PEOPLE'S COMPUTER CO.

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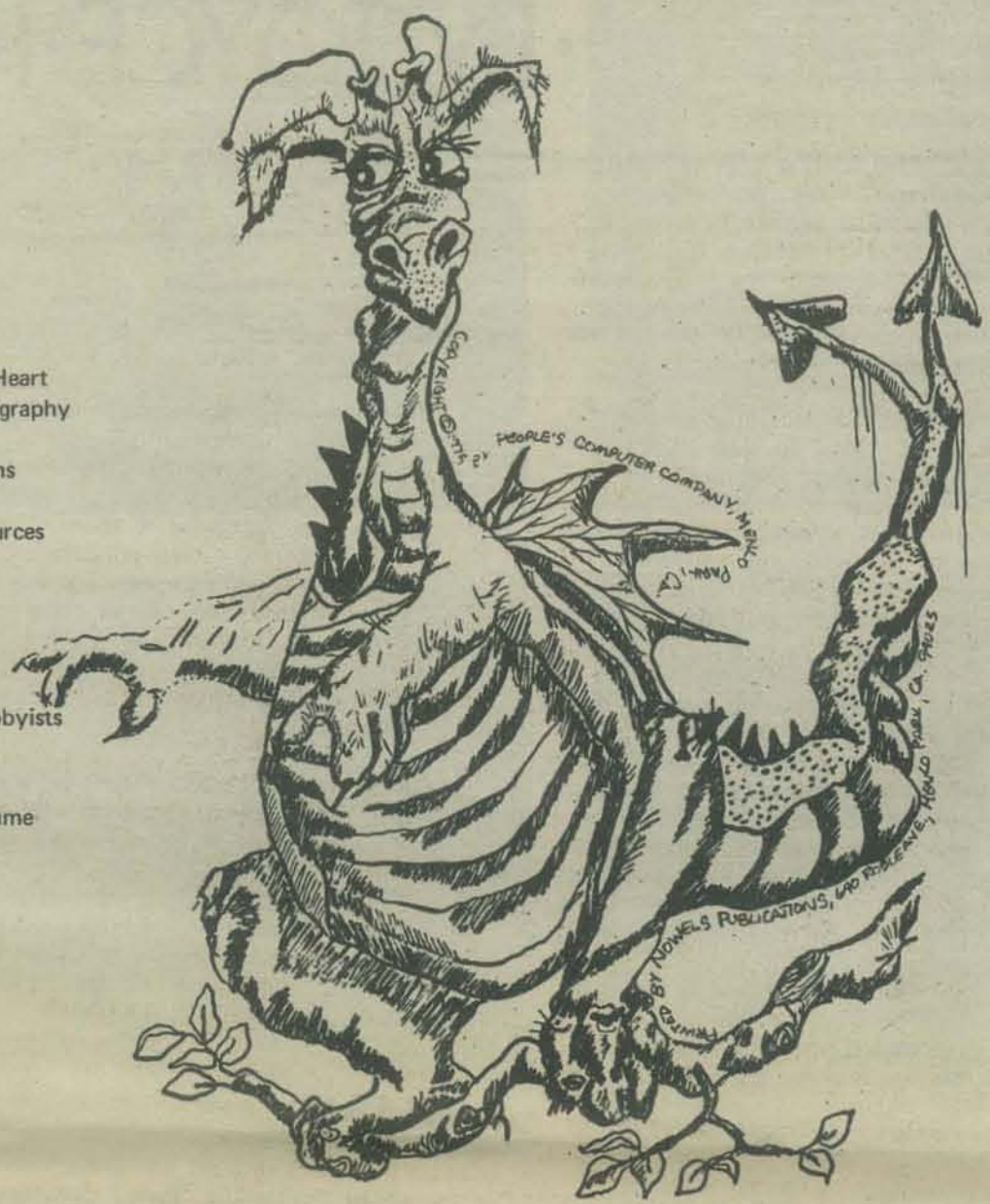

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The Cutting Edge

Now that Dr. Dobb's Journal is here to deal with the present, PCC will move out into the future. The next year or two of PCC will skim the edge of realizable fantasy while holding on to the realities of computers in schools, homes and in the hands of people. Watch for–

- Kids Building Kits
- New Low Cost Computers for Schools
- Computer Clubs
- Computer Stores
- Improbable Art
- The Impossible Game (The Don Quixote Starship)

COMPUTER·AWARENESS·VAN·
·by·JOYCE·HATCH

The Computer Awareness Van has ended its first year operation, with plans being made for a second year. This year has been funded with a $34,505 grant from National Science Foundation. However, with cut backs in NSF high school funding, N.C. State University will provide an almost total support. The N.C. Department of Public Instruction has provided the van, and the Mathematics Division of the department has done almost all correspondence and scheduling with the high schools of North Carolina.

Dr. James D. Powell, Associate Professor of Computer Science at NCSU, who directs the project says, "Most students have heard about computers but they don't know what a computer is or how it works. They tend to think of computers as mechanical monsters." With the computer demonstrations, students and teachers become more familiar with computer hardware, and see how computers can be used as a learning tool in math, science, business and social studies classes. Even music, art and games have an interesting computer future.

The van goes mainly to high schools in North Carolina which have no computer facilities for student use. It stays at each school for two days. Four students from the school being visited are given a quick course (about 30 minutes) and become computer operators for the two days. After a school-wide assembly, classes visit the van. Student response to the assembly presentation is great. The program suggests ways computers are used to solve some of society's problems and explains different ways of producing computer music, accompanied by recordings of each type. There is also a recording of a computer singing, "When you're out of Schlitz, you're out of beer." Chips are also discussed. Students hear a song program on the microprocessor, go through a bit of game logic and hear about core memory (there's a large core memory for them to see). Much of the information has come from reading PCC (Thanks!) Lots of interesting ideas and stories have come from talking to software and hardware people here at NCSU.

The microprocessor is the newest addition to the van's equipment, being loaned by Pro-Log Corporation. Other equipment includes an analog computer, a "Classic" digital computer and up until Christmas, a "Nova" digital computer. The "Classic" is leased from DEC for one year; it is a PDP8 in a desk with floppy disk storage and a CRT display. Students coming through the van can choose any one of the "101 Computer Games" to run. The games keep the "Classic" busy from early morning till late afternoon, even occasionally, late evening.

The analog computer, belonging to NCSU, is programmed for the Huntington II simulation POLUT. The wiring for the program is shown behind a sheet of plexiglass. A separate instrument panel and display were designed for input/output. Students enter the parameters for the the simulation by setting a series of dials. These dials indicate the type of water, amount of pollution, water temperature, type of pollutant and type of treatment. A graphic tablet displays the results of the simulation with plots of the amount of oxygen vs. time in days and the amount of waste vs. time in days. A line is printed on the graph paper which separates the oxygen scale into two parts. Above the line there is sufficient oxygen for fish to live, below the line there is not enough oxygen in the water to support fish. The graphic output dramatically illustrates the effect of pollution on the body of water.

Next year we're hoping someone will loan us a time-sharing system and we'll put in four or five CRT's and teletypes. (One can always dream).

The walls of the van are papered with computer printouts of drawings, draftings and electrical wiring diagrams, computer poetry, photography and engineering applications. A display of wafers and chips, with a chip under a microscope for students to view, is impressive to them. There are also displays of computer technology advancements and the beginnings of information processing. The core memory sets under some close-up photographs of it. Tapes of Hal Chamberlain's (of The Computer Hobbyist) computer music are frequently played while students are in the van. There are also two good IBM films, "The Information Machine" and "A Computer Glossary" for classes to see.

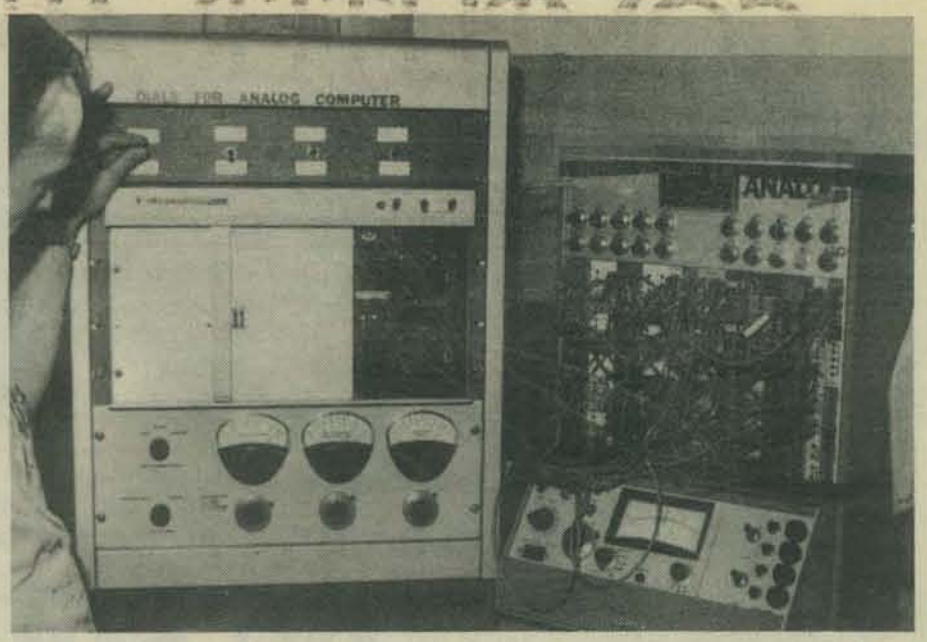
Feedback has been tremendous, with more requests for the van than can be filled. Students are really turned on to computers. Teachers would be, given some time. Administrators and School board members are the key to getting computers in schools. We're not really getting through to them yet. Information regarding educational computing around the state, together with alternate ways of providing computing in schools is left with an interested teacher or principal of each school. Meetings with faculty and administrators are hoped for, even asked for, but there is seldom time in their busy schedules. We can only hope that enthusiasm will filter from students to those controlling school budgets.

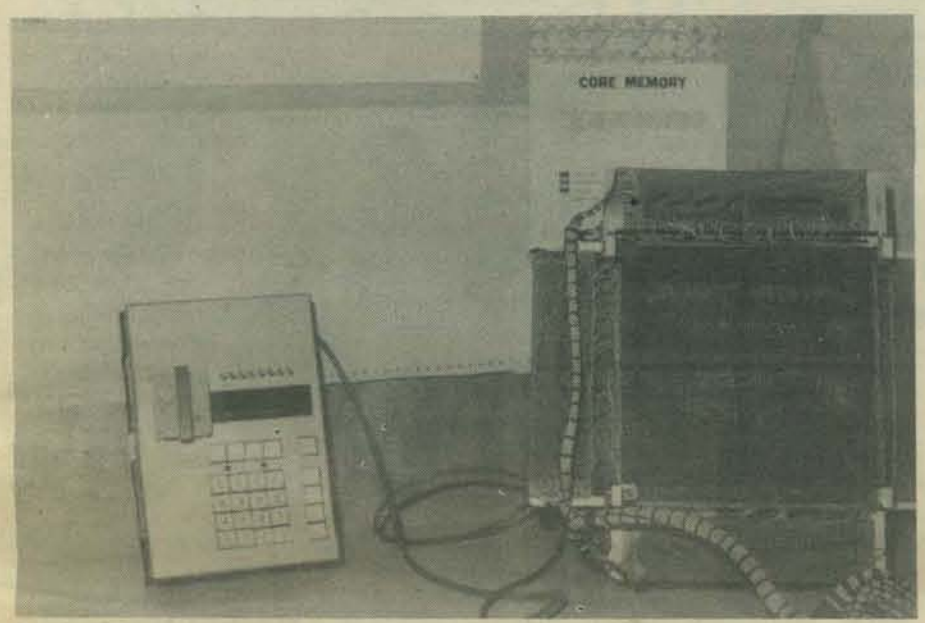
Next year we hope to have a "Nova" which Data General loaned us, to replace the "Nova" belonging to NCSU which was in the van the first half of the year. It was taken for a bridge-monitoring system which NCSU students are designing for the Highway Department of North Carolina. Originally the "Nova" was taken from the van to classroom for Huntington II simulations, primarily STERL and MARKET. The "Nova" had a card reader, a CRT, and a teletype, giving students exposure to more peripheral equipment.

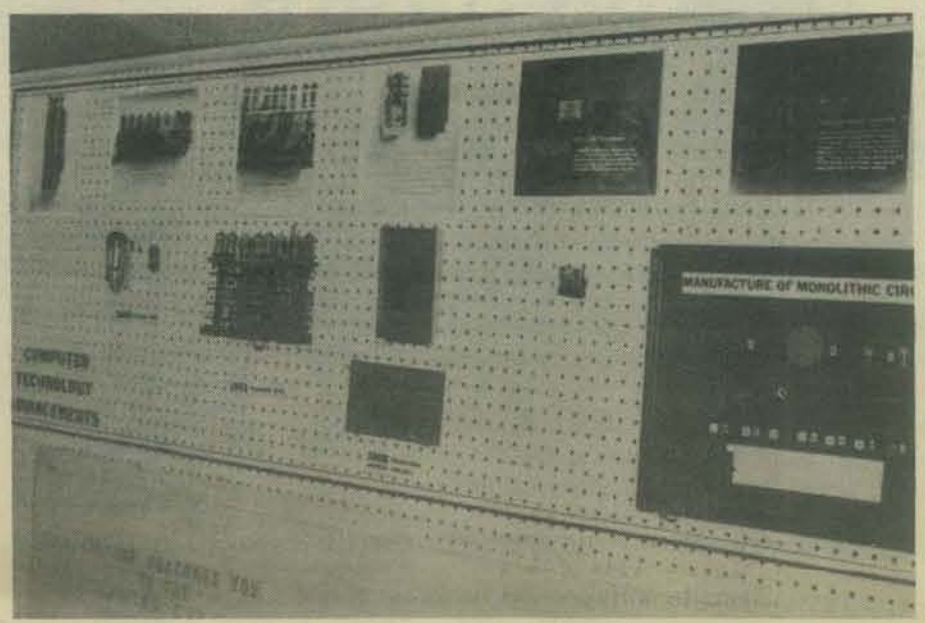
Students get really involved in the simulations. Teachers say they haven't seen such enthusiasm on the part of every student.

The project has been successful in showing students that computers are into many, many things besides math and business. Many students are deciding that computers have a definite place in their future studies and in their choice of occupations.

For more info, contact Joyce Hatch, Department of Computer Science, North Carolina State University, P.O. Box 5972, Raleigh, NC 27607







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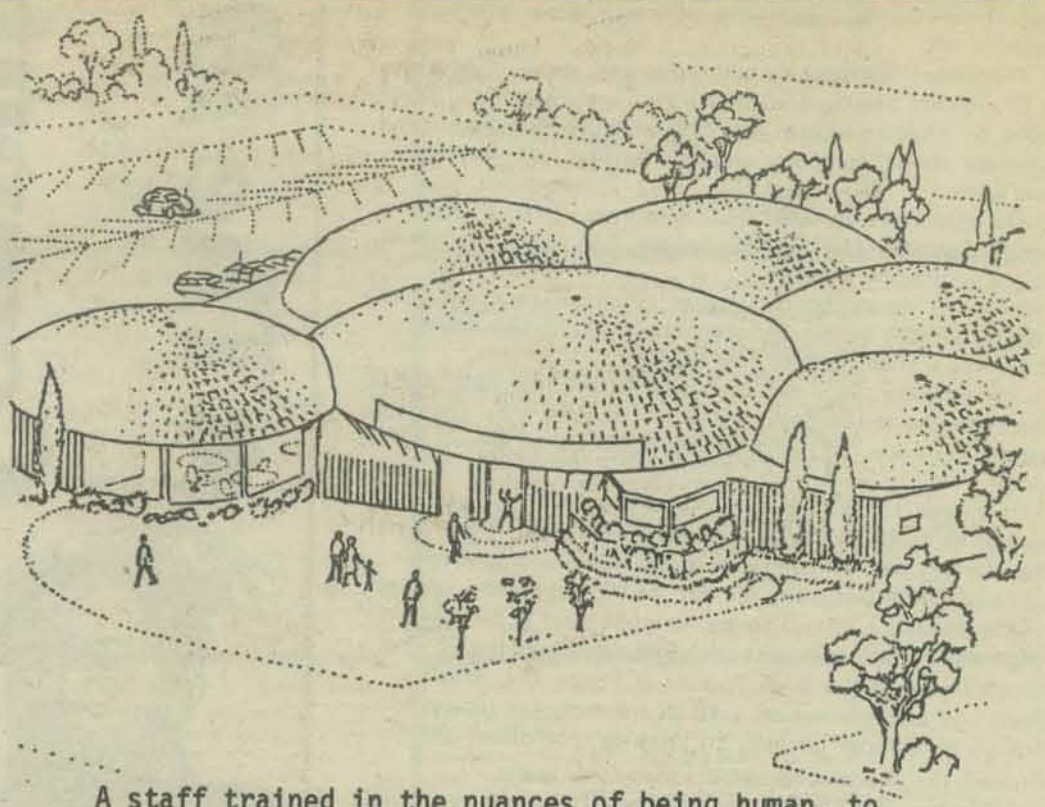

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It is all possible . . .

We are meeting weekly to explore the beginnings of this.

Contact: Gregory Yob
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Palo Alto, CA
326-4039

DAVE AHL (Creative Computing editor) spoke on computer games.

SOL LIBES, ACG-NJ president, spoke at the "Computer Club Congress".

The 1976 Trenton Computer Festival

by sol libes

100 door prizes—worth about $2K—were handed out at the festival.

[Editor's Note: The 1976 Trenton Computer Festival was the first manufacturer-independent computer convention of national scope for hobbyists. It was held on May 2nd.]

● Back in November 1975 when Al Katz and I conceived of a Computer Festival, if you had said that 1,500 people would attend, I would have said you didn't know what you were talking about. And, if you had said that we would have 45 exhibitors, I would have thought that you belonged in the "cuckoo nest." But, it all happened on May 2nd at Trenton State College in New Jersey.

What started out as a small affair for about 300 people (we only had about 100 members at the time), six to nine exhibitors, and a flea market, exploded. Considering that we did not anticipate such a large affair, it is incredible that everything went so well.

The Festival turned into a National Convention—the first of its kind. People came from California, Colorado, Florida, North Carolina, Virginia, Washington DC, Maryland, Ohio, Pennsylvania, Massachusetts, Illinois, Indiana, New York, Connecticut, New Hampshire, Michigan, and, of course, New Jersey—18 states in all!

There were 26 speakers with such well known authorities as Dr. Robert Suding, Hal Chamberlin, and Dave Ahl. They spoke on subjects such as the Z-80 Mpu—including demo, computer music, computer graphics, writing software, 16-bit mpu's, etc.

The exhibitors included DEC, Motorola, RAC, Digital Group, dealers for MITS, IMS, Sphere, E&L, HAL Communications, and many others.

Amateurs set up demo's of their systems. There was a free program-copying service for programs in the public domain. There was a huge outdoor flea market.

One exhibitor, who had brought 14 CRT terminals (@$500 apiece) to the festival, sold 12 within minutes after the doors opened. By noon, all his stock was gone and he closed up his booth!

Of course, I was very busy during the Festival, but I did manage to go to two talks—and they were great. I heard Hal Chamberlin's talk on computer music. Hal is doing some radically new things using his IMP 16-bit mpu and a special Fourier hardware system to create music that is better than that I have heard from systems using other techniques. Hal played a tape of the Bach Toccata & Fugue in D Minor which was programmed on a 16-bit machine and processed through his Fourier circuitry to produce a rendition which sounded like the best musician I have ever heard.

The other talk I heard was Dr. Robert Suding's concerning the new Zilog Z-80 Mpu. Bob had received an engineering sample of the Z-80 about 6 weeks ago and quickly and easily reworked a Digital Group CPU board to accept the Z-80 (it is *not* pin compatible with the 8080). Bob showed his system with a very impressive CRT display of all those Z-80 double registers.

All I can say is, if you were not there, you really missed the event of the year (there must have been about 100 Mpu-based systems up and running).

Henry VIII

KEYNOTE SPEAKER

DR. ROBERT SUDING talked about, and demonstrated his new Z-80 microcomputer system.

HAL CHAMBERLIN (left), Computer Hobbyist editor, demonstrated his new techniques for computer music.

〈 photos by Marj Kirk 〉

〈 Reprinted from *Dr. Dobb's Journal* May 1976 〉

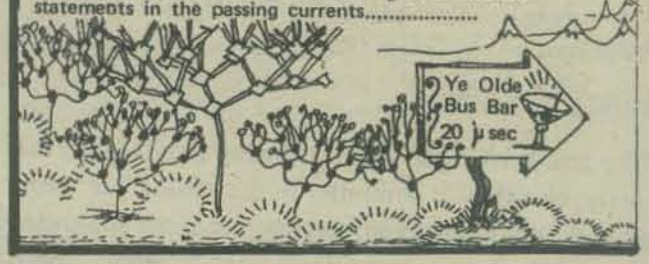
FORTRAN MAN

by Lee Schneider & Todd Voros

Yes, readers, once again it is time to set aside our programming pencils and soldering irons, and follow yet another episode in the fantastic adventures of that King of Compilers, Saver of Software, and ever fearless fighter for truth, justice, and the Algorithmic Way: the one, the only. FORTRAN MAN!

Our story opens today not amid the transients and turmoil of the vast metropolis of 360 City, which Fortran Man calls his home, but rather in the vast and peaceful countryside in that region of the computer world known as TRANSISTORIA - that ancient and venerable land oft times referred to by today's system components (in a reverent manner) as 'the Old Country'.

Far removed from the world of big industrial programs and multi-megahertz hardware, TRANSISTORIA remains a quietly peaceful place, where small local jobs border great expanses of unsorted data fields filled with bit bushes and logic trees, gently waving their branch statements in the passing currents.....



But today, in one of these villages, things are not so peaceful — for in a dimly lit room of the local physicians office, a local job controller watches intently as his associate, the kindly old Doktor Debug, examines the remains of a recently terminated file.....

Hmmm....Ist most interesting!

Tell me, Herr Doktor - is it.....?

Finishing with the examination, the doctor sadly pulls a clean coding sheet over the body and turns away from the lookup table.....

Yes, I'm afraid so - just like the others!

You say you found him like this?

Yes, Herr Doktor - we found him at the edge of the data field, near the pool.....

Herr Doktor, this is incredible! Seven cases so far this cycle - impossible!

Yes, I agree it seems unbelievable, but there is no arguing with the facts! This file, like the others, has been completely drained of data! And, as before, the only evidence of anything suspicious are those two small file marks on the body of the victim!

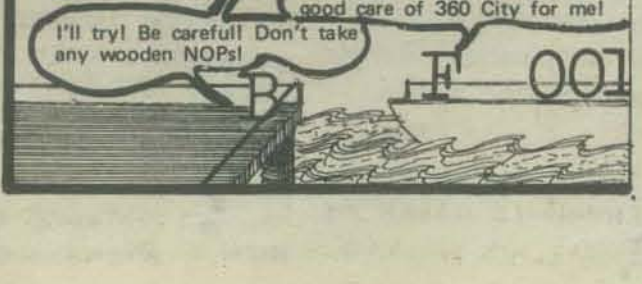
In all my years of practice and thousands of cases, I have diagnosed and debugged a great score of faults and glitches, patched sick code and set fractured breakpoints ..... but never have I seen a case like this!

But, Herr Doktor! What kind of a fiend would go around putting the byte on innocent files like this?

More important, what are we going to do about it? The countryside is in total oscillation! Every file in town has closed itself off and gone into hiding! Our town locksmith can't make file protect keys fast enough.....and still we are losing files!

I tell you, we need help! But who? Who can we turn to to get us out of this crisis?

With a sudden look of determination, the doctor branches out of the diagnostics area and proceeds into the strangely deserted village common, with the local controller close behind.....



Come with me, officer - quickly! Healtime is running out! We must send a message.....

I think I know someone who can help us - and this situation calls for the best!

Doktor Debug and the local controller hurry to the village UART, and an urgent message goes out over the lines....

Meanwhile, in faraway 360 City, a well-known system crimefighter is just returning home from lunch.....

Egad - if I don't stop eating these Big Macros for lunch I'll be in no condition to combat the forces of evil!

I think I'd better go downline and run through a couple of fast DO loops to keep myself in shape!

Ugl

MacDigitals
Fast Feedthru
over 10^9 sold

Fortran Man heads downline for a brisk session of stretching his DIMENSIONS and lifting weighted sums - when suddenly he is discracted by a rapidly flashing indicator.....

Wha....? Its my wrist register -- and thispattern indicates I'm needed!

I'd better get back home fast!!

Shifting into high-speed run mode, Fortran Man heads back towards his resident location.....

Within a few microseconds, he is examining the most important message which has just come in on his direct pipeline to the system I/O control center....

Hmmmm.....from my old friend Doktor Debug in the Old Country and it looks like serious trouble!

There's no time to lose - I'll leave for Transistoria immediately!

