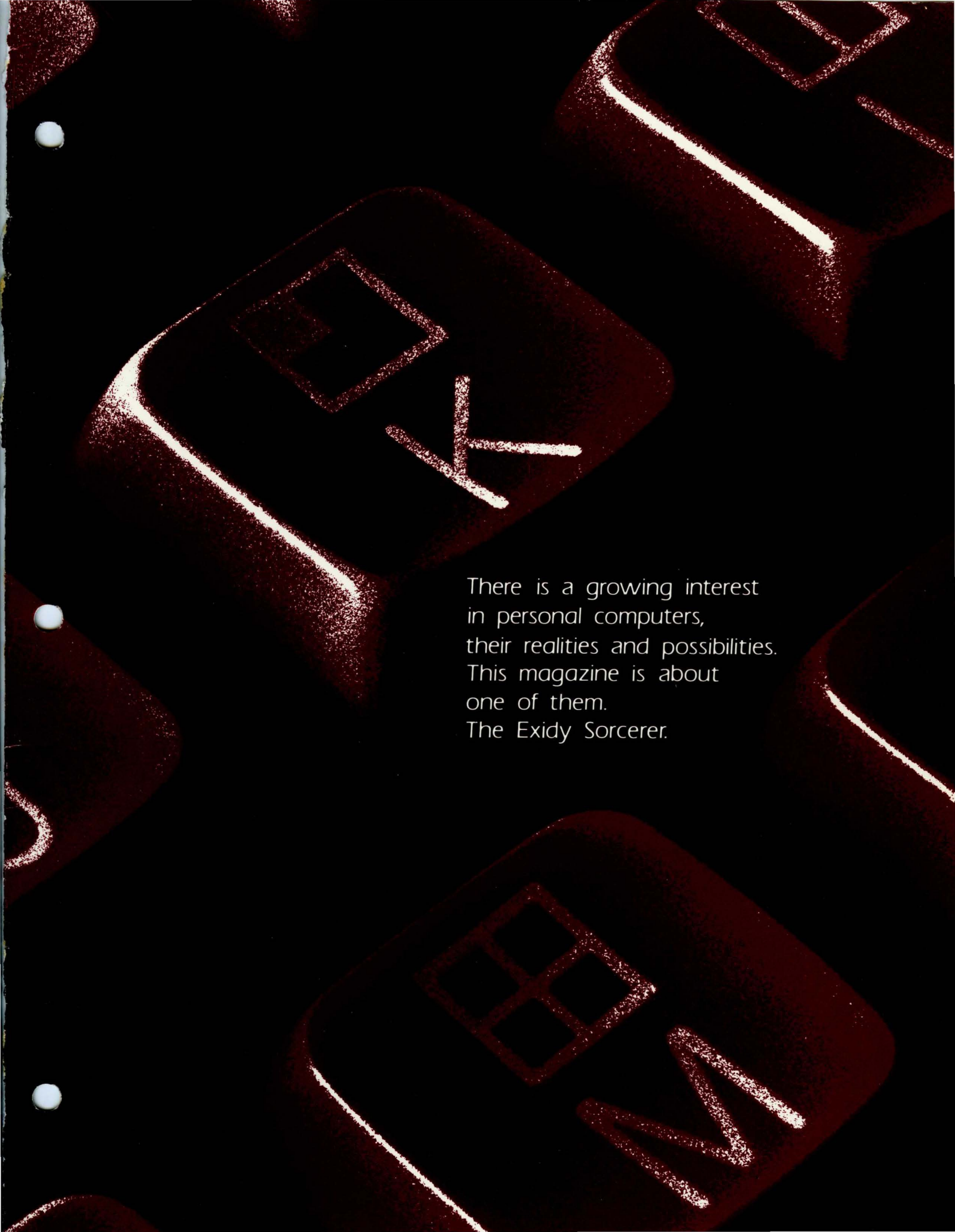
There is a growing interest
in personal computers,
their realities and possibilities.
This magazine is about
one of them.
The Exidy Sorcerer.

Contents

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At the Flip of a Switch,

A laser light picks up information encoded on a can of soup . . . the information is transmitted to a small computer in the store which updates the canned food inventory in a fraction of a second. Inside the hood of an automobile, a miniature processor, smaller than a deck of playing cards, continually monitors the number of miles driven and the amount of gasoline expended . . . at the driver's command, it calculates and flashes a "miles-per-gallon" readout. A digital watch, purchased at the local drug store, operates like a stopwatch and gives the correct time with the push of a button. Computers, from the size of deep freezers to portable typewriters, are confirming airline reservations, diagnosing blood diseases, running assembly lines, calculating bills and receipts, and composing music . . . little "talking" boxes are teaching arithmetic to grade schoolers . . . other little boxes are turning living room television sets into ping-pong boards and hockey rinks . . .

"... the growth of the use of computers is much like that of the telephone a half-century earlier — from government agencies and large corporations to smaller companies, then finally, into the home."

Technological advances in electronics have changed the nature of the communications and computing industries, and in so doing, have brought about changes in every facet of our lives, from the ways we work and shop, to the ways we educate and entertain. The first digital computers weighed tons, took up rooms of space, and consumed enough electrical energy to power small towns. It's no wonder that only governments and the largest of corporations could afford them. Today, tens of thousands of small businesses are using small, personal computers that handle more information and work faster than the biggest of the early computers. Thanks to the innovative spirit of the electronics industry, component parts for computers are getting faster, smaller and so inexpensive that a person can buy a computer with less money than it took to power one in the 1950's.

As with any invention, the component parts of the computer had been in existence for some time, waiting for people to see a need and to put them together. The necessities of government, in particular, the problems of correlating huge masses of census data, and the seemingly impossible task of determining an artillery shell's path before it reached its destination, were the impetus for the development of the modern computer.

With the needs of governments and corporations driving its improvement, the computer got faster, smaller, less expensive to buy and to operate, and much easier to use. Soon, universities and smaller companies were able to use and to afford them. Now, the computer is well within reach of the average family. Thus, the growth of the use of computers is much like that of the telephone a half-century earlier — from government agencies and large corporations to smaller companies, then finally, into the home.

Many small businesses today are finding the computer an indispensable tool in dealing with an increasingly complex and changeable business environment. Governmental regulations are stricter, competition is stiffer, and time a more precious commodity than ever before. Companies, employing from two or three to hundreds of people, use personal computers for help in filing reports and income tax returns, maintaining up-to-the-minute inventories and accounts receivable, and a host of other vital functions. While the cost of just about everything connected with running a business is going up — labor, energy, parts, machinery, research, etc. — the cost of the computer, and the specialized devices working in conjunction with it, are going down. At the same time, the speed and capacity of the computer, as well as its application and ease of use in the solution of real problems is increasing dramatically. The computer is more than a marvel of modern technology, it could very well be that a computer is to problem solving what a jet aircraft is to walking — an enormous magnification of our capabilities.

Although they're often compared, a computer is quite different from a calculator. Let's take a look at some of the differences. A calculator can only perform those functions for which it has keys. If it doesn't have a square root key, for instance, the square root calculation can't be done. Another important distinction is the way in which functions are performed. With a calculator, the sequence of functions is determined by the sequence in which the keys are pressed. The human operator of a calculator must not only press the function keys, but must do so during the solution of the mathematical problem. Thus, human attention to the problem, or operator intervention, is always required.

A computer, on the other hand, is a general purpose device. It's as comfortable with arithmetic functions as it is with lines of poetry. The functions it performs are determined ahead of time and are written into a program. The program then controls the operation of the computer, telling it which function to perform and when. In addition, the program can alter itself, or select different sequences of computer functions, without any human attention.

