobbyists and were freely traded much as housewives swap favorite recipes. The authors were often more interested in displaying their work than in earning money from the programs. Copies were readily made and duplicates given away at computer-club meetings. As recently as 1980, software was still something of a cottage industry, with programs packaged in plastic bags and sold through the mail.

Independent programmers operate much like authors, selling their software to publishers in return for a percentage of the sales. About 50 of these freelance programmers have earned more than \$500,000 each. Several have become stars in the software constellation and are referred to by their colleagues in awe as "demon coders." To computer hobbyists, their names are as well known as their popular programs.

Among the most prominent is Bill Budge, 28, who has written two of the industry's biggest entertainment hits: Raster Blaster, a computerized pinball game, and Pinball Construction Set, a program that allows players to custom-build their own video pinball machine. He earned \$500,000 in 1982 and resides in a \$240,000 eight-room house with a spectacular view of San Francisco Bay. Budge, though, does not spend his day admiring the scenery. Most of the time he is down in the yellow-walled basement, swigging cans of Coke while hunched over a computer.

The proliferating number of software

CompuChurch records contributions and gifts



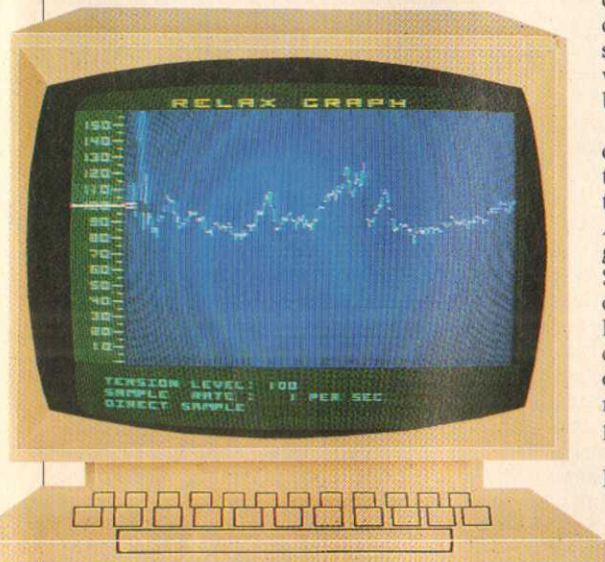
Pole Position lets players drive a racing car

titles means that it is harder to strike it rich quickly. Says Ron Fisher, vice president of VisiCorp in San Jose, Calif.: "There is now a surfeit of good people with good programs." Independent programmers once received royalties as high as 37% of the wholesale price, but their commissions have slid to an average of about 10%. Concur's Gibbons of Software Publishing: "The days of giant royalty payments are gone for good."

With rare exceptions, so has the eminence of the solitary programmer. Much of the latest personal-computer software is too complicated to be written by any individual. MSA, the big Atlanta software firm, uses at least eight people to complete a business program and sometimes as many as 24.

As software grows ever more complex, it becomes harder for companies to produce error-free programs on schedule. The appearance of Apple's new Macintosh computer was delayed for two years primarily because of software problems. In late 1982 VisiCorp announced that a new software product called Visi On, which allows the operator to run and display several different business programs simultaneously, would be on sale by the summer of 1983. After spending \$12 million on development, VisiCorp was unable to get it to stores until December. By then, the software had lost some of its technological edge. To remain competitive, the price of the product had to be cut from \$495 to \$95 after just a month on the market.

One of the hardest things to comprehend about software, at least for consumers, is the price. While the cost of making a floppy disc and the packaging runs only about \$4 to \$7, the software sells for much more. A data management program like dBase II costs \$700, while Micro/Scan II, a stock-analysis program, can be as much as \$12,500. Even a popular educational product like Bank Street Writer has an undiscounted price of \$69.95, and a program to teach a preschooler the alphabet can be \$40.



Relax soothes nerves by measuring tension

will be happy spending nights and weekends figuring out how to make the products work."