Doing a high-speed sort, Fortran Man gathers a few essential items and within another few microseconds is ready to depart.....

Lets see.....I'll need my disguise kit, some clean coding forms, and I'd better take my Transistorian-to-ASCII lookup table.....

After a quick change of sign bit, he branches out of his resident location and ventures forth into the mainstream of 360 city, where he is soon hailed by a familiar ally.....

Hey! F-Man! Wait up!

F-Man's old friend and newest ally, Billy Basic, watches excitedly as Our Hero gets out his passport....

I'll bet you're off on another adventure, huh F-Man? Can I go along? Huh? Can I?

I've been practicing a lot lately, F-Man! My DIMENSIONS are getting bigger, and I can run a DO loop almost as fast as you can!

TO LONG-DISTANCE DATA PORTS

Sorry, Billy - not this time! I'm going somewhere very far away and outside of your operating specs.....and this job looks like its going to be very dangerous!

Besides, Billy.....I need you to stay here and keep and eye on 360 city for me....and thats no small job!

All right! Next! Come on! Move it along!

SHOW YOUR HASP NO.

His HASP number validated, Fortran Man passes the port and boards one of the many transports which serve the channel.....

Turning, he waves farewell to Billy Basic and to exchange some final COMMENT statements with him...

Gee, F-Man - I wish I were going along!

You'll be all right, Billy! Take good care of 360 City for me!

I'll try! Be careful! Don't take any wooden NOPs!

As the long-distance transport pulls out of the port and heads down the channel, Fortran Man watches as 360 City recedes into the distance - and has time to contemplate his upcoming adventure....

It sure will be nice to see my old friend Doktor Debug again - I just hope I arrive in time to help!

From his brief description, I have a feeling this could be the toughest and most dangerous assignment I have ever attempted!

BASIC MUSIC: Overtone Series

BY PETER LYNN SESSIONS

Reprinted from PCC Vol.1

MUSIC IN BASIC?

Why not?! We don't know of many BASIC systems that can *play* music directly, like the big computer music setups, but with humans to do the planning, programming, and playing, the small computer becomes a useful tool for people who know music or want to learn. There are even some published music programs in BASIC (we'll try to review these in later issues of PCC). The programs in this issue were concocted by local music freaks, however.

GOOD VIBRATIONS

To start with, let's look at musical pitch. Sound is made by something vibrating, i.e., moving back and forth in some regular way. The faster the rate of vibration (i.e., the *frequency*) the higher the pitch of the sound.

Do you have a guitar? Try this experiment.

First, strike any string so that it makes a good loud sound. Then, place your finger gently on the string right over the 12th fret. DON'T PRESS THE STRING DOWN TO THE FINGERBOARD, just TOUCH IT.

The result should be a bell-like ringing sound higher in pitch than the sound of the open string.

THE OVERTONE (OR HARMONIC) SERIES

This ringing sound is called an overtone. The overtone you heard is produced by the string vibrating in parts (like the diagram along the side of the page yonder). In this case the string is vibrating in halves (the 12th fret is exactly halfway between the bridge and the nut). Any integer division of the length of the string will produce an overtone. The number of overtones is theoretically infinite, since the integers go up to infinity. However, the higher ones are hard to locate or hear. The first eight overtones (at 1/2, 1/3, 1/4, 1/5, 1/6, 1/7, and 1/8 of the string length) are pretty audible.

Also, the string vibrating as a whole (1/1) is an overtone! Now ... experiment some more ... try other places on the string. Can you get any more overtones?

QUESTION: ARE ALL THE OVERTONES YOU OBTAINED LOCATED RIGHT OVER FRETS ON THE GUITAR FINGERBOARD? ARE THERE ANY THAT SEEM TO BE BETWEEN FRETS? HOW IS THE GUITAR FINGERBOARD CONSTRUCTED?

QUESTION: IF THERE IS AN INFINITE NUMBER OF OVERTONES, AM I RIGHT TO SAY, "WHEN YOU HEAR ONE NOTE, YOU HEAR THEM ALL"?

QUESTION: IS THERE ANY PHYSICAL BASIS FOR THE COUNTING NUMBERS, OR ARE THEY JUST IMAGINARY CONCEPTS?

INTERVALS

One more idea, before we look at some programs. The musical interval between tones is determined by the ratio of the frequencies of the tones. For example, if one tone has a frequency of 100 vibrations per second, and another has a frequency of 300 v/sec, then the ratio of their frequencies is 3/1. This idea about intervals and frequencies was worked out by Pythagoras, as was the idea of overtones as integer multiples of a fundamental frequency (the fundamental is the 1/1 overtone frequency).
Other peoples have recognized this principle, however, and there are elaborate Chinese, Arabic, etc., music theories based on this definition of intervals. The Chinese may have learned of these concepts from travelers who knew about Pythagoras.

QUESTION: IS THERE ANY CONNECTION BETWEEN MUSIC AND RIGHT TRIANGLES? WHAT INTERVAL IS GIVEN BY THE RATIO 3/4? 4/5? 3:4:5?

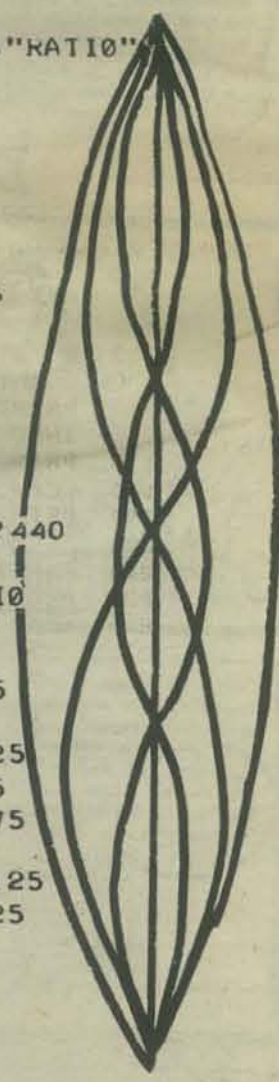
OCTAVES

One of the most important intervals worldwide is the ratio 2/1. Western (i.e., European, etc.) musicians call this interval the octave. There is a tendency in human musical culture to use octaves as "defining points" in making up musical patterns. Most scales essentially begin repeating every octave. Why is this?

The following BASIC program computes the overtones of an INPUT fundamental (F). The program also computes the ratio, and reduces it to a decimal that lies between 1 and 2. Since any power of 2/1 is also an octave of the fundamental (an octave of an octave is an octave), all octaves of F can be said to have ratio 2/1 without falsifying the relationship. Reducing the ratio is done in lines 190 to 210. Here is the program, and a RUN for the first 10 overtones.

```
100  REM OVERTONE SERIES GENERATOR
110  PRINT "HOW MANY OVERTONES DO YOU WANT";
120  INPUT T
130  PRINT "WHAT IS THE FUNDAMENTAL FREQUENCY";
140  INPUT F
150  PRINT
160  PRINT "OVERTONE","FREQUENCY","RATIO"
170  FOR I=1 TO T
180  H=F*I
190  R=I
200  IF R <= 2 THEN 230
210  R=R/2
220  GOTO 200
230  PRINT I,H,R
240  NEXT I
250  PRINT
260  END
RUN
```

F is for FUNDAMENTAL
H is for HARMONIC
R is for RATIO
P is for PYTHAGORAS



```
HOW MANY OVERTONES DO YOU WANT?10
WHAT IS THE FUNDAMENTAL FREQUENCY?440

OVERTONE        FREQUENCY       RATIO
 1               440             1
 2               880             2
 3               1320            1.5
 4               1760            2
 5               2200            1.25
 6               2640            1.5
 7               3080            1.75
 8               3520            2
 9               3960            1.125
 10              4400            1.25
```

QUESTION: HOW MANY OCTAVES ARE THERE IN THE FIRST 10 OVERTONES? ARE THERE ANY OTHER RATIOS OCCURRING AS OFTEN IN THE FIRST 10? DOES YOUR EAR PRODUCE OVERTONES WHEN YOU HEAR SOUNDS? WHY MIGHT THE OCTAVE BE "UNIVERSALLY" IMPORTANT TO HUMANS?

SCALES

The number of possible frequencies is infinite, because the spectrum of sound is continuous. In practice, human musicians have attempted to select definite frequencies to work magic/music with. A set of definite tones (or intervals, which amounts to the same thing) is called a scale.

There are infinitely many different scales. Pythagroas constructed a 7-tone scale based on the 3/1 overtone (next most important after the octave). The Pythagorean scale contains tones at intervals of 3/2, starting with a tone 2/3 that of the Fundamental. Try to write a program to compute the frequencies of such a scale. We'll publish our version next issue.

Meanwhile, on to the 18th Century and J.S. Bach. The scales of Pythagoras and other variations (we'll get to them next time too) implied a scale of 12 tones to the octave, increasing proportionately (i.e., geometrically) from F to 2*F. Scales of this type are called tempered scales, and were apparently known as theoretical possibilities to the ancient Greeks. Only by the time of Bach, however, was the 12 tone tempered scale a practical possibility. Why was it so difficult? Because the proportionality constant for a 12 to the octav scale has to be the twelfth root of two!!! Think about it ... the first tone has frequency F, the second has F*C, the third has F*C*C of $F*C^2$. Tone 13 must have frequency $F*C^{12}$, and must also equal 2*F, since it represents the octave (12 different tones, remember?).

If $F*C^{12} = 2*F$, then $C^{12} = 2$ and $C = 2^{1/12}$, the 12th root of 2.

This is an irrational number (like all roots of 2), and is difficult to calculate without logarithms. Logarithms were discovered by Napier in the late 16th Century (see Newman, *The World of Mathematics, Vol. 1*, p. 123), and tables of logarithms were probably not generally available (or appreciated) until nearly a century later. So, Bach's "Well-Tempered Clavier" could have been written earlier, but could not have been played at one sitting.

The program below calculates the frequencies of a tempered scale with an INPUT number of tones in one octave. It uses the LOG and EXP functions; we could have used an expression like $F*2^{1/12}$ instead, but this way seems neat. No doubt Napier, after 25 years of hand calculations to produce the first book of log tables, would rather have done it this way!

```
100  REM *** SCALE FREQUENCY GENERATOR ***
110  PRINT
120  PRINT "HOW MANY TONES TO THE OCTAVE ";
130  INPUT T
140  PRINT
150  PRINT "WHAT IS THE BASE FREQUENCY ";
160  INPUT F
170  PRINT
180  LET L=LOG(2)/T
190  PRINT "TONE","FREQUENCY"
200  PRINT
210  FOR I=0 TO T-1
220  PRINT I+1,F*EXP(I*L)
230  NEXT I
240  PRINT
250  END
```

RUN

```
HOW MANY TONES TO THE OCTAVE ?12

WHAT IS THE BASE FREQUENCY ?440

TONE            FREQUENCY

 1               440
 2               466.164
 3               493.883
 4               523.251
 5               554.365
 6               587.329
 7               622.254
 8               659.255
 9               698.457
 10              739.989
 11              783.991
 12              830.609
```

At this point we have enough background information to discuss the program. As the RUN here indicates we are first asked to INPUT the "base frequency." This is the frequency from which the frequencies of the 12 tone scale are computed. We have used the conventional "A above middle C" or 440 cps. Then the program asks for the "upper" (30 cps) and "lower" (10 cps) limits of the critical range. These are INPUT so the effects of changing the limits can be explored.

Next the program asks for the two chromatic scale tones you wish to examine. The base frequency is considered to be zero, positive numbers represent tones above the base frequency in pitch, negative numbers represent tones below the base frequency. With the base frequency of 440 cps as in our example, 12 would represent 880 cps and −9 would be the number to INPUT for "middle C."

TEMPER, TEMPER. . . .

Earlier we discussed various properties of single tones, such as their overtones. The program below, titled "BEAT FREQUENCY ANALYZER" allows us to explore, in a simplified way, one of the musical effects produced when two tones are sounded together. This effect is called *beating* and is one of the main factors which determine whether a pair of tones are consonant (or dissonant) with respect to each other when they are played together. Whenever two frequencies are vibrating simutaneously a complicated motion is set up in the vibrating "medium" or substance, since it is being made to vibrate in two different ways at once. One of the effects caused by this compound vibration is that, in addition to hearing the two tones being played, we also hear *another tone* whose frequency is *the difference between the frequencies of the other two tones.* This sound is called the *difference tone.* Because of the way our ears work there is a lower limit to the frequencies we perceive as continuous sounds. Below this limit frequencies are heard as separate "pulses or beats. This lower limit varies from person to person and is also somewhat dependent upon other factors as well, but for our purposes we will say it lies somewhere between 20 and 60 cps (cycles per second) say something like 30 cps. If we examine still lower frequencies, below 10 cps for instance, we find that the beats are coming too slowly for us to notice, and we usually don't hear them at all. Now, if the difference tone has a frequency in this range (10 to 30 cps) it sort of "breaks up" the sound we are hearing in what is usually considered an "unpleasant" or dissonant manner. We might say that it is "sour" or that the tones are "out of tune." Since most musical tones have overtones these also produce difference tones with *all the overtones of the other sound* as well (what are the difference tones produced by the overtones of a *single* tone?) and if any of these difference tones lie in the critical range the same sort of effect occurs, they sound "dissonant."

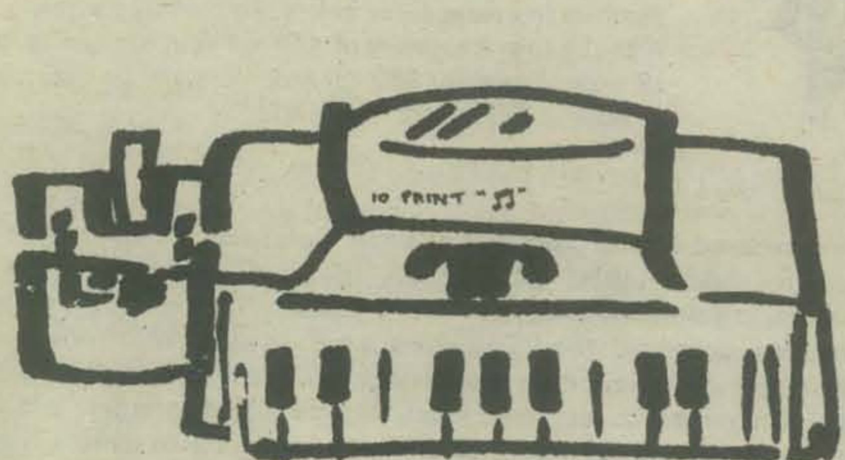
```
100  REM *** HARMONIC BEAT-FREQUENCY ANALYZER ***
110  PRINT
120  L=(LOG(2))/12
130  PRINT "INPUT BASE FREQUENCY, LOWER LIMIT, UPPER LIMIT "
140  INPUT F,D0,D1
150  DEF FNT(X)=F*EXP(X*L)
160  PRINT
170  PRINT "INPUT FIRST TONE, SECOND TONE ";
180  INPUT P,Q
190  PRINT
200  U=FNT(P)
210  V=FNT(Q)
220  K=1
230  T=K*V
240  J=1
250  S=J*U
260  W=ABS(T-S)
270  IF W>D1 THEN 310
280  IF W >= D0 THEN 350
290  PRINT "CONSONANT ";
300  GOTO 360
310  J=J+1
320  IF S<T THEN 250
330  K=K+1
340  GOTO 230
350  PRINT "HARMONIC #1","HARMONIC #2","BEAT FREQUENCY"
360  PRINT J,K,W
370  GOTO 160
380  END
```

RUN

```
INPUT BASE FREQUENCY, LOWER LIMIT, UPPER LIMIT ?440,10,30

INPUT FIRST TONE, SECOND TONE ?1,8

CONSONANT  3                    2                   1.57812

INPUT FIRST TONE, SECOND TONE ?1,5

HARMONIC #1     HARMONIC #2     BEAT FREQUENCY
 5               4               18.499
```

(MORE)

(MORE) BASIC Music



The program then computes the difference tone produced by these frequencies, and also the difference tones produced by their overtones until it finds one whose frequency is less than the frequency we INPUT as the "upper limit." It then checks to see whether the difference tone produced is in the critical range (i.e., its frequency is greater than the "lower" limit). If the tone is in the critical range it PRINTs out which overtone (also called *harmonic*) of each of the two original tones produced the difference tone, and also PRINTs the frequency of the difference tone (also called the beat frequency). If, on the other hand, the beat frequency is less than the number given as the "lower" limit of the critical range the two tones are considered "consonant" so it PRINTs the word CONSONANT followed by the three values mentioned above.

We mentioned previously that this program allows us to explore the phenomenon of beat frequencies in a simplified way. The perception of sound is a very complicated subject, and any very precise computer model that is to be used to explore the intricate ideas of "consonance" would have to take this into account.

In any case, despite its limitations, the program is a fairly good place to begin to get a feel for the subject, and hopefully will help you in your own experimenting.

---

10 PRINT "♫"

Now for a taste of things to come. In some subsequent issue of PCC we hope to review composing simulators in BASIC. For example, Kemeny and Kurtz have an interesting harmony generator which we'll try to review/reprint. As a starter, we present one of our efforts in the genre: the MAD COMPOSER. This composer can keep his tunes "in key" even if the key "spelling" isn't always correct (no flats – you may wish to modify the program to eliminate this deficiency). Line 430 selects a number at random, 1 through 7. Line 440 then gets a tone from the circle of fifths (the Chromatic scale arranged with a chromatic interval of 7 between adjacent tones). Since any 7 adjacent tones on the circle of fifths is a key, this step ensures that the correct key (INPUT by the user) will be used.

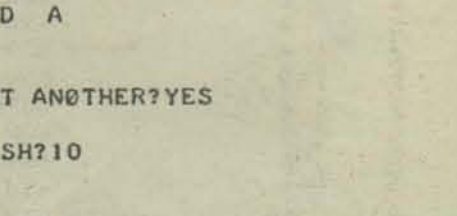
The program has string input and output; a sample RUN is reprinted with the program.

We hope that this program will stimulate some of you readers to write composers of your own. If you do, and you think we'll like them, send them in. Also, feel free to use any of our music programs, for free if you don't charge for them yourself.

Written for HP 2000C

```
100  REM ***RANDOM MELODY GENERATOR WITH STRINGS***
110  REM ***COPYRIGHT 1972 BY DYMAX***
120  DIM M[100],A$[24],K$[2],J$[2],Q$[3]
130  A$="A A#B C C#D D#E F F#G G#"
140  MAT M=ZER
150  PRINT "DO YOU WISH INSTRUCTIONS";
160  INPUT Q$
170  IF Q$="NO" THEN 260
180  PRINT "I AM A (SLIGHTLY) MAD COMPOSER.  MY MELODIES MAY"
190  PRINT "AMUSE YOU.  YOU TELL ME THE KEY, AND HOW MANY NOTES"
200  PRINT "TO COMPOSE, AND I WILL DO THE REST.  "
210  PRINT "THE KEY MAY BE A SINGLE LETTER, A B C D E F G, OR"
220  PRINT "IT MAY BE A LETTER FOLLOWED BY '#' (SHARP)."
230  PRINT "NO FLAT KEYS, PLEASE.  "
240  PRINT "FOR EXAMPLE, TYPE F FOR F-NATURAL, F# FOR F-SHARP."
250  PRINT "THE MELODY MAY BE UP TO 100 NOTES LONG."
260  PRINT "WHAT KEY DO YOU WISH";
270  INPUT K$
280  J$="  "
290  IF LEN(K$)=2 THEN 320
300  J$[1,1]=K$
310  K$=J$
320  FOR J=1 TO LEN(A$)-1 STEP 2
330  IF K$=A$[J,J+1] THEN 350
340  NEXT J
350  K=(J+1)/2
360  REM**K IS NOW A NUMBER, 1<=K<=12, REPRESENTING THE KEY.***
370  PRINT "HOW MANY NOTES DO YOU WISH";
380  INPUT N
390  PRINT
400  PRINT
410  REM ** THIS IS THE MELODY GENERATOR **
420  FOR I=1 TO N
430  Y=INT(7*RND(0))+1
440  M[I]=7*(Y-2)+K+12
450  REM **NOW TO REDUCE THE TONE MOD 12 **
460  M[I]=M[I]-INT(M[I]/12)*12
470  IF M[I]#0 THEN 490
480  M[I]=12
490  Q=2*M[I]-1
500  PRINT A$[Q,Q+1];" ";
510  NEXT I
520  PRINT
530  PRINT
540  PRINT
550  PRINT "HOW ABOUT THAT ONE?  WANT ANOTHER";
560  INPUT Q$
570  IF Q$="YES" THEN 260
580  PRINT
590  PRINT "THAT'S ALL, FOLKS !!"
600  END
```

```
RUN
MAD

DO YOU WISH INSTRUCTIONS?YES
I AM A (SLIGHTLY) MAD COMPOSER.  MY MELODIES MAY
AMUSE YOU.  YOU TELL ME THE KEY, AND HOW MANY NOTES
TO COMPOSE, AND I WILL DO THE REST.
THE KEY MAY BE A SINGLE LETTER, A B C D E F G, OR
IT MAY BE A LETTER FOLLOWED BY '#' (SHARP).
NO FLAT KEYS, PLEASE.
FOR EXAMPLE, TYPE F FOR F-NATURAL, F# FOR F-SHARP.
THE MELODY MAY BE UP TO 100 NOTES LONG.
WHAT KEY DO YOU WISH?A
HOW MANY NOTES DO YOU WISH?10


F# D  D  F# B  F# G# C# D  A


HOW ABOUT THAT ONE?  WANT ANOTHER?YES
WHAT KEY DO YOU WISH?C
HOW MANY NOTES DO YOU WISH?10


E  B  A  A  A  G  B  E  A  B


HOW ABOUT THAT ONE?  WANT ANOTHER?NO

THAT'S ALL, FOLKS !!
```



THE SAN ANDREAS FAULT CAPER

Books Suggested by USGS

Iacopi, Robert, 1971, EARTHQUAKE COUNTRY – HOW WHY, AND WHERE EARTHQUAKES STRIKE IN CALIFORNIA (3rd ed.): Menlo Park, CA, Lane Book Co., 160 p. Paperback, (Junior High and up).

Lawson, A.C., and others, 1908, THE CALIFORNIA EARTHQUAKE OF APRIL 18, 1906 – REPORT OF THE STATE EARTHQUAKE INVESTIGATION COMMISSION: Carnegie Institution of Washington Publication 87 (2 vols. and an atlas). Reprinted November 1969.