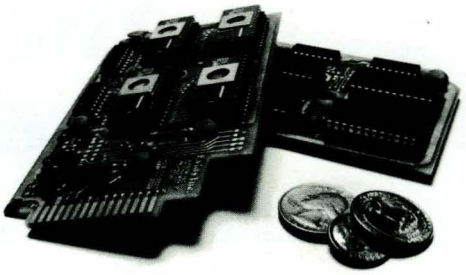
True, there are programmable calculators which can perform a number of mathematical functions with one push of a key. Only a computer, however can be programmed to operate on numbers and words, which brings us to the heart of the difference between computers and calculators. Numbers and words, in fact, anything that can be defined — light or temperature levels, the placement and movement of dancers on a stage, the volume, rhythm and pitch of a musical instrument — can be translated into manageable and understandable form for the computer. And since it can be translated into a language a computer understands, that information can be translated back into a human language.

Although a computer doesn't need a person to continually instruct it as to the functions it's to perform, no computer can operate without a program, and that's where

people come in. For it is people, after all, who write the programs that tell the computer what to do, and when, and how to alter themselves, and under what conditions. A program can leave nothing to chance, for a computer, unlike you and me, cannot accept ambiguity, and can only do exactly as it's told. In all fairness, the computer may be unimaginative, but it does work very fast, tirelessly, and extremely accurately.

A person who writes a program for a computer must know every logical step in the solution of the problem the computer's to solve. The person also has to know where information that is needed for the problem solution is, and in what form the solution should be presented. To illustrate the point further, let's look at a sequence of functions we all perform at least once a year — income taxes.

Even if the income tax forms we use remained the same, year after year, probably the most time-consuming task of all is the series of calculations we must perform. The data we work with, the income figures, the deductions, may change, but that in itself adds little to the drudgery of the calculations. What if the rules for calculating the tax or the refund to be paid were contained in a single algorithm, or formula, and all we had to do was plug the correct information — income, taxes paid, deductions, etc. — into the appropriate places? And what if all the additions, subtractions and multiplications were done for us? This, in a general fashion, is how computers, programs and people work together to solve problems.



"Thanks to the innovative spirit of the electronics industry, component parts for computers are getting faster, smaller and so inexpensive that a person can buy a computer with less money than it took to power one in the 1950's."

The computer performs arithmetical and logical functions according to an algorithm which embodies a particular set of rules. That algorithm is contained in a computer program, which also tells the computer what information is needed, where it is located and how to present the solution. The program was written by a person who understands the logical steps to be taken in solving the particular problem — the rules, and the means for making all of this clear to the computer — a computer language.

Computer languages have undergone a startling transformation in the thirty years they've been in existence. The programs written in the earliest languages were nothing more than long strings of zeroes and ones. The binary notation of zeroes and ones was used because it corresponded to the binary state of the computer's electronic circuitry — circuitry that was either "on" or "off". Although individually simple, thousands or hundreds of thousands of these circuits add up to a rather impressive array of complex functions.

Probably because people had a difficult time remembering what particular sequence of zeroes and ones would result in a particular computer function, symbolic and high-level languages were born. These computer languages were structured more like natural languages. They were easier to remember, to understand, and consequently, easier to use. They were also easier to learn, which means that for the first time computers could be used by people who were not computer professionals.

The use of computers by non-computer professionals, coupled with the productivity of an industry that year after year produces smaller components with greater function at a diminishing cost has resulted in the present boom in personal computing. The small business is looking to the computer as a competitive edge, as a way to make sense of the mass of details that is an integral part of today's business environment. The virtually unlimited power of the computer for problem solving is being tapped by people in their own homes. Personal computers are being used to help around the house ... from keeping financial records and preparing income tax returns, assisting in the preparation of meals, by storing, updating, and retrieving menus and recipes ... to entertaining and educating.

Most personal computer manufacturers and a growing number of independent software firms provide packaged computer programs for a wide range of applications. Many first-time owners of a personal computer begin their computing experience with packaged programs. As their experience grows, they start, tentatively at first, to develop their own programs, using any one of a number of programming languages designed for the beginning programmer. In a very short time, these novice users are as familiar with their computes as most people are with their typewriters.

A mind-boggling collection of equipment that can be plugged into a small personal computer to enhance its usefulness is readily available. Devices for storing information and packaged programs, like tape cassettes and magnetic disks, printers, color television monitors, voice synthesizers, light sensors and motion detectors are but some of the specilized equipment that can be plugged into a moderately-priced personal computer to augment its basic function. And with the addition of extensions to its memory, a personal computer can perform sophisticated functions usually found only in commercial computers costing ten or a hundred times as much.

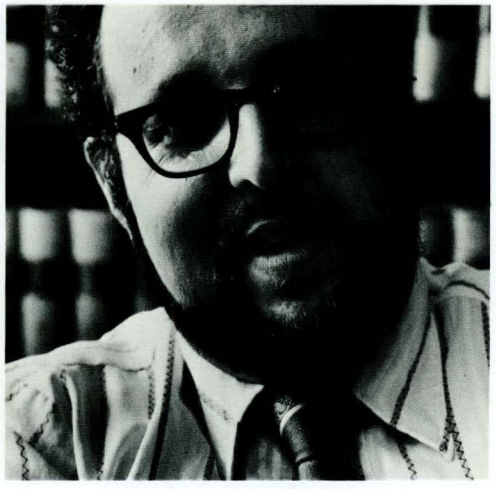
The future promises even more exciting and useful functions and capabilities for the personal computer user. Imagine a computer in your office or home that can provide at your command stock market quotations, current prices of commodities, and abstracts of technical journals. Imagine the same computer helping you maintain a personal diet, looking after the security of your home, and entertaining and educating young and old with games of knowledge, skill, chance and dexterity. These are not dreams for the future, but current realities ... realities within our reach, at the flip of a switch.

"... it could very well be that a computer is to problem solving what a jet aircraft is to walking — an enormous magnification of our capabilities."

The Defense Rests . . .

or at least takes it a little easier, thanks to the Exidy Sorcerer

Kyriakis and Guralnick is a law firm located in Daly City, California, just south of San Francisco. As their clientele grew, the partners were faced with a common problem among modern small businesses: mounting paperwork was beginning to impact productivity and tax their human and mechanical resources. In the following interview, one of the partners, Steven Guralnick, an attorney since 1963, tells how the firm solved this problem by installing a word processing system powered by an Exidy Sorcerer.



"The computer could be housed in a box made of shredded lettuce; I really wanted to know what the software could do."

Exidy: Tell me about your situation and how you became interested in buying a word processing system?

Mr. Guralnick: We're a commercial law office, a general practice firm with two lawyers and one hard working secretary. We were getting increasingly involved in jobs that entail a lot of paperwork: contracts, leases, wills and the like. They require laborious typing and great attention to detail. Multiple drafts — a necessary evil in legal work — were giving us a particularly bad time. The secretary was out there for hours, typing the same document over and over.

We tried using an outside word processing firm, but when you send a job out, you lose control over it. And you can't afford to lose control in our business; one scrivener's error — or typo — and you're looking at a potential malpractice action. For instance, the outside firm once changed an "or" to "of" in a will. It altered the whole meaning of the paragraph, and, as a result, we had to redo something like eight wills. I can assure you it was no fun going back through our files, recalling the wills and correcting the clauses.

