

NORTHWEST COMPUTER NEWS

4-4

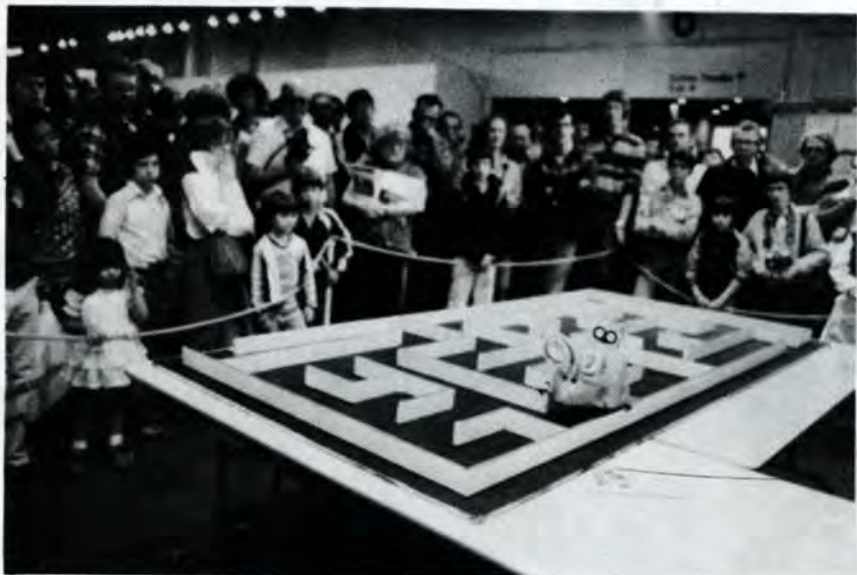
NORTHWEST COMPUTER SOCIETY
P.O. BOX 4193, SEATTLE, WA 98104

APR 79

RECORDED INFO: 284-6109

Single copy 47 cents / Subscription & Membership \$7.00

Standing room only for the Midnight Special



Computer Fair Gallery

— more on page 2

FOR THE BEGINNER

by Walt
McGowan

We propose to start a column in the News for beginners. This will be in the form of simple questions with answers, hopefully, to match. Perhaps a single group of related topics will be treated each month. The purpose is to aid the beginner in overcoming shyness in introducing himself to the apparent mysteries of hardware, what all the phrases mean, and so forth.

Address your questions to Walt McGowan by mail care of the Editor, or phone Walt at 242-8494. He will coordinate the questions, solicit answers from experienced members, and screen the answers for cryptic jargon that beginners might not understand.

So let's have those questions! Do not be

SMALL BUSINESS PEOPLE

The Northwest Computer Society would like to help businessmen who have acquired their own computers and need help with software or other problems causing frustration. There are members who would be willing to help but a means of contacting each other is required.

If you, as a business person or an enthusiastic club member, are interested, Walt McGowan at 242-8494 will act as a clearing house to compile names, etc., and try to get a useful service started. How about BASIC programming classes, etc.?

Call and chat with Walt! Let's hear

MEETINGS

Seattle — The Society meets at Seattle University, in the Library Auditorium, room 115. Seattle University is on 12th Avenue, between E. Madison St. and E. Cherry St. Meetings are held the first and third Thursdays of each month at 7:30 PM. The first meeting of the month usually features a formal presentation by a speaker or speakers. The second meeting is usually more informal with freewheeling discussion and problem solving.

Thursday, May 3

Bill Gates of Microsoft will be talking to us.

Thursday, May 17

Informal meeting with no speaker scheduled. Bring your things for "show and tell."

Thursday, June 7

Nordata timesharing usage session

Thursday, June 21

Informal meeting with no speaker scheduled.

Tacoma — The Tacoma section meets at the Computerland store in South Tacoma, 8971 South Tacoma Way, on the second and fourth Tuesdays of the month at 7:30 PM. Use the 72nd - 82nd Street' exit from I-5; go West to South Tacoma Way, then South to South Tacoma Village. Meetings normally have a presentation or symposium discussion.



MY SYSTEM

by Don Baer

Three years ago, I started looking for a computer to handle the routine typing and record keeping chores of my lumber wholesaling business. A few Tuesdays ago, the computer generated the first "hands off" invoice. It was a few steps away from instant satisfaction.

The brain of the system is a Northstar Horizon with two mini-floppy Shugart disk drives. I have four 16K memory boards (1 original from Northstar and the other three from Seattle Computer Products). The Horizon has been very reliable — in approximately a year of daily 8-10 hours of operation I've only had one drive go out of alignment and one memory card fail (and be repaired under warranty).

The CRT is a Delta Data 4500. It is an intelligent terminal with cursor command, two pages of scrollable memory and function keys. It also has a ten key number pad which is a must if you have extensive number entry. The Delta Data CRT has been very reliable — there have been only two failures. The first was a chip that gave up and the second failure (some eight paid hours of tech time) was simply a switch in the wrong position. Maybe that really shouldn't count as a failure.

The printer is a Gencom 300-Q (now manufactured and serviced by Agile). It uses a Qume Sprint 55 mechanism with Agile firmware. The printer can justify text in either single or double column; it is capable of plotting; and the horizontal and vertical spacing is highly variable. The printer has been very reliable — although it has difficulty pulling my 6-part invoice form.

My system is off the shelf — which is great for a business system. Whenever I have something go down, the backup to get me back up and running is not more than a few hours away. Since I haven't had to type an invoice by hand in over a year, the prospect of down time is unsettling.

The next acquisition will be a Modem to allow me to hook up with other computers, Nordata (it would have been nice for John if I could have pushed in this article direct) and other Northstar systems.

the machine to do what I want done. It is disturbingly literal — which frustrates the tar out of me.

While my equipment was bought off the shelf, my software is all tailor made. The main program (Papermanager — but abbreviated to satisfy the machine) generates and keeps track of all the purchase orders issued, the order acknowledgments, the invoices and (in a few weeks) the checks. As a wholesaler, I sell truck load lots of lumber and forest products (frequently a single commodity such as medium shakes and occasionally mixed trucks such as 4x4 Posts, 2x4 Rails and 1x4 Fencing). Consequently, a purchase order (PO) to the mill, order acknowledgment (ACKN) to the customer and the invoice are all linked together by a file number. Naturally, since I have to pay the mill and the trucker for selling and hauling the goods, a check must be issued as well. Papermanager keeps track of these different transactions.

All these transactions have more than the file number in common — and part of what Papermanager does is keep track of all the data so that as each document is issued, I only have to input the new data. If I issue an invoice (which is the final document — excepting the checks which I also issue), it already knows who the customer is (from the order acknowledgment), who the supplier is (from the purchase order), what the commodity is (from either the PO or the ACKN — depending upon which came first: the buy or the sale), what I agreed to pay (from the PO) and what I agreed to sell it for (from the ACKN). So, at the time I issue the invoice, I only need to enter the quantity shipped, who the trucker is and what I agreed to pay him to haul the load.