Pamphlets from USGS

Active Faults in California USGS: INF-74-3 (R.1)

The San Andreus Fault. USGS: INF-66-3 (R.10)

From: U.S. Dept. of the Interior /Geological Survey
Reston, Virginia 22092

GEOLOGICAL SURVEY
Large Scale Maps of Major Faults in California

I-553 Map showing recently active breaks along the San Andreas Fault between Tejon Pass and Cajon Pass, Southern California, by D.C. Ross, 1969. (Scale 1:24,000. Price $1.00)

I-574 Map showing recently active breaks along the San Andreas and related faults between Cholame Valley and Tejon Pass, CA, by J.G. Vedder and R.E.Wallace, 1970 (Two sheets, scale 1:24,000. Price $1/set)

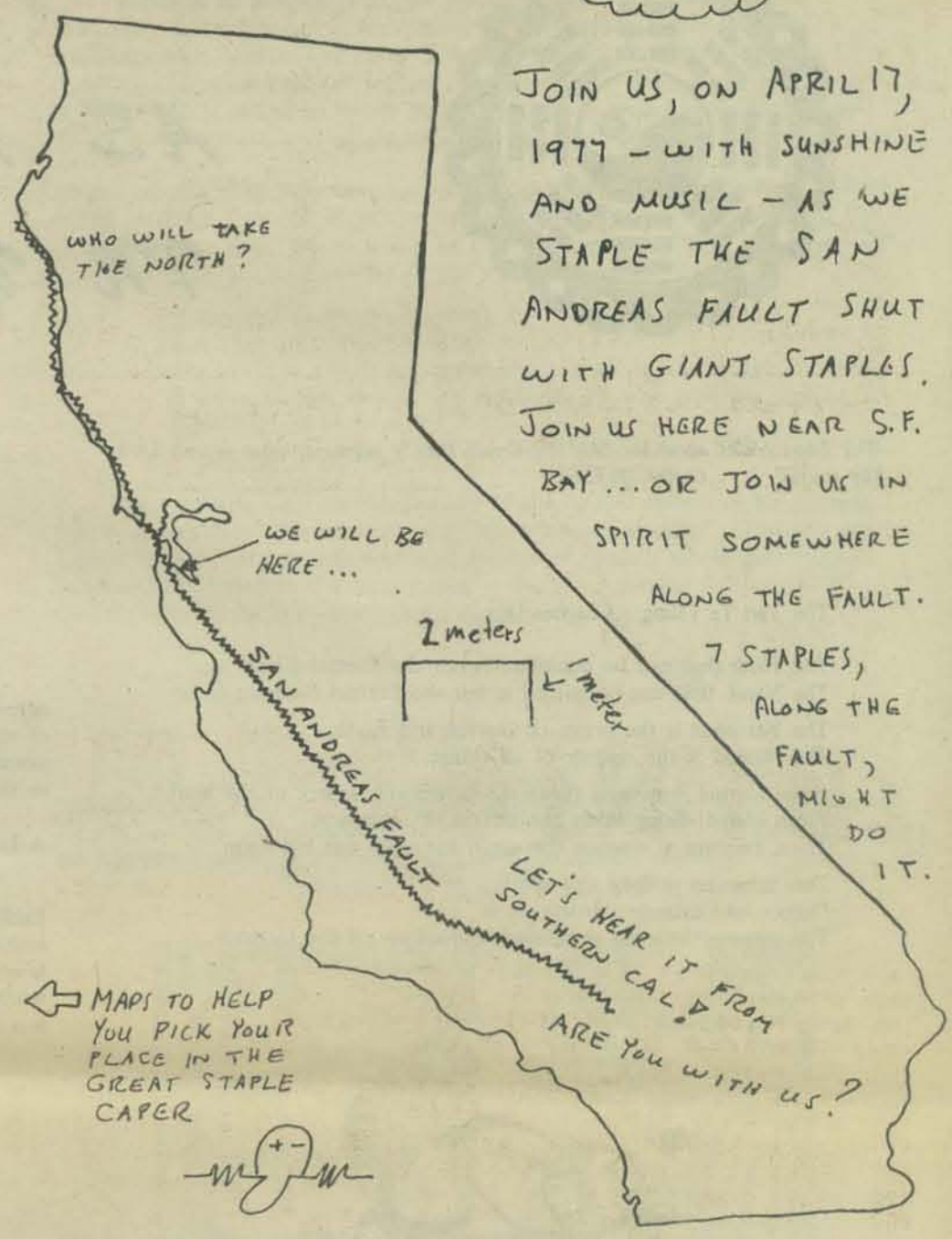
I-575 Map showing recently active breaks along the San Andreas and related faults between the northern Gabilan RAnge and Cholame Valley, CA., by R.D. Brown, Jr., 1970. (Two sheets, scale 1:24,000. Price $1/set)

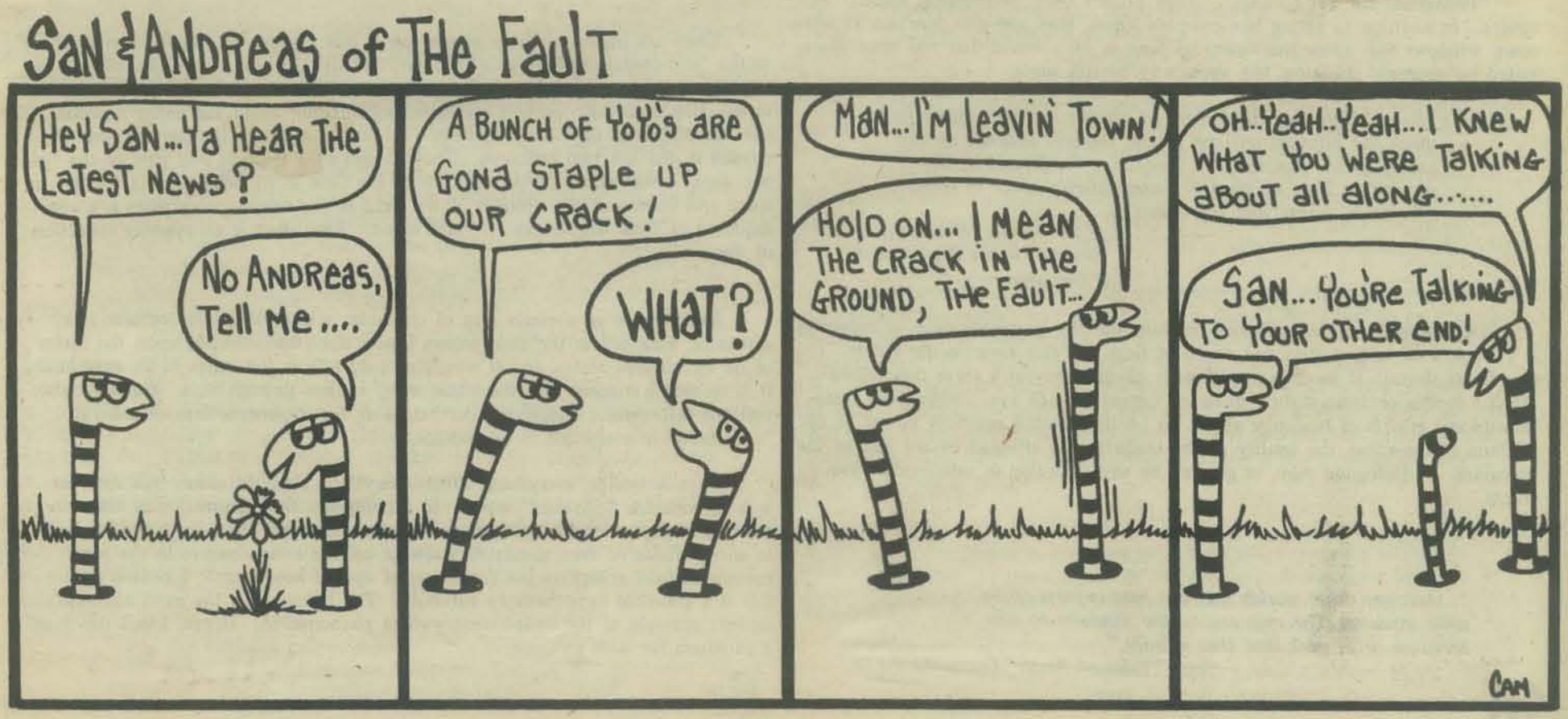
I-692 Map showing recently active breaks along the San Andreas fault between Point Delgada and Bolinas Bay, Calif., by R.D. Brown, Jr., and E.W. Wolfe, 1972. (Two sheets, scale 1:24,000. Price $1.25/set)

MF355 Active faults, probable active faults, and associated fracture zones, San Mateo County, CA., by R.D. Brown, Jr., 1972. (Scale 1:62,5000. Price, $0.50)

MF650 Map showing recently active breaks along the San Andreas fault between the central Santa Cruz Mountains and the northern Gabilan Range, by A.M. Sarna-Wojcicki, E.H. Pampeyan, and N.T. Hall, 1975. (Two sheets, scale 1:24,000. Price $1/set)

Order From: Branch of Distribution
U.S. Geological Survey
Bldg. 41, Federal Center
Denver, CO 80225





THE WORLD AS A HOLOGRAM IN YOUR HEART

dong seeley

'The heart looks no more like the world than a grammaphone record looks like music' ...*Cathy McTavish*

The Tao Te Ching: Chapter One

The Flow that can be described is not the Eternal Flow;
The Name that can be named is not the Eternal Name.

The Nameless is the origin of Heaven and Earth;
The Named is the mother of all things.

From eternal non-being flows the mysterious source of the world;
From eternal being flows the surface of existence;
These two are at essence the same, but only one has form.

This sameness is deep and subtle,
Deeper into infinite subtlety, it is
The gateway into the mysterious unfoldings of the Universe.

Holograms are Weird

"Holograms are weird things". They project three dimensional spatial images. In addition to acting like complex lenses, they can also function as windows, windows that allow the viewer to peek in on a world that was once illuminated by coherent radiation, but appears to be still there.

> *"Bohm, in tracing the history of physics has emphasized how much our physical universe (image thereof) depends on the use of lenses. Lenses have shaped our images and lenses objectify. Thus we tend to assess external space in terms of objects, things, and particulars".*
>
> *...Karl Pribram, Holonomy and Structure in the Organization of Perception*

Depending upon the recording medium and the laser coherence, a hologram is a window of various sizes and depth of field. It may encircle the viewer. One looks through it from many different perspectives for a three dimensional effect. It also provides slightly different images to each eye, yielding the three-dimensional effects of binocular vision. In addition to the resolving power of the medium of recording, the quality of the image is also affected by the size of the hologram. A Hologram may, in general, be any recording of interfering wave-fronts.

> *"...there are other worlds that can pass in front of the same windows...The eyes can be the windows to peer into boredom or to peek into that infinity."*
>
> *from "Tales of Power".Castaneda P.173*

Looking at or through any part of an optical hologram, the eye sees the entire world from one point of view. Two eyes see two slightly different points of view. These disparate images are "fused" and perceived as one three dimensional view. This process occurs in the nerve cells responsible for binocular vision in the cortex on the right side of the brain.

A Little Bit of Everything

Information about the original scene exists in each part of the hologram. Each part "sees" the world from a slightly different point of view. One small isolated part will yield a slightly less well resolved image because less information is composed to form the image; nevertheless, there is information about the entire world from that limited and particular point of view. In this sense then, "there is a little bit of everything, everywhere" in a hologram.

> *"The air is full of an infinity of straight and radiating lines intersected and interwoven with one another without one occupying the place of another." On this basis, Leonardo Da Vinci explained that the optical images of illuminated objects are potentially present everywhere in the space around them... 'All bodies together, and each by itself, give off to the surrounding air an infinite number of images which are all in all and each in each part, each conveying the nature, colour, and form of the body which produces it. Leonardo wrote a passage entitled 'prove how all objects, placed in one position, are all everywhere and all in each part'.*
>
> *Optics, Painting and Photography, M.H. Pirenne. P.14,15.*

There are many processes in the world that suggest the "little-bit-everywhere" or the "part-containing-the-whole" property. Mach's principle states that the mass of a single particle is determined by the distribution of matter in the rest of the universe. Hence, a single particle represents information about the entire universe. The concept of "fields of force" has been a strong paradigm in the development of physics in the last two centuries. The strength of a force in any part of the field is a direct consequence of the strength of the field in its neighbouring locality in space and time, and the strength of the field in the neighbouring parts is a consequence of their neighbours . . . and so on. Every part is an ongoing reflection of the whole.

Similarly, in an abstract area of computer science known as cellular array automata, each cell in the array enters a new state that depends upon the states of its surrounding states, and it simultaneously affects the states of its neighbours. It is in such a manner that the whole array evolves through time. Consider also, that the information concerning our beings as vast superstructures of cells, is "contained" in every cell in our bodies.

In such worlds, everything affects everything else. Intuition tells me that it is so with our "physical" world. In a hologram, the information is also contained within the local neighbourhood interrelationships. Can the wave-fronts in energy fields or even simulated waves in cellular arrays behave in the same manner as light energy in the formation of optical holograms? I believe that this is a plausible hypothesis to entertain. The hologram is the most concrete current example of the little-bit-everywhere phenomenon. Hence, I will use it as a paradigm for such processes.

"Our work brings out in an intuitive way just how and why a quantum many-body system cannot properly be analyzed into independently existent parts, with fixed and determinate dynamical relationships between each of the parts. Rather, the "parts" are seen to be an immediate connection, in which their dynamical relationships depend, in an irreducible way, on the state of the whole system (and indeed on that of broader systems in which they are contained, extending ultimately and in principle to the entire universe.) Thus, one is led to a new notion of unbroken wholeness which denies the classical idea of analyza-

bility of the world into separately and indepentently parts..."

D. Bohm and B. Hiley, "On the Intuitive Understanding of Non-Locality as Implied by Quantum Theory" (Birbeck College, U. of London, 1974).

The World Hologram

Now what is a hologram? It is a recording not of just light intensity, but of an interference pattern. of different wave-fronts. Usually this is the rippling of a reference beam of coherent radiation (laser light) criss-crossing with the ripplings of a beam deflected from the hologram world. Vast intertwinings of light energy. A hologram appears to be a meaningless jumble. Although it makes no sense when viewed in ordinary light it contains all the information that light waves can reveal. It contains in coded form all the information an eye would intercept if it were located at the position of the photographic plate. In general, a hologram is a recording of two or more coherent waves interfering. When it is illuminated again with one of these two waves, the other wave appears simultaneously.

"The reality we experience in ordinary states of consciousness is due to the constructive interference of the dynamic phases or 'actions' associated with each of the indefinite number of co-existing universes. I suspect that consciousness may be able to alter the patterns of constructive interference to create separate but equally real realities."

Jack Sarfatti, in "Space, Time and Beyond." P. 128

Now what does the outside world consist of? All matter has been shown to have wave-like properties, packets of buzzing energy swirling in relatively vast and empty arenas of interacting energy fields. All of this energy is in flux, in complex and rapid oscillations whose effects ripple throughout space-time. These many-dimensional waves interact in manifold ways that yield the "things" and "actions" in the warp and the woof of the world. Vast intertwinings of energy.

"Considered in its physical, concrete reality, the stuff of the universe cannot divide itself but, as a kind of gigantic "atom", it forms in its totality...the only real indivisible. The farther and more deeply we penetrate into matter by means of increasingly powerful methods, the more we are confounded by the inter-dependence of its parts. ... It is impossible to cut into this network, to isolate a portion without it becoming frayed and unravelled at all its edges."

Teilhard de Chardin, "The Phenomenon of Man"

Consider the world, therefore, to be one enormous intermingling of energy, a huge interference pattern. As such, will it have the little-bit-everywhere property? That is, that any chunk of space-time represents the entire universe of space-time in the same that a piece of a hologram can still create the original scene from a limited point of view. Holograms have that property because each part of a scene deflects radiant energy to each spot on the recording medium. Is each chunk of space-time therefore, a window on the comings and goings of the entire universe? My experience suggests that this may well be the case. I shall encapsulate this assumption into the phrase "world hologram", metaphorically.

". . . the world is merely a view. . ."

Don Juan Matus in "Tales of Power" by Carlos Castaneda p.240

As Without, So Within

"How do we perceive the outer world?". . .Since we are using optical holography as an illustration, take vision for an example of perception. Our familiarity with cameras and movies gives us models that represent sight as the neural processing of "images" formed upon the retina. We are conditioned to understand these images as we do photographs which record only the light intensity not the phase information about the relative location of surfaces in space.

Retinas process phase information. Perhaps brains store the interference patterns of the perceived "outside world". Evidence by Pribram and others suggests that this may be the case. Brains would be thus storehouses of "little-bit-everywhere" views of the world, the evolution of the world hologram!

"There are worlds upon worlds, right here in front of us. And they are nothing to laugh at . . .
The world is a mystery, and it is not at all as you picture it. Well, it is also as you picture, but that's not all there is to the world; there is much more to it."

From "The Teachings of Don Juan," Castaneda

While working with the descriptions of the 40,000 dreams of his patients, Carl Jung postulated the existence of a "collective unconscious". This was considered to be a vast common source of archetypal symbols whose constellated information lay deep in the unconscious of everyone. During dreams this resource of knowledge is revealed (from whom to whom?).

"Even sleepers are workers and collaborators in what goes on in the universe!"

Heraclitus

Various spititual paths speak of the "Akashic records", the memory of the universe existing everywhere and only requiring one to become a so-called "open-channel" in order to access its knowledge. Folks who practise psychometry, reading the history of an object and those who have touched it, appear to be accessing such a process.

"The problem for tonight is seeing people. First you must stop your internal dialogue, then you must bring up the image of the person that you want to see; any thought that one holds in mind in a state of silence is properly a command, since there are no other thoughts to compete with it."

Don Juan, "Tales of Power", p. 37.

A couple of years ago, I performed some pyschic reading experiments while in a trance state. When I asked, in a reverent and respectful manner, for information on the illnesses of distant strangers, the information "appeared" instantly sometimes visually, sometimes tactile. It was crystal clear and was certainly of a different quality than the internal dialogue of thought or even ordinary imagination. I have since experienced the same phenomenal quality during states of reverie, often just after recording in a dream journal before going back to sleep.

When I experienced these psychic phenomena, my scientific background gave me no models with which to understand these facts. There had to be a source of information about everything going on in the universe that is available to our souls anywhere! But both conventional wisdom and science could not help until I read of Pribram's ideas on holographic brain processing and Jungian archetypes. Shortly afterwards, I attended a lecture of Pribram's where he spoke of the isomorphism of the "world-within" as hologram and the "world-without" as holograms. This came as a revelation, for at last I had a model for some psychic phenomena.

"Could it be that for the physical universe, just as in the case of brain function, structure and distribution mutually interact? After all the brain is part of the physical universe for brain function, we found structure to be in the form of program and distribution in the form of holograms. Is the rest of the universe built along these lines as well???"

...Karl Pribram, Holonomy and Structure in the Organization of Perception

In the English language, "heart" oftens means the source of emotions, will, and inner essence, the true self. Physiology picked the wrong space/time location for this "heart". I believe it to be in the right hemisphere of the brain. Split brain experiments (Sperry, Gazzaniga and Ornstein) suggest that hemispheres of the walnut shaped brain function differently. Serial, intellectual logic is intimately tied to the speech centre in the left hemisphere; the jigsaw puzzle processing of intuitive and creative skills occurs in the right one.

"To the Egyptians, the heart, and not the brain, was the seat of mind and emotion, that organ that recorded for the gods all the good and evil deeds one did during life. In religious scenes, the heart of the deceased was shown being weighed against the symbol of truth to determine whether the deceased was worthy of heaven or not. The heart, therefore, had to be kept with the body for this ceremony."

"X-Raying the Pharoahs", James E. Harris and Kent R. Weeks, New York, 1973, P.88.

When surgeons, in order to remove deep tumours, began splitting the brains of humans in the 1930s, they were much afraid that terrible changes would occur in their patient's function and personality. But to their surprise they observed no changes at all. What was cut was the corpus callosum, a huge trunk line of nerve fibres that transmits memories and learning from one hemisphere to the other. Man appears to be alone amongst the mammal (including whales and dolphins?) in having different uses for the halves of his brain. It is turning out that the left cerebral hemisphere plays a dominant role in speech for most people. It also appears to be where language skills such as logic and analysis originates. The right hemisphere however, is where artistic, musical, and intuitive skills preside.

"All language is of a successive nature. It does not lend itself to a reasoning of the eternal, the intemporal."

Borges, "Labyrinths", New Directions Press

The Fall from Grace

In healthy humans, there seems to be a well-tuned process that continually selects hemispheres, depending upon the type of problems presently confronting them. The different modes of the two brains can be loosely characterized by the duality of serial/parallel (digital/analogue?). The right hemisphere is better at grasping the total picture, the gestalt of a scene, the jigsaw puzzle causality of an all-at-once world. It is this specialization of functions that lets us utilize language in the left brain to manipulate symbols and gives us a handle on manipulating and controlling a world of objects. But, at the same time does it hide or mask our latent psychic abilities, was this specialization the fall from grace?

". . . tonal, no time for irrational crap. . .
nagual; no time for rational crap . . ."

Castaneda, "Tales of Power", P.173

Our culture is dominated and molded by printed language and its artifacts. The "heart" is just where the linear sequential causality of the "internal dialogue" of thought is not. The domination in our culture, of technology over the arts is a projection of an inner domination in our minds by the left hemisphere. The heart is in those mansions of the mind that our print-sodden civilization has ignored and virtually written out of existence.

The spoken word is a magical tool that extends our power into the world around us. It makes us self-conscious about manipulating and identifying the things and objects of the world. It is the source from whence comes our artificial world. Although tools magnify and manipulate, our linguistic tools cannot synthesize the all-at-onceness of change in the outer and inner worlds. However, constellations of symbols in the images of dreams and the creative imagination can synthesize this complexity. The contents of the unconscious.

It has been noted by Edmund Carpenter that some Eskimos and other peoples have an innate capacity to understand complex machines, even electronics, without prior knowledge or help from manuals. It is supposed that this is because their language is more "process-oriented" and less thing-oriented, as Whorf had earlier so vividly described with the Hopi Indians. It seems plausible that this could be because their words require more all-at-once thinking for survival, and hence their cultures do not oppress right-brain processing (gestalt, parallel, analogue). It could also be that their brains do not have the same asymmetry as ours, and that the asymmetry is learned (experiment could verify this).

"Jerome Bruner has found that babies around age one distinguish between two kinds of grip—the power, or holding grip, which stabilizes an object, usually with the left hand, and the precision, or operating grip which does the work, usually with the right . . . only in man does the power grip migrate to the left and the precision to the right. This asymmetry and specialization is the beginning of a long road leading to the human use of tools and toolmaking . . ."

Maya Pines

I suggest that by "stopping the world", by relaxing the incessant projections into the world by our print-tripping left hemispheres, that we can experience the expanded awareness available to us when the net of word-things has been removed from our perception:

"What stopped inside you yesterday was what people have been telling you the world is like. You see, people tell us from the time we are born that the world is such and such and so and so, and naturally we have no choice but to see the world the way people have been telling us it is."

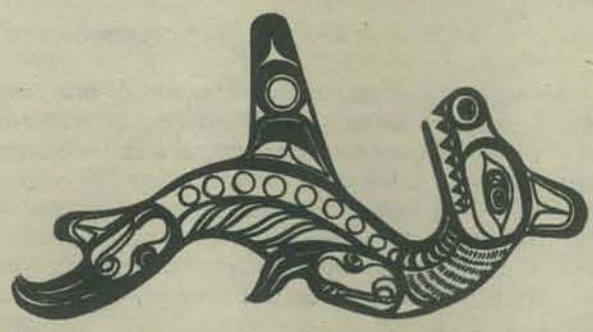
Don Juan Matus, in "Journey to Ixtlan", P.299

The Gateway Into Eternity

Then we can allow our awareness to access the memories of the world hologram as stored in our brains and to access our own inner essence as imminent in the genetic knowledge of all of our cells. Multitudinous separate realities beyond the wildist left hemisphere musings are revealed. Here is the channel to the universal storehouse of happenings in the world. Just as any piece of hologram "contains" the whole, then our holographic-like memories contain views of the entire universe, a composite of experience and cosmic history. Hence the thought, "the world as a hologram in you heart."

"I was concerned with those jolts you have had, because that is the way the nagual surfaces. At those moments the tonal becomes aware of the totality of oneself. It is is always a jolt because that awareness disrupts the lull. I call that awareness the totality of the being that is going to to die . . . at death, the nagual becomes fully operative and the awareness and memories and perceptions stored in our calves and thighs, in our back and shoulders and neck, begin to expand and disintegrate. Like the beads of an endless broken necklace, they fall asunder without the binding force of life."

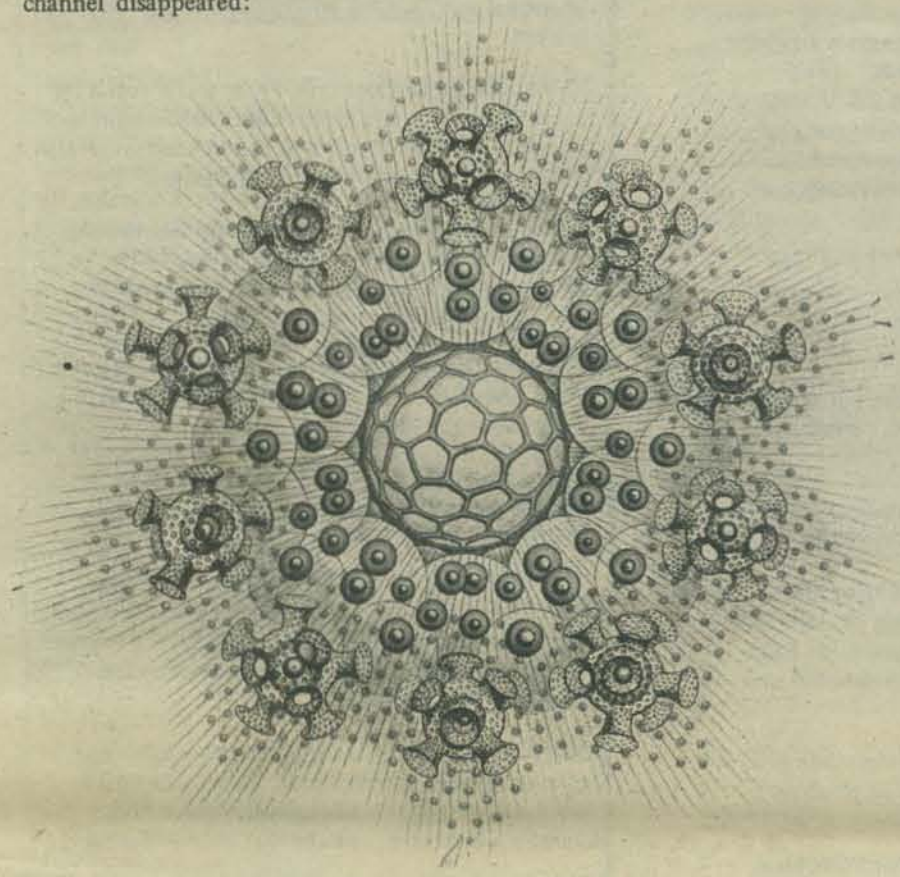
Don Juan Matus in "Tales of Power", P.133.