What really convinced us to get our own word processing system was one particular experience we had. A woman came in and wanted us to draw up a trust will — one of those complex and lengthy jobs. A repeated name in the will was like "McPherson," so we typed out an eight- or nine-page will for her, including a few drafts. She called up a few days before she was due to come in and said, "Oh, by the way, I just noticed that there's an error in this thing." The error? The name was "MacPherson," not "McPherson." Well, you can't slip an "a" in there and make it look like anything, so out of the eight or nine pages we had prepared, we had to tear up six of them. I recall very vividly that this occurred at a time when we were extremely busy and a lot of other things had to be put aside to get the job done. I said, "That's enough. We're going to find ourselves a word processor," and we started the "Great Hunt," as I'm fond of calling it.

Exidy: How did you arrive at the decision to go with a personal computer?

Mr. Guralnick: A big factor was the cost. You see, I first got curious about word processing systems about five years ago, but it seemed like you couldn't get your hands on anything for under 10 or 20 thousand dollars. And frankly, that was a bit discouraging. However, since then, I found that the technology had changed dramatically, and that it would now be possible to set up a complete system for a fraction of the former cost. It was clear that a microprocessor was the way to go.

I started looking over various magazines on the industry, and I went to Radio Shack and played with one of their microprocessors. I was also fortunate to have a friend who had bought one of the early Exidy units, and he was very pleased with it, so I had a chance to sit down and get familiar with his machine for a few evenings. It took me over a year to find the system we wanted, but because of that one little episode with the "MacPherson clan," I was determined.

Exidy: What finally settled you on the Sorcerer?

Mr. Guralnick: In a sense, I approached the problem of finding the right machine from a strange angle. It was never a question of looking for a system; it was a search for the right software. The computer could be housed in a box made of shredded lettuce; I really wanted to know what the software could do. The program had to be able to perform the jobs we needed, and do them precisely to our specifications. So I rejected software left and right, and, in most cases, I never even got down to considering the hardware. After all, there's no point looking at this pretty box if the software was not for us.

Once I became aware of the Sorcerer's word processing software, that was the end of the ballgame. And as far as I'm concerned, short of some of the monsters they use for the newspapers, nobody has a better word processor.

Exidy: Did you have any previous experience with computers?

Mr. Guralnick: No, absolutely none. I had a good math background, but the only experience I had with computers was working with my HP97, which is a sophisticated table model calculator. I had done very well with that, so I had some sense of how to run a program. But until I sat down and started to play with a microprocessor, I didn't know one end of a computer from the other.

Exidy: You refer to the Sorcerer as a word processing unit, but it has many other business and home applications. Do you use it for any other purposes?

Mr. Guralnick: Well, I sometimes write a few BASIC programs when I have some free time at lunch, but we bought it primarily as a word processor, and that's all we really use it for right now. There's no question in my mind that the Sorcerer can be made to run very sophisticated financial programs, but we haven't used it in that capacity yet.

Exidy: All right, as a word processor, what are the features of the system that you find particularly valuable? It seems that accuracy is very important to you. Do you find the system reliable?

Mr. Guralnick: Yes, it's totally consistent: I'm very impressed with its integrity.

It may help if I briefly explain one of the ways we use the system. We have binders of standardized texts — wills, contracts, etc. — that have to be modified for individual clients. When we put a document together, we load the appropriate standardized text into the machine from the cassette on which it's stored. We then edit the text to suit the client's needs, deleting the sections that don't apply, adding information that does. When it comes out on the printer, it's exactly as the client wanted it.

Now, as I mentioned before, a lot of the documents we compile are quite lengthy and intricate. They originally required a lot of time to type and carefully review. When I receive the printout, I have to ask, "Can I skip over the standard language and just read the customized sections?" I might read it once, but if I have

to read the second, third and fourth versions to check for typos, it's of no value to me.

Exidy: So the consistency of the system becomes very critical?

Mr. Guralnick: Absolutely, we have not yet had one problem that I can attribut to the word processor.

I will confess that you sometimes hold your breath just a bit when you're running out a 25-page document and all you do is check the changes on page 23 and sign it. You get a little nervous. But, and this is the point, you're not so nervous that you would sit there and do no more than quickly scan the other 24 pages.

That brings me to another important consideration. The reliability of the machine is very important because it lets you save so much time. You can turn out a job overnight and not bring the whole office crashing down. The savings of time and labor it affords is definitely another great benefit of the system.

Exidy: As long as we're talking about time and labor, what about the amount of time you had to invest to train your secretary? Were there any problems?

Mr. Guralnick: We had no problems whatsoever. I would say that all it takes is a good typist and a few hours to spend on training.

Now, I don't want to make it seem like the system is shallow and superficial, and there's nothing to learn. On the contrary, there's a great deal to learn. But the program and machine are laid out so beautifully, it's really quite an easy matter to teach someone to use it.

For instance, virtually all the other word processors I looked at require dual key operation. The Sorcerer is different; it's literally a one-finger operation. Utilizing the numeric pad on the right-hand side of the keyboard is a stroke of genius. All you have to do is learn what those ten keys do and you can operate the entire editing system.

Also, in the command mode, if you want to find memory, you type "m." If you want to delete something, you hit "d." If you want to go to the end of the file, you type "e." And so on. If you have half a wit about you, you can remember which key to push for what, because the way the system was constructed, everything ties logically to the keyboard.

Exidy: Even though the system is relatively inexpensive, as you said, we're still talking about a few thousand dollars. Since you use the machine almost exclusively as a word processor, has it been worth the money?

Mr. Guralnick: Yes, absolutely, That machine goes on at 8:30 in the morning and doesn't shut off until 5:30 at night, Monday through Friday. And that's not counting the time spent on weekends when we get behind.

Exidy: You seem very positive about the machine. Can you honestly say that it has helped your business?

"That machine goes on at 8:30 in the morning and doesn't shut off until 5:30 at night . . ."

Mr. Guralnick: Well, aside from the obvious benefits, we are now in the posiion of accepting more business than we ever could before.

It's also helped us save money. Before we set up this system, we were at the point of hiring another secretary. And do you know what it costs to bring in a secretary, even a part-time one? The first thing you have to do is find the physical room. This whole system sits on a six-foot table. Good luck in putting a secretary in a six-foot space. And for what a part-time secretary costs for a year, I could buy two of these systems.

Look, let me give you an example of one of the times when the system's been worth its weight in gold.

A client came in and said that he wanted to purchase, and make an exchange of some property. On Friday morning, we prepared the first draft, and the client came by that afternoon, picked it up and said he'd read it that weekend. On Monday morning he called and said that he'd come by at one o'clock to go over the deal. I don't know why, but my sixth sense told me to load the contract into the computer before he even got here. Well, one o'clock rolls around, then three, and at three-thirty, the door flies open and our client marches in with all the people from both sides — I think there were about five of them — and they all had copies of the draft we drew up on Friday. We sat around the table and they picked at it for about half an hour. By this time, everybody's getting a little edgy because it's four o'clock and the deal was supposed to be closed that day. Now, with the former arrangement we had, this would have been almost impossible because the changes that were required would have meant about four hours of typing. We would have been there until eight or nine that night.

But we had the Sorcerer, so I told them to have a slow cup of coffee, went to the computer, and twenty minutes later, they had a fresh contract in their hands. They read it and signed it on the spot. Our client was ecstatic; he had his deal.