Papermanager only handles the data entry, Hardcopy handles the printing of all the documents. Hardcopy goes into Papermanager's data files to see which documents need printing and then prints them onto our heavy six-part continuous forms. Here we have a small glitch — the forms are just too heavy for the printer's stepping motor — which means that someone

Northwest Computer Society
P.O. Box 4193
Seattle, Wa 98104

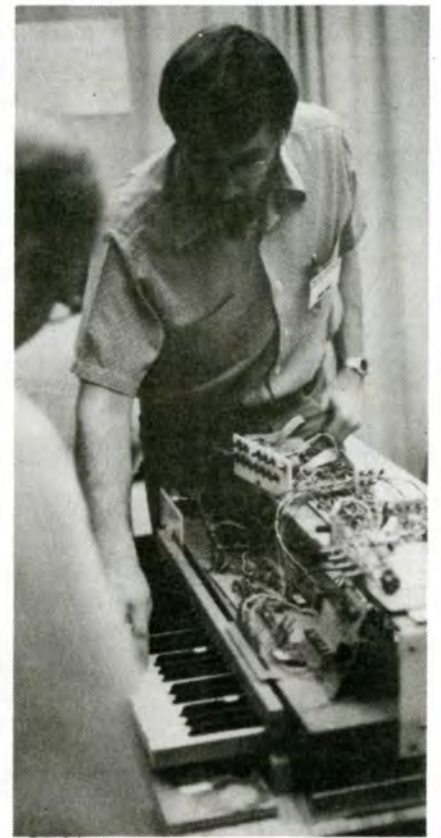
Bulk Rate
US Postage
PAID
Renton, Wa. 98055
Permit No. 282



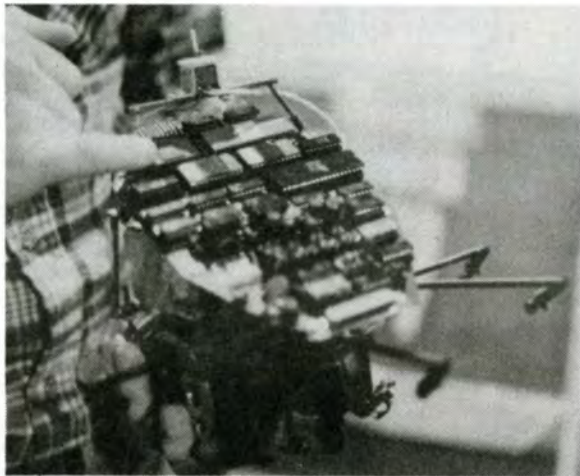
The Midnight Special



Learning the maze How will it do the second time?



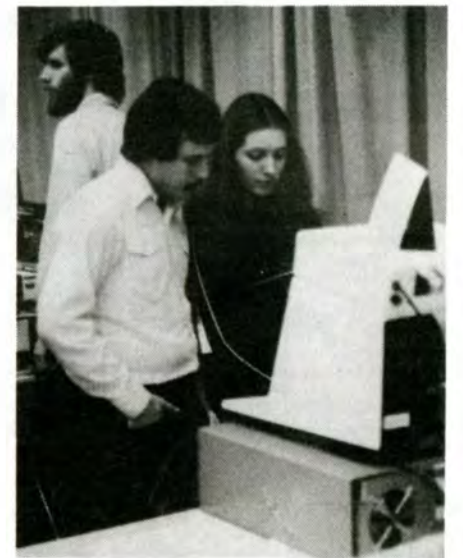
Members' annual progress report



See? No mirrors!



A serious affair!



Cooperative evaluation

PERSONAL COMPUTER FAIR

**Attendance 6090
— Up 20% over last year**

Photos by John Marshall



Now, the accounts receivable connects to the general ledger . . .



Youthful collaboration



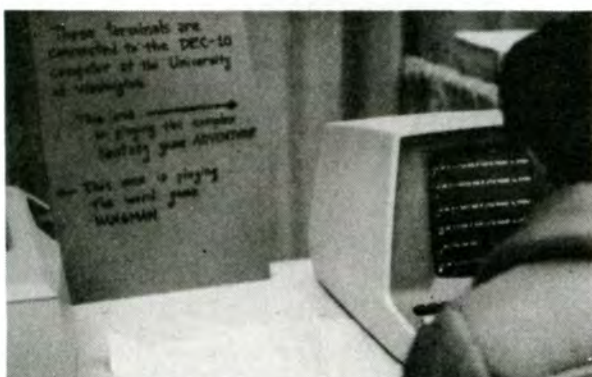
The game of Hangman



Intense concentration



Fair staff conference



The U.W. connection



Business transactions



RANDOM NUMBERS

by Joe Felsenstein

This month, for a change of pace, I want to concentrate on book reviews. Although this started out as a review of two books, it will turn out to be a review of three books. These are Joseph Weizenbaum's "Computer Power and Human Reason," and two books by Ted Nelson, "The Home Computer Revolution" and "Computer Lib / Dream Machines."

COMPUTER POWER AND HUMAN REASON

If you have read around in the microcomputer magazines, you can hardly escape being aware of Weizenbaum's book. Excerpts were printed in ROM, and Weizenbaum has been interviewed on a Nova program on public TV. It would be nice to report that this book is highly overrated, a bit of commercial exploitation of the computer boom (although that's a bit of a contradiction in terms - commercial exploitation of commercial exploitation).

In fact, this just as important a book as they have been saying, although that doesn't mean that it shouldn't be taken with a grain of salt. The book is a bit of a hodgepodge. The first part is largely concerned with introducing the reader to how computers work. There are elementary descriptions of the Turing Machine, which is an abstract model of a computer (an abstraction of an abstraction) used in computability theory. There is a simple introduction to logic design, to stored program computers, assembly language, and higher-level languages. All of these are very well done and very concise, without the unnecessary detail that tends to drive lay persons away from introductory books on computers. If this were all that there were in the book, it would deserve moderate applause and a recommendation to buy.

But that's only the beginning. Weizenbaum then pulls out the heavy artillery and proceeds to a short essay on the compulsive programmer (you know - the demon that lurks inside of most computer hobbyists, those that aren't compulsive gadget builders). His description of the syndrome is scathing. But there is a reason why Weizenbaum suddenly interjects this essay. He believes that the addiction of the compulsive programmer, an addiction which loses sight of ends while becoming obsessed with means, is simply a smaller version of an affliction of our society.

There follows a head on assault on artificial intelligence, and the world which it is leading us into. Weizenbaum points out a number of times that AI proponents constantly oversell the near-term potential of their field. Machine intelligence, like prosperity, is always just around the corner. For as long as the field has existed, it has always predicted the achievement of true artificial intelligence in ten years. There is no sign of success. Weizenbaum's credentials are impressive: he teaches computer science at MIT and is the author of ELIZA, a system for "understanding" natural language which you may know as DOCTOR, the artificial (and fake) psychiatrist.

This is the part of the book that has attracted the most attention. It is also where I begin to have problems with the argument. I don't object to debunking AI, but the way Weizenbaum proceeds is to argue that artificial intelligence is impossible. Computers cannot be made to understand natural language, they cannot be made to have human emotions, therefore they cannot achieve true intelligence. At this point Weizenbaum veers off into mysticism. I am a biologist by trade,

and my view of the organism is that it is, in fact, a machine. It is a machine which has emotions, passions, religions, societies, wars, and book reviews, but a machine nevertheless (let's leave out the soul to avoid controversy).