Accessing this knowledge is by the principle of correspondence. An image in mind creates the neural equivalent of a reference beam by resonance. Attention follows this cycling and generative process towards required knowledge:

"Ghost images elicited by almost-reference beams might then comprise a sort of associative memory . . . A hologram can be composed of the interference pattern of two object beams . . .the reflection from one object . . . forming a primitive associative memory. . . Fourier transform holograms need not have the reference placed in a fixed position, the other will come out relative."
Michael Arbib, "The Metaphorical Brain"

Here is where the ego cannot come in and direct the search, since it is so attached to its own verbal self-image and world view. It disrupts the flow. In trance or reverie, whenever "I" tried to concentrate on the images page-flipping through my mind in order to analyze them, the channel disappeared:



"Whenever the dialogue stops, the world collapses and extraordinary facets of ourselves surface, as though they had been kept heavily guarded by our words."
Don Juan Matus, "Tales of Power" P. 40

"You could not discover the limits of the soul, even if you traveled every road to do so: Such is the depth of its meaning."
Heraclitus

This principle is also the method whereby the mind can directly alter happenings in the world, but the unattachment so required is even more difficult to attain. There is a flow in the universe; we can join it!

"Everything flows and nothing abides; everything gives way and nothing stays fixed."
Heraclitus

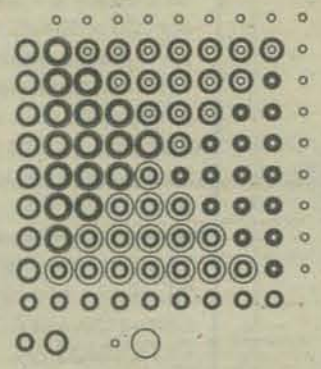
"Jesus says: 'He who knows the all, but has failed to know himself, has failed completely to find the kingdom.'"
The Gospel of Thomas (71)
(Gnostic, Nag-Hammadi)

The Two Becoming One

There are many questions that these speculations and models trigger. What about the assumed distinction between the inner and outer worlds? A description of the nature of the outer worlds applies to the inner worlds as well.

"Jesus says to them" 'When you make the two become one, and when you make the inside like the outside and the outside like the inside, and the upper like the lower . . .and an image in place of an image, then will you enter the kingdom.' "
The Gospel of Thomas (27)
(Gnostic, Nag-Hammadi)

The inner world is part of the world hologram too! And does the part contain the whole? Is the world/consciousness a hologram within a hologram[2]. . .ah sweet mystery.



"The most beautiful thing we can experience is the mysterious. It is the fundamental emotion which stands at the cradle of true art and science."
Albert Einstein

The very use of the noun "hologram" strongly suggests that it is a static object and that there should be an atomistic world hologram. . .ah, the underdeveloped metaphysics of the western intellectual tradition. In reality the world hologram must be a dynamic process without limit in space, time and dimension. And there will be levels within levels[2] of the "little bit of everything, everywhere" principle at work/play.

Even if the recognition of the identity of the inner and outer worlds is one of the major landmarks on most spiritual paths, the fact remains that at least in human beings, consciousness ordinarily exists as a focus in time and space (occasionally it may be transcended). I wonder why this is, and in wondering I am reminded of Alan Watts description of the universe playing hide-and-seek with itself.

"He said that every man is an organ put forth by the divinity in order to perceive the world."
Borges, "Labyrinths" P.124

It seems appropriate to me then, to begin to understand the purposes behind our sojourns as human beings in this world, by regarding our nature as filters and transducers of the universe. When I was a teenager I was deeply moved when I read that 2500 years ago, the Greek philosopher Anaximander claimed that the primordial stuff of the universe was the "boundless". Much of my musings and this paper have since been directed to understanding the unfoldings of this mysterious "boundless".

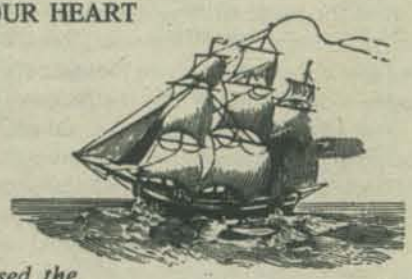
"I'm saying that we all are unfathomable beings, liminous and boundless. . .You, Genaro, and I, are stuck together by a purpose that is not our decision. . .We are perceivers. We are an awareness; we are not objects; we have no solidity. We are boundless. The world of objects and solidity is a way of making our passage on earth convenient. . ."

[1]Actually, there are some language tools from the computing field that have some ability to synthesize all-at-once processes. These are psuedo-parallel languages such as SIMULA and SMALLTALK and cellular array automata (see the author's earlier paper "Simulation and Synchronicity"). Also field theories in physics have this capacity.

[2]See the notion of a "cellular holarchy" in the author's paper "Simulation and Sychronicity".

THE WORLD AS A HOLOGRAM IN YOUR HEART

DOUG SEELEY
COMPUTING SCIENCE PROGRAM
SIMON FRASER UNIVERSITY
BURNABY, B.C. CANADA V5A 1S6



"He was a star treader. A traveler who used the starry galaxies for fleet stepping points toward the outer blackness."
"The white bird fled swifter than a dream, winged through infinity almost as instantly as the mind itself could thing of the spaces outward. . .The crystallite cruiser traversed voids and eons in moments."
"Colossus", Donald Wandrei, 1934

BILL FULLER's BIOFEEDBACK BIBLIOGRAPHY

Bill Fuller is with The Computer Hobbyist Group – North Texas and Editor of TCHG-NT Newsletter. Thanks Bill; for the biofeedback info. We will soon be including some or all of the books you recommend in PCC Bookstore.

Bob,

I promised you a listing of references related to biofeedback. Since PCC picked up this subject in the latest issue, thought it about time I pass on the info without the computer doing it. The enclosed list represents some of what I have accumulated in the last few years related to the 'hardware' aspect. 99% can be built with components like the 741, 558, 725, and in general are fairly accurate (this conclusion based upon paper evaluation rather than my testing or breadboarding). There is enough information in the articles for the hobbyist or experimenter to adapt the instruments output to a computer via A/D. But what do you do with it in the computer? We need software to analyze manipulate and play with.

Rosenboom's circuit in *Biofeedback and the Arts* is also recommended. I'm "not into" the art aspect of biofeedback mainly because of a philosophical hangup about using gadgetry to replace our own subtle signs. Must be a sign of senility.

I disagree that the Karlins and Anderson book "remains the best full field introduction"; it's good in providing sources of reference material, but it impressed me as being written by two snake oil salesmen.

You might pass on to Daniel Rosset the following suggestion for books in the Biofeedback area:

- *Brain Revolution* by Marilyn Ferguson
- *Alpha Brain Waves* by Jodi Lawrence
- *The Human Biocomputer* and *The Center of the Cyclone*, both by John Lilly
- *The Nature of Consciousness* and *Psychology of Consciousness*, both by Robert E. Orstein
- *Altered States of Consciousness* by Charles Tart
- *The Living Brain* by Walters

Most of the above titles would indicate they are not related to biofeedback, however, just the opposite; they give direction to where biofeedback should be headed to avoid falling into the gadgetry trap which in some cases is already upon us. Of course, a good reading of Lilly's books indicates that the best biofeedback device available is free--the encasement we all have. But if we must have gadgetry, the enclosed list is a good start. Hopefully it could cause some good high-level private research where the results don't have to be determined by the funder.

Bill Fuller
2377 Dalworth No.157
Grand Prairie, TX 75050

Technical Sources:

This listing contains references to articles that contain schematics for low cost instrumentation using readily available components. Or the articles contain information that is valuable to know in designing your own. The listing is disorderly in that EEG may be intermixed with EKG, also no chronological order exists. The computer exists to order such a list.

"A Biofeedback EEG synthesizer" *EDN*, July 20, 1973 -- two circuits, one for the detector using Analog Devices AD520J; synthesizer uses two FETs, CMOS PPL and FF.

"A Hybrid Broad-band EEG Frequency Analyzer for Use in Long-Term Experiments" - *IEEE Trans. on Biomedical Engineering (IEEE BM)*, Jan. 1973 - analog frequency analysis coupled with digital output provides efficient means of data collection. Block diagram of system; and schematic of analyzer portion.

"Low Drain EEG Amplifier" - *IEEE BM*, Jan. 1974 - uses transistors for detection and VCO controlled transmitter for telemetry type transmission.

"Electrocardiogram Recording with Pasteless Electrodes" - *IEEE BM*, May 1971 - schematic of impedances amplifier.

"Capacitance Electrode and Biomedical Electrodes" *IEEE BM*, Aug. or Sept. 1968. Schematic.

"Collecting the body's signals" - *Electronics*, July 10, 1967 - excellent discussion of electrical characteristics of various body signals, i.e. EEG, EMG, EKG, EOG; tells why input detector and amplifiers differ.

"Interface Design for biomedical electrode system" *IEEE Spectrum*, Oct. 1972 - similiar to above except electrodes are main topic.

"Build a Cardio-Tach" - *Electronics Illustrated*, July 1972 - somewhat dated and hard to find.

"Designing a nonaveraging tachometer" - *Electronic Design*, March 15, 1974 - outputs a voltage that is proportional to rate; uses CMOS, design is for EKG, but could be modified for EEG; schematic.

"Measuring random-pulse frequencies 'the analog way'" - *Electronic Design*, June 24, 1973 - schematic for EKG. Analog is not dead.

"Portable EKG Telephone Transmitter" - *IEEE BM*, July 1973 - schematic; for transmitting EKG over the telephone.

"Your own little Photoplethysmograph" - *Popular Electronics*, July 1968 - schematic; displays blood volume in finger on oscilloscope. A plethysmograph was used by E. Douglas Dean at Newark College of Engineering to validate changes in blood pressure during ESP experiments with twins.

"Build the Muscle Whistler" *Popular Electronics*, Nov. 1971 - schematic, EMG monitor, not best design in world, but effective.

"A Self-Centering Respiration Monitor for Small Animal Research" - *IEEE BM*, Sept. 1971 - schematic, could be used with large animals.

"The Design and Use of an FM/AM Radiotelemetry System for Multi-channel Recording of Biological Data" *IEEE BM*, Oct. 1967 - schematic using available components, but could use some later, better linear ICs.

"A Peak Amplitude Selector for Data Analysis" - *IEEE BM*, April 1969 - an amplitude window detector with outputs available to paper recorder, tape recorder or rate out.

"Patient Electrode Isolation Adapter" - *IEEE BM*, November 1971 - eliminates shock hazard and should be used if you're crazy enough not to use a battery system.

"A Multipurpose Electronic Filter and Integrating Level Detector" - *IEEE Bm*, Sept. 1972 - schematic a general purpose circuit that can be used with both EEG and EMG, one of the better designs.

"A Novel High-Performance Preamplifier for Biological Applications" - *IEEE BM*, Nov. 1971 - schematic, uses low cost available components, good as a front end detector.

"Window Discrimination Using Integrated Circuits" *IEEE BM*, July 1973 - schematic, can be used to detect peaks of selected waveforms.

"More Experiments in Electroculture" *Popular Electronics*, June 1971 - GSR type of monitor for you or your plants.

"An Inexpensive Digital Temperature Integrator" *IEEE Trans. on Instrumentation and Measurement*, Sept. 1974 - operates in range of 40 to 110 degrees F; block diagram, but enough information for the circuit experimenter.

"Circuit built with quad op amp measures temperature digitally" - *Electronic Design*, March 15, 1974 - schematic, uses LM 3900 and a 2N222 with thermistor detector, range can be adjusted.

"Further Development of the Field Effect Monitor" *Technical Information Service No.A67-41582* - a monitor for cardiovascular variables, but other uses possible i.e. low-frequence electromagnetic phenomena of human physiology. Block diagram only, ramifications of the unit are yet unexplored.

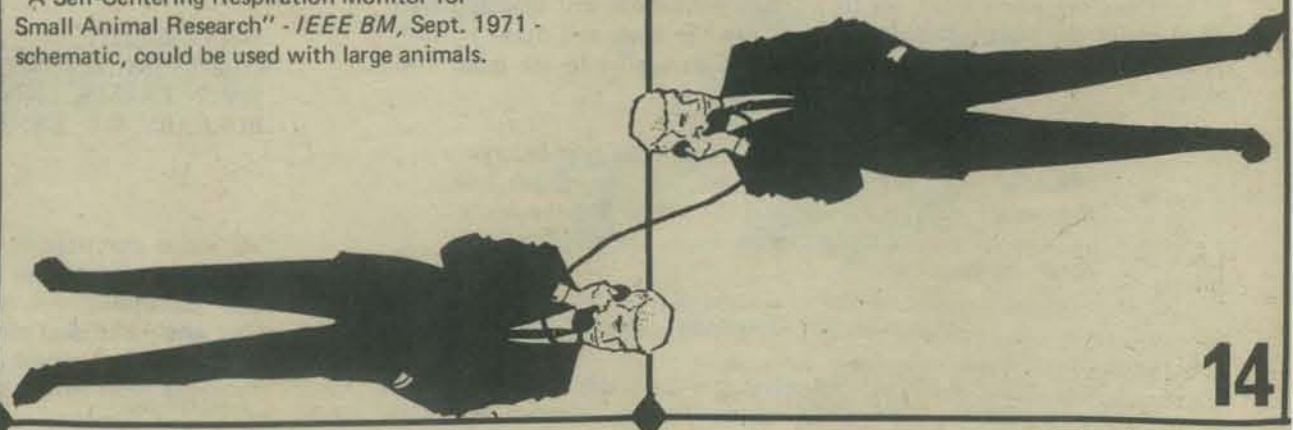
"Opto-isolator logic units" - *Electronic Design*, June 7, 1974 - has a schematic for an EKG circuit which could interface to digital circuitry.

Extended Digital Concepts, Box 9161, Berkeley, CA 94709 - sold kits and plans for EEG in 1971 have no up-to-date information.

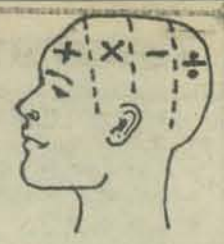
"Build a Brainwave Monitor" *Radio Electronics*, January 1975 - construction article for an alpha detector, not the best design available, a good experimenter could improve on it.

"Electronic Thermometer with Biofeedback Output, *Radio Electronics*, Feb. 1976 - construction article, good accuracy, but thermistor costs $14.50.

"Build this Brainwave Monitor" *Popular Electronics*, July 1976- construction project with video and sound on your TV screen.



Your Brain Is A Hologram In Your Head



Roger Hensley

Dear PCC (Perfectly Crazy Company):

Here is $5.00 to renew my subscription to 'Amazing' otherwise known as PCC.

Before the ink dries on my BS (what do you think it stands for?) in chemistry and before I turn to Other Things (as they say) I would like to 1)describe my alma mater's EDP system, and 2)discuss an idea with you.

Central State U. in Edmond, Oklahoma has a PDP-11 and over 20 interacting terminals. At present the system is open to those with legitimate projects and uses among students and faculty. The staff spend the usual 20% of their time chasing down and eliminating 700 block versions of 'Star Trek' and 'Life', and divide the remainder between prayers for protection from electrical storms (futile in Okla.) and running the IBM-370, et al. The students spend 10% of their time in study and 90% of their time feeding paper tapes of 700 block versions of 'Life' and 'Star Trek' into the system.

It works surprisingly well.

As a Chemistry Major with aspirations equally divided between graduate research in biochemistry and Medicine, I might never have joined the Software World were it not for three things: 1) a delightful red-haired siren and confirmed computer addict named Robin; 2) unstoppered ears (see No.1); 3) a free seminar in BASIC conducted by Ardoth Wilson of the campus computer center staff, and a jewel among people.

Before I knew it I was spending 10 hour stretches at the terminal, feeding in 'KINGDOM' from Robin's PCC, and forcing my friends to play it. It now stands at 20 blocks, and includes Oz Wall, the assassin...*It ate my semester.*

Now I have PCC delivered to my door and am as happy as Bung in the Royal Cellars.

Your opening paragraphs note that PCC will now devote itself to the future. I wonder if you would be interested in an idea of mine which came out of my research on the biochemistry of learning and memory. It is quite possible that others are already working on the concept, which is quite simple, really, or have something else to say on the matter. If so, I would be happy to hear about it. I enter Medical School in the Fall, and am told I will have little time for any other activities (although I have learned there is a computer at the research foundation across the street which I might be able to perver -- er, use!)

First some background on the mechanisms by which nervous systems generate reality, specifically those aspects of reality called learning and memory. The material herein presented is drawn from the work of many, particularly Karl Pribram and Peter Fong, but the final form and central hypothesis is my own contribution.

Pribram suggested that the process of consciousness and particularly learning, was holographic, that is that perception and processing are interference phenomena, rather than symbolic interactions. Fong and others have suggested a link between memory and the process of protein synthesis, which seems to be born out by experimental evidence.

Let us suppose that the "reference beam" of the holographic process is the synthesis of a definite sequence of bases into a strand of mRNA. The "interference beam" is the rate of firing of the neuron, which so modifies the synthesis of this mRNA that a different protein is synthesized from it. The process of synthesis allows the distorted base sequence of the mRNA to "restack", thus producing an electrical pulse sequence identical to the original coding pulse. This ferroelectric phenomenen builds in intensity as long as the coding pulse (the interference beam) is present, reinforcing it and itself and potentiating the entire phenomenen. This is the basis for short-term memory.

However, protein synthesized from the coded mRNA also builds up, and is transferred to the synaptic wall (or perhaps to the synaptic cleft itself) where its electromagnetic properties modify the pulses of neuronal firing. A shaped electric field is thus produced in the synaptic cleft, which directs the migration of transmitter substance electrophoretically, producing a firing pattern in other neurons unique to that experience.

The hologram consists of the continuously modified protein sheath at the synaptic junction. Learning is a process of establishing a hologram by repetition and reinforcement. Memory is a process of selecting from the hologram of neuronal firing (which contains all synaptic experience) the pattern desired, by reinforcement and interference.

The essential feature of the model is a constantly modified hologram from which information is abstracted by duplicating the coding sequence, its correlates, or suppressing all other facets of the pattern. Information is added by direct interaction. That is, the hologram of previous information is the 'reference beam' for storage of new information.

Although the concept obviously lends itself to mechanical duplication, a new approach to processing and storage is necessary.

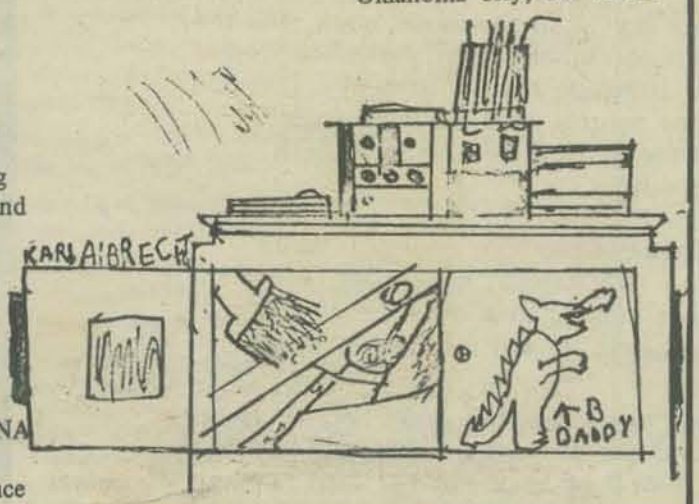
Dyes exist which can be "programmed" in that they respond in different ways to different frequencies and polarizations of light. These same dyes may be suspended in a colloidal medium and exposed to coherent radiation to produce holograms. One visuallizes a block of colloids and an array of lasers which can be used to illuminate them from any angle. An enormous quantity of discreet holograms could be stored and recalled in this fashion. More difficult to imagine is the collection of techniques and concepts necessary to process data holographically. It will probably call for a new approach to data, from which we may learn much about the colloidal computer everyone owns and operates; the brain.

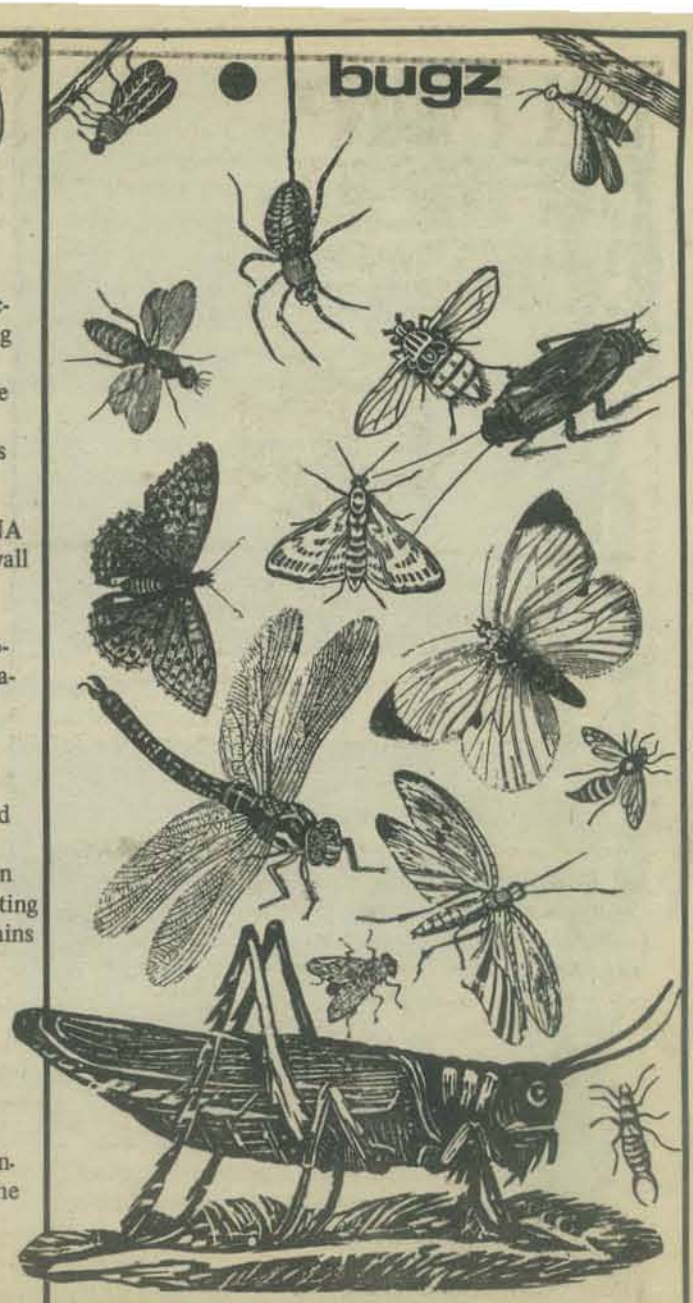
This letter is already over-long (I've resorted to strike-overs), so I will terminate with a request for reflection, should anyone be interested.

Perhaps someday we will be able to create not only tools, but companions.

Roger Hensley

145 Lake Aluma Dr.
Oklahoma City, OK 73121





ELECTRONIC PROJECTS FOR MUSICIANS or BILL GODBOUT RESCUES THE KIT BUILDING CLASS by DON INMAN

Don Inman
350 Nelson Rd.
Scotts Valley CA 95066

"Even if you know nothing about electronics, you can build preamps, ring modulators, mixers, tone controls, miniamps, fuzzes and a dozen other inexpensive musical projects." So proclaims the cover of Craig Anderton's book, *Electronic Projects for Musicians* (available from PCC bookstore, see page 47 for ordering information). This paperback is a real gem. I have used the first four chapters as background material for a kit-builders class at San Lorenzo Valley High School in Felton, California. Filled with excellent sketches, drawings and diagrams; the book leads the neophyte by the hand from the resistor through integrated circuits.

The long-term goal of our class is to build up a computer system for the school from microcomputer kits which are available from many sources. However, most of the students enrolled have a limited background in electronic circuits. Our financial backers were a little dubious about the quality of work which might be produced. In order to prove and improve their abilities, it was decided that the class would begin with simpler circuits.

Kids have a terrific appetite. Not only for food, as shown in the photo (it looks like he's attacking the PCC dragon) - but also for what's going on in the world around them. Give them anything that moves, lights up, or makes a loud noise, and they will dig into it.

Photos 2 and 3 show another kind of attack. This time it's a malfunctioning electro-mechanical calculator. The calculator was a donation from a well-meaning friend, but it seems the necessary repairs would cost more than the calculator is worth.

To whet the students appetites for kit-building, we used electronic music due to its universal appeal to young people. Bob Albrecht and PCC were instrumental in introducing us to Bill Godbout Electronics. The class was suddenly furnished with three electronic projects of their choice. The projects were chosen from *Electronic Projects for Musicians* mentioned above. My students selected the Miniamp, Supertone Control, and the Stereo Tone Control.

Each project was constructed by a different student. The students first laid out a breadboarded circuit of the projects from the circuit diagrams. Breadboards were then torn down, and the components were mounted on the pc boards provided in the kit. The method of final chasis mounting was designed by a group of four students.