Even the instruction manuals provided to help users over the difficult first steps can range from barely acceptable to awful. Such bestselling programs as WordStar, for writing and editing, and dBase II, which helps organize business records, originally had terrible manuals, although the manufacturers have just issued improved instructions. Some software, including both WordStar and dBase II, now contains tutorial discs that show novices how to use the programs in a simple, step-by-step fashion.

Some of the idiosyncrasies of software can be traced to the people who create it. Writing software is often a solitary occupation, especially for specialized programs with limited markets. A programmer can frequently spend 18 hours a day at a terminal working on a difficult problem. That fanaticism allows very little time for ordinary human pursuits; programmers often wryly characterize

Forty Days and Forty Nights

When Michael Wise sits down at a keyboard, he never knows when he will get up. The plump, bearded computer programmer often works twelve, 24, even 36 hours without a break, filling a green screen at the San Rafael, Calif., offices of Broderbund Software with words and numbers that only he and his computer completely understand. Since December, Wise has written 40,000 lines of instructions for a video game he calls *Captain Goodnight*, after the old *Captain Midnight* radio series. By the time the program is ready for release this summer, it will have grown to 50,000 lines and swallowed up some 900 hours of programming time, or nearly 40 days and 40 nights.

The lines of code Wise types into his Apple IIe may look like a meaningless string of letters and numbers, but they are the crucial link between computers and the people who use them. At the heart of every machine are thousands of on-off switches. Wise's 64K Apple has 524,288. Software tells the switches when to turn on and off, and those switches control the machine.

Wise's first task in writing his program was to create the objects displayed on the screen. These are actually just patterns of colored dots, with each dot controlled by an individual on-off switch. Wise sketched the images on an electronic drawing



Michael Wise and a screen from *Captain Goodnight*

tablet that translated his lines into patterns of ones and zeros, where one represents a dot of color and zero a blank space. The image of *Captain Goodnight's* airplane is stored in the computer as a list of 798 zeros and ones that look like this: 11111100 00000001 10000000 . . .

After the objects were drawn, Wise began creating a series of small, self-contained mini-programs called subroutines. One subroutine, for example, moves the captain's jet. Another controls the enemy planes. A third fires a missile. In all, the finished program will have 400 differ-

ent subroutines. Wise writes it one subroutine at a time, making sure that each new one works before continuing. A typical section of coding reads:

```
EMIS-HIT? LDA JETY
           SBC EMISY
           CMP #10
           BGE EMISEXIT
PLAYR-HIT? LDA #01
           STA JETCOND
```

Those commands tell the computer to determine the jet's altitude (JETY) and subtract the altitude of the enemy missile (EMISY). If the result is ten or more, the two objects have missed each other. If it is less than ten, the program puts a one in a special switch called JETCOND that sends the jet into a flaming crash.

As the pieces of the program fall together, their interrelationship becomes maddeningly complex. Even one letter misplaced in 10,000 lines of code is enough to throw the whole program out of kilter. At one stage in the game's development, the computer had the captain walking in mid-air because one subroutine was inadvertently modifying another subroutine's instructions. "I almost went blind trying to find that bug," Wise recalls.

Wise has been dabbling in software since the age of 14, when he learned FORTRAN on an IBM at Stewart Junior High School in Tacoma, Wash. He dissected nearly every radio and television set in the house and then skipped college to take a series of odd jobs on the periphery of the computer world. He repaired video-arcade games, Xerox machines and personal computers, and at one time ran the ComputerLand store in Renton, Wash. In 1979, convinced that there were fortunes to be made, he bought an Apple II Plus and began churning out video games, working as a building manager by day and programming at night.

Wise still does his best work at night. Every evening after dinner he picks up where he left off at work. "My wife is a computer widow," he confesses. During the past month, he has been working until dawn with increasing regularity. "When I'm done, we're taking a vacation," says the 29-year-old programmer. "I'm almost getting too old for this."