The impressive thing about natural organisms is that they are able to do all this while being machines made of carbon, hydrogen, oxygen, nitrogen, and phosphorus (plus a tablespoon of this and a smidgen of that). The question which has to be asked is - if we are machines (but not "merely machines"), why can't we build machines that act like us? Of course we are talking about the very long term - Weizenbaum is right to say that AI has been oversold badly. Biology long ago banished from its world view all mysterious vital essences, those eighteenth century analogues of caloric, phlogiston, and the ether. I think that Weizenbaum wants to bring them back.

In a way, the view I am pushing is more frightening than the one Weizenbaum projects. If we can build a human intelligence (though not at our present stage of knowledge) then we could equally well build a non-human or an anti-human intelligence, say a robot that is only truly happy when killing people. This immediately means that ethical questions must be brought to the fore in artificial intelligence. That is what Weizenbaum thinks as well. The last few chapters of his book are devoted to a scathing and largely accurate attack on the way the mystique of the computer has been used to justify the unjustifiable.

Weizenbaum's book is most important for these last chapters, where he drives home again and again the point that what are presented to us as merely technical questions are actually ethical questions. Again and again we hear the alibi that "the computer made me do it" or that "the computer did it to you". Weizenbaum is listening to no such excuses. Humans - specific humans - are responsible for the atrocities committed by "systems".

I end up with the feeling that anyone who wants more than a "how to" book or a collection of advertisements of current products should buy Weizenbaum's book, read it, and weep. But I wish that he did not feel compelled to resurrect eighteenth century vitalism. If he had stuck to a more materialist view, his book would have had even more power.

Weizenbaum's book is "Computer Power and Human Reason," a W. H. Freeman paperback currently priced at \$5.95.

OFFSPRING OF COMPUTER LIB

The second book I intended to review was Ted Nelson's "The Home Computer Revolution". Everyone has asked me what it was like. It hasn't been widely distributed. The reason everyone is so interested is Nelson's earlier book, "Computer Lib / Dream Machines". "Computer Lib / Dream Machines" (henceforth CL/DM) is in my view the best book ever written about computers. The closest analogy is the old Whole Earth Catalogue. Nelson produced a one-person tour de force (and tour de farce). CL/DM is not one book, but two books back to back, with two front covers and no back covers. It consists of everything Nelson ever wanted to say about computers, all the anecdotes and history he wanted to tell us, all the cute techniques of computer graphics he wanted to tell us about, all the nasty things he wants to say about IBM (mostly deserved), all the wild and woolly possibilities for the future, all the homespun maxims he wants to push. It is enormous fun reading.

You don't read it cover to cover, you bounce around enjoying yourself. It's not a linear book, but more an attempt at 3-D. It's full of

fascinating stuff. Interestingly enough, Weizenbaum and Nelson are not far apart in their concern for the dangers of the oncoming wave of computers. Nelson raises a number of possibilities that worry him, and is generally concerned that computers bring about a true and constructive revolution in human society.

If you haven't read CL/DM, you are an incomplete person. Locally, it is stocked in the University Book Store, on the home computer shelf of the paperback department. I've also seen it from time to time in computer stores. It costs \$7 and was published privately by Nelson, so it's hard to get ahold of. It can also be ordered from Creative Computing (P. O. Box 789-M, Morristown, NJ 07960). Add \$1 for shipping charges.

Two warnings, however. The book was written in 1974, before the home computer market existed. So it is really about computers in general, not home computers in particular. (Nelson keeps recommending that people buy PDP-8s). Also, being a low-budget book, it was produced by typing long columns of text with hand-drawn illustrations, pasting up, and making the text as small as possible. You may need a magnifying glass and good lighting, but it is great fun.

I wish that I could say that "The Home Computer Revolution" was a worthy successor to CL/DM. It isn't. Not that it's a bad book. It has about 50% overlap with CL/DM, and Nelson tries very hard to make things lively. But there are a couple of differences that make for less fun and less relevance. First of all, this is a linear book, a little paperback that you read from one front cover to one back cover. That is not as much fun, and Nelson manages to sound like a windy preacher, full of enthusiasm that he wants to stuff down your throat. Furthermore Nelson's views seem to have changed. Now he no longer sees dangers ahead, but he sees instead the Magic Instrument Of Change. The small computers (which he calls "dinky computers" - that made me ill) are going to remake society and make IBM irrelevant.

While we talk there is going on a massive shakedown in the home computer market. The small outfits are being driven out by the large, as happened with automobiles in the early years of the century. Soon we will have only TI and Guess Who. I suspect that we will soon find that the home computer revolution leaves us still facing the same monoliths.

I hope that Nelson manages to put out a worthy Offspring Of Computer Lib. His current little book is not bad (\$2 from Creative Computing's book service, add \$1 for shipping) but you should run out and buy Computer Lib first, then proceed to Weizenbaum (or the other way round). You can read "The Home Computer Revolution" just before you get to "The Umpteenth Book of BASIC Games".

I'm sure that there are bugs in this book review, but I'll fix them next month.

* SYSTEMS ANALYSIS & DESIGN, WITH AN EMPHASIS ON SYSTEMS FOR SMALL BUSINESSES.

Computer Resources

Data Processing Consultant
ROY S. GILLETTE (206) 523-2866

The Northwest's largest exclusive Ham store

Amateur Radio Supply

Amateur Radio parts & equipment

TOM PACE, K7YST
Sales and Service

6213 13th Ave. So.
Seattle, Wa. 98108
206 / 767-3222

by Ken Berkun

This month's topic is what I call alternative uses of computers. This means either non-traditional (although it's hard to conceive of traditions forming in so few years) uses or using in alternative cultures, or non-establishment uses.

Before the age of the microcomputer only the very rich and very powerful could afford to have a computer. This led to the establishment of a few large companies and educational institutes controlling all computing resources. Later on computer technology advanced and prices dropped so that somewhat smaller companies could use computers. Eventually it got to the point where any business not classified as "small" by the government, could use a computer cost effectively.

Of course during this entire process the various governments were using computers for their own ends (chiefly extensions of the bureaucracy and for keeping tabs on people). They were actually the primary consumers of computers, and always bought the biggest and the best.

All this resulted in leaving the little people (you, me, and your cousin Max) as data in someone else's machine, but with no machines of our own. So here the imbalance sat for many years. During this time those with computers were perfecting the skills, developing techniques, and building massive databases.

But someone goofed up. A maveric young company named INTEL grasped onto the space-age technology of micro-miniturization and developed a

.....
**A recent dialog, presented
 without further comment:**

ALGORHYME

I'm so fed up with ASCII codes
 And ITERATION episodes —
 If I had just a human brain,
 I think that I would go insane —
 With FILES of DATA to COMPILE
 It hardly seems a BIT worthwhile,
 I BYTE off more than I can chew
 And overwork my CPU.
 I'll slip a DISK or blow a fuse —
 That information would confuse
 The most logical of us around
 And make it INPUT-OUTPUT BOUND —
 Then to the CORE send such a chill
 To make one TERMINALLY ill.