We are mounting the projects in cases salvaged from donated malfunctioning electronic "gifts". In fact, most of our tools, wire, and miscellaneous parts have come from various sources as cast-off donations. Photo number four shows some of our collection of "supplies". A good part of our time is spent in examining and tearing down parts from this supply. If it wasn't for this type of gift, we would be unable to operate.

The miniamp project was the first to be constructed, as we had an immediate practical application for it. Barry Lippey, a freshman, is shown in photo number five completing the final assembly of the Gnome Micro-synthesizer*, which was purchased by the Mountain Digital Group. In Photo number six, a pair of SLV students use the Godbout amplifier to check the Gnome's final operation.

The system works; sirens, whistles, saxophones, the wind and many other wierd sounds spill forth from the miniamp as curious students experiment with electronic sound synthesis.

The supertone control, project no. 17 in the music book, was the next kit to be completed. Photo number seven shows the tone control ready to be mounted alongside the miniamp in a common chasis. The miniamp and tone control were mounted together as the students felt they wanted to further experiment with its effect on the synthesizers output.

We had a minor mishap with the stereo tone control. While mounting the kit in its case, a terminal was broken on one of the potentiometers. As school was coming to a close we did not have time to complete this project. It will be finished up in the fall.

Alas, as the school year came to a close, the desks became empty, the power was turned off, and our projects sit alone (as seen in photo number eight). But, they'll be back this fall with renewed interest, and we'll be there too-with more kits and more chapters in the story of building computers and other things.

Photo 1

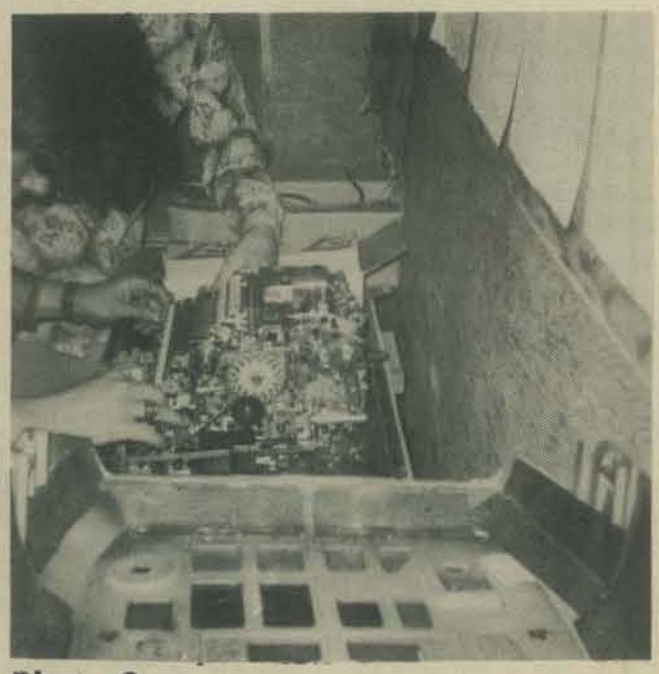


Photo 2

Photo 3

Photo 4

Photo 5

Photo 6

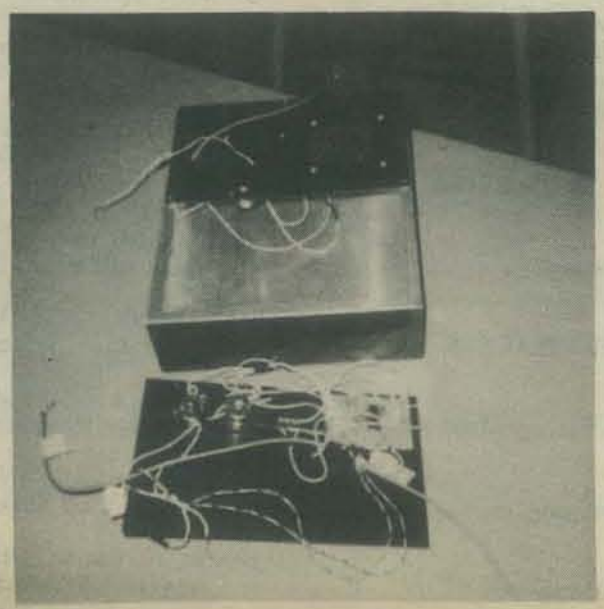


Photo 7

Photo 8

Computer Music References

suggested by John Snell

Computers may be used for controlling analog synthesizers, composing music, analyzing (or tracking several parameters of) traditional musical instruments and the voice, spacial movement of sounds, and processing of musical sounds (filtering, reverberation, choral effects, etc.) Below is a short list of relatively easy reading to aid in the development of computer music systems. For more high level sources, see *Dr. Dobb's Journal*, Vol. 1, no. 7. For a more comprehensive, well organized listing see the bibliography from **Electronotes** (a fine electronic music periodical edited by Bernie Hutchins.)

J. Backus, **The Acoustical Foundations of Music**, W.W.Norton, 1969.

J.W. Beauchamp & H. von Foerster; eds., **Music by Computer**, Wiley, 1969.

J.M. Chowning, *"The Synthesis of Complex Audio Spectra by Means of Frequency Modulation"*, **JAES**, Vol. 21, no. 7, pg. 526, September, 1973.

J.M. Chowning, *"Stanford Computer Music Project"*, **NW**, no. 1, 1972.

S. Gill, *"A Technique for the Composition of Music in a Computer"*, **Computer Journal**, vol. 6, no. 2, pg. 129, July 1973.

L. Hiller, *"Computer Music"*, **Scientific American**, pg. 109, December, 1959.

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NUMUS West, no. 4, 1973 (issue on computer music).

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P. Samson, *"Digital Synthesizers--Brief Functional Description"*, Systems Concepts, San Francisco, Calif.

P. Samson, *"Digital Synthesizers--Programming Specifications"*, Systems Concepts, San Francisco, Calif.

L. Smith, *"Score--A Musicians Approach to Computer Music"*, **JAES** Vol. 20, no. 1, January/February 1972.

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S. Smith, *"Computer Music in 1972"*, **Computers and Automation**, October 1972.

T.G. Stockham, Jr., *"A--D and D--A Converters: Their Effect on Digital Audio Fidelity"*, AES preprint no. 834 (D-1), October, 1971.

W. Strong & M. Clark, *"Synthesis of Wind Instrument Tones"*, **JASA**, vol. 41, pg. 39, 1967.

W. Strong & M. Clark, *"Perturbations of Synthetic Orchestral Wind Instrument Tones"*, **JASA**, vol. 41, pg. 277, 1967.

R. Talambiras, *"Digital-to-Analog Converters: Some Problems in Producing High Fidelity Systems"*, **Computer Design**, vol. 15. no. 1, pg. 63, January, 1976.

J.C. Tenny, *"Sound Generation by Means of a Digital Computer"*, **JMT**, vol. 7, pg. 24, 1963.

T. Winograd, *"Linguistics and the Computer Analysis of Tonal Harmony"*, **JMT**, vol. 12, no. 1, pg. 2, 1968.

J. Zingheim, *"Introduction to Computer Music Techniques"*, **EN**, vol. 6, no. 42, pg. 1, August, 1974.

Communications of the ACM
1133 Avenue of the Americas
New York, N.Y. 10036

ACM = Association for Computing Machinery

Computer Design
P.O.Box A
Winchester, MA 01890

Computer Journal
British Computer Society
29 Portland Place
London, England W1n 4AP

Computers and Automation (now called **Computers and People**)
Berkeley Enterprises, Inc.
815 Washington St.
Newtonville, MA 02160

EN = **Electronotes**
203 Snyder Hill Road
Ithaca, N.Y. 14850

JAES = **Journal of the Audio Engineering Society**
Room 929, Lincoln Bldg.
60 E. 42nd St.
New York, N.Y. 10017

JASA = **Journal of the Acoustical Society of America**
American Institute of Physics
335 E. 45th
New York, N.Y. 10017

JMT = **Journal of Music Theory**
Yale School of Music
Yale University
New Haven, CT 06520

NW = **NUMUS West**
P.O.Box 135
Mercer Island, WA 98040

Science
American Association for the Advancement of Science
1515 Massachusetts Ave.
Northwest Washington, D.C. 20005

Scientific American
415 Madison Ave.
New York, N.Y. 10017

MINICALCULATOR INFORMATION RESOURCES

By The National Council of Teachers of Mathematics

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About NCTM

NATIONAL COUNCIL OF
Teachers of Mathematics

1906 Association Drive, Reston, Virginia 22091
(703) 620-9840

History and Purpose

The National Council of Teachers of Mathematics (NCTM) was organized in 1920. Its purpose, as stated in its charter, is *to assist in promoting the interests of mathematics in America . . . and to vitalize and coordinate the work of local organizations of teachers of mathematics.*

The NCTM has had a major influence on the teaching of mathematics in elementary schools, junior and senior high schools, two-year colleges, and teacher-education colleges. The most outstanding persons in mathematics education have been leaders and participants in its programs. It has served as an agency for both the coordination and stimulation of major efforts to improve the teaching of mathematics.

The membership of the NCTM has grown rapidly. On 30 November 1974 there were 50,000 individual memberships, with 32,000 institutional subscriptions to the two official journals, the *Mathematics Teacher* and the *Arithmetic Teacher*.

Requirements for Membership

Membership is available to all persons interested in mathematics, the teaching of mathematics, and related problems.

Membership Fees

Individual Membership

Including either journal, $11.00
Including both journals, $16.00

For individuals only. Includes subscription, for individual use, to either the *Mathematics Teacher* or the *Arithmetic Teacher*.

Student Membership

Including either journal, $5.50
Including both journals, $8.00

An individual membership for any student who has never taught professionally.

National Council of Teachers of Mathematics
1906 Association Drive, Reston, Virginia 22091

HP-65 USERS CLUB

Idea and information sharing for calculator users, from beginners to experts.

The club newsletter, 65 NOTES, provides the membership with the latest developments in calculator programs and programming techniques. Each month an unusual mix of numerical methods, hardware characteristics, technical developments, programs, and routines are covered in such regular columns as:

Beginners Corner	HP Status	Tips
Bits & Pieces	55/25 Notes	Users Forum
Fun & Games	Routines	Users Review

The club is not sponsored, nor in any way officially sanctioned by Hewlett-Packard.

☐ Enclosed is $12 contribution for one year membership; U.S., Canada, Mexico. Other foreign: $18 air mail.

☐ Send ____copies of the club brochure*

☐ Send sample newsletter.*

*Note: This is a volunteer, non-profit organization. Enclose business size self-addressed, stamped envelope with this form for reply. Sample newsletter is 2 Oz. Write: HP-65 Users Group, 2541 W. Camden Pl, Santa Ana CA 92704.

DO-IT-YOURSELF SPACE NAVIGATION

With a little imagination and some help from a pocket calculator, you can plot courses to the frosty Jovian planets or plunge inward to the molten world of Mercury. See PCC, Volume 4, Number 6, May 1976, page 8.

GAMES WITH THE POCKET CALCULATOR

Games With The Pocket Calculator
Authors: Sivasailam Thiagarajan and Harold D. Stolovitch

A Review by Dr. Ruth Irene Hoffman, University of Denver

Elementary and junior high school teachers should get this book for arithmetic games for their students. The content contains real games, not tricks. Each one involves competition and challenge on an arithmetic operation and/or estimation. The games can well be used to introduce students to the calculator, but also to build computational skills, understanding and estimation.

The book is not an open, "see-at-a-glance" format as would be true with calculator tricks. As with all games, directions must be read and understood. Teachers will find it worth their while to use this resource book, presenting games one at a time as they relate to the skills and concepts the students are learning.

[*Games With the Pocket Calculator* is available from PCC Bookstore; See page 46, this issue.]

GAMES FOR PROGRAMMABLE CALCULATORS

Guess the Number, Hunt the Hermit, Moon Landing, Mars Landing, Nim, Tic-Tac-Toe and other games for the Monroe 1600 Series, Compucorp 025, and 125, and similar machines. For info, send a stamped, self-addressed envelope to Richard Moffie, 3355 Canfield Ave. No.10, Los Angeles, CA 90034.

MORE CALCULATOR STUFF

For your reading pleasure, here are additional sources of info about using and enjoying calculators, not included in the NCTM list.

CALCULATOR LIB

For all people interested in the world of calculators: *"CALCULATOR LIB"* is a newsletter dedicated to bring to the calculator enthusiast up-to-date information on matters related to calculators. Helping to develop the 'calculator wizardy' of its liberated readers, it acts as a clearing house of collective ideas, limited solely by the ingenuity of the human mind." Published bimonthly by: TECHNOLOGICAL DEVELOPMENTS, P.O. Box 2151, Oxnard, CA. 93034. Single issue - $1.75, six issues - $8.00, twelve issues - $15.00.

A CALCULATOR FOR YOUR OVERHEAD PROJECTOR

Now available, a four-function calculator modified for use with an overhead projector. Put it on your overhead projector and compute. Results appear in large numerals on the screen, clearly visible to everyone in your classroom or auditorium. For info, contact Stokes Publishing Company, P.O. Box 415, Palo Alto CA 94302.

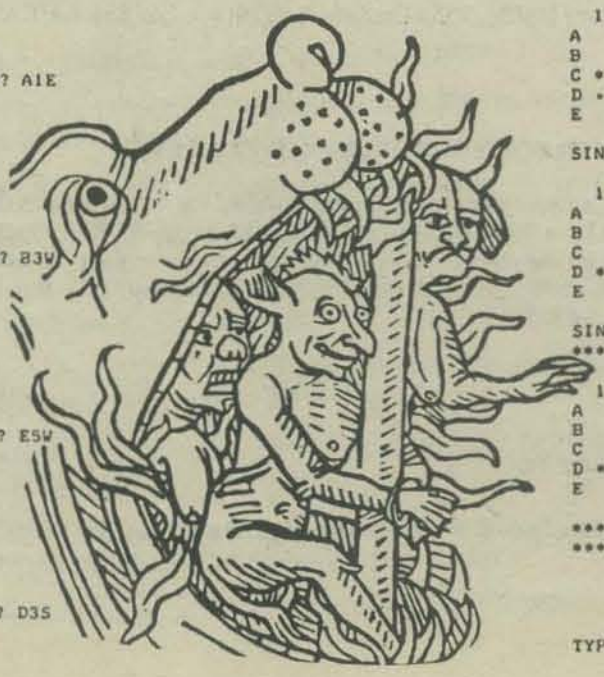
IN THIS ISSUE OF PCC:

See "Pocket Astrodynamics" (Letter) on page 39 and "CAI for $24.95" on page 41.

SINNERS —

MAC OGLESBY

```
RUN

SINNERS  14 MAR 76  21:07

WANT INSTRUCTIONS FOR SINNERS? YES

THREE OF SATAN'S FIENDS (MOVED BY THE COMPUTER) PLAY
AGAINST A GROUP OF CONDEMNED SINNERS (MOVED BY YOU).
IF THEY WIN, THE SURVIVING SINNERS WILL BE SET FREE.
OTHERWISE... (SHUDDER) ...INTO THE BLACK PIT!!

THE PLAYING FIELD HAS 25 SQUARES.  HERE'S THE INITIAL SETUP:

  1 2 3 4 5
A . . . . .
B . * . . .
C . . . . .
D . . * . .
E . . . * .

SINNERS ARE SHOWN AS DOTS (.) AND FIENDS AS STARS (*).

A SINNER MAY MOVE INTO ANY ADJACENT EMPTY SQUARE.  A FIEND
MOVES ONLY INTO AN ADJACENT SQUARE WHICH CONTAINS A SINNER,
WHO IS THEREBY CAPTURED AND REMOVED.  THERE ARE NO DIAGONAL
MOVES AND NO JUMPS.

THE SINNERS WIN IF THE THREE FIENDS ARE ALL IN A LINE (ALL
IN THE SAME ROW OR COLUMN).  THE SINNERS LOSE IF THE FIENDS,
AT THEIR TURN, CANNOT CAPTURE A SINNER.

  N
W * E
  S

TO MOVE A SINNER, TYPE 3 CHARACTERS: THE ROW (A LETTER) AND
COLUMN (A DIGIT) GIVING SINNER'S CURRENT LOCATION, AND THE
DIRECTION OF MOVE (JUST THE INITIAL LETTER).
EXAMPLES:
  B3E  MEANS THE SINNER NOW AT B,3 WANTS TO MOVE EAST;
  E5N  MEANS THE SINNER NOW AT E,5 WANTS TO MOVE NORTH.

ALSO, TYPE S TO STOP, R TO RESIGN, H FOR HELP.

THE FIENDS MOVE FIRST.

  1 2 3 4 5
A . . . . .
B .   . . .
C . * . . .
D . . * . .
E . . . * .

SINNERS' MOVE? A2S

  1 2 3 4 5
A .   . . .
B . * . . .
C .   . . .
D . . * . .
E . . . * .

SINNERS' MOVE? D2N

  1 2 3 4 5
A .   . . .
B . * . . .
C . . * . .
D .   . . .
E . . . * .

SINNERS' MOVE? A1W
ILLEGAL MOVE!
INPUT IGNORED.  TYPE HELP IF YOU NEED IT.
PLEASE TRY AGAIN...
SINNERS' MOVE? HELP
THE SINNERS HAVE THESE LEGAL MOVES:
  A1E  A3W  C2S  D1E  D4W  E2N  E3N

SINNERS' MOVE? E3N

  1 2 3 4 5
A .   . . .
B . * . . .
C . . * . .
D .   . * .
E . .     .

SINNERS' MOVE? A1E

  1 2 3 4 5
A   * . . .
B .   . . .
C . . * . .
D .   . * .
E . .     .

SINNERS' MOVE? B3W

  1 2 3 4 5
A   * . . .
B . .   . .
C . . * . .
D .   .   *
E . .     .

SINNERS' MOVE? E5W

  1 2 3 4 5
A     . . .
B . *   . .
C . . * . .
D .   .   *
E . .     .

SINNERS' MOVE? D3S

  1 2 3 4 5
A     . . .
B . *   . .
C . .   . .
D .   * .   *
E . .     .

SINNERS' MOVE? B4W

  1 2 3 4 5
A     . . .
B *   .   .
C .   . * .
D .   * .   *
E . .     .

SINNERS' MOVE? B4W

  1 2 3 4 5
A     . . .
B *   .   .
C .   . * .
D . .     *
E . . . .

SINNERS' MOVE? B4W

  1 2 3 4 5
A     . . .
B     .   .
C *   . * .
D . .     *
E . . . .

SINNERS' MOVE? B,3,SOUTH

  1 2 3 4 5
A     . . .
B       .
C *   .   .
D . .     *
E . . . .

SINNERS' MOVE? H
THE SINNERS HAVE THESE LEGAL MOVES:
  A3S  A3W  A4S  B5W  C5W  D2N  D2E  E3N  E4N  E4E

SINNERS' MOVE? D2E

  1 2 3 4 5
A     . . .
B       .
C *     .
D .   *   *
E . . . .

SINNERS' MOVE? C5W

  1 2 3 4 5
A     . . .
B       .
C *     .
D .     *
E . . * .

SINNERS' MOVE? E4E

  1 2 3 4 5
A     . . .
B       .
C *     .
D .     *
E . * .

SINNERS' MOVE? D1E

  1 2 3 4 5
A     . . .
B       .
C *     .
D
E . *   .

SINNERS' MOVE? E1N

  1 2 3 4 5
A     . . .
B       .
C *     .
D . *
E

SINNERS' MOVE? C4N

  1 2 3 4 5
A     . . .
B     . .
C
D * *
E       .

SINNERS' MOVE? B5 S
*** THE SINNERS HAVE LOST!!

  1 2 3 4 5
A     . . .
B       .
C       .
D * *
E       .

*** ABANDON HOPE, YE SINNERS!
*** SINK DOWN, D
                O
                  W
                  N... (SHUDDER) ...INTO THE BLACK PIT!!

TYPE  RUN  TO PLAY AGAIN.
```



LOSING ↗

(not recommended)