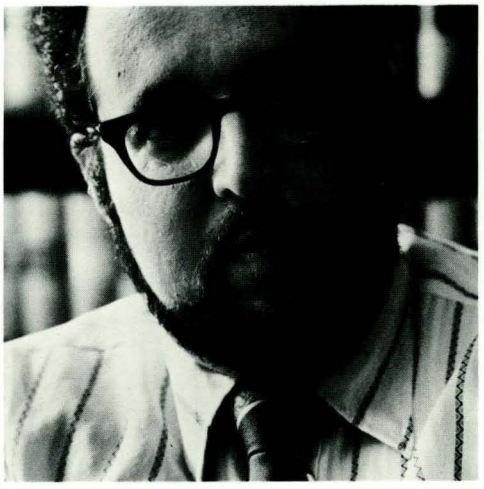
Exidy: Okay. Here's the final test. What if someone were to walk in and take your machine away?

Mr. Guralnick: I'd go right out and buy another one.

I'm sure there are fancier, much more expensive systems that would be just as efficient, but they also require a lot of fancy labor. You just don't hire a secretary to run one of those machines; you need a computer operator.

Dollar for dollar, for the reliability and capabilities of this system, you simply can't beat it.

"If you have half a wit about you, you can remember which key to push for what, because the way the system was constructed, everything ties logically to the keyboard."



". . . until I sat down and started to play with a microprocessor, I didn't know one end of a computer from the other."

Bullish on Computers

"Capital Gains" "Productivity"

"Cost Effectiveness" "Equipment Expenditure"

"Inventory Control"

"Enter the microprocessor . . . it can act as a tax consultant, a productivity swami, a typewriter that corrects itself, and a two hundred pound file cabinet and it's just about the size of a breadbox."

These are a few words being bandied about in business circles these days, almost as if spoken in homage to an unknown religious leader. That guiding star of the business world is referred to as "Profit", and all the rigamaroll the business world puts itself through boils down to a few more percentage points. What is it? It's a company's measure of success; how well it fared against the competition. It is why Wall Street exists, and, in essence, it is what feeds everything from Fido to France.

Somewhere, underneath it all, there usually resides a computer. It sits there, people ask questions, and it obliges.

It all seems rather straight forward, except for one thing. As the questions get more complex, so do the computers. They sprawl out over computer rooms, sometimes acres square, until a simple question like "what is our inventory of office equipment?" isn't so simple anymore.

Enter the microprocessor. It is the consumate tool for the individual. It can keep track of incredible amounts of information, and will give it back transformed with very little effort on the part of the operator. It can act as a tax consultant, a productivity swami, a typewriter that corrects itself, and a two hundred pound file cabinet and it's just about the size of a breadbox.

It's no wonder they call this personable little wonder a personal computer. Originally designed to give small business a big hand, it soon found its way into the hip pockets of productivity wizards as a cure for some of those down-to-earth problems that keep small business, well, small.

It can keep track of inventory that comes and goes, and, at night, it can even keep track of some who might want your inventory gone. It can write a check for your prize employees, while keeping track of Uncle Sam's appetite. It can give that personal touch to those 1200 letters you sent without having to personally touch them. It can show you where you've been and suggest where to go from there. The bottom line is this: a personal computer provides business people with information, quickly, conveniently and at a reasonable cost. And if used wisely, gives business the edge on profit.

From hardware to hospitals, the Sorcerer has an impressive list of success stories. Here is a sampling.

Credit customers present a unique set of circumstances to the small business. While highly valued for their continued patronage, these customers necessitate the monthly billing process that is, in fact, the most labor-intensive part of a store's accounting procedures. Such is the case of the Borego Hardware Company in Borego Springs, California. The owners of this family-run store were faced with keeping track of their customers' credit purchases, many of which are small items that are particularly difficult to deal with when billing time rolls around. The solution turned out to be a basic Sorcerer System that consists of two cassette units, a printer, video monitor and, of course, the Sorcerer Computer. The system software consisted of a custom-written program that could take into account any situation that could arise in the hardware store. The computer records account numbers, names, addresses and all account activity since the last billing. When it comes time to send out a new bill, current information is entered and tabulated with

existing records to create a new account status. The new invoice is then printed directly from the computer records. It seems the only thing the system can't do is lick the stamps. The owners of the Borego Hardware Company estimate they've cut their billing time by two thirds. That leaves plenty of time for the real nuts and bolts of the business.

Top Inc. had a different idea for the Sorcerer. In fact, about eighty of them. The firm is placing them in credit unions all around the Troy, Michigan area to do calculations on loans and insurance on loans. Due to government regulations in these areas, procedures for calculating loans have become extremely complex. Right in its element, Sorcerers took a tremendous load off workers who previously had only the help of a calculator. The heart of the system is the 32K Sorcerer with special programming. That programming resides in a 16K EPROM PAC that plugs right into the side of the machine. This special firmware allows the sophisticated program essential to this type of operation to run in the Sorcerer without occupying valuable RAM memory.

The beauty of this system is that the loan can be calculated several ways with a minimum amount of effort on the loan officer's part. That's an added level of service rarely afforded to credit unions without computers or those on a costly timeshare system.

At an estimated minimum savings of twenty minutes per loan, it's no wonder that (at last count) eighty Sorcerers have found homes in the Troy, Michigan area.

It's only right that the oldest savings bank in the United States employs the newest techniques in banking procedures. After all, you don't stay in business for 240 years by

"... it can give that personal touch to those 1200 letters you sent without having to personally touch them."

falling behind the times. At least, that's the story behind Philadelphia Savings Fund Society (P.S.F.S.), started in 1740, who finds Sorcerer one of the newest tools to help make banking a smooth operation.

Among the myriad decisions a bank's branch manager must make is the physical layout of the branch itself. It seems like a simple enough thing to devise, but if you think about it, the location of windows and machines in the bank can make a big difference. If it is found that customers are spending too much time at window 12 and very little at window 2, it may be because there is a vital machine placed near window 2 and the teller at 12 spends half their time walking across the bank. A Sorcerer and some creative programming help give a branch manager second-by-second information on the teller's performance under a variety of conditions. This same information can help a bank anticipate rush periods, rather than wait for a long line to form and pull a teller off another job to help out.

When the Sorcerer isn't keeping an eye on the bank, it has another big job: making IRA and Keogh Accounts as easy as pressing a button for both banker and customer. Sorcerer is responsible for storing data, printing all the appropriate forms, making the required calculations and then interfacing with the bank's central computer to let it know what transaction is taking place. By themselves, these jobs can be quite a chore, but Sorcerer handles them in style.

Sorcerer's future at P.S.F.S. is also promising. The bank has plans to use the machine as the heart of a "personal financial planning center" to further expand their customer services. The system will be able to plan savings accounts for a college education, or give advice on whether to buy a new house or fix up the old one. The beauty of the versatile programming involved is that the parameters can be radically altered to get new results ... instantly. Suppose a customer is expecting a raise in the near future; the planning center can suggest what to do with the extra money. If a layoff seems more likely, Sorcerer can tell how long your savings will last. Eventually, the "personal financial planning center" will be entirely customer-operated, but that welcome innovation will take some time.

The University of Pennsylvania Medical Center has something in common with P.S.F.S.; besides being over 100 years old, that is. That's right, Sorcerer computers. They've employed about half a dozen to do a variety of jobs around the hospital. Not the least of which is the mountain of paperwork that can be found around any modern hospital.

"Rather than resisting this technology, the staff has even taken to playing computer games during coffee breaks."

The Sorcerer's formidable word processing capabilities have cut the task down to an easily managed system. The secretaries like the feel of the keyboard and the way each key can be redefined to represent specialized hospital terminology. Rather than resisting this onslaught of technology, the staff has even taken to playing computer games during coffee breaks. When Sorcerer isn't turning out documents, it doubles as an excellent remote terminal to the hospital's main computer. Data can be retrieved from the latter machine, and processed locally within the Sorcerer so as not to tie up expensive computer time with jobs that can just as easily be done by a microprocessor.