Anita Westrum

.....
 Anita Westrum
 5421-34th Ave. S.W.
 Seattle, WA 98126
 March 14, 1979

John Craig, Editor
 CREATIVE COMPUTING
 RFD Box 100-D
 Lompoc, CA 93436

Dear John: I'm glad you bought my poem
 Entitled "ALGORHYME"
 Although the eight buck check I got
 Won't make my income climb.
 I was a bit surprised last month
 When I received your letter —
 The Writer's Digest rates you quote
 Are even somewhat better
 Than what I got for what I wrote
 which you would like to share
 With all your readers, so I hope
 That you could kindly spare
 A copy of the issue when
 You print that poem by me
 Because I just could not afford
 One if it wasn't free.

Poetically yours,
 Anita Westrum

complete processor on a chip. Little did they suspect it at the time, but they had just developed the technology to put the little people on an equal footing with the establishment.

Not that this has happened over night. The first microprocessors were slow, weak machines. Not good for much more than fancy controllers. But INTEL knew they had a market, and kept at it. So pretty soon we were faced with the 8008, and then the 8080.

Now all this is history. But suddenly we're at the point where almost anyone can afford a computer. And believe me, soon the ads will be insisting that we have to own a computer. Ok, let's go with the flow, and pick one up, as a matter of fact let's pick up several of them. Say, why don't we pick up enough, so that at least one person owns one every twenty or so miles in a grid across the country? That's not really so many, only about 75 up and down the coast, times 225 across the border, or less than 17,000 all told.

This means that there is a network of microcomputers covering the whole country entirely within reach of local phone calls!!! By setting up what are called protocols, or standards of communication, any computer owner can dial a local number and talk to another computer owner, transfer some data either or both ways, and have that person transmit the information to the next person.

Granted this is a bulky and slow way to do it. But it is cheap. If you include an occasional long distance call, or use of a HAM radio net, then things become easier. In any case, we now have thousands of computers talking with each other, sharing data, and capable of storing incredible amounts of information.

We have here the power to keep tabs on the government, just as they keep tabs on us. Imagine entering into the network names of businesses that ripped you off? Imagine developing a database of statistics on automobile accidents, so that we could challenge the actuarial tables used by the insurance companies! Imagine public meetings held from the convenience of your living room with everyone in the city, or state, who shared an interest in your hobby, or in the activities of the state legislature, or what have you!

Although that network does not yet exist, the technology for it does. The number of computers needed for it are small compared with the numbers already in existence. The protocols have been designed (by the PCNET) and the low cost modems exist (dozens of people in our club alone are probably using the "35 dollar Mike Holley Modem").

It's just a matter of time until this network starts to function. People who are interested in this kind of thing are encouraged to write standard small communications programs, articles that talk about practicalities of implementation, and talk it up with people.

By the way, in case you still believe this to be a pipe dream, tune in to the "New Directions" HAM radio network. This is a world wide network of HAM radio operators who meet on the air at certain specified times and frequencies to discuss alternative uses of technology, new spiritualism, and so on.

The real key to the power of the microcomputer is its availability. Because they are so cheap you can buy as many as you need and set them to dedicated processing. It doesn't matter if it takes weeks to do some number crunching. It does for the large corporations, because their machines cost so much that they must make maximum use of them.

Which of course brings up a very

valid point. If they are so cheap for us aren't they even cheaper for the large corporations? The answer is yes. Our only advantage is the element of time. It takes awhile for a company to change its habits and techniques. We have the advantage of being able to take the new technologies and use them immediately.

I'd like to describe now a few examples of alternative uses of computers that are in existence today. Not all of these use microcomputers, but the same advances that made them available, made minicomputers more available also.

Probably the earliest alternative uses were the community memory projects. The two most successful of these were the San Francisco Bay Area project, and the Associative Personal Memory (APM) project in Vancouver BC.

These two projects endeavored to set up electronic bulletin boards. They used computers to keep the information current and keyed, so that a user could ask for specific information and not get garbage. Each project was online for about a year, and enjoyed quite a good popularity. In the case of the Bay Area project, their computer was just too cranky to keep the project up, and in Vancouver their donated computer time was cut off.

However both of these projects are springing back up. The community memory project expects to be back online using LSI 11's by the end of this year, and the associative personal memory project has a subset for individual use running now. The Bay Area group publishes a magazine called the Journal of Community Communications, edited by Sandy Emerson. This is worth subscribing to.

Other projects in existence are the hobbyist bulletin boards, which now exist in a half dozen or so places across the country. These are micro computer based systems which can be dialed into, and maintain keyed bulletin board type information. These are primarily for hobbyists, as they require having use of a terminal. As I have described these before, I won't dwell on them.

In other uses, we merely find computers doing the same for people oriented groups as they do now for big business. For instance in a system I developed for the Community Resource Center at Seattle University, the computer, an HP3000 minicomputer, maintains a database of all the community councils and clubs in the Seattle area. This is used to print a directory, create mailing lists, and maintain the information's currency. Thus, this low budget, community supportive organization is able to take advantage of this new technology to keep its data up to date and of value to the community. The results have been a great response from the clubs to keep the CRC informed of current activities, officer changes, locations and so on.

The above few examples are just the beginning. In previous articles I have talked about user interaction. This is another key point in alternative uses of computers. In all these cases, an attempt was made to make the computer as easy to use as possible, and to de-mystify it as much as possible. This is all in keeping with the spirit of bringing the technology home, making the computer work for us, instead of against us.

Again I want to encourage people who are interested in these kinds of computer uses to get together and make plans for similar projects. Seattle is a perfect town for a community memory project. Is there any interest out there? Let me know. As usual, here are my phone numbers: 655-9945 at work, and 524-7260 at home. Let's take the computers to the people, we need them.

The Heath Report

by Marty Lindal

This month we are starting a new column exclusively on the H-8 computer. The purpose of this new column is twofold. One is to inform the non-Heath computer owners and computer novices a little about our Heathkit machines. Another is to be a communication device for H-8 owners. Direction and content will vary from month to month depending on the whims of the author(s).

About 35 local H-8 owners have a very informal Users' group for the advancement of our hobby. We have meetings on the first Monday of each month at the local Heathkit store (505 Eighth Avenue North. Near the Washington Natural Gas Building.) About 10 to 15 people from diehard computer professionals to simply interested people attend the meetings. Come just past six if you are interested.

Some H-8 owners are quite advanced, I was talking to Dave B., an H-8 owner that lives in Kent, and was told of three programs he wrote over a recent weekend. One was a BASIC renumbering program that handles all

situations. Another was a packing program that takes any BASIC program and converts it to a more efficient form. The program removes all unnecessary spaces and deletes REM statements. It will save anywhere from 10 to 45% of the programs' RAM requirements. Dave finds it useful to use the packed version of a program on a day to day basis and save the version loaded with REMARKS and extra spaces as the backup and source for future modifications. I tried it out on a 120 line program of mine that had only one statement per line. After the packing program got through with it, my program was 23 lines of multiple statements per line. It dropped from needing 13 disk sectors to only requiring six. Great for that often used but never changed program.