SINNERS ~

```
100 ' NAME:  ELEMLIB***:SINNERS
110 '
120 ' BY:  MAC OGLESBY ON 02/27/76.
130 '
140 ' DESCRIPTION:  THREE OF SATAN'S FIENDS (MOVED BY THE COMPUTER)
150 '   PLAY AGAINST A GROUP OF CONDEMNED SINNERS (MOVED BY THE USER).
160 '
170 ' REMARKS:  THE GAME OF SINNERS IS BASED ON A GAME BY HAAR HOOLIM
180 '   DESCRIBED IN SID SACKSON'S BOOK, "A GAMUT OF GAMES" (RANDOM
190 '   HOUSE).
200 '
210 '
1000 DIM P(12,4)
1010 RANDOMIZE
1020 FOR J=1 TO 4
1030    READ M(J)                       'ASCII VALUES FOR N,E,S,W
1040 NEXT J
1050    DATA 78,69,83,87
1060 FOR J=1 TO 4
1070    READ R(J),C(J)                  'CHANGES NEEDED TO ROW, COL TO GO
1080 NEXT J                             '   NORTH, EAST, SOUTH, WEST
1090    DATA -1,0,0,1,1,0,0,-1
1100
1110 'SET UP BOARD
1120 FOR J=0 TO 6
1130    FOR K=0 TO 6
1140       IF (5-J)*(J-1)<0 THEN 1180
1150          IF (5-K)*(K-1)<0 THEN 1180
1160             LET D$(J,K)="."         '25 DOTS IN A 5X5 ARRAY
1170             GOTO 1190
1180       LET D$(J,K)="@"               'SURROUND THE DOTS WITH @'S
1190    NEXT K
1200 NEXT J
1210 FOR I=1 TO 2                       'MAKE SURE FIENDS NOT IN LINE
1220    FOR J=1 TO 3
1230       LET H(I,J)=1+INT(RND*5)
1240       FOR K=1 TO J-1
1250          IF H(I,J)<>H(I,K) THEN 1270
1260             GOTO 1230
1270       NEXT K
1280    NEXT J
1290 NEXT I
1300 FOR J=1 TO 3
1310    LET D$(H(1,J),H(2,J))="*"       'PUT FIENDS ON THE BOARD
1320 NEXT J
1330
1340 PRINT "WANT INSTRUCTIONS FOR SINNERS";
1350 LINPUT A$
1360 GOSUB 2610                         'PROCESS INPUT
1370 IF A(1)<>89 THEN 1400
1380    GOSUB 2930
1390    GOTO 1420
1400 PRINT "HERE'S THE INITIAL SETUP:"
1410 GOSUB 2750
1420 PRINT "THE FIENDS MOVE FIRST."
1430
1440 'ROUTINES TO GENERATE COMPUTER'S MOVE
1450
1460 LET T1=0                           'RESET POSSIBLE MOVE COUNTER
1470 FOR J=1 TO 5                       'LOCATE POSSIBLE MOVES
1480    FOR K=1 TO 5
1490       IF D$(J,K)<>"*" THEN 1580
1500          FOR L=1 TO 4
1510             IF D$(J+R(L),K+C(L))<>"." THEN 1570
1520                LET T1=T1+1         'COUNT POSSIBLE MOVES
1530                LET P(T1,1)=J       'STORE MOVES IN MATRIX P(,)
1540                LET P(T1,2)=K
1550                LET P(T1,3)=J+R(L)
1560                LET P(T1,4)=K+C(L)
1570          NEXT L
1580    NEXT K
1590 NEXT J
1600 'WINNER?
1610 IF T1>0 THEN 1660
1620    PRINT "*** THE SINNERS HAVE LOST!!"  'BELLS
1630    GOSUB 2750
1640    PRINT "*** ABANDON HOPE, YE SINNERS!"  'BELLS
1650    GOTO 2490
1660 LET T0=T0+1                        'COUNT SINNERS CAPTURED
1670 'CHECK OUT POSSIBLE MOVES
1680 FOR I=1 TO 3
1690    FOR J=T1 TO 1 STEP-1
1700       LET T9=1+INT(RND*J)          'PICK A MOVE AT RANDOM
1710       LET D$(P(T),1),P(T9,2))=" "
1720       LET D$(P(T9,3),P(T9,4))="*"
1730       IF I<3 THEN 1790             'LOOK FOR FIENDS IN LINE
1740          PRINT "*** THE SINNERS ARE WINNERS!!"  'BELLS
1750          GOSUB 2750
1760          PRINT "*** ALL SURVIVING SINNERS ARE FREE!"  'BELLS
1770          GOTO 2500
1780          'SEEK MINIMUM ALIGNMENT OF FIENDS
1790       FOR K=1 TO 5
1800          LET R9=C9=0
1810          FOR L=1 TO 5
1820             IF D$(K,L)<>"*" THEN 1860  'CHECK ROW K FOR FIENDS
1830                LET R9=R9+1
1840                IF R9<=1 THEN 1860
1850                   GOTO 1980
1860             IF D$(L,K)<>"*" THEN 1900  'CHECK COLUMN K FOR FIENDS
1870                LET C9=C9+1
1880                IF C9<=1 THEN 1900
1890                   GOTO 1980
1900          NEXT L
1910       NEXT K
1920       GOSUB 2750                   'PRINT BOARD
1930       IF T0<22 THEN 1960           'ANY SINNERS LEFT?
1940          PRINT "*** THAT'S THE END OF THE SINNERS!!"  'BELLS
1950          GOTO 2500
1960       GOTO 2130                    'CONTINUE GAME...
1970
1980       LET D$(P(T9,1),P(T9,2))="*"  'RESET DISPLAY
1990       LET D$(P(T9,3),P(T9,4))="."
2000       FOR J1=1 TO 4                'REARRANGE POSSIBLE MOVE MATRIX
2010          LET U(J1)=P(J,J1)
2020       NEXT J1
```

```
2030       FOR J1=1 TO 4
2040          LET P(J,J1)=P(T9,J1)
2050       NEXT J1
2060       FOR J1=1 TO 4
2070          LET P(T9,J1)=U(J1)
2080       NEXT J1
2090    NEXT J
2100 NEXT I
2110
2120 'GET MOVE FROM PLAYER
2130 PRINT "SINNERS' MOVE";
2140 LINPUT A$
2150 IF LEN(A$)>10 THEN 2550            'TOO MUCH INPUT
2160    GOSUB 2610                      'PROCESS INPUT
2170    IF A(1)=83 THEN 2530            'LOOK FOR S
2180       IF A(1)=82 THEN 2480         'LOOK FOR R
2190          IF A(1)=72 THEN 2360      'LOOK FOR H
2200             IF (69-A(1))*(A(1)-65)<0 THEN 2330  'LOOK FOR A-E
2210                LET R1=A(1)-64      'R1 IS ROW OF SINNER
2220                IF (53-A(2))*(A(2)-49)<0 THEN 2330  'LOOK FOR 1-5
2230                   LET C1=A(2)-48   'C1 IS COLUMN OF SINNER
2240                   IF D$(R1,C1)<>"*" THEN 2330  'LOOK FOR SINNER
2250                      FOR J1=1 TO 4  'FIND DESIRED DIRECTION
2260                         IF A(3)<>M(J1) THEN 2320
2270                            IF D$(R1+R(J1),C1+C(J1))<>" " THEN 2310
2280                               LET D$(R1+R(J1),C1+C(J1))="*"
2290                               LET D$(R1,C1)=" "
2300                               GOTO 1460  'CONTINUE GAME...
2310                            GOTO 2330
2320                      NEXT J1
2330             PRINT "ILLEGAL MOVE!"
2340             GOTO 2550
2350             'HELP SECTION PRINTS LEGAL MOVES.
2360          PRINT "THE SINNERS HAVE THESE LEGAL MOVES:"
2370          FOR J=1 TO 5
2380             FOR K=1 TO 5
2390                IF D$(J,K)<>"*" THEN 2440  'LOOK FOR SINNER
2400                   FOR L=1 TO 4     'LOOK N,E,S,W IN TURN
2410                      IF D$(J+R(L),K+C(L))<>" " THEN 2430  'LEGAL?
2420                         PRINT "  ";CHR$(J+64);CHR$(K+48);CHR$(M(L));
2430                NEXT L
2440             NEXT K
2450          NEXT J
2460          PRINT CHR$(10)
2470          GOTO 2130
2480       PRINT "*** THE SINNERS GIVE UP!!"
2490       PRINT "*** SINK DOWN, D
                                  O .
                                   W
                                    N... (SHUDDER) ...INTO THE BLACK PIT!!"
2500       PRINT
2510       PRINT "TYPE  RUN  TO PLAY AGAIN."
2520       STOP
2530    PRINT "PROGRAM HALTED!"
2540    STOP
2550 PRINT "INPUT IGNORED.  TYPE HELP IF YOU NEED IT."
2560 PRINT "PLEASE TRY AGAIN..."
2570 GOTO 2130
2580
2590
2600 'PROCESS INPUT; CHANGE LOWERCASE TO UPPER, IGNORE COMMAS, SPACES, ETC.
2610 CHANGE A$ TO A
2620 LET A9=0
2630 FOR J=1 TO A(0)
2640    IF A(J)<96 THEN 2660
2650       LET A(J)=A(J)-32             'CHANGE LOWERCASE TO UPPER
2660    IF (89-A(J))*(A(J)-65)=>0 THEN 2690  'LOOK FOR LETTER (A-Y)
2670       IF (53-A(J))*(A(J)-49)=>0 THEN 2690  'LOOK FOR DIGIT (1-5)
2680          GOTO 2710                 'ELSE IGNORE THIS CHARACTER
2690    LET A9=A9+1
2700    LET A(A9)=A(J)                  'STORE THIS CHARACTER
2710 NEXT J
2720 RETURN
2730
2740 'PRINT THE BOARD
2750 PRINT
2760 PRINT "  1 2 3 4 5"                'IDENTIFY COLUMNS
2770 FOR J=1 TO 5
2780    PRINT CHR$(J+64);               'IDENTIFY ROWS
2790    FOR K=5 TO 1 STEP-1             'IGNORE TRAILING SPACES
2800       IF D$(J,K)=" " THEN 2820
2810          GOTO 2840
2820    NEXT K
2830    GOTO 2870
2840    FOR L=1 TO K
2850       PRINT " ";D$(J,L);           'PRINT THE REST OF ROW
2860    NEXT L
2870    PRINT
2880 NEXT J
2890 PRINT
2900 RETURN
2910
2920 'INSTRUCTIONS
2930 PRINT
2940 PRINT "THREE OF SATAN'S FIENDS (MOVED BY THE COMPUTER) PLAY"
2950 PRINT "AGAINST A GROUP OF CONDEMNED SINNERS (MOVED BY YOU)."
2960 PRINT "IF THEY WIN, THE SURVIVING SINNERS WILL BE SET FREE."
2970 PRINT "OTHERWISE... (SHUDDER) ...INTO THE BLACK PIT!!"
2980 PRINT
2990 PRINT "THE PLAYING FIELD HAS 25 SQUARES.  HERE'S THE INITIAL SETUP:"
3000 GOSUB 2750
3010 PRINT "SINNERS ARE SHOWN AS DOTS (.) AND FIENDS AS STARS (*)."
3020 PRINT
3030 PRINT "A SINNER MAY MOVE INTO ANY ADJACENT EMPTY SQUARE.  A FIEND"
3040 PRINT "MOVES ONLY INTO AN ADJACENT SQUARE WHICH CONTAINS A SINNER,"
3050 PRINT "WHO IS THEREBY CAPTURED AND REMOVED.  THERE ARE NO DIAGONAL"
3060 PRINT "MOVES AND NO JUMPS."
3070 PRINT
3080 PRINT "THE SINNERS WIN IF THE THREE FIENDS ARE ALL IN A LINE (ALL"
3090 PRINT "IN THE SAME ROW OR COLUMN).  THE SINNERS LOSE IF THE FIENDS,"
3100 PRINT "AT THEIR TURN, CANNOT CAPTURE A SINNER."
3110 PRINT
3120 PRINT "  N"
3130 PRINT "W + E"
3140 PRINT "  S"
3150 PRINT
3160 PRINT "TO MOVE A SINNER, TYPE 3 CHARACTERS: THE ROW (A LETTER) AND"
3170 PRINT "COLUMN (A DIGIT) GIVING SINNER'S CURRENT LOCATION, AND THE"
3180 PRINT "DIRECTION OF MOVE (JUST THE INITIAL LETTER)."
3190 PRINT "EXAMPLES:"
3200 PRINT "  B3E  MEANS THE SINNER NOW AT B,3 WANTS TO MOVE EAST;"
3210 PRINT "  E5N  MEANS THE SINNER NOW AT E,5 WANTS TO MOVE NORTH."
3220 PRINT
3230 PRINT "ALSO, TYPE S TO STOP, R TO RESIGN, H FOR HELP."
3240 PRINT
3250 RETURN
3260
3270 END
```

YAY VERMONT!!

TINY BASIC

GOS. A + B

@ (20) = R. (T/50 + 1)

P.#1, I+1

@ (M) = 0

If you have been a faithful PCC reader, you know that a number of people have defined "tiny" BASIC languages and implemented interpreters for them. The latest of these is Li-Chen Wang's "Palo Alto" tiny BASIC, which is outlined on this page.

This is the first tiny BASIC I've looked at and I expected it to be a subset of "real" BASIC. I was surprised to find that compared to the BASIC I have used (HP-2000) there are some extensions as well as restrictions. For example:

you can print a prompt and input the responses with one instruction

compound statements (up to one line long) are permitted --this enables you to clean up the structure of your BASIC programs a bit. Sure would be nice to continue past 1 line.

logical terms may be used in arithmetic expressions (true=1 and false=0).

all keywords may be abbreviated.

Some of the restrictions are:

there is no provision for file handling (except for "saving" programs)

all constants and variable values are integers between -32767 and 32767.

there are only 26 scalar variables, named A thru Z.

there is only a single, unidimensional array, @(I). The dimension of this array is set automatically to make use of all of the memory which is not used by the program.

there are only 3 functions

ABS (X) –absolute value of X,
RND (X)–random number between 1 and X,
SIZE –the number of bytes unused by the program.

there are no string variables.

only 3 "direct commands" are available: RUN, LIST, and NEW (like SCRATCH) plus good old control C.

OK, let's look at what the program can say in this tiny BASIC.

REMARK: nothing new here.

LET: like you're used to but remember that expressions may contain logical terms so

LET V=(A>B) *X + (A<B) *Y

sets v to x,y or o depending on whether A is greater than, less than or equal B.

PRINT: values are normally printed in 6 spaces; however, you may override this using "#n" to change field size, so that —

PRINT A,B,#3, C,D,E,#10, F,G

will print the values of A and B in 6 spaces, the values of C,D, and E, in 3 spaces, and the values of F and G in 10 spaces. If there are not enough spaces specified for a given value to be printed, the value will be printed with enough spaces anyway.

You may also cause overprinting since:

PRINT 'ABC', - 'XXX'

will print the string "ABC", a CR without a LF, and then the string "XXX" (over the ABC) followed by a CR-LF.

Bay area folks can get paper tapes at the BYTE SHOPS!!! Get your computer store to get a copy.

INPUT: automatic prompts and input of expressions—

INPUT A, When this command is executed, Tiny Basic will print "A" and wait to read in an expression from the input device. The variable A will be set to the value of this expression. Note that not only numbers, but also expressions can be read as input.

INPUT 'WHAT IS THE WEIGHT' A –This is the same as the command above, except the prompt "A:" is replaced by "WHAT IS THE WEIGHT·"

IF: IF A<B LET X=3; PRINT 'THIS STRING'

will test the value of the expression A<B. If it is true (1) the commands in the rest of this statement will be executed. If the value of the expressions is false (0), the rest of this statement will be skipped. Note that the word "THEN" is not used.

GOTO: You may say GOTO (expression) for example GOTO A*10+B.

GOSUB and RETURN: the usual except that the GOSUB may also use any expression for it's argument.

FOR and NEXT: like you've seen before.

STOP: what do you suppose this does????

Two more things you'll need to know about are the enhanced RND functions and abbreviations.

RND: LET R=RND(30) Assigns a random integer between 1 and 30 to R
LET R = RND (100), A = (R<3) + (R<15) + (R<56) + (R<98)
Assigns R a random integer between 0 and 4 with probability
.03 of being 0, .12 of being 1, .41 of being 2
.42 of being 3 and .02 of being 4.

ABBREVIATIONS and BLANKS:

You may use blanks freely, except that numbers, command key words and function names can not have embedded blanks.

You may truncate all command keywords and function names and follow them by a period. "P.", and "PRI.", and "PRIN." all stand for "PRINT". Also the word LET in LET command can be omitted. The "shortest" abbreviation for all keywords are as follows:

A.=ABS	F.=FOR	GOS.=GOSUB	G.=GOTO
IF=IF	IN.=INPUT	L.=LIST	N.=NEW
N.=NEXT	P.=PRINT	REM=REMARK	R.=RETURN
R.=RND	R.=RUN	S.=SIZE	S.=STEP
S.=STOP	TO=TO		

If you would like complete documentation on this language, including a well-commented source listing of the interpreter, get a copy of the May 1976 issue of Dr. Dobb's Journal.

TINY TREK

★ TREK FOR YOUR 8k ALTAIR

On this page you see a listing of the smallest STARTREK program known to man , dragon or even Cheshire cat. It was written by Li-Chen Wang in his own version of Tiny BASIC, and the STARTREK program plus the Tiny BASIC interpreter will all fit in an 8K Altair.

"Far out" you say – but then notice that you can't read the listing because you aren't familiar with Li-Chen's Tiny BASIC. Don't despair, for on the facing page

is a description of the language.

prompting included with input

random numbers from 1 - 8

1 character mini-strings

@, the 1-d array

double or single quotes OK

```
  5 Y=2999;IN."DO YOU WANT A DIFFICULT GAME?  ","(Y OR N)"A
 10 P."STARDATE 3200:  YOUR MISSION IS ",;IFA=YY=999
 15 K=0,B=0,D=30;F.I=81D63;J=R.(99)<5,B=B+J
 20 M=R.(Y),M=(M<209)+(M<99)+(M<49)+(M<24)+(M<9)+(M<2),K=K+M
  25 @(I)=-100*M-10*J-R.(8);N.I;IF(B<2)+(K<4)G.15
 30 P."TO DESTROY ",#1,K," KLINGONS IN 30 STARDATES.
 35 P."THERE ARE ",#1,B," STARBASES.";GOS.160;C=0,H=K
 40 U=R.(8),V=R.(8),X=R.(8),Y=X.(8)
 45 F.I=7;TO152)@(I)=0;N.I;@(8*X+Y+62)=4,M=A.(@(8*U+V-9)),N=M/100
 50 I=1;IFNF.J=1TON;GOS.165;#(J+134)=300,@(J+140)=S,@(J+146)=T;N.J
 55 GOS.175;M=M-100*N,I=2;IFM/10GOS.165
 60 M=M-M/10*10,I=3;IFMF.J=1TOM;GOS.165;N.J
 65 GOS.145;GOS.325;IFKG.95
 70 P.;P."MISSION ACCOMPLISHED.";IFD<3P."BOY, YOU BARELY MADE IT.
 75 IFD>5P."GOOD WORK...";IFD>9P."FANTASTIC!";IFD>13P."UNBELIEVABLE!
 80 D=30-D,I=H*100/D*10;P.#1,H," KLINGONS IN ",D," STARDATES. (",I,")
 85 J=100*(C=0)-5*C;P.#1,C," CASUALTIES INCURRED. (",J,")
 90 P."YOUR SCORE:",I+J;G.110
 95 IFD<0P."IT'S TOO LATE, THE FEDERATION HAS BEEN CONQUERED.";G.110
100 IFE>=0G.120
105 P."ENTERPRISE DESTROYED";IFH-K>9P."BUT YOU WERE A GOOD MAN
110 Y=9873P.;IN."ANOTHERE GAME?  ","(Y OR N)"A;IFA=YG.5
115 P."GOOD BYE.";STOP
120 S=220,G=180,L=200,P=260,R=420,W=465,T=555;IN."CAPT:IN"A
125 IF(A=S)+(A=G)+(A=L)+(A=P)+(A=R)+(A=W)+(A=T)G.A
130 P."R=REPORT        S=SR. SENSOR   L=LR. SENSOR
135 P."G=GALAXY MAP    P=PHASER       T=TORPEDO
140 P."W=WARP ENGINE  **PLEASE USE ONE OF THESE COMMANDS***";G.120
145 F.I=X-(X>1)TOX+(X<8);F.J=Y-(Y>1)TOY+(Y<8)
150 IF@(8*I+J+62)#2N.J;N.I;O=0;R.
155 IFO=0P.'SULU: "CAPTAIN, WE ARE DOCKED AT STARBASE."
160 E=4000,F=10,O=1;F.I=64TO70;@(I)=0;N.I;R.
165 S=R.(8),T=R.(8),A=8*S+T+62;IF@(A)G.165
170 @(A)=1;R.
175 P."ENTERPRISE IN Q-",#1,U,V," S-",X,Y;R.
180 GOS.175;J=2;GOS.375;IFIG.120
185 P." OF GALAXY MAP";F.I=0TO7;P.;P.#1,I+1,":";F.J=0TO7;M=@(8*I+J)
190 P.#4,(M>0)*M;N.J;P.N.I;P."  ";F.I=0TO7;P."  ..";N.I;P.
195 P."  ";F.I=1TO8;P.#4,I,;N.I;P.;P.;G.120
200 GOS.175;J=3;GOS.375;IFIG.120
205 P.;F.I=U-1TOU+1;F.J=V-1TOV+1;M=8*I+J-9,A=0
210 IF(I>0)*(I<9)*(J>0)*(J<9)A=A.(@(M)),@(M)=A
215 P.#4,A,;N.J;P.;N.I;G.120
220 GOS.175;J=1;GOS.375;IFIG.120
225 M=8*U+V-9,#(M)=A.(@(M))
230 P.;F.I=1TO8;P.#1,I,;F.J=1TO8;M=@(8*I+J+62);IFM=0P." .",
235 IFM=1P." K",
240 IFM=2P." B",
245 IFM=3P." *",
250 IFM=4P." E",
255 N.J;P.;N.I;P." ";F.I=1TO8;P.#2,I,;N.I;P.;G.120
260 J=4;GOS.375;IFIG.120
265 IN." ENERGIZED. ","UNITS TO FIRE"A;IFA<1G.120
270 IFA>EP.'SPOCK: "WE HAVE ONLY ',#1,E,' UNITS."';G.120
275 E=E-A;IFN<1P."PHASER FIRED AT EMPTY SPACE.";G.65
280 A=A/N;F.M=135TO140;IF@(M)=0G.290
285 GOS.295;P.#3,S," UNITS HIT ";GOS.305
290 N.M;G.65
295 IFA>100P."...OVERLOADED.."J=4,@(67)=1,A=9;GOS.375
300 I=@(M+6)-X,J=@(M+12)-Y,S=A*30/(30+I*I+J*J)+1;R.
305 P."KLINGON AT S-",#1,@(M+6),@(M+12),;@(M)=@(M)-S
310 IF@(M)>0P." **DAMAGED**";R.
315 @(M)=0,I=8*U+V-9,J=@(1)/A.(@(I)),@(I)=@(I)-100*J,K=K-1
320 I=8*@(M+6)+@(M+12)+62,@(I)=0,N=N-1;P." ***DESTROYED***";R.
325 IFN=0R.
330 P."KLINGON ATTACK";IFOP."STARBASE PROTECTS ENTERPRISE";R.
335 T=0;F.M=135TO140;IF@(M)=0G.350
340 A=(@(M)+R.(@(M)))/2;GOS.295;T=T+S,I=@(M+6),J=@(M+12)
 345 P.#3,S," UNITS HIT FROM KLINGON AT S-",#1,I,J
350 N.M;E=E-T;IFE<=0P."*** BANG ***";R.
355 P.#1,E," UNITS OF ENERGY LEFT.";IFR.(E/4)>TR.
360 IF@(70)=0@(70)=R.(T/50+1),J=7;G.375
365 J=R.(6),@(J+63)=R.(T/99+1)+@(J+63),I=R.(8)+1,C=C+1
370 P.'MC COY: "SICKBAY TO BRIDGE, WE SUFFERED',#2,I,' CASUALTIES."
375 I=@(J+63);IFJ=1P."SHORT RANGE SENSOR",
380 IFJ=2P."COMPUTER DISPLAY",
385 IFJ=3P."LONG RANGE SENSOR",
390 IFJ=4P."PHASER",
395 IFJ=5P."WARP ENGINE",
400 IFJ=6P."PHOTON TORPEDO TUBES",
405 IFJ=7P."SHIELD",
410 IFI=0R.
415 P." DAMAGED, ",#1,I," STARDATES ESTIMATED FOR REPAIR";R.
420 P."STATUS REPORT:";P."STARDATE",#10,3230-D;P."TIME LEFT",#7,D
425 P."CONDITION      ";IFOP."DOCKED";G.445
430 IFNP."RED";G.445
435 IFE<999P."YELLOW";G.445
440 P."GREEN
445 P."POSITION       Q-",#1,U,V," S-",X,Y;P."ENERGY",#12,E
450 P."TORPEDOES",#7,F;P."KLINGONS LEFT",#3,K;P."STARBASES",#6,B
455 F.J=1TO7;IF@(J+63)GOS.375
460 N.J;G.120
465 J=5;GOS.375;IFI=0P.
470 IN."SECTOR DISTANCE"W;IFW<1G.120
475 IF1+(W>2)P.'CHEKOV: "WE CAN TRY 2 AT MOST, SIR."';G.470
480 IFW>9;W=9;P.'SPOCK: "ARE YOU SURE, CAPTAIN?"
485 IFE<W*W/2P.'SCOTTY: "SIR, WE DO NOT HAVE THE ENERGY."';G.120
490 GOS.615;IFR=0G.120
495 D=D-1,E=E-W*W/2,@(8*X+Y+62)=0
500 F.M=64TO70;@(M)=(@(M)-1)*(@(M)>0);N.M
505 P=45*X+22,G=45*Y+22,W=45*W;F.M=1TO8;W=W-R;IFW<-22G.525
510 P=P+S,G=G+T,I=P/45,J=G/45;IF(I<1)+(I>8)+(J<1)+(J>8)G.530
515 IF@(8*I+J+62)=0X=I,Y=J;N.M
520 P."**EMERGENCY STOP**";P.'SPOCK: "TO ERR IS HUMAN."
525 @(8*X+Y+62)=4;GOS.175;G.65
530 P=U*72+P/5+W/5+S/R-9,U=P/72,G=V*72+G/5+W/5*T/R-9,V=G/72
535 IFR.(9)<2P."***SPACE STORM***";T=100;GOS.360
540 IF(U>0)*(U<9)*(V>0)*(V<9)X=(P+9-72*U)/9,Y=(G+9-72*V)/9;G.45
545 P."**YOU WANDERED OUTSIDE THE GALAXY**
550 P."ON BOARD COMPUTER TAKES OVER, AND SAVED YOUR LIFE";G.40
555 J=6;GOS.375;IFIG.120
560 IFF=0P." EMPTY";G.120
565 P." LOADED";GOS.615;IFR=0G.120
570 P."TORPEDO TRACK ",;F=F-1,P=45+X+22,G=45+Y+22;F.M=1TO8
575 P=P+S,G=G+T,I=P/45,J=G/45;IF(I<1)+(I>8)+(J<1)+(J>8)G.585
580 L=8*I+J+62,W=8*U+V-9,R=@(W)/A.(@(W));P.#1,I,J," ";G.585+5*@(L)
585 N.M;P."...MISSED";G.65
590 S=R.(99)+200;F.M=135TO140;IF(@(M+6)=I)*(@(M+12)=J)GOS.305
592 N.M;G.65
595 B=B-1,@(L)=0,#(W)=0(W)-10*R;P."STARBASE DESTROYED
597 P.'SPOCK: "I OFTEN FIND HUMAN BEHAVIOUR FASCINATING."';G.65
600 P."HIT A STAR";IFR.(9)<3P."TORPEDO ABSORBED";G.65
605 @(L)=0,#(W)=0(W)-R;IFR.(9)<6P."STAR DESTROYED";G.65
610 T=300;P."IT NOVAS     ***RADIATION ALARM***";GOS.360;G.65
615 IN."COURSE (0-360)"I;IF(I>360)+(I<0)R=0;R.
620 S=(I+45)/90,I=I-S*90,R=(45+I*I)/113+45;G.625+5*(S<4)*S
625 S=-45,T=I;R.
630 S=I,T=45;R.
635 S=45,T=-I;R.
640 S=-I,T=-45;R.
```

You can also order paper tapes of these programs from the Community Computer Center. See page 32 for information.