Also of great value to the hospital is the way Sorcerer can work hand-in-hand with existing laboratory equipment through the S-100 family of compatible interfaces. There is even talk in the air of using Sorcerer to analyze electro-cardiogram data.

From all these varied applications it is evident that the Sorcerer has cured a lot of "headaches" around the medical center.

"... the monthly billing process is, in fact, the most labor-intensive part of a store's accounting procedures."

Computing: Sorcerer-Style

Every computer, from a desk-top personal computer costing less than $1000, to one costing millions or more, operates in essentially the same way. And although they may differ drastically in appearance, every computer has input and output devices, a central processing unit or CPU, memory, and programming. Most also have peripheral storage devices, or at least, the capability to use them.

Input devices are the eyes and ears of the computer. Through them the computer is instructed to perform various functions on data. A typewriter-like keyboard is the most common input device for personal computers. The Sorcerer's keyboard, designed for beginner as well as the data processing professional, consists of 63 keys of upper and lower case, and graphic characters, and a 16 key numeric pad, for rapid information entry or inquiry. Since the keyboard style is familiar to most typists, information entry or retrieval is as easy as typing a letter.

"A Computer's programming is ultimately what makes the machine useful to people. Without it, a computer is nothing more than a collection of wires and circuits."

The keyboard has a graphic key and unique graphic symbols engraved on the keytops for use in the same manner as shifting for uppercase on any typewriter. By depressing the graphic and shift lock keys you may use the graphic symbols as you would text and create any image you wish. User-defined graphic symbols allow you to create symbols or geometric forms, including a "foreign language" of computer-generated symbols. The Sorcerer keyboard can generate a total of 256 characters. 128 are predefined, while the other 128 are programmable, which means that you can define them yourself.

Output devices are what the computer uses to communicate with the user. In addition, any information the user enters into the computer in the way of instructions or data is displayed on this device. Sorcerer's standard output device is a 12" high-resolution television monitor.

With 64 characters per line and 30 lines per screen, Sorcerer puts more information on the output monitor than any other personal computer. That means that at any one time there is room on the screen for 1920 characters, or about a full page of double-spaced typing. The Sorcerer also provides for the attachment of a hard copy printer as an optional output device.

The CPU monitors and controls the functions of the computer. It receives input information and data, performs operations on the data in accordance with its programming, and displays the output information. The heart of the Sorcerer's CPU is the Z80 microprocessor, one of the fastest and most advanced circuit "chips" in use today. The Sorcerer CPU is entirely contained within the keyboard enclosure.

Random-access memory (or RAM), also contained within the computer, is used to hold the programming that is directing the computer's operations, as well as the data on which the operations are being performed. The information in this memory can be instantly read or changed and retained as long as the computer is powered on. Memory capacities are generally stated in terms of thousands of bytes. A byte, 8 binary digits or bits, is required to express and to store a single alphanumeric character.

The Sorcerer comes in three random-access memory variations: 16K (or 16,000 bytes), 32K and 48K. A 16K computer can hold on the order of 16,000 characters in RAM. Expansion and growth capabilities are built into Sorcerer. Memory expansion units, containing component parts and instructions, are available to expand memory within the computer enclosure up to 48K.

A unique feature of the Sorcerer computer is the read-only memory cartridge, or ROM PAC. Read-only memory differs from random-access memory in that its contents

"The heart of the Sorcerer's CPU is the Z-80 microprocessor, one of the fastest and most advanced circuit 'chips' in use today."

cannot be changed, nor can it be erased in the event of a power failure. ROM PACs look and feel like 8-track cartridges, but they contain programs (on a printed circuit board rather than tape) to allow you to get maximum use of Sorcerer while saving on random-access memory.

A computer's programming is ultimately what makes the machine useful to people. Without it, a computer is nothing more than a collection of wires and circuits. One way to distinguish among the various kinds of programming is to look at the way in which they are stored.

The most basic kind of program is the type which is permanently "wired" into the basic circuitry, or hardware, of the computer. This type of programming, commonly called firmware, controls the intimate functions of the hardware, and generally, controls the operations of other types of programming which are introduced into the computer. The Sorcerer's monitor program is of this type. It resides in 4K of read-only memory, and is always present in the computer. When the Sorcerer's power is turned on, the monitor program goes into operation and provides keyboard control.

A second kind of program, also firmware, is contained on ROM PACs, When a ROM PAC is inserted into the Sorcerer it becomes part of the computer's read-only memory, the program imprinted in the ROM PAC cartridge becomes accessible to the CPU. Several standard programs are available on Sorcerer ROM PACs.

The Standard BASIC PAC contains all of the necessary programming for the BASIC computer programming language. Virtually all of the communication with the Sorcerer is through this language. BASIC was chosen because it is a conversational interactive language that is easily learned and useful in a wide range of applications.

The Word Processor PAC is a text editing and formatting system for business and home. Some of its many features include: indentation, right justification, line width and line-to-line spacing, proportional letter spacing, multiple column printing, and boldface printing.

The Development PAC is an advanced programming development system for users who wish to write extensive Assembler language programs.

The EPROM PAC is designed for users who want their own programming in a ROM PAC cartridge. Up to 16K of read-only memory is available.

Finally, a third type of programming, usually called application software, resides in the computer's random-access memory during its operation. It can be loaded into the computer through the typewriter keyboard or, in the case of a packaged, ready-to-run program, loaded from a peripheral storage device. A number of these packaged, ready-to-run programs are available for use in the Sorcerer.

Peripheral storage devices are used with most computers to enlarge the storage capacity of the computer system. Usually, the information contained in peripheral storage is needed only occasionally. When it is needed, the information is loaded into the computer's random-access memory from cassette tape or magnetic disk. Computer programs are most commonly kept in peripheral storage.

The basic Sorcerer computer is designed to handle two cassette players and a magnetic disk unit as peripheral storage devices. A standard cassette player attached to the Sorcerer can transfer information into and out of the computer at 300 or 1200 baud (about 120 characters per second).

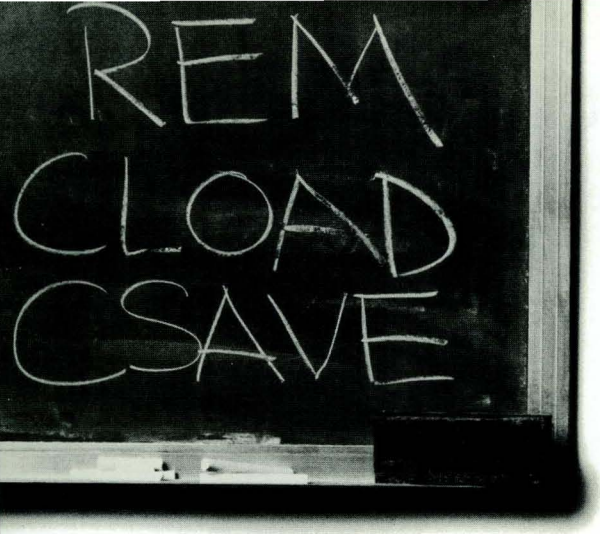
Exidy provides a combination monitor and magnetic disk unit. The disk unit contains two 5¼" magnetic diskettes with a total storage capacity of 630K bytes.

With the Exidy S-100 Expansion Unit the Sorcerer computer can become the center of an entire computing network. The Expansion Unit not only allows additional output and peripheral storage devices to be connected to the Sorcerer, but exotic music and speech synthesizers, analog input devices, and other Sorcerer computers as well.

As we have seen, the wide variety of its applications and the flexibility afforded by its compatible attachments lend the Sorcerer a unique versatility, making it a personal computer you can begin with and grow with.