The third program is a very useful line number reference program that takes any BASIC program and prints out a list of line numbers and all other line numbers that reference to those lines. Dave is a professional programmer and CPA. He uses his H-8 extensively in his accounting business. Dave chose the H-8 after studying microcomputers for over a year.

Microsoft BASIC for the H-8 was

announced by Heath recently. Cost is \$100.00 and will be available in late June or July. Orders for it will be rejected until it can be sent. RAM requirements will be 32k vs. 12k for the old BASIC. One wonders just what extra features will be incorporated with that much RAM required.

Microsoft FORTRAN for the H-8 will have a relocating macro assembler and relocating linking loader. It costs \$150.00 and 40k of RAM

I just read in the Cincinnati Heath newsletter, the newest rumour about the Heath soon to be announced H-19 video terminal (mentioned in the last Heath catalog). The H-19 will have a Decwriter keyboard, 24 x 80 screen with a 25th line for special display(?). There is an addressable cursor, and reversible (black on white) screen. Also there will be user programable keys and a single line buffer with Z-80 control. It will sell for \$850.00. I must repeat, no details have been officially released from Heath.

There is a national Heath Users group called HUG. It is run by Jim Blake in Benton Harbor, Michigan. In a recent phone call he had the following to say:

1. Software tape number two is ready to ship. BASIC program tape (no. 885-10-12) and assembly tape (no. 885-10-14) can be had for \$9.00 for both. What a deal! Not many games on these tapes, mostly file handling and application programs. Software tape number one with over 100 programs will still be available. Disk versions will be ready soon.

2. The character oriented text editor is ready now (no. 885-1022 called BWEDIT). cost is \$15.00.

3. A full feature Text Processor will be ready in a few weeks, It will cost around \$30.00- \$40.00 because HUG will have to purchase it. A text processor takes text in one form and converts it to another. Most people use them to right justify text and to change a manuscript to the form required by the publisher.

4. CP/M will be ready sometime in May. It will cost \$145.00 from Lifeboat Associates in New York. There is a CP/M Users' Group and Library of about 200 Volumes (disks). There will be 20 disks available from Hug at the end of May. CP/M and Microsoft BASIC are the defacto standard of microcomputing software.

5. HUG has a National magazine called REMark. Issue six, to be released in early May, will have over 40 pages and detail a very advanced RTTY package.

6. The Heath accounting programs described in the latest catalog are written in Microsoft BASIC and are proven programs currently in use on other systems. The business capabilities of the H-8 may be finally unleashed! Since these programs are supposed to work, Heath is charging around \$350.00 each for them (\$350 x 5).

7. HUG will soon have a Modem and Mailbag program to call up for the latest Heath scoops.

I have just completed a List Programs Routine that will take selected filenames from the disk directory and list them on the system printer. It starts by making an index, and then form feeds to the top of each page and prints the page number and title for each file. The end result is a indexed book of selected programs and data files.

Work has been started on a program exchange library. We hope to have as many as 300 programs in it by the time we publish the first catalog. send your tape and disk programs to me I'll copy them and return the original to you. More on the library next month. My address is: P.O. Box 78006 Seattle, Washington 98178 (h)283-0806 (w)725-7111.

Sample output from the directory produced for the Community Resource Center of Seattle University. The directory currently lists about 200 community groups.

SEATTLE AREA NEIGHBORHOOD IMPROVEMENT GROUP DIRECTORY

A COOPERATIVE PROJECT BETWEEN THE SEATTLE UNIVERSITY COMMUNITY RESOURCE CENTER AND THE SEATTLE PUBLIC LIBRARY, FUNDED BY THE DEPARTMENT OF HEALTH, EDUCATION AND WELFARE.

COMMUNITY GROUP INFORMATION PROVIDED BY JULIE BURKE, COMMUNITY INTEGRATION SPECIALIST, COMMUNITY RESOURCE CENTER.

PROGRAMMING SERVICES COMPLETED BY THE CASCADIAN REGIONAL LIBRARY KEN BERKUN AND PHIL HARRISON, PROGRAMMERS.

FOR FURTHER INFORMATION ON THIS DIRECTORY, CORRECTIONS OR ADDITIONS, CONTACT THE COMMUNITY RESOURCE CENTER: TELEPHONE 626-5573. ADDRESS: INSTITUTE OF PUBLIC SERVICE, COMMUNITY RESOURCE CENTER, SEATTLE UNIVERSITY, SEATTLE, WA, 98122.

ALKI COMMUNITY COUNCIL

ALKI INFORMATION:

GROUP: ALKI COMMUNITY COUNCIL GROUP NUMBER: 1
700 O'KEEFE'S REALTY
ADDRESS: 2202 4TH AVE SW
CITY: SEATTLE STATE: WA ZIP: 98116
PHONE #:

OFFICER NAMES:

KLEFE JACK OFFICE: PRES
2202 4TH AVE SW
SEATTLE WA 98116 OFFICE #: 937-1555 HOME #: 453-7755

PIROTT BETSY OFFICE: SEC
WA OFFICE #: HOME #: 932-0702

EDERSON JOHN OFFICE: VPRES

PETERSON SANDY OFFICE: TREAS

BOARD MEETING KEYS: F1-DONKEY
BOARD FEETS:

COMMUNITY KEYWORDS: FFW REC
COMMUNITY FEETS:
ALKI CONGREGATIONAL CHURCH

ISSUE KEYWORDS:
TRANSPORTATION FVINDOGE 11

ISSUES:
ALKI BEACH PARKING, SEA GREAT PARK, FEELEISELE

COALITIONS:

NEWSLETTER: NO
USE WEST SEATTLE HERALD
FOUR FEETS:
SPOKANE STREET ON BURNARD AVE, LUCARD PARK, C-SOUTH, DE EDGE OF HILL

ELECTIONS: APRIL
KEYS TO 1988 FOR: WANTED VOICE TO GET HEAV
FEEDING KEYS:
FEEDING:
UPDATES: FEETS ON 940227

Glass Terminal . . . etc.

by John P. Aurelius

This story is about two short machine language programs for the 8080. They are related, but only loosely, and the reader should have little trouble lifting one or the other out of the listing.

MICROCOMPUTER AS TERMINAL

The first program is used to configure my microcomputer as a terminal so it can talk to the "big guys" like Nordata through telephone lines. No, Virginia, this is NOT a software modem! I have a Mike Holley modem (see NCN Issue 3-4), and have used it very successfully with my Trendata 1000 terminal (in fact most of the copy in NCN for the last year was generated using Nordata and this terminal). But that terminal is noisy and slow - necessary evils when hard copy is required, but who needs that when writing articles or programs? In addition, my terminal generates IBM Correspondence Code, not ASCII. Fortunately, Nordata accepts this code, but not all larger systems do.