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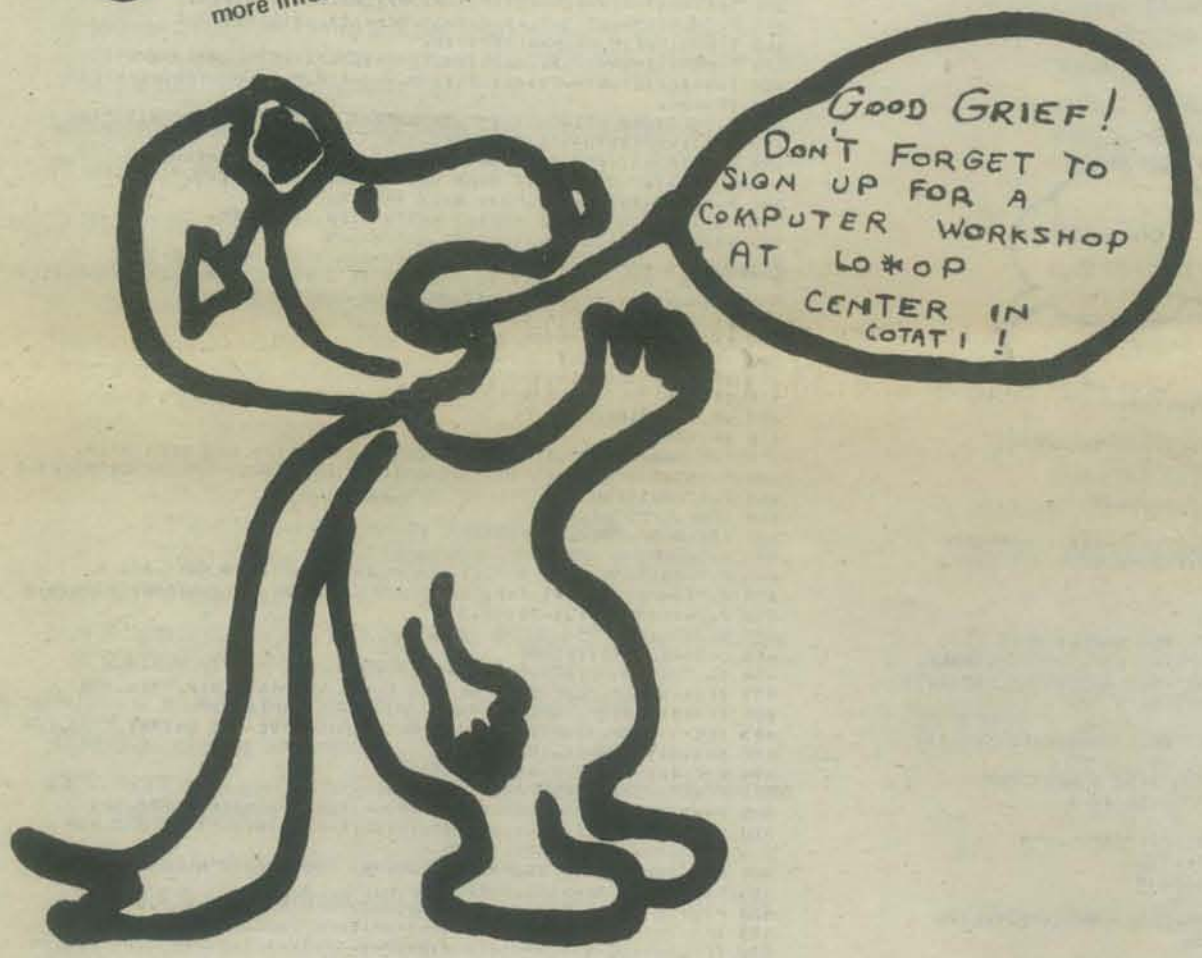

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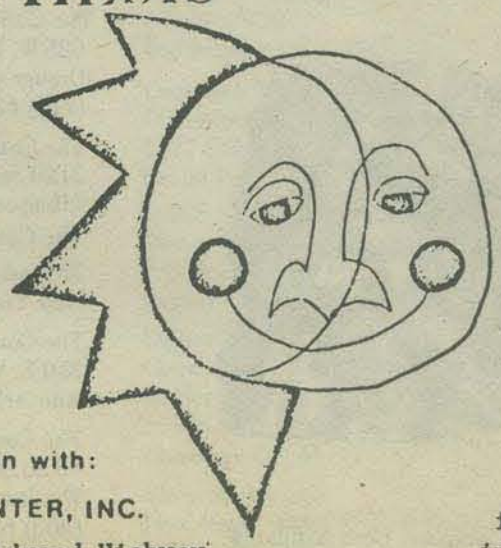

THE ACTIVITIES OF SYNTHESIS ARE:

* to collect, organize, and distribute information about all educational resources in Sonoma County and surrounding areas,

* to encourage contact and dialogue amongst schools, youth groups, educational community organizations and individuals through face to face meetings and publications,

* to assist in improving existing programs and in initiating new ones,

* to advise individuals concerning the variety of educational resources available and identify the particular programs which will best fill their needs.

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in association with:
LO'OP CENTER, INC.
8055 Old Redwood Highway
Cotati, Ca.

'756241

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FILED
In the office of the Secretary of State
of the State of California
OCT 16 1975
MARCH FONG EU, Secretary of State
By BILL HOLDEN
Deputy

LO*OP Center is for you to use. The computer education project and synthesis are realities now and there is room for more. A public data bank access project needs a co-ordinator. We need more teachers with a sense of play. We need money-finders. Please join us – and remember computers and other educational endeavors are only different for people to touch each other.

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First:

The name of this corporation shall be LO*OP CENTER, INC.

Second:

A. The Specific and primary purposes are:

(1) To create, establish, and provide an independent non-profit resource for the advancement of education and science
(2) To operate a center at which the general public may obtain access to computers and other educational resources.
(3) To develop, test, and promote techniques of learning and teaching.
(4) To publish and distribute materials related to the LO*OP Center's activities.
(5) To aid other organizations in the development and implementation of educational techniques or materials on a contract or consultant basis.

LISTS OF...

KEEP THOSE ADDITIONS
AND CORRECTIONS
ROLLING IN.

CLUBS

THESE ARE NEW CLUBS WE'VE LEARNED ABOUT SINCE LAST TIME.

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c/o Walter Marvin
408 Thurber Dr. West No.6
Columbus OH 43215

Ann Arbor Computing Club
C/O Roger Gregory
1485 Newport Rd.
Ann Arbor MI 48103

Chicago User Group
195 Ivy Ln
Highland Park, IL 60035

Computer Club
University of Chicago
Laboratory High School
1362 E. 59th St
Chicago IL 60637

Contra Costa County Computer Club
Eric Bergman
3188 Kingsley Pl
Lafayette CA 94549

Computer Science Club of the U. of Waterloo
Dept of Computer Science
Univ. of Waterloo
Waterloo, Ontario Canada

DMA
Dayton Microcomputer Association
c/o Doug Andrew
8668 Sturbridge Dr.
Cincinatti OH 45236

HP-65 User's Group
Richard J. Nelson
2541 W. Camden Pl
Santa Ana CA 90024

Louisville Area Computer Club
c/o Andy Ehalt
115 Edgemont Dr.
New Albany IN 47150

New England Computer Society
103 Spit Brook Rd. A12
Nashua NH 03060
(Bill Risch)

Niagra Region Computer Group
c/o Church Fischer
355 South Creek Dr.
Depew NY 14043

North Alabama Computer Club
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Memphis TN 38114
(901) 743-6155

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John Campbell
6278 Lake Lucerne
San Diego CA 92119

SEMCO
South Eastern Michigan Computer Org.
c/o Dick Weir
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Mt. Clemens MI 48043

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Microcomputer Club
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Aggieland Station TX 77844

Winston-Salem N.C.
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Andy Pitts (919) 765-1277
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TRACE
Toronto Region Assoc. of Computer Enthusiasts
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Streetsville Post Office
Mississiauga, Ontario Canada L5M 2C1

Ventura County Computer Club
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Port Hueneme CA 93041

Washington Amateur Computer Society
c/o Robert J. Jones
4201 Massachusetts Ave.
Washington DC 20016

Westchester Amateur Computer Society
c/o Harold Shair
41 Colby Ave.
Rye NY 10580

STORES

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Orange CA 92667
(714) 633-1222

The Computer Shack
3120 San Mateo NE
Albuquerque NM 87110

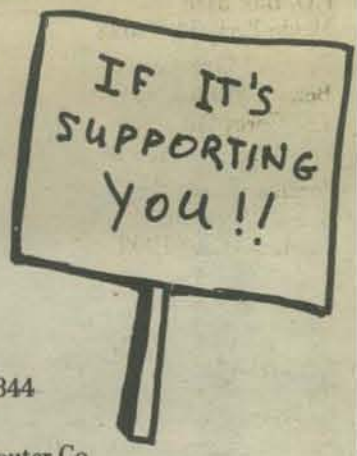
The Computer Store of New York
55 West 39th St
New York NY 10018

The Computer Store of Ann Arbor
310 E. Washington St.
Ann Arbor MI 48108

The Computer Store
63 So. Main St.
Windsor Locks CT 06096
(203) 627-0188

The Data Center
c/0 Programma Consultants
3400 Wilshire Blvd.
Los Angeles CA 90010

Dialect
1076 El Dorado Dr.
Livermore CA 94550
(415) 433-0390



Electronic Products
645 Stewart Av
Garden City NY 11530

Rainbow Enterprise
10723 White Oak Ave.
Granada Hills, CA 91344
(213) 360-2171

The Small Business Computer Co.
400 Dewey Blvd.
San Francisco CA 94116
(415) 665-2575

WHK Electronic & Scientific Instrumentation
P.O. Box 147 St. Albans, Victoria
Australia 3021

PUBLICATIONS

COMPUTERS ONLY

BYTE
70 Main St.
Petersborough NH 03458

Computer Hobbyist
Box 295
Cary NC 27511

Computers & People
815 Washington St
Newtonville MA 02160

Creative Computing
P.O. Box 789-M
Morristown NJ 07960

Dr. Dobb's Journal of Computer Calisthenics & Orthodontia
P.O. Box 310
Menlo Park CA 94025

The Journal of Community Communications
LGC Engineering
1807 Delaware
Berkeley CA 94703

Micro-8 Newsletter
Cabrillo Computer Center
4350 Constellation Rd.
Lompoc CA 93436

On-Line
D.H. Beetle
24695 Santa Cruz Hwy.
Los Gatos Ca 95030

People's Computer Co.
P.O. Box 310
Menlo Park CA 94025

Personal Computing
Benwill Publishing Corp.
167 Corey Rd
Brookline MA 02146

Popular Computing
Box 272
Calabasas CA 91302

INDUSTRIAL

Bit Bucket
National Semiconductor, MS115
2900 Semiconductor Dr.
Santa Clara CA 95051

Computer Notes
MITS
2450 Alamo SE
Albuquerque, NM 87108

Data General Education News
Data General Corp.
Southboro MA

EDU
Education Products Group
Digital Equipment Corp.
ML5 - 2/M 40
Maynard MA 01754

HP Educational Newsletter
Hewlett Packard
11000 Wolfe Rd.
Cupertino CA95014

Microcomputer News
Intel Corporation
3065 Bowers Ave.
Santa Clara CA 95051

Polyphony
PAIA Electronics, Inc.
1020 W. Wilshire Blvd.
Oklahoma City OK 73116

NEWSLETTERS

ACGNJ News
Amateur Computer Group of New Jersey
UCT I
1776 Raritan Rd.
Scotch Plains NJ 07076

ACS Newsletter
Amateur Computer Society
260 Noroton Ave
Darien CT 06820

Cache Newsletter
Chicago Area Computer Hobby Enthusiats
P.O. Box 36
Vernon Hills IL 60061

Cola Insight
Computer Organization of Los Angeles
P.O. Box 43677
Los Angeles CA 90043

Computer Hobbyist Group - NT Newsletter
Computer Hobbyist Group - North Texas
2377 Dalworth No. 157
Grand Prairie TX 75050

DACS Newsletter
Denver Amateur Computer Society
P.O. Box 6338
Denver Co 80206

Digiter's Digest
Cleveland Digital Group
G. Henkel
6590 Chaffee Ct.
Cleveland OH 44141

Electronotes
Newsletter of the Musical Engineering Group
203 Snyder Hill Rd.
Ithaca NY 14850

Homebrew Computer Club Newsletter
P.O. Box 626
Mountain View CA 94042

HP-65 Users Group
Richard J. Nelson
2541 W. Camden Pl
Santa Ana CA 90024

Interface
SCCS (Southern California Computer Society)
P.O. Box 3123
Los Angeles CA 90051

I/O Newsletter
South Florida Computer Group
410 NW 117th A
Miami FL 33168

MAPLE (APL & Micro's)
Box 574 NUMS
Chicago IL 60611

Newsletter of Washington Amateur Computer Society
WACS
C/O Robert J. Jones
4201 Massachusetts Ave
Washington D.C. 20016

Northwest Computer Club Newsletter
P.O. Box 5304
Seattle WA 98105

Personal Systems
San Diego Computing Society
P.O. Box 9988
San Diego CA 92109

TACS Newsletter
Larry Hughes
Rt. 14, Box 351-116
Tallahassee, FL 32304

The Analytical Engine
Chesapeake Micro Computer Club
236 St. David Court, X4
Cockeysville MD 21030

The Pilot Information Exchange
Gregory Yob
c/o LO*OP Center
8099 La Plaza
Cotati CA 94928

PROFESSIONAL

Circuit Manufacturing
Benwill Publishing
167 Corey Rd.
Brookline MA 02146

Computer Decisions
50 Essex St.
Rochelle Park NJ 07662

Computer Design
221 Baker Ave.
Concord MA 01742

Computer World
797 Washington St.
Newtonville MA 02160

Computing Newsletter
Box 734J
Colorado Springs CO 80933

Datamation
1801 S. La Cienega Bl.
Los Angeles CA 90035

EDN
221 Columbus Ave.
Boston MA 02116

Electronic Engineering Times
Electronic Buyers News
280 Community Dr.
Great Neck NY 11021

MFO Systems
Hitchcock Bldg.
Wheaton IL 60187

The Journal
Technological Horizons in Education
Information Synergy Inc.
P.O. Box 992
Acton MA 01720

Microcomputer Digest
2589 Scott Blvd.
Santa Clara CA 95050

Minicomputer News
Benwill Publishing Corp.
167 Corey Rd
Brookline MA 02146

Oregon Computer Teacher
Oregon Council for Computer Education
4015 S.W. Canyon Rd.
Portland OR 97221

ELECTRONICS

Electronics Projects Newsletter
Box 1026
Fremont CA 94538

Elementary Electronics
229 Park Ave South
New York NY 10003

Popular Electronics
One Park Ave.
New York NY 10016

Radio Electronics
200 Park Ave. South
New York NY 10003

73 Magazine
Peterborough NH 03458

dr. dobb's journal of

COMPUTER Calisthenics & Orthodontia*

Running Light Without Overbyte

A REFERENCE JOURNAL FOR USERS OF HOME COMPUTERS

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no4

no5

16 Bit Computer Kit

evaluation

by John Snell

I recently put to gether a Pacer 3H microcomputer development system kit, made by Project Support Engineering.[1] It has by far the easiest to use operational and debug functions of any computer kit that I have used. It has a NOVUS type (no tactile feedback) calculator keyboard built into the front panel. When you want to deposit a number such as 7532, you hit the 7, 5, 3, 2 keys on the keyboard instead of binary switches 1,1,1, 1,0,1, 0,1,1, 0,1,0. The Pacer uses the hexadecimal number system for keyboard input and display. If you do not know hexadecimal, the keyboard will convert from decimal to hexadecimal as well as perform hexadecimal arithmetic. Addresses are displayed to the left and data contents to the right in alphanumeric LED's. Using the keyboard you may examine and/or modify not only memory locations but also:

- 4 accumulators X 16 bits,
- a 16 bit program counter,
- a 16 bit status register,
- a 10 word X 16 bit stack,
- a 16 bit value register used for scanning memory to find the address at which a value is located,
- a 16 bit mask (for use if you are not certain about some of the bits or digits in the value),
- and 10 break point registers, 16 bits each.

The keyboard will also allow you to sequentially increment or decrement through memory or internal accumulators and registers for examination or modification of contents. Other front panel buttons include run, initialize (reset), restart (halt CPU but do not reset), and cancel last command.

The kit includes all parts one needs to have a working desk top microcomputer development system. The CPU board includes the PACE 16 bit MPU with necessary input and output buffers. On the control and I/O boards are two DM8531 (2038 x 8 each) ROMs for the system monitor. Also included on these boards are four MM2112 (256 x 4) static RAMs, one MM5740 keyboard encoder, two hex latches and LED driver circuits as well as all required support components to interface with the two 4 digit displays and 32 keypad. The control board has space for four more MM2112 RAMs. The memory board comes with four MM2112 RAMs. Space is provided for 12 more MM2112 RAMS and four MM5204 (512 x 8) PROMs for future memory expansion. The PAC II card has 2K x 16 of MOS RAM. The PAC I, PAC II, and PAC III cards are optional cards. PAC III is a prototyping card with voltage regulators. All other boards also have their own on board voltage regulators. PAC I is a TTY (or RS232C) interface and resident assembler card. With PAC I the user may perform all the front panel functions from a teletype (or similar device using current loop or RS232C) as well as the following useful functions:

- Load or punch a paper tape – no bootstrap need be loaded.
- Display a block of memory in one of several formats including assembly language (yes a dis-assembler! - very useful), ASC II, hexadecimal, unsigned decimal, or signed decimal.
- Set, list, or reset break or snap points (Break points are placed at strategic locations in a program. They halt execution and display the contents of specified registers and memory locations. Snap points do the same except program execution is not halted.)
- Enter programs in assembly language format (the assembler converts your programs line by line as you type them, to hexadecimal. No paper tape or cassette need be used for this. The assembler and other features listed here reside in two EA4900 type ROMs which hold 16K bits each.)
- Use symbols; the assembler does all address assignment and referencing. (One may also list the symbol table, delete a symbol or clear the table.)

In addition to the resident ROM memory in PAC I space is provided for twelve MM5204 (512 x 8) PROMs, for future user resident programs.

So what else comes standard with the basic Pacer kit? A case, keyboard, push buttons, alphanumeric LED's, all interface logic for keyboard and LED's, a power supply, a mother board (which reduces interconnect wiring and makes expansion easy), cables, connectors and a fan. Space is provided on the mother-board for 8 extra PC boards for future expansion. The power supply included in the kit will put out 8 amps total. If you used mostly CMOS on optional PC boards, the power supply would probably allow you to fill all the available space on the motherboard. P.S.E.[1] says the supply will power the CPU board, control board, front panel and logic cards, standard memory board, plus a TTY/line assembler (PAC I) and two RAM (2K x 16) memory boards (PAC II).

The assembly of the Pacer 3H was easy and quick. I had only a couple of minor problems. I forgot to connect the fan power lines at the right step of assembly. So I had to remove some heat shrink, solder wires, and then put new heat shrink on. Really no big deal, but I don't have a heat gun or hair dryer. Shrinking heat shrink with a match near the plastic case was somewhat of a hassel. I really should get a heat gun. They are also great for troubleshooting circuits with temperature sensitive problems.

There is a thin flexible cable that runs from the keyboard to the logic. This looked fragile, so I took my time installing it in its connector. Once installed however it will never be moved or flexed again, so this is really nothing to complain about.

The Pacer worked perfectly the first time I turned on the power. As I played with it, I began to appreciate the beauty of its high level front panel operational and debug capabilities.

Now I wanted to try our teletype with it. I quickly wired up our TTY to the connector and plugged in a PAC I pc board (TTY interface/resident assembler). The TTY would not work – oops, I neglected to ground the TTY select (low = select) pin on the connector. Once I did this everything worked perfectly, and I enjoyed exploring the fine operational capabilities of the unit.

Available soon from P.S.E. will be a PROM burning board, and an audio cassette interface, a CRT character generator and interface, a floppy disk interface, and BASIC (the debugged program burned into PROMs) as well as other programs in firmware. Since the Pace shares instructions with the IMP-16 (minor modification of programs might be needed), there is a lot of software already available. The *Bit Bucket* [2] newsletter is the best source of PACE and IMP-16 software. Program listings are free, source tapes $5, object tapes $3.

Overall I very much like the Pacer. I wish sockets had been provided for all the IC's and a heftier power supply had been used, however, these additions would of course increase the cost. The front panel operation and debug capabilities are the best I have seen on any commercial computer kit. I have not used any PAC II operational memory cards yet; so I can't evaluate them. However, I would highly recommend the PAC I TTY interface/resident assembler optional card. Having an assembler and dis-assembler as well as a system monitor in firmware result in relatively quick and easy assembly language. programming and debugging. The 16 bit instructions and data provide for efficient assembly language programming as well as increased accuracy. One may use words as a whole or in 8 bit bytes. Common memory and peripheral addressing result in simple quick I/O instructions.

With the Pacer's 16 bit accuracy and easy I/O and a couple of floppy disks, one could program something like Music V[3] and Score[4] for composition and playing of high fidelity music. Of course you would also need a 16 bit DAC[5]. If a very fast hardware multiply card were added as well as a fast Pace IC (rumored to be coming out from National Semi) to replace the pMOS IC, a real time FM systhesis[6] of timbre might be possible. I'm not sure if the rest of the Pacer circuits would be fast enough. Oh well – back to the 4 bit bipolar slices for real time Fourier synthesis

PRICE LIST ON PAGE 31

(1) Project Support Engineering/750 N. Mary/Sunnyvale, Ca. 94086

(2) *Bit Bucket*/Compute-115/National Semiconductor/2900 Semiconductor Dr. Santa Clara, Ca. 95051.

(3) Described in *The Technology of Computer Music* by M. Mathews, MIT Press, Cambridge, MA 1969.

(4) "Score – A musician's Approach to Computer Music" by L. Smith in the *Journal of the Audio Engineering Society* (JAES) Vol. 20, No. 1, Jan/Feb, '72.

(5) "Digital-to-Analog Converters: Some Problems in Producing High Fidelity Systems" by R. Talambiras, *Computer Design*, Vol 15, No. 1, page 63, Jan '76.

(6) J. Chowning, "The Synthesis of Complex Audio Spectra by Means of Frequency Modulation" JAES, Vol. 21, No. 7, p. 526, Sept. 1973.

A MUSICAL NUMBER GUESSING GAME

kurt inman

ADDRESS	MNEMONIC	CODE	EXPLANATION
000	LXI H	041	Load number to be guessed into register H
001	b2	000	
002	b3	( )	
003	LDA	072	Load guess into accumulator from address 200
004	b2	200	
005	b3	000	
006	MOV B,A	107	Move accumulator to register B
007	SUB H	224	Subtract register H from accum.
010	JZ	312	Jump if above result = 0 to address 030
011	b2	030	
012	b3	000	
013	JP	362	Jump to address 023 if result is greater than zero.
014	b2	023	
015	b3	000	
016	MVI A	076	Move the data in next line into the accumulator
017	b2	000	
020	JMP	303	Jump to address 036
021	b2	036	
022	b3	000	
023	MVI A	076	Move the data in the next line into the accumulator
024	b2	377	
025	JMP	303	Jump to address 036
026	b2	036	
027	b3	000	
030	CALL	315	Go to 'DAISY' subroutine
031	b2	050	
032	b3	000	
033	JMP	303	Jump to address 041
034	b2	041	
035	b3	000	
036	STA	062	Store accumulator (answer) in 047
037	b2	047	
040	b3	000	
041	EI	373	Turn INTE light on
042	JMP	303	Jump to address 041
043	b2	041	
044	b3	000	
050	LXI H	041	Load address of first music data entry
051	b2	110	
052	b3	000	
053	MOV A,M	176	The following lines (053-247) make the music
054	CPI	376	
055	b2	377	
056	JZ	312	
057	b2	050	
060	b3	000	
061	MVI D	026	
062	b2	040	
063	DCR B	005	
064	JNZ	302	
065	b2	070	
066	b3	000	
067	MOV B,M	106	
070	DCR C	015	
071	JNZ	302	
072	b2	063	
073	b3	000	
074	DCR D	025	
075	JNZ	302	
076	b2	063	
077	b3	000	
100	INR L	054	
101	JMP	303	
102	b2	053	
103	b3	000	

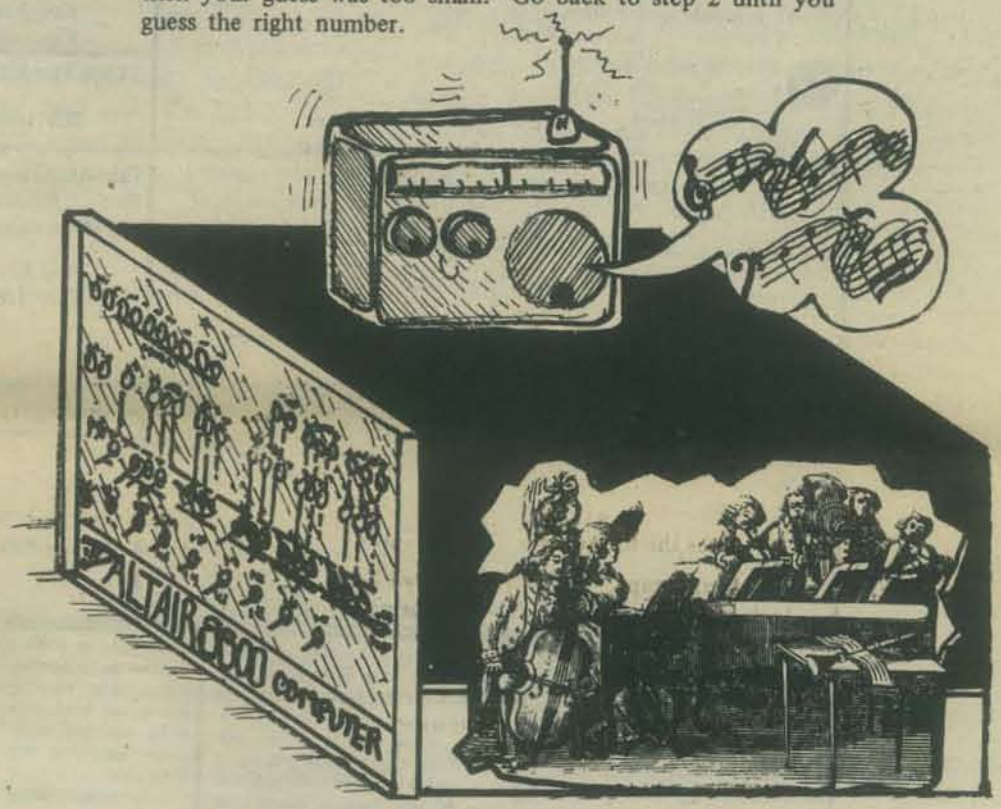
By Kurt Inman

350 Nelson Rd.
Scotts Valley CA 95066

This is a number guessing game for the Altair 8800. When you guess the right number, the Altair plays the song "DAISY" over the radio. It requires no connections between the computer and the radio. This program is written for the Altair 8800 with 256 words of memory and machine language. I demonstrated this program at Cabrillo College and at the State Science Convention in Fresno. [See "Electronics Class" by Kurt Inman in the May 1976 issue of PCC]

OPERATING INSTRUCTIONS

1. Deposit the number to be guessed in address 002
2. Deposit your guess in address 200.
3. Place radio on top of the Altair and tune it to 550-700 KC and turn it on.
4. Hit 'RUN'. If computer plays "DAISY", then you have guessed the number. Rotate the radio to find best reception. If INTE light comes on, hit STOP and examine address 047. If all lights go on then your guess was too big. If none of the lights on on then your guess was too small. Go back to step 2 until you guess the right number.