"... at any one time there is room on the screen for 1920 characters, or about a full page of double-spaced typing."

"Since the keyboard style is familiar to most typists, information entry or retrieval is as easy as typing a letter."



Programmed for Learning

The minute you enter the room, you sense that something very important is taking place. The class is divided into two groups of students, earnestly conversing in tones that range from even and rational to harsh and insistent.

"No, I don't think we should stress your political affiliation — the Republicans haven't seen the inside of the White House for 16 years."

"Look, Joe, listen to your campaign manager. She's studied the polls, and you've got to take a hard line on inflation."

Judging by the ages of the speakers, they should be talking about a high school class election, but words like "Republicans," "White House," and "inflation" suggest that the scope of this particular election is much larger than your average secondary school. A further investigation reveals that one of the students believes he's Harry S. Truman, and one of the others thinks she's Thomas E. Dewey. "Harry" is going around saying "damn" a lot, while "Thomas" exudes a quiet confidence, and both are infuriating their respective packs of advisors, campaign workers and speech writers.

These students are engaged in an unusual classroom exercise, one of the educational programs developed to add a realistic, and memorable, dimension to learning. With the aid of a literate instruction booklet, an easy-to-operate program, and a microprocessor, they will re-enact one of the major American Presidential races. The students have assumed the roles of assorted political functionaries and determined their initial campaign strategies. By feeding variables into the computer, they can gauge the success of their efforts as the contest progresses, and project what the election results might have been if the historical candidates had played it their way. The simulation allows the students to "participate" in the electoral process, giving them a unique understanding of the complex issues and emotions involved in this important aspect of government.

Having a computer in school once only meant that the computer studies program was up to snuff, but now, educational programs run the gamut from elementary spelling to advanced chemistry. Varying degrees of complexity, both in the subject matter and the input required, allow students of all ages and intellects to be challenged. For example, a first grader's math program may only ask for a letter representing the correct answer to be entered, while a college-level physics simulation might require the user to plug in a sophisticated and lengthy string of variables. As in biology and chemistry labs, by making learning a tactile, as well as an intellectual, process, computer-aided instruction requires another level of involvement on the part of the student, and when a student is involved, it can only enhance the value of the educational experience. Through this hands-on interaction and by permitting them to work at their own pace, students from kindergarten to college can get the type of individual attention often lacking in overcrowded schools. A lack of pertinent software and the high cost of equipment had hindered the introduction of computers into general education classes, but, as the election exercise described earlier demonstrates, some imaginative and engrossing programs are now being produced, and the low price of microprocessors has put computing in the range of most school budgets.

"Having a computer in school once only meant that the computer studies program was up to snuff . . ."

". . . computer-aided instruction requires another level of involvement on the part of the student, and when a student is involved, it can only enhance the value of the educational experience."

However, as affordable as microprocessors may be, educators often have a difficult time selling the initial investment to the people who dole out the school's funds, and some enterprising computer advocates have helped justify this expense by making the machines earn their keep by performing administrative tasks. For example, students at Alhambra High School in Martinez, California, wrote a program that allowed the results of the state-mandated physical performance test to be compiled at a fraction of the previous year's cost. The students developed a system to score the tests by entering the information on cards and feeding them into the school's microprocessors. The experience gave the students a chance to gain a working knowledge of computers in a "real life" situation, and the school saved almost $5,000.

Of course, if educators had a mind to, they could use the school's microprocessors for a variety of filing, word processing, and tabulating functions, but those are really just incidental sidelights of the value computers have in an academic setting. As one teacher at Alhambra commented, "The potential is for more personalized education due to the ability of computers to tailor programs to individual students. We started using our machines strictly in computer science classes, but we gradually realized their usefulness in other courses, such as physics and political science." In fact, the simulation described in the beginning of this article is from Alhambra High.

We are still a long way from witnessing computer-assisted learning in most general education classrooms. Cost, limited availability of useful programs, the uniqueness of the concept — all the objections that were originally raised to discourage the use of computers in schools are still valid to some extent. These factors guarantee that, right now, facilities that employ microprocessors as learning aids are the exception. But there are already enough exciting, successful examples to intimate that, rather than proving the rule, these exceptions are a hopeful prelude of things to come.

At Home in the Lab

Computers were born in the laboratory, and it is there that they find the greatest challenges to their abilities. The requirements of the lab, while often paralleling those of business, require extreme levels of precision. Whether used to channel information to other equipment, or to gather data for processing, the computer must be precise to a degree rarely demanded by other, nonclinical, applications.

One of the crucial requirements of a lab computer is repeatability. In order for a lab operation to be of any value, it must be able to be repeated a great number of times today, tomorrow, next week or next year — in exactly the same way it was done originally. In the case of a diagnostic medical lab, this factor of repeatability can be literally a matter of life and death.

Many times, a computer is asked to receive or create data at speeds far beyond the abilities of human or mechanical means. A computer functions on the order of microseconds (millionths of a second). In fact, it is quite easy for a computer to generate hundreds of completely different signals in less time than it takes to blink. This quality of computers is especially valuable when using them as data acquisition devices. Sampling rates can be so high that small portions of the information received can be analyzed with the same precision as the collective data.

"Many times, a computer is asked to receive or create data at speeds far beyond the abilities of human or mechanical means. A computer functions on the order of microseconds."

To the scientists who use these machines a computer's untiring quest for accuracy is probably its most valuable feature. If instructed to do so a microprocessor will calculate the value of "PI" until it runs out of space to store the answer, or is made to stop. The very nature of digital equipment is inherently accurate. A ten dollar calculator is more precise than its more expensive, antiquated ancestor (a slide rule) of professional quality was ever expected to be. It is this type of "digital" accuracy that has allowed scientists to delve deeper into questions than ever conceived possible.

In the not so distant past, computers were prohibitively expensive for all but the largest of scientific facilities. Microprocessors have changed all that; for less than most of the mechanized equipment found in a lab, a fully operational computer system can now be acquired. One of the most functional of these micros is the Sorcerer, which performs as naturally for the research scientist as it does for the ten-year-old child playing computer ping-pong. Many of the features found in a Sorcerer are particularly useful for scientific applications because they allow complete communication between the user and any peripheral devices that may be attached. The "doorways" that allow input and output of information through the Sorcerer include parallel and serial ports, cassette drive jacks, and S100 and RS232 interfaces. Almost any peripheral device can be attached through one or more of these. And, because of the unique versatility of the machine, programming and programming languages come to Sorcerer as easily as plugging in the appropriate ROM PAC cartridge.

It is through this last feature that Exidy engineers and programmers devised the Development PAC. This software package contains everything necessary to write and execute extensive programs in Z80 Assembler Language. The advantages assembler language provide over other languages, such as BASIC, are particularly attractive for scientific applications. Assembler langauge takes up less memory and runs faster than other non-machine languages, and provides closer control of the Z80 processor itself. Perhaps the most useful feature of the Development PAC is the way it allows the user to "construct" a program. Rather than writing an entire program, small portions or modules are written for a singular purpose. These modules can then be individually debugged, using the built-in DDT80 (Designers Debuging Tool). From a library of object modules, an extensive program can be compiled to fit the specific needs of the application. These modules can also be juggled and shifted as if they were building blocks. Another feature for easy manipulation of object modules is the Relocating Linking Loader. Through this mode, object modules can be loaded from tape or RAM buffers to resolve any junction conflicts that may occur between modules.

"... because of the unique versatility of the machine, programming languages come to Sorcerer as easily as plugging in the appropriate ROM PAC cartridge."