But I have a nice microcomputer with a serial output port and VDM softcopy display. Why not just connect the serial port to the modem? This ought to give me a 'glass Teletype' at no cost at all. Visualize the configuration: we have a serial port connected to the "big" computer, a keyboard, a VDM display, and a CPU. Gotta have software to make them all talk to each other. Now, my system also has a monitor, called CUTER, to do the housekeeping to put characters on the VDM screen. So all we need is some very simple routines to check for input from the serial port or keyboard and pass characters on to the VDM or the serial port as appropriate.

The listings accompanying the article work with the monitor by calling it whenever a character is to be input or output. You could easily modify the routines by changing these to calls to your own monitor or to your own input and output routines. The label in the CUTER monitor for inputting a character is SINP and the

label for outputting a character is SOUT. To return control to the monitor, we jump to the label RETRN. The listings were hand assembled.

There are two entry points, one at 8B03 hex named HALF, and the other at 8B08 hex named FULL. These set a flag in the C register so the routine will know whether to put characters from the keyboard onto the screen as well as out to the serial port. In "full duplex" the other computer echoes, or sends back, the character you typed as confirmation that it was received properly. In "half duplex" the other computer does not send your character back, and if you want to see it you'd better put it up on your screen yourself. The choice of half or full duplex is made by the owner of the computer you are talking to.

The two instructions starting at TERM are there because my input/output board (a P. Tech 3P+S) has its serial port configured sometimes for the Trendata 1000 terminal with its 7 bit word at 134.5 baud and sometimes for remote computers using the ASCII code, 8 bit words at 300 baud. The board can be hard wired for both these configurations, with software selection between them. So at TERM, the routine places the value 136 decimal into the accumulator and the next instruction outputs it to the status port. This sets the 3P+S I/O board for the 7 bit, 300 baud configuration. You probably won't use this feature, and can eliminate these four bytes - this would merge the labels TERM and TOP.

At the label TOP, we input from the status port and check first if there is keyboard input and then if there is input from the serial port. If either device has data ready, it jumps to the appropriate device handling routine. You may worry that it would never check the serial input if there is always keyboard data. True, but it will handle keyboard data so fast that you'll never have a key pressed by the time it makes the next check. If neither device has data, it just loops back to TOP.

At SERIN, it processes data from the serial port, just inputting it and calling the monitor to put it on the screen. Then it jumps back to TOP.

The keyboard handling routine, KBD, is a bit more complex. First it gets the character from the keyboard. Then it checks to see if the character is a "null" (my keyboard has the parity bit marked, so all characters have 128 added to the ASCII value). If it is "null", the routine ends by jumping to the monitor return point, RETRN. Otherwise, it checks for a zero in the accumulator, which would signal that nothing was typed - this relates to the upper/lower part of the story, and these bytes can be eliminated if that routine is not used. Now we send the character to the serial port (instruction at 8B33). The last thing to do is to check if we are in half duplex mode; if so, the character is put on the screen. Then back to TOP to do it all again. It's all done with 61 bytes of code.

UPPER / LOWER

My other problem is that I saved a few bucks when I bought my keyboard, and it's upper case only. That's fine if you don't care about word processing. Of course, word processing is one of my heavy interests (oops!). But it is a trivial processing problem to convert an ASCII upper case letter to lower case - just add 32. So it should be easy to do this in software. First you have to figure how to tell the computer when you want lower case. Select a character you don't need for other purposes, perhaps a control character, or a printing character you don't ever use. My keyboard has a closing square bracket but no opening square bracket! An obvious choice. So the routine changes from upper case to lower case mode, or from lower case to upper case mode whenever it sees the square bracket character. In other words, this character acts as a toggle.

Beginning at the label KEY, the routine gets a character from the keyboard and checks to see if it is the square bracket. If so, it jumps down to the label KREA4, which will be discussed later. If not, it processes the character as input. If the character is not a letter we don't want to change it, so first the routine looks to see if its value is less than 193 or greater than 219. These are the ASCII values of "A" and "Z", with 128 added since this

```

;UPPER lower CASE ROUTINE
;Enter addr 8AC0 at 8800,8801 to make it
;pseudoport 3 in CUTER
8AC0 DB 00      KREA2 IN      STAPT ;Get status word
8AC2 2F         CMA          ;Invert so active bits=1
8AC3 E6 01     ANI          KDR   ;Kbd data bit - is it 1?
8AC5 C8        RZ           ;NO - Go back with 0 in A
8AC6 DB 03     KEY        IN      KDATA ;YES- Get char fm kbd
8AC8 FE DD     CPI          221    ;Is it ')' + 128?
8ACA CA E3 8A  JZ          KREA4 ;YES- Change case
8ACD C5        PUSH B      ;NO - Process input
8ACE 47        MOV BA      ;Save char in B
8ACF D6 C1     SUI          193    ;.LT. 'A' + 128?
8AD1 FA E0 8A  JM          KREA3 ;YES- Skip ahead
8AD4 78        MOV AB      ;NO - Restore char in A
8AD5 D6 DB     SUI          219    ;.GT. 'Z' + 128?
8AD7 F2 E0 8A  JP          KREA3 ;YES- Skip ahead
8ADA 3A B7 8A  LDA          CASE   ;NO - It's 'A' to 'Z'
8ADD 80        ADD B       ;Char + case value
8ADE C1        POP B       ;equals UC or LC char.
8ADF C9        RET         ;Back with char in A
8AE0 78        MOV AB      ;Restore char in A
8AE1 C1        POP B       ;Back with non alfa char
8AE2 C9        RET
8AE3 3A B7 8A  KREA4 LDA      CASE   ;Get case byte
8AE6 FE 00     CPI          0      ;Is it zero?
8AE8 CA EF 8A  JZ          KREA5 ;YES- Skip ahead
8AEB AF        XRA A       ;NO - Zero in A then
8AEC C3 F1 8A  JMP          KREA6 ;Skip ahead
8AEF 3E 20     KREA5 MVI A    32    ;Offset of make lw case
8AF1 32 B7 8A  KREA6 STA      CASE   ;Put away revised byte
8AF4 AF        XRA A       ;Zero in A
8AF5 C9        RET         ;and back with no char.
;ROUTINE TO CONFIGURE MICRO AS TERMINAL
;Enter at 8B03 for half duplex
;Enter at 8B08 for full duplex
8B03 0E FF     HALF MVI C    255    ;Half duplex flag in C
8B05 C3 0A 8B  JMP          TERM    ;Skip ahead
8B08 0E 00     FULL MVI C    0      ;Full duplex flag in C
8B0A 3E 88     TERM MVI A    136    ;Command word to
8B0C D3 00     OUT          STAPT ;set 3P+S for ASCII
8B0E DB 00     TOP        IN      STAPT ;Get status word
8B10 47        MOV BA      ;Save word in B
8B11 2F         CMA          ;Invert so active bits=1
8B12 E6 01     ANI          KDR   ;Kbd data bit - is it 1?
8B14 C2 26 8B  JNZ        KBD   ;YES- Go get char
8B17 78        MOV AB      ;NO - Chk for ser. data
8B18 E6 40     ANI          SDR   ;Ser data bit - is it 1?
8B1A CA 0E 8B  JZ          TOP    ;NO - Loop back
8B1D DB 01     SERIN IN      SDATA ;YES- Input the data
8B1F 47        MOV BA      ;In B for CUTER
8B20 CD 19 A0  CALL        SOUT ;CUTER puts it on screen
8B23 C3 0E 8B  JMP          TOP    ;Loop back/do it again
8B26 CD 1F A0  KBD        CALL        SINP ;Get a char fm CUTER
8B29 FE 80     CPI          128    ;Is the char 'null'?
8B2B CA 04 A0  JZ          RETRN ;YES- To CUTER monitor
8B2E FE 00     CPI          0      ;NO - Is it 'no har'?
8B30 CA 0E 8B  JZ          TOP    ;YES- Loop back
8B33 D3 01     OUT          SDATA ;NO - Send to ser port
8B35 47        MOV BA      ;In B, safe & for CUTER
8B36 AF        XRA A       ;Clear accum
8B37 B9        CMP C       ;Is C zero also?
8B38 CA 0E 8B  JMP          TOP    ;YES- Loop back
8B3B CD 19 A0  CALL        SOUT ;NO - CUTER puts on scrn
8B3E C3 0E 8B  JMP          TOP    ;Loop back/do it again
;EQUATES
00          STAPT EQU    0      ;Status I/O port
01          KDR      EQU    1      ;Kbd Data Ready bit
01          SDATA   EQU    1      ;Serial data I/O port
03          KDATA   EQU    3      ;Keyboard data IN port
40          SDR      EQU    64     ;Serial Data Ready bit
B7 8A      CASE    EQU    8AB7H ;Upper/Lower case byte
04 A0      RETRN   EQU    A004H ;CUTER return point
19 A0      SOUT    EQU    A019H ;CUTER output char point
1F A0      SINP    EQU    A01FH  ;CUTER input char poin
CUTER addresses here are for it beginning at A000, with
parameters stored in RAM beginning at 8800.