PACER continued - 30

PACER PRODUCT LINE RETAIL PRICE LIST (JUNE, 1976)

Quantity	Pacer Units 1H	2H	3H	PAC I	PAC II	PAC III	PAC IV	Fan Kit
1 – 3	$895	$1075	$1025	$180	$225	$50	$7	$25
4 – 9	$855	$1035	$985	$175	$245	$47	$6	$23
10 – up	$820	$995	$950	$170	$235	$45	$5	$22

Club group buys would help reduce costs.

Pacer 1H – totally unassembled (not recommended by P.S.E. for beginners.

Pacer 2H – completely assembled, tested and burned in.

Pacer 3H – unassembled except for logic cards which are tested and burned in.

PAC I – TTY interface/resident assembler card.

PAC II – 2K x 16 MOS RAM card.

PAC III – prototyping card with voltage regulators.

PAC IV – dual 43 pin mother board connector (this comes with PAC I, PAC II or PAC III).

Fan kit – designed for general purpose use

PROGRAM REPOSITORY & TAPE DUPLICATION FACILITY

A PUBLIC DOMAIN ALTERNATIVE TO MANUFACTURERS' USER GROUPS

The Community Computer Center (CCC) will act as a repository for program tapes; both source tapes and binary tapes. Everyone wishing to contribute programs to the public domain may do so by forwarding appropriate paper tapes to CCC. In particular, if you are hesitant about submitting a program for publication in *PCC* or *Dr. Dobb's Journal* because you don't want to hassle with its distribution, you are encouraged to forward the tapes to CCC and the documentation to PCC for publication.

The CCC will thus serve as a desirable alternative and supplement to the User Groups that are controlled and operated by many of the processor manufacturers, some of whom charge up to $100 for "membership" and access to the programs that their *customers* developed and offered to the User Group, without compensation.

There is *no* membership fee for access to the tapes from the Community Computer Center. Instead, one pays only for the duplication and mailing costs:

Duplication charge: $1/ounce or fraction thereof, for tapes (weighed after punching)
(Add 6% tax for orders mailed to a California address)
Postage & handling: $0.50 on orders of $5 and less
$1 on orders exceeding $5
Payment must accompany all orders. Orders will be mailed First Class, within 3 days of receipt.

Lists of tapes will be published now and then in PCC and in Dr. Dobb's Journal. Order tapes from:

Community Computer Center
1919 Menalto Avenue
Menlo Park, CA 94025
(415)326-4444

The following source tapes are currently available. They are programs written for the version of BASIC that is implemented for the HP 2000F minicomputers, and are discussed in *What To Do After You Hit Return* (available from the PCC Bookstore, $6.95).

Number Guessing Games	$12
Number	2
Abase	3
Trap	2
Stars	2
Clocks	3
Bagels	2
Quadgt	3
Button	2
Word Games	$10
Letter	2
Abagel	3
Hangmn	3
Madlib	6
Word	2
"Nimlike" Games	$11
23Mtch	2
Batnum	3
Nim	4
Chomp	3
Zot	5
Hide-n-Seek in 2D	$ 4
Hurkle	2
Mugwmp	2
Snark	2
Pattern Games	$11
Dangle	2
Sunsgn	3
Biosin	3
Mandal	3
Life	3
Amaze	3
Board Games	$11
Qubic5	5
Gomoku	4
Teaser	3
Rover	5
Welcome to the Caves	$ 9
Caves1	5
Wumpus	4
Caves2	5
Business & Social Science	$22
Hamrbi	3
King	5
Civil2	7
Market	5
Stock	5
Policy	4
Polut	4
Science Fiction Games	$12
Trader	10
Sttr1	9
Last Chapter	$10
Crash	4
Lunar	3
Revers	2
Zeros	3
Taxman	3

The following games are in Dartmouth BASIC and are described in recent issues of PCC

Motie	$5
Rescue	5
Pounce	1
Dodgem	3
Sinners	2

English and Spanish versions of Kingdom are written in TSS/8 BASIC

Kingdom (English)	$2
Kingdom (Spanish)	2

STAR TREK FOR YOUR 12K ALTAIR OR IMSAI

Star Trek (ALTAIR BASIC)	2

Palo Alto Tiny BASIC is now available for your ALTAIR or IMSAI. Plus . . . (fanfare) . . . Tiny Trek for Tiny BASIC! See pages 00 and 00 of this issue for more info.

Palo Alto Tiny BASIC	$2
Tiny Trek	2

And so it begins – low cost software! You can help keep it coming by sending tapes and complete documentation to CCC or PCC.

PCC
P.O. Box 310
Menlo Park, CA 94025

CCC
1919 Menalto Ave.
Menlo Park, CA 94025

Personal Computing

76 Consumer Trade Fair
Atlantic City, N.J.
August 28th, 29th, 1976

PERSONAL COMPUTING '76 will be a national gathering of manufacturers and users to discuss and exhibit microcomputers, and is open to the public. The weekend show is sponsored be the Southern Counties Amateur Radio Association of New Jersey, K2BR, and is being held in the AIRCONDITIONED convention facilities of the Shelburne Hotel/Motel, Michigan Ave. on the famous Atlantic City Boardwalk. Experts in their fields will conduct many varied seminars and demonstrations on all aspects of personal computing. For the beginner, for the student, for the businessman, and even for the advanced computer experts.

For information, write to PERSONAL COMPUTING '76, 503 West New Jersey Ave., Somers Point, New Jersey, 08244.

PROGRAMS FOR SALE?

Newcomers to the computer field are sometimes surprised, once they have their system up and running, to find that all they have is machinery and the darned thing just sits there . . . not *doing* anything. Not that everyone hasn't heard of software and programs – it's just that many neophytes don't understand the tremendous importance of such.

Old hands are culpable in this, too, for they are generally familiar with a commercial or school system which came with software and, shucks, you can get all sorts of programs from the users groups . . . from libraries . . . no strain. Oh yeah?

Foreseeing this problem last year, I organized the Kansas City meeting of the microprocessor industry to form a standard cassette medium for program interchange. The meeting was difficult to get going . . . I had to get the site set up for it . . . send out letters to all involved . . . write it up in *Byte* . . . and then make an awfuf lot of phone calls to follow it up. The meeting, for which *Byte* has been given credit, was my idea and my doing . . . and the people who had taken over *Byte* were furious that I had set up the conference . . . they didn't want to be bothered.

So much for that.

So now we have a medium which can be used for entering programs into small computer systems. One thing which I think will help hobby computers and small business computer systems grow more than anything else will be a low cost plentiful supply of programs. I hope to provide same.

Here is the deal. I will buy programs from programmers and pay a good royalty on them. I will duplicate these and have them on sale in all of the computer stores around the country . . . and possibly in some of the more forward looking electronics distributors. I will have them carefully checked in my own lab to make sure that they work as advertised and that duplicates are perfect. We already have excellent tape duplicating equipment which we use for making the Morse code and radio theory cassettes we are presently selling . . . over 2500 a month.

If you are a programmer and have a good program available, please let me know. I need to know what it can do, what system it is for, and how much memory it takes. We will be able to check out programs on the Altair 8800 . . . have been promised a Sphere system . . . and hope to eventually have all other popular systems set up and running so we can check the programs.

What kind of programs can sell? Just about anything. I would expect we might have a cassette with five games on it which would go for $2.95. A real fine Star Trek program might go for $4.95. A payroll program for small businesses could go for perhaps $19.95. We would want to keep the prices down to where it would not be worthwhile to bootleg them or even make copies for friends . . . thus getting out from under the problem MITS has had with their BASIC, which apparently has been copied quite a bit.

Programmers would benefit substantially under this plan, since they would make 10% of the gross sales. Thus a $12 program would wholesale to computer stores for about $8 and the programmer would make an 80¢ royalty. This would mean $8,000 royalty for every 10,000 of the programs sold . . . and with several hundred thousand customers out there, if only 10% of them bought a given program this would mean a very nice return for the effort of writing and documenting the program.

These programs would be a bonanza for the stores . . . it would give them the ammunition they need to sell systems . . . not to mention that they might eventually be a good profit item in themselves as businesses and hobbyists come into the store to find out what new programs are available every week or so.

It is going to take this idea a while to get into motion. First we will have to get our own computer systems up and working . . . our experience has shown this not to be a minor undertaking. We have two computer techs and programmers on our staff right now and are looking for more. Then we will have to run thorough tests on cassettes to see which work best . . . using a computer to check each tape as it is made, comparing it, bit for bit, against the original.

Programmers . . . it's time to get working on your programs. Be sure to document them well . . . be sure you are not drawing on others' work . . . all our programs will be copyright . . . please put in some extra steps which are not needed, as a key to copyright infringement prosecution. We will need games . . . chess, backgammon, Star Trek, and so forth . . . business programs such as inventory, general ledger, accounts payable, accounts receivable, mailing list, and so forth. We will have to have a statement from you that your work is original.

Hopefully this system will provide the money to encourage programmers to work overtime to provide the software we need to sell small computer systems. By bringing a system to this presently chaotic aspect of computers, perhaps we can help the field to grow more rapidly.

I/O Editorial by Wayne Green, reprinted from the July 1976 issue of *73 Magazine*, published monthly by 73, Inc., Peterborough, NH 03458.

TeleVISIONS is the magazine for media producers and activists . Theory meets practice and artistry meets public need. Bi-monthly, $10 for ten issues from TeleVISIONS Magazine, P.O. Box 21068, Washington D.C. 20009.

The AMRAD COMPUTERFEST will be an exposition of microcomputers for computer amateurs, radio amateurs and the general public. It is being sponsored by the Amateur Radio Research and Development Corporation (AMRAD), a non-profit scientific and educational organization.

The AMRAD COMPUTERFEST will be held on October 24. 1976 at the Vienna Community Center, 120 Cherry St., Vienna, Virginia, near Exit 11S of the Washington, D.C. Beltway.

The exposition will be almost entirely devoted to small computers of the type suitable for home use. There will be displays of microcomputer systems by various manufacturers' representatives as well as tables for used or surplus equipment, circuit boards and parts. Peripheral devices including video terminals, teletypewriters and RTTY equipment will be shown. Forums will run through-out the day on subjects of interest to the serious hobbyist, students, and the general public. There will also be an opportunity to talk to representatives of various computer clubs and magazines.

Admission will be $4.00 at the door ($3.50 advance registration by mail for pickup at the door). Make checks payable to AMRAD. Write: COMPUTERFEST, P.O. Box 682, McLean, VA 22101.

NASAGA ANNUAL CONFERENCE
Oct 14-16, 1976
Crabtree Sheraton Hotel
Raleigh NC

The 1976 North American Simulation and Gaming Association Conference will attempt to meet the needs of the game designers and users with a series of workshops and papers in specific subject areas while continuing to offer papers and symposia in game theory, design and evaluation.

For info: NASAGA, c/o Office of Research, Evaluation and Planning, North Carolina State University, Durham NC 27707

THE BATTLEGROUND GAME STORE

is a place to play board games and computer games. Emphasis on games simulating historical and future military conflicts [What? No peace games?] The store is at 71 Bleeker Street, just east of Broadway, in New York City.

C.H.O.I.C.E.

The Clearing House for Options in Children's Education is a non-profit corporation serving as a resource and fund-raising center for alternative schools in the Washington metropolitan area. We believe that people should have the freedom to learn in an environment that nurtures their natural curiosity and enthusiasm. Since alternative schools are unique models pioneering this kind of growth environment, we work in a variety of ways to support and strengthen them.

C.H.O.I.C.E. NEWSLETTER
Sumner School Building
17th & M Streets, N.W.
Washington, D.C. 20036

Our newsletter is published ten times a year by the C.H.O.I.C.E. staff.

$3.00, one year subscription for individuals
$10.00, one year subscription for institutions
$5.00, one year subscription for individuals and a contribution to help cover the cost of sending the newsletter to people who can't afford it.
Donations are tax-deductible.

THE TOWN FORUM

The Town Forum is a community of communities. Subscribe to the Town Forum Journal and attend our May meetings to learn more about Cerro Gordo, Experimental City 1, Arcology Circle and many other communities across the country. Join us and choose your own level of participation, from interested subscriber to community builder and resident. We welcome your interest, your ideas, and your active participation.

The Town Forum, Cerro Gordo Ranch, Dorena Lake, Cottage Grove OR 97424.

SCIENCE FOR CITIZENS?

The National Science Foundation has prepared a report to Congress on a proposed program to accomplish the following 3 objectives:

- Improve public understanding of public policy issues involving science and technology.
- Facilitate participation of scientists and engineers in public debate on scientific and technical issues.
- Enable non-profit citizens groups to acquire necessary expertise to assist them in dealing with scientific and technical aspects of public policy issues.

Nine approaches considered are:

* Registries of scientists and engineers.
* Media programs
* State based support centers
* Scientist and engineers Associate program
* Internship program for science and engineering students
* National clearing house with regional branches
* Regional centers
* Forums, conferences and workshops
* Grants to independent journals.

It's difficult to fully visualize just where this program could lead, but when you consider the potential of any Federal program, it is worth looking into, just to make sure it does not become a tool of special interests and/or a government guide to acceptable technological and scientific thinking.

Check with your library, or write the National Science Foundation, Washington D.C. 20550 for a copy of the report.

–The Old Soldier–

COMPUTALKER

Voice output for your ALTAIR, IMSAI or POLYMORPHIC computer. Available September 1, 1976. Price: $395. For info, write to Computalker Consultants, 821 Pacific Street No.4, Santa Monica, CA 90405.

edcentric

EDCENTRIC: *A Journal of Educational Change* supports people working to change education and to make change through education.

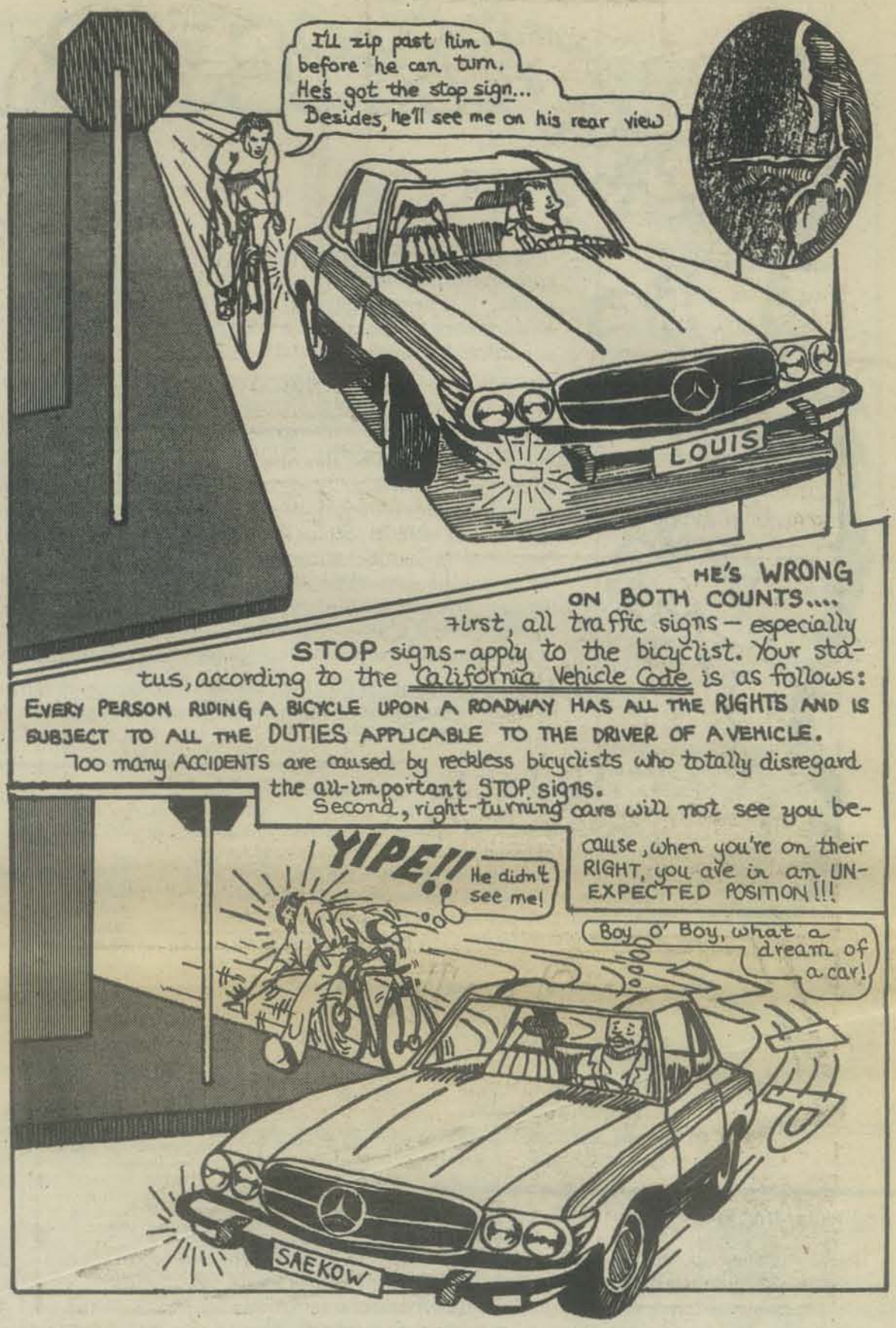
$6/year (6 issues) Sample copy $1.00
EDCENTRIC, P.O. Box 10085, Eugene OR 97401.

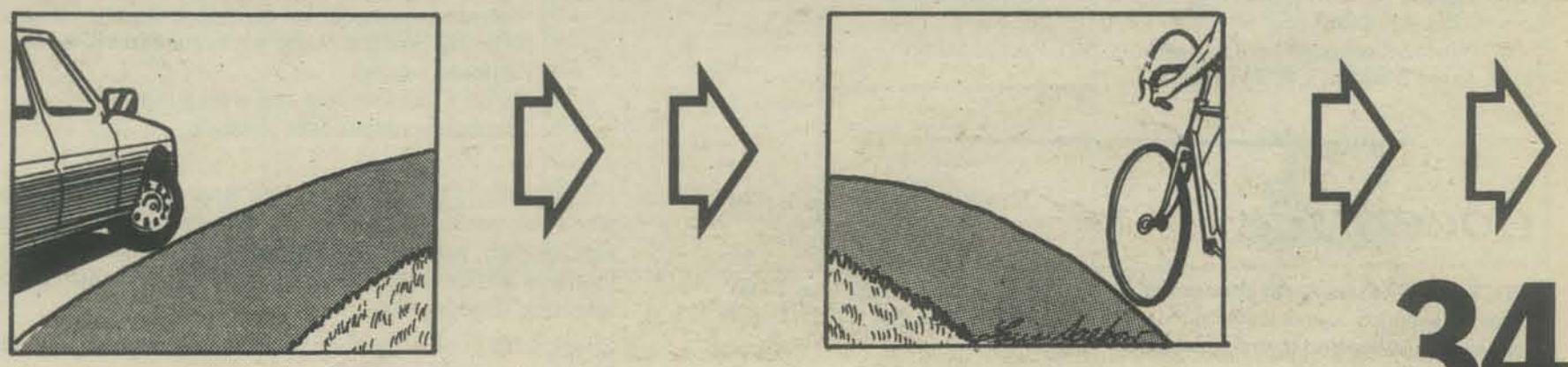
* SPROCKET MAN *

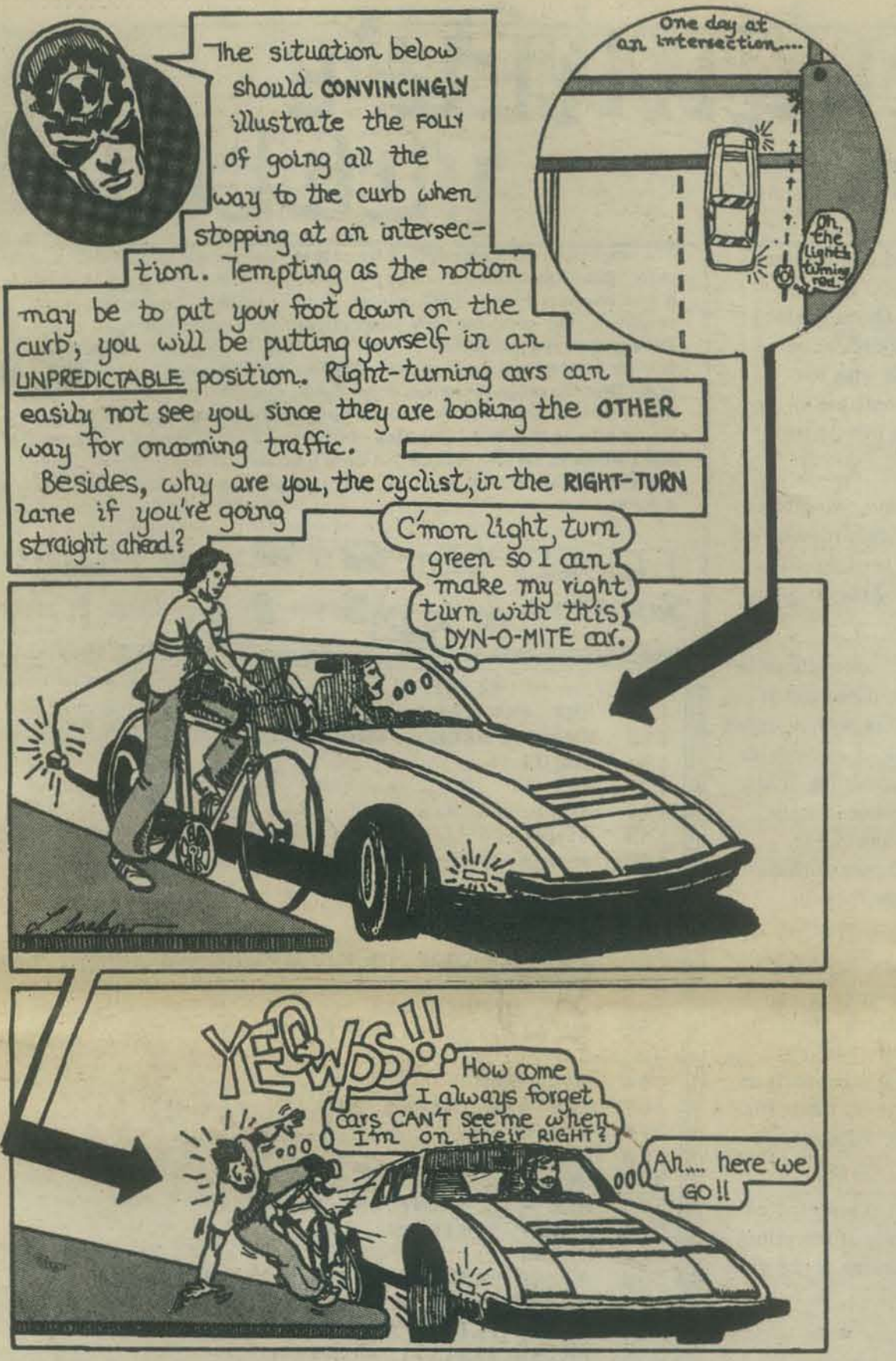
(...continues his two-wheeled pedagogical ways from last issue)

Cyclists today must learn to interact smoothly with cars and traffic flows. Our roadways are rarely designed with bicyclists in mind, and motorists often don't take extra precautions on your behalf.

Bike-car collisions, as well as doing great damage to your bike, offer the greatest risk of serious personal harm