All of this programming activity is controlled directly through Sorcerer's keyboard by switching between the specific software command modules required to carry out a particular task. While this type of flexibility usually requires elaborate language switching techniques, the Development PAC integrates all features into one compact, plug-in cartridge.

Sorcerer also provides many other features useful to scientific applications, such as the ability to redefine keys and create custom symbols. These graphic capabilities make extremely precise charts and graphs possible. In the final analysis the one feature of the Sorcerer that most effectively recommends it as the ideal scientific computer is its versatility. This easy adaptability makes the answer only a short step away from the question itself.

The Exidy Sorcerer: A Very Personal Computer

"Your computer can prove to be a formidable chess, checkers, or backgammon player. It will deal you a mean hand of blackjack and simulate a no fuss, no muss pie throwing contest between you and a close friend."

Bold headlines in magazines and newspapers have long since announced that the age of personal computing is here — or is coming, or might be here soon, depending on how much caution the various publications like to exercise. No matter how far you might think we are from a chicken in every pot, a car in every garage, and a computer in every home, we have undeniably witnessed a great change in the way the public views computers, and their role, during the last quarter century. With the advent and proliferation of microprocessors, computers have become more personalized and accessible, no longer seen as the sinister weapon of big business and government or the ambitious, plotting Hal of **2001**. Microprocessors, with their modest proportions and familiar typewriter keyboard, have knocked computers down to size and revealed them as the helpful tools they are.

Many home applications for personal computers still lie in the future, but if the development of this area continues at the frenetic pace of the computer industry as a whole, tomorrow will be here very shortly. In the meantime, there's quite a few practical or entertaining functions your Sorcerer can perform right now.

First, but not necessarily foremost, home computers can be a lot of fun. Just running a computer — entering data, having the box respond, getting the desired results — can provide endless entertainment for the gadget-oriented. For the rest, there is an impressive array of inexpensive, prepackaged programs designed to suit the gaming interests of almost everyone. Your computer can prove to be a formidable chess, checkers, or backgammon player. It will deal you a mean hand of blackjack (without robbing you of your life's savings) and simulate a no fuss, no muss pie-throwing contest between you and a close friend. And, for those who still associate computing solely with cold, number-crunching activities, the Sorcerer will show, once and for all, that it can unlock a fantasy world of adventures in space, underground, or in a pirate's kingdom. Many of these games take advantage of the Sorcerer's exceptional graphic capabilities; all utilize the user's imagination and logic.

"No matter how far you might think we are from a chicken in every pot, a car in every garage, and a computer in every home, we have undeniably witnessed a great change in the way the public views computers . . ."

But a personal computer belongs in the den as well as the office for a variety of other, less playful reasons. A Sorcerer can balance your checkbook, figure out your taxes, plan

menus (and supply you with the nutritional information for each repast), keep your appointment calendar and remind you of Aunt Bessie's birthday. It can help you budget your money and painlessly convert to the metric system. You can use your computer to control your appliances, activate a security system, and guide you through a weight-loss program. Software firms and individual users are constantly expanding the horizons of the home computer, discovering new applications so imaginative and seemingly so far afield from the original intentions behind computers that they test our credulity. We are left to ask, "Can that little box really do that?"

For example, you can subscribe to any number of database networks that contain stores of information as specialized or general as your interests. The networks, which were previously available only to businesses, team up the Sorcerer, a telephone, and an acoustic coupler, a device which allows your microprocessor to communicate with other computers. Any time of the day or night, for as little as 4½ cents a minute, you now have access to such wire services as United Press International, and can review the latest stories that interest you. Say you're concerned about the oil situation and you'd like some up-to-the-minute information about it. You enter a key word (oil), and the computer will list all the recent stories that have appeared on this topic over the wires. You survey the index and decide that story number 7, "Oil Prices Rise Ever Upward," sounds interesting, and you ask the machine to display that particular story. Voila ... well, don't blame the machine for bad news. You can also immediately receive constantly updated reports for over 3,500 stocks, and search through The New York Times Consumer Data Bank, that hallowed storehouse of information past and present. Another unique feature is the "Electronic Mail Box." You can send messages instantly to one or all fellow subscribers as well as retrieve any messages that were left for you. Of course, all this activity can be conveniently billed to one of your major credit card accounts.

While such home applications are keeping Mommy and Daddy occupied, we can't overlook the children. Parents and teachers everywhere are discovering the amazing interest in, and proclivity for computers these little people have. Personal computers are natural teachers; their programs instruct children in such subjects as math, foreign languages, and geography, while allowing them to develop at their own pace and participate in the learning process by interacting (or "playing," as they're more likely to put it) with the machine. The graphic capacity of microprocessors such as the Sorcerer enables the child to be entertained by amusing images while learning, as was demonstrated by one user who recently developed a program that turned his computer into a personalized alphabet picture book. His 2½-year-old neighbor took great delight in pushing a key for one of the letters in the alphabet and seeing a picture of some object beginning with that letter "magically" appear on the screen. For instance, the child presses "h" and a horse frolics on the screen, "b" and a bear shows a toothy grin. As a special-added bonus, each computer comes equipped with an inexhaustible supply of patience that might well be the envy of parents everywhere. Your Sorcerer will tolerate endless exploratory fumbling, and even the most rambunctious youngsters cannot hurt the machine with "creative" keyboard manipulations.

Education. Personal finances. Games. Health. The role of the computer in the home is only limited by the resourcefulness of the people who use the machines and design the programs to run them. And with the way things are going, that's no limitation at all.

"Just running a computer — entering data, having the box respond, getting the desired results — can provide endless entertainment for the gadget-oriented."

"I have found a number of ways to control the motors of my cassette drives . . ."

"Now for those rumors I promised. Exidy has not verified these, but I believe my sources to be reliable enough . . ."

". . . One New Expansion Box for sale . . ."

These are samples from literature produced by one of the newest cult followings in the United States and abroad. From Maine to Australia, on both sides of the Atlantic, Sorcerer users' groups are forming to provide members with the latest information about their ruling passion — personal computing. Sometimes they're started by stores, sometimes by individuals, but they're always a good place to exchange tips on how to improve a particular program, what printer seems to work best with your machine, who's got some used equipment to sell, etc.

One of the benefits of joining such a group is the newsletters that many of them publish, tabloids that survey the computer scene, offer industry book reviews and evaluations of the latest hard- and software, and include new programs invented by users' group members. The newsletters vary in their slickness of production and writing flair, but most of them turn out to be very ... well, "userful."

So, if you're interested in joining a Sorcerer users' group or subscribing to a newsletter, please contact Exidy for more information about what's available in your area. You'll have the opportunity to learn a few tricks of the trade, keep abreast of the latest developments, and meet some people who share your interest in personal computing.