```


keyboard has the 8th bit always equal to "1". If the character is outside the A to Z range, the routine jumps to the label KREA3 and simply returns to the calling program with the character in the accumulator.

If the character is in the A to Z range, the routine gets the CASE byte from memory and adds it to the value of the character. This byte will have a value either of 0 or 32. If zero, it won't change the character, and if 32 the addition will produce the lower case equivalent. After the addition, the routine returns to the calling program with the character in the accumulator.

The last part of this routine, at label KREA4, sets the value of the CASE byte. This byte must be in memory, not in a register, because the routine returns with each character to a calling program that may scramble any register you pick. So at KREA4 this byte is loaded into the accumulator and examined to see if it is zero. If it is not zero it is changed to be zero. If it is zero, it is given the value 32. Then the revised byte is stored. Zero is put into the accumulator to signify that no character was acquired, and the routine returns to the calling program. That's the whole thing, in 47 bytes.

These routines are working nicely for me right now. I'm writing this article on Nordata, using my microcomputer as a terminal and generating upper and lower case text with my cheap upper - case - only keyboard.

MY SYSTEM

Continued from page 1

to make sure that the paper advances and that no line is over-written.

As you can guess, we push the memory capabilities of the Horizon. In part, that is why we have separate programs. We have some other programs that either already tie into the Papermanager data files or soon will. One of these programs is "Pricequote". It has a date file that keeps track of all the quotations our suppliers make to us. When a customer calls up, we just plug in the freight rate and Pricequote flashes a grid display on the screen giving different sell levels based upon our known costs and estimated returns ranging from two to five percent (Damn little profiteering here -- the buyers do too much comparison shopping).

Our accounts receivable and accounts payable also are kept up-to-date by auxiliary programs that share Papermanager's data files. As time goes on, I see different programs that have business applicability. We are now working on a program that will produce a price list for different areas of the country. All we will have to put in is the base costs, and the lists will be generated for different areas of the country from the base costs and the freight rates to the areas.

I didn't start out with Papermanager full-blown. The writing of the program was easily six months before the first machine-generated invoice was printed under the control of Hardcopy. I started out with just three programs, and they were independent: "Purchase Order", "Order Acknowledgement" and "Invoice". At the beginning, before I had the Horizon, I was using a Delta Data 4700 mini-computer with eight inch Shugart disk drives. At that time, the invoice program wouldn't even do the calculations. The Delta Data (this will be a familiar story to many) came with a higher language. They promised that in six months to a year Basic would be available at a nominal cost. About a year after I had shelled out for the equipment, they notified me that they would not be able to provide Basic after all, but Fortran would be available for several thousand more dollars.

Once I had the Horizon, the genesis of Papermanager proceeded through the development of individual programs, communicating through an integrated set of files. "Invoice" was the first program to have a complete menu of the different

commodities I sell. It was also the first program to perform any 'magic'. It began calculating the discounts that I give customers to encourage early payment, the net margin on a shipment and -- Real Magic -- using a Julian formula from an H-P manual, it began determining when the customer should postmark his payment. Just a few months ago, using another formula, it began printing the DAY (Monday, Tuesday, etc.) of the week that the bill was due to be mailed to me.

The next generation of programs that were written were my check writing program, creating a datafile for an accounts payable program and accounts receivable program (from making the invoice program store the key data on disk), and pushing in about four hundred customer, supplier and employee names so that I wouldn't have to type all the individual entries every time a check or other document was created.

Now that I have an idea of some of the things that a computer can be used for, I wonder how businesses ever got along without them. To do the work the computer does during the busy season would require several full-time typists, and a full-time bookkeeper. With the computer, I have no typists (besides the Gencom, which never makes a mistake and never is late), and a bookkeeper that comes in only two days a week. The computer has given me the free time to do what I do best -- sell wood.

Except, I'm always programming...

A pitch for what I'd like to see the Northwest Computer Society doing more of: We have a lot of technical knowledge and programming knowledge that we can share. An active software exchange is just the beginning; People have ideas and are doing things with their computers that would just boggle some of us -- give us ideas on new uses and new programs for our equipment.

For example, when I start up my Horizon, I just push the bootstrap switch. The machine then goes automatically through the DOS, into BASIC and into running a program called "Startup". All Startup does is chain-in any program I choose from a menu of my library of programs -- telling what disks to put in which drives. For someone who has never been exposed to computers, taking the machine from a "cold start" manually can be a trying experience. It took me two hours the first time I touched the keys on my original system. But to get the machine to do this automatically, requires knowing which bytes to change in the disk copy of the DOS. There are people in the club (not me, unfortunately) who already know techniques that make real magic on the keyboard possible.


There are a lot of people out there that don't know what is going on, and events like the Computer Fair only begin to clue them in to what is possible. And what is possible today is passe tomorrow. The best advice I can give to someone is "Learn how to program". There is no easier way to learn how to program than owning your own computer. Programming takes practice, and lots of computer time.

SELLING last of S-100 BOARDS - Imsai PIO4-1 assembled, tested, new, \$80; also Demo and used: Vector Graphic PROM+RAM, \$75; Poly Idea Board, \$50; Extendsys 32K DRAM Memory, \$400; Imsai proto boards, \$20; MITS 4PIO-1 board, \$75; MITS 1KRAM, \$40; TCH Proto board, \$15; PROM setter, \$100. Bernie Brunson, 488-4441 (Bothell).