—By Philip Elmer-DeWitt

The enormous disparity between manufacturing costs and selling price has led some users to accuse software makers of arbitrarily raising prices. In their defense, program producers contend that they are merely covering their costs of development and distribution, as well as providing profit for themselves and a reasonable markup for retailers. As in any new and fast-growing field, the competition that will force manufacturers to price products more realistically has not yet developed. When it does, the cost of software is likely to fall, perhaps sharply.

Adam Osborne, founder of Osborne Computer, now operating in bankruptcy after a couple of go-go years, charges that "marketing hype" has caused some prices to quintuple. Osborne has formed a new company called Paperback Software International, which hopes to sell programs for about \$50. He expects to keep prices down by operating the company somewhat like an agricultural cooperative, with software writers being given stock in the firm, and by mass marketing.

In part because software is often so expensive, copying it has become popular. Some software companies put special codes into the programs to prevent illegal duplication, but the codes are frequently broken. When that happens, a copy can be made in a procedure that is not much more complicated than making a duplicate of a cassette tape. Successful copiers like to refer to themselves as "pirates." Complains William ("Trip") Hawkins, 30, founder and president of Electronic Arts, a San Mateo, Calif., firm selling entertainment software: "Calling people pirates is a lot more palatable than calling them what they are—thieves."

Pirate or thief, one high school student in Alpine, N.J., interviewed by TIME is typical. The 15-year-old sophomore owns an Apple IIe computer and augments his allowance of \$10 a week by bootlegging software. He buys a game like Commodore's Omega Race for \$29.95, copies it onto a blank disc that costs him about \$3 and sells it to his buddies for \$10. "It's really simple," says the boy. "Nothing's easier than copying software."

All software, even the systems software inside the computer, can be protected by copyright, but that does not stop dedicated pirates. Ric Giardina, general counsel of MicroPro, which publishes WordStar, estimates that as many as 20 fraudulent copies of a program may be made for every one sold. Manufacturers are aggressively defending their products. In February Lotus Development sued Rixon, a Silver Spring, Md., computer-accessory manufacturer, for \$10 million, charging it made copies of Lotus' popular business program 1-2-3 for its own use. Declared Lotus President Kapur: "Software piracy is the theft of intellectual property." When the suit was settled in March, Rixon agreed to return all unauthorized copies to Lotus and pay an undisclosed sum of money.

Computers

BEST SELLERS



| Name | Program | Price | Can be used on |
|---------------------|-----------|---------|----------------|
| Flight Simulator II | Strategy | \$49.95 | 1 |
| Ultima III | Fantasy | 54.95 | 1,2 |
| Lode Runner | Action | 34.95 | 1,2,3,4,11 |
| Zork I | Adventure | 39.95 | 1,2,4,5,6,7 |
| Zork II | Adventure | 39.95 | 1,2,3,4,5,6,7 |



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|-----------------|-----------------|-------|-------------|
| Dollars & Sense | Home budgeting | \$100 | 1,4 |
| Bank St. Writer | Word processing | 69.95 | 1,2,3,4 |
| The Home Acct. | Home budgeting | 74.95 | 1,2,3,4,7,8 |
| HomeWord | Word processing | 49.95 | 1,3 |
| Tax Advantage | Tax assistance | 59.95 | 1,2,3,4,7 |



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|--------------|-------------------------|---------|------------|
| Master Type | Typing instruction | \$39.95 | 1,2,3,4 |
| Math Buster! | Math skills (6-12 yrs.) | 49.95 | 1,3,4 |
| Word Attack! | Vocabulary skills | 49.95 | 1,3,4 |
| Type Attack! | Typing instruction | 39.95 | 1,2,3,4,11 |
| PC Tutor | Computer instruction | 59.95 | 3,4,7 |



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|--------------|------------------------|---------|-------------|
| 1-2-3 | Information management | \$495 | 4,6,7,9,10 |
| PFS: File | Filing system | 125-175 | 1,4,7 |
| dBase II | Data-base system | 700 | 1,4,5,6,7,9 |
| Tax Preparer | Tax preparation | 225 | 1,4 |
| PFS: Write | Word processing | 125 | 1,4 |

1.Apple, 2.Atari, 3.Commodore 64, 4.IBM, 5.CP/M, 6.DEC Rainbow, 7.Texas Instruments Professional, 8.TRS-80, 9.Victor 9000, 10.Wang PC, 11.Commodore Vic-20

Source: Softsel Hot List, week of April 9

Game manufacturers have probably been hardest hit by piracy. Says Michael Katz, president of Epyx, a California company: "It's like the weather. We accept it as something we cannot control but wish we could. Any smart kid can figure out how to break into a game." Some companies plot profits around the safeguards built into the software; once the pirates have cracked the codes, sales quickly fall off. No one in the industry can accurately estimate the extent of the copyright theft involving games.

The most dangerous potential threat to American software manufacturers, surprisingly, has not materialized. While the Japanese are making initial forays into the hardware side of personal computers in the U.S., the only major Japanese software export hits have been games like Pac-Man and Donkey Kong. Concedes Hisao Ishihara, managing director of the Japan Software Industry Association in Tokyo, which represents nearly 200 companies: "The number and variety of Japanese products are indeed behind American ones, and our industry will have to work hard to correct this."

Until recently, there was little incentive for the Japanese to develop a software industry of their own. Software was usually custom designed by computer manufacturers and included in the price of the machine. Hardware engineers were granted higher pay and had more status than software designers. Language and culture also presented formidable barriers to Japanese software makers trying to penetrate the U.S. market. In developing tax-computation programs, for example, it is not easy for computer experts in Tokyo to try to keep up with legal changes in the U.S., some 5,000 miles away.

The Japanese, however, have come up with an innovative move that may help them crack the U.S. software market. Kazuhiko ("Kay") Nishi, 28, president of Microsoft Far East, the U.S. company's sales agent for Japan, has developed MSX, a standardized hardware and software system for small personal computers. The norms have been generally adopted by 35 companies, which include such big-name Japanese brands as Sony, Panasonic, Sanyo and Toshiba; Philips of The Netherlands has also joined up. The MSX system is designed to permit programs written for one computer to run on all of them. The machines built to the MSX specifications will be unveiled in the U.S. later this year. Some computers will come equipped with high-quality printers and sell for less than \$1,000, making them highly competitive with American products. If these machines are successful, they could create a market for Japanese software.

Japan is fighting American software on another front. The powerful Ministry of International Trade and Industry (MITI) wants to see software treated as industrial property covered by patent law, which allows for only 15 years of protection. The U.S. Government argues that

software is intellectual property and should be protected for up to 50 years under copyright treaties. MITI is also pushing for an arbitration system, in which software developers could be legally obliged to make certain products available to competitors if the product is considered "highly useful to the public interest." U.S. officials are extremely wary of the arbitration proposal, and negotiations are stalemated.

While software industry growth remains steep, development and marketing costs are climbing. One of the firms hit hardest is VisiCorp, which rose to early industry leadership as the distributor of VisiCalc, the business planning program that is still the alltime bestseller, with more than 700,000 copies sold. But VisiCalc has been surpassed by newer programs like Microsoft's Multiplan, and sales are lagging. At the same time, VisiCorp has been burdened with the development woes of its elaborate Visi On program. VisiCorp is also engaged in a messy court battle with Software Arts of Wellesley, Mass., the company that actually wrote VisiCalc. Last September VisiCorp sued Software Arts for \$60 million, charging that the creators had failed to keep the program up to date. Software Arts in February filed a counterclaim, arguing that it wanted all the rights to VisiCalc returned because VisiCorp had broken a marketing agreement.

Companies that make entertainment software for personal computers have suffered setbacks during the past year. Too many firms entered the field too quickly, and customers are becoming more discriminating about the programs they buy. Sirius Software of Sacramento, Calif., maker of the hit Type Attack, in 1983 issued three or four new games every month. This year, however, it will not introduce a new one until next month, and since October it has laid off 15 of its 35-member staff.

Some game companies have tried to insulate themselves from the crush by producing educational programs, but they are running into competition from specialized firms like the Learning Company. Founded in 1979 by Ann Piestrup, a former Roman Catholic nun and an educational psychologist, the company has been partly financed by a grant from the National Institute of Education. In January it unveiled five new programs, including ReaderRabbit: Fabulous Word Factory, which develops reading skills for children ages five to seven.

As the software business gets bigger, the cost of admission is going up. Lotus Development set new industry standards by spending \$6 million on the development and advertising of 1-2-3. Last month Ashton-Tate announced Framework, a new business program, and the company figures its introduction will cost \$10 million. "The investment in market-

ing is ratcheting up higher and higher," says Julian Lange, president of Software Arts. "It's become difficult for two guys in an attic to launch a product like VisiCalc."

To increase their visibility, software companies have begun using a time-tested sales technique: celebrity endorsements. Electronic Arts has put out a computer basketball game featuring a match-up between Larry Bird and Julius Erving. Micro Education Corp. of America in Westport, Conn., is beginning to introduce programs that carry the names of well-known writers: Andrew Tobias' *Managing Your Money* (\$199.95) and James F. Fixx's *The Running Program* (\$79.95). Both Tobias and Fixx say they helped develop the software, though neither is a programmer.

Some major corporations with only scant connection to high technology are getting into the software business. Late last year McKesson, the drug and health-care giant (1983 sales: \$4 billion), acquired a half interest in SKU, a software distributor. Both CBS and Warner Communications have started software units. Also investigating or developing their own software are publishing houses (Simon & Schuster and Random House), toy firms (Fisher-Price and Parker Bros.) and movie companies (United Artists, MCA, Walt Disney and Lucasfilm). But small firms seem to do best in the innovative world of applications programs. Cautions Software Publishing's Fred Gibbons, who



The first programmer: Countess Lovelace

runs one of the fastest-growing companies: "Being big does not help you become good in the software business."

All the firms in the field are now reaching out to discover even more inventive ways to put computers to work. At times the future seems so vast that even industry leaders are amazed by its potential. Says Microsoft Programmer Charles Simonyi: "It's hard to describe how wonderful software will be. There will be a tremendous amount of simulation. You will be able to inspect or take apart anything you want on a computer. You will

be able to simulate a journey on the space shuttle or a trip to Paris. You will not just be able to shop from home, you will be able to look through a catalogue, take an item and then inspect it from different angles and really take it apart."

One of the hottest developments in programming is integrated software, pioneered by Lotus Development with 1-2-3. Integrated software permits an individual to perform several different tasks with the same program. Someone using a computer to keep track of the family budget, for example, could classify his expenses into a variety of categories, see how the budget might change if, say, interest rates went down and then look at a chart that represents how his money is being spent. All that can be done with just a few keystrokes in less than a minute. In February, Lotus Development launched an expanded version called Symphony, which allows the same kind of information to be inserted into a letter or other document, which can either be printed out or be sent electronically over phone wires to another computer.

Some integrated software, like Symphony, can simultaneously display different programs on a computer screen in separate sections or windows. This allows someone to work on one part of a task while having other parts of it displayed in front of him. Such window programs are expected to become increasingly popular in the next year.

Future software is likely to be much easier to use—if manufacturers master

A Hard-Core Technoid

He looks like an undernourished grad student as he waits for a plane at Seattle-Tacoma International Airport. His gray sweater has patches on the elbows; his shoes are scuffed; his ginger hair flops over a pair of steel-framed glasses. He fidgets with a thick pile of papers that contain preliminary sketches for a new portable computer and technical details for silicon chips that will be used in machines of the late 1980s. The tag on his battered black suitcase reads "William H. Gates, Chief Executive Officer and Chairman of the Board, Microsoft."

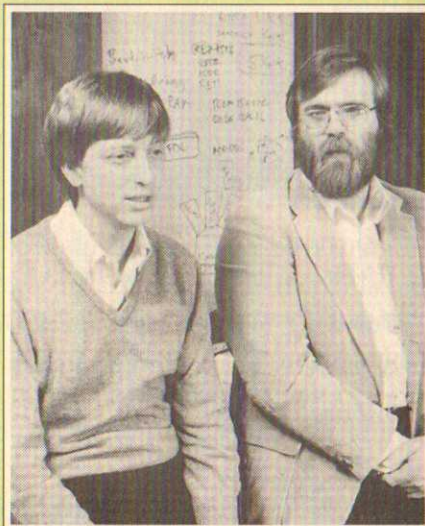
Gates, 28, has helped catapult Microsoft to the forefront of the software industry, and his list of customers includes every major manufacturer of personal computers. When IBM wanted an operating system for its Personal Computer, it turned to Gates. When Apple needed software for its Macintosh, it gave Microsoft a test model to use in writing the programs. Gates helped with the design of Radio Shack's Model 100, the first truly portable computer. Microsoft produced the MSX systems software that will be used for a new series of Japanese computers. Thanks to that business (and more), Gates, who owns almost half of the privately held company, has become America's software tycoon.

The son of a prominent Seattle lawyer, Gates has spent most of his life

around computers. He initially encountered them as a seventh-grader in 1967 when the proceeds from a mothers' club rummage sale were used to buy a machine for Seattle's Lakeside School. Gates devised a class-scheduling program so that he could take courses with the prettiest girls. Recalls Lakeside Math Teacher Fred Wright: "Bill had the ability to see shortcuts."

Teaming up with Paul Allen, a friend and schoolmate, Gates formed a pint-size company, Traf-O-Data, that studied traffic patterns for small towns near Seattle. When he was 15 and a tenth-grader, the company grossed \$20,000. Says Gates in his characteristic computerspeak: "I was a hard-core technoid." He temporarily abandoned computers for a year in the early 1970s for such nontechnical pursuits as acting in the school play, but he did not lose his touch for making money. While he was working as a congressional page in 1972, he and a friend snapped up 5,000 McGovern-Eagleton campaign buttons for a nickel each just after South Dakota's George McGovern dumped Missouri Senator Thomas Eagleton from the Democratic ticket. They later sold the scarce mementos for as much as \$25 each.

After the first microprocessor was introduced in 1972, Gates and Allen tried to build a personal computer, but eventually decided to stick with software. Says Allen: "Building a machine was too hair raising." In 1975, when Gates was in a pre-law program at Harvard, Allen persuaded



Gates and Microsoft Co-Founder Paul Allen

the art of writing intelligible instructions. Many basic programs will probably be available as part of the computer instead of being sold separately. When software is built in, it is faster to use. Several popular lap-size computers, such as Radio Shack's Model 100 and the Workslate from Convergent Technologies, already have built-in software like text editing and financial planning.

There is one drawback to built-in software: a user cannot easily replace an outdated program with a newer one when it is built in. However, silicon chips known as EEPROMs (electrically erasable, programmable, read-only memory), which can be electronically erased and then reprogrammed, have already begun to reach the market.

Software under development will help link up groups of personal computers to a central computer, thus allowing data to be freely exchanged among them. Other new software will help speed communication between machines. By connecting computers with a video-disc machine, which can store on a single platter all the information in the *Encyclopaedia Britannica*, the amount of data quickly available to the user is greatly increased. In June, Digital Research will introduce a product that will make this possible.

To reach a truly mass audience, however, software producers will have to achieve a major technological break-



Creator of a language: Commodore Hopper

through. Instead of typing often incomprehensible combinations of symbols, letters, numbers and code words, users should be able to give commands to their computers in plain English. That is no simple task. Language by its very nature does not have the mathematical precision that computers deal with so well. English syntax, in particular, is irregular and hard to codify, and many words have several different meanings. Computers, despite their complexity, are not as subtle as the human brain in understanding and interpreting instructions.

This is where artificial intelligence comes into play. Artificial intelligence is software programming that makes computers simulate human reasoning. If machines can be made more like people, then people will not have to obey so rigidly the dictates of machines. A program called Intellect, introduced last month for IBM computers, permits a business executive to get information from a computer by giving simple, direct commands—for example, Give me last week's sales report. The development of this kind of software is extremely complex, however, and the programs require extremely powerful machines. It will be several years before artificial-intelligence software is widely available.

Since the invention of the primitive hand ax, humanity has turned to tools as a way of making life easier or work more productive. "Man is a tool-using animal," wrote the 19th century Scottish historian and essayist Thomas Carlyle. "Without tools he is nothing, with tools he is all." Computer software is only the latest of those tools, and programmers are only beginning to understand the true potential of software. Says Dan Bricklin, chairman of Software Arts: "We're just really getting started. I think that you will see programs coming along in the next few years that will make the current ones look like the stone axes of computing."

—By Alexander L. Taylor III
Reported by Michael Moritz/San Francisco and Peter Stoler/Boston

him to help adapt the computer language BASIC to run on the Altair, the first commercially available microcomputer. Gates and Allen spent six weeks writing a version of the language on a Harvard computer. Then, despite his parents' objections, Gates dropped out of Harvard. He recalls, "Paul kept saying, 'Let's start a company. Let's do it.'"

In 1978 Microsoft had just 15 employees. Today it has 510 and sells 29 products, including computer languages like COBOL and FORTRAN, devices that permit computers to run programs originally designed for different machines, and software programs for such tasks as text editing and financial planning. Microsoft last year announced plans to sell a package called Windows that will enable different programs to run on a computer simultaneously.

Although Gates and Allen agree on most things, they have differed strongly about prices. Allen prefers to charge what the market will bear on the ground that people are willing to pay top dollar for good products, while Gates wants "to sell a lot at a low price." The chairman generally gets his way.

Last year Allen discovered he was suffering from cancer. Though the illness is in remission, he is only now returning to full-time work as a company vice president. To ease his work load, as well as to shore up Microsoft's managerial team, Gates has recruited executives from other companies. James Towne was hired from Tektronix, an electronic instruments maker, to become president, but he lasted

less than a year. Last August, Towne was succeeded by Jon Shirley, 45, a former Tandy vice president.

Towne's departure was due in part to Gates' sometimes prickly and abrupt style. He reportedly has a sharp temper. Says Charles Simonyi, 35, a Microsoft programmer: "Bill isn't going to explain everything twice."

Gates and Shirley are naturally concerned about maintaining Microsoft's success. The company had a jolt in January, when IBM announced that it would buy a version of UNIX, another operating system, from one of Microsoft's competitors.

That could cut into sales of the MS-DOS system; it also was a warning that Gates and his colleagues should not rely too heavily on IBM.

Though Gates no longer does programming, he has little time for anything but business. Says he: "I'm still fairly hard-core." Once or twice a week he finds time to see his current girlfriend, Jill Bennett, 27, who sells computers for Digital Equipment. In the past six years he has taken only 15 days' vacation, four of them at a Phoenix tennis ranch in 1982. His \$750,000 home, which is just a 14-minute drive from Microsoft headquarters, has a 30-foot indoor swimming pool and a view of Lake Washington. But the hub of the home is an IBM PC in the den. Many evenings he works at the machine. When he grows tired, he can look up to the ceiling at a giant map of the world. It has been a long way from McGovern buttons.

—By Michael Moritz



The Chairman with Girlfriend Jill Bennett