Sorcerer Computer Hardware:

Sorcerer Computer: (1)

A completely assembled and tested Z80 based microprocessor available in three models; 16K RAM, 32K RAM, 48K RAM.
All models incorporate the following features:
63 key typewriter-style keyboard
16 key numeric pad
Dual cassette I/O with remote control
300 and 1200 baud data rates
RS232 serial I/O port
Parallel data port
S-100 connection port
4K ROM operating system
Composite video of 64 characters/line, 30 lines/screen
128 upper/lower case ASCII character set
128 user defined graphic symbols
240X 512 graphic resolution
Operation manual
Cassette and video cables

Video Display Unit: (2)

12" CRT screen
20 MHz bandwidth for high resolution
P31 phosphor
Colored and styled to match Sorcerer

16K RAM Expansion Kit:

Component parts and instructions to add RAM memory within Sorcerer Computer enclosure up to 48K

S-100 Expansion Unit: (3)

Independent power supply
6 slot chassis
S-100 translation logic card
Interconnect cable
Colored & styled to match Sorcerer Computer

S-100 I/O Kit:

S-100 translation interface card
Interconnect cable
Plugs into any S-100 mainframe for I/O expansion

Floppy Disk Subsystem: (4)

120K bytes per disk (formatted)
Independent interface logic
Uses 5¼" floppy disks
Plugs directly into Sorcerer's 50 pin edge connector
Includes CP/M Disk Operating System and Microsoft Disk Extended BASIC
Colored and styled to match Sorcerer Computer

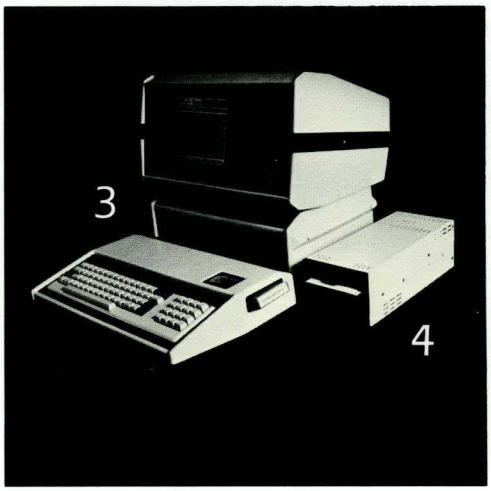
Display/Disk Unit: (5)

VIDEO DISPLAY SECTION:
12" CRT screen
20 MHz bandwidth for high resolution
P31 phosphor
DISK DRIVE SECTION:
Dual drive
315K bytes per drive (formatted)
630K total, between two drives
Independent interface logic
Uses 5¼" floppy disks
Plugs directly into Sorcerer's 50 pin edge connector
Includes CP/M Disk Operating System and Microsoft Extended Disk BASIC
Swivel base, colored & styled to match Sorcerer Computer

Accessories:

Serial/cassette cable
Parallel data cable

Talk



Sorcerer Computer Software:

Standard BASIC PAC (ROM PAC):

8K ROM in plug in cartridge
Numeric and string arrays up to 255 dimensions
All ANSI standard BASIC commands plus
CSAVE, CLOAD, PEEK, POKE, INP, OUT, WAIT
Special USR(X) function that allows Standard BASIC program to call machine language subroutines

Word Processing PAC (ROM PAC):

Plug in cartridge
Single key command operation
Automatic text wrap-around (insertion)
Search and replace feature
Four direction cursor controls
Right line justification
Scan, scroll, indent, tab, soft hyphen features
Macro programming
Mail merge letter typing
Multiple column printing
Automatic multiple forms entry
Many more

Development PAC (ROM PAC):

Relocating linking Z80 Assembler
Relocating linking Loader
Line Editor
DDT80 debugging tool
Special I/O routines

EPROM PAC:

For putting custom software into plug in cartridge form
Provides sockets for up to 16K of ROM or EPROM chips

Extended Cassette BASIC:

Additional BASIC features in cassette form

Extended Disc BASIC (CPM BASIC):

Full Feature BASIC in disk form

CP/M FORTRAN:

CP/M COBOL:

Applications Software:

MicroBiz (in disk form):

Features include:
General Ledger
Accounts Payable
Accounts Receivable
Inventory Control
Payroll

Microhome (in cassette form):

Features include:
Recipes and calories
Measurement Conversion
Appointment Calendar
Family Budgeting

Systems Software:

CP/M, ROM PAC, Linkers, Z80 Assembler, Text Editor, Extended Disk BASIC
CP/M Development Pac Linker
CP/M Word Processor Pac Linker
CP/M Video Editor

Documentation:

Sorcerer Technical Manual
Sorcerer Software Manual

tidBITS

Pardon Us for Blowing Our Horn, But . . .

Tom Bun is a man with a unique perspective on the Sorcerer's potential for home and business use. Mr. Bun works for Compumax, a Palo Alto-based software firm which develops programs specifically tailored for use with various personal computers. Compumax has designed several programs for the Sorcerer, and his comments about the Exidy machine add up to an unabashed endorsement for the product.

"We work with seven computers — all top sellers — and the Sorcerer is one of our favorites," Mr. Bun reports. "Of course, working with seven machines leads you to make all types of comparisons, and I have to conclude that, although the Sorcerer costs less than some of the others, it works better.

"What we like about the machine is its ease of usage, portability and extreme reliability. In fact, it has never broken down and we've used it now for over a year. Comparing it with the other machines, you will find that most of the others need a lot more maintenance and attention. All in all, it's a very fine little computer."

Thank you very much, Mr. Bun.

Shall We Dance . . .

Maintaining the elements of a dance as conceived by the choreographer has always been a problem in an art that relies on as fragile a medium of preservation as the human memory. Cognizant of this dilemma, choreographer and dancer Rudolf Laban used geometric symbols to develop a dance notation system, called labanotation, to provide a concrete representation of these ephemeral exercises. Despite the ability of this system to reconstruct dance with great fidelity, it requires a laborious, dedicated effort of almost herculean proportions on the part of the notator, which may account for its lack of widespread acceptance in the dance community since its inception over half a century ago.

However, all this may be changed by the recent introduction of microprocessors, with their versatile graphic capabilities, into the quest for a simpler, less ponderous method. Over the past few years, computer scientists have devised programs that allow them to translate dance notation symbols into animated representations of the number being studied. With growing sophistication, programmers can create figures on the screen of a microprocessor that "dance" just as the choreographer intended, preserving the creator's vision of his or her work and allowing performers to analyze the style, tempo, movements, and other components of the dance.

On Libraries and the Computer . . .

As almost everyone and everything else is these days, public libraries across the nation are feeling the pinch of inflation. Books cost over 100% more to purchase than they did 10 years ago, and in order to attract public and government support, many libraries are expanding their services, much to the dismay of hardcore bibliophiles and to the delight of those who require a more eclectic offering to lure them into these venerable storehouses of knowledge. The practical, rather than the literary, seems to be stressed in most of the new services, and computerized information banks are among the foremost carrots being dangled. One library in Ohio, for example, offers access to a listing of job openings throughout the state. Information on pollution and land use is available in the Denver Public Library's information bank, and the U.S. Senate uses a computer to follow the progress of legislative proposals. Although businesses and scholastic institutions are currently the main patrons of the existing information banks, many librarians are beginning to visualize computers in the stacks, as well as the checkout desks, in the libraries of the future.

Getting to Know You . . .

Wade Ellis, a professor at West Valley College in Saratoga, California, is presently engaged in a project to develop a three-hour computer science course to be distributed by the Northern California Community Learning Consortium. Using various microprocessors, including the Sorcerer, the course will follow what Mr. Ellis describes as a "three-pronged attack": an introduction to word processing, applications (i.e., games), and programming in BASIC.

Students are familiarized with computer concepts gently, initially using the Sorcerer for word processing activities.

"The idea is to sit somebody down at a machine and make them feel that it's really a typewriter by introducing them to word processing. Then they go on to applications, and soon they're accustomed to using a keyboard and feel comfortable interacting with a computer," said Mr. Ellis.

He is confident that this program will enable people to explore the potential of personal computing and help them apply it to their individual situations. "If you have a machine, here's a way to find out what to do with it. If you don't have one, here's a way to find out whether or not you ought to get one," he commented. "People are excited by the idea of personal computers, but they don't really know what to do with them. They're crying out for this type of instruction in some sort of structured format."

A structured format is just what Mr. Ellis' class will offer, and completion of the course will earn students three credits in community colleges throughout California.

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