TELETYPE MODEL ASR-33 WITH AUTO-PUNCH \$400 ... 226-2880 ... RON COWLES

ZILOG DEVELOPMENT SYSTEM - 32K, 2 Shugart 801s (630k), 2 parallel I/O chips, 1 RS-232 serial port, Zilog Z80 CPU and counter timer. Text editor, Assembler, BASIC, FORTH and Real time Debugger, \$6,000. OKIDATA Model 22 125 lpm x 132 character Printer with 8 bit "Centronix" interface, \$1,500. LEAR SEIGLER ADM-3 CRT, \$500. All three items, \$7,500. Call Martin Matthews 828-3619 (Kirkland).

HELP - I have an odd 8080 CPU board that I am trying to convert to a S-100 buss. Ron Schuman, 723 - 6285.



Get the Most Out of Your Computer with Creative Computing

Software and Applications. Pragmatic, well-documented programs with complete listings on data base systems, word processing, communications, simulations, investment analysis, games, music synthesis, computer art, business functions, building control and more.

System Evaluations. In-depth, probing evaluations of personal and small business systems every issue. No-nonsense reviews of software from independents as well as the majors.

Regular Features. Operating Systems Q and A. Columns on the TRS-80, Apple and PET. Book reviews. Programming techniques. Short programs. Computer games. New products. Even a dose of fiction and foolishness.

We guarantee that Creative Computing will help you get more out of your personal, school, or business computer or we'll give you your money back!

3 years \$40 (Save \$32 over retail price)
 2 years \$28 (Save \$20 over retail price)
 1 year \$15 (Save \$9 over retail price)

Foreign: Surface add \$9/yr. Air add \$24/yr.

To order, send payment or bankcard (Visa or Master Charge) number and expiration date with your name and address to Creative Computing, Attn: Bob P.O. Box 789-M Morristown, N.J. 07960.

Save Time! Phone bankcard orders toll-free to:

800-631-8112

(In NJ call 201-540-0445)

creative computing

P.O. Box 789-M, Morristown, NJ 07960

OLYMPIA AREA COMPUTER CLUB

We have had a club in Olympia for over a year, known as Olympia Area Computer Club (OACC). It has now come out of the woodwork and meets each third Wednesday of the month at the Olympia Public Library (until further notice).

No dues or officers yet or planned. We do have some special interest groups, so come and see - 7 PM, 3rd Wednesday. For info contact Scott at 943 - 1938.

UNCLASSIFIED

FOR SALE - 16 Bit Computer: Technico SS9900 computer with 2k ram, monitor rom, manual and cables. Used 20 hours, no problems, cost \$460, only \$295. SOLA power supply for above, +5V, +- 12V, 28V, \$90. Extra Technico manual, \$15. Homebrew digital cassette deck with line by line assembler and games for Technico, \$50. S. M. Perry, USCG Air Station, Port Angeles, WA 98362, (206) 457 - 4401.

FOR SALE - IMSAI 8080 system, just over a year old. Up and running and can be viewed and tested in Tukwilla. Includes IMSAI 8080 32K static RAM, I/O serial and parallel, North Star controller with Shugart drive, 9" Monitor, ACT 1 Terminal, accessories, Release 4 Northstar BASIC and DOS, misc. programs. \$2700. Patrick Mc Enulty, 242 - 2780 (H), 237 - 9802 (W).

PROGRAMMER - Needed for Polymorphic Systems 88 microcomputer. Need complete book keeping facilities. Berjac is a small finance company. Pete Snook, Mgr., Berjac of WA, P O Box 1018, Lynnwood, WA 98036, 776 - 4995.

CRT TERMINALS and PRINTERS - Delta Data Tel Term-1 terminals working with RS-232 interface. Display is 80 characters by 27 lines, \$200. Gulton LG-10/30 30 CPS printers with RS-232 interface, 132 column tractor feed (Univac DCT print mechanism). Working, \$300. Complete but sick, \$150. Phil Hughes, P O Box 2847, Olympia, WA 98507, (206) 352 - 9637.

FOR SALE - IMSAI 8080 Computer. 28K RAM, serial I/O, 2K PROM board, Video Mon. Board, TTY ASR 33, North Star Floppy Disk, Software Library. Completely Operating \$2900. By Appointment. Don Ford, RR 2, Box 327G, Monroe, WA 98272, 794 - 5312. Messages 522 - 4929.

COMPUCOLOR II

is here!



for the one-of-a-kind person who demands, and will not settle for anything less than, the best.

How we measure up.

	CCII Model 3	TRS80 BASIC II 16K RAM	PET	APPLE
Retail Price	\$1,495	\$789	\$795	\$970
CPU Processor/Speed	8080A/2MHz	Z80/	6502/	6502/1MHz
Disk BASIC	Yes	No	No	No
Random Access File Capabilities	Yes	No	No	No
ROM Memory Supplied	17K	8K	14K	8K
RAM Memory Supplied	8K	16K	8K	4K
Maximum RAM in Unit	32K	16K	8K	48K
Number Characters/Line	64	64/32	40	40
Number Lines	16/32	16	25	24
Number of Character Sizes	4	2	1	1
Display Type	DM	TVM	DM	TV (not supplied)
Colors	8	B/W	B/W	15
Graphics	128 x 128 (8 colors)	128 x 48	No	40 x 48 (5 or more colors)
Vector Software	Yes	No	No	Yes
Special Characters	64	No	64	Yes
Special Character Resolution	384 x 256	No	320 x 200	280 x 192
Lower Case Characters	No	No	Yes	Yes
Standard External Interface	RS-232C	No	IEEE-488	No
Mass Storage Type	Mini-Disk	Cassette	Cassette	Cassette (not supplied)
Access Time	1 sec.	420 sec.	420 sec.	420 sec.
Data Transfer Rate	7680 CPS	50 CPS	50 CPS	100 CPS
Storage Capacity	51.2KB	50 KB	50 KB	100 KB
Keyboard (#Keys/Type)	72/COM	53/COM	73/CAL	52/COM
Disk Price Adjustment	0	\$798*	\$700	\$595
Color Price Adjustment	0	\$199 (B/W Display)	N/A	\$400 (must include)
RS-232C Interface Price Adjustment	0	Included in*	\$200	\$180
TRUE SYSTEM COST				
With Color and Disk	\$1,495	\$1,786	\$1,695	\$2,145

Cassette system based upon 15 min. tape lengths. For 5 min. tape lengths access and storage amounts are 1/3 of indicated. All prices are as advertised in October 1978

Compucolor II The complete personal computer

the Renaissance Machine



BYTE SHOP™

THE AFFORDABLE COMPUTER STORE

BELLEVUE
14701 N.E. 20TH AVENUE
BELLEVUE, WASHINGTON 98007
PHONE: (206) 746-0651

LYNNWOOD
20101 - 44TH AVE. W.
LYNNWOOD, WA 98036
PHONE: (206) 775-7436

SEATTLE
2605 2ND AVENUE
SEATTLE, WASHINGTON 98121
PHONE: (206) 622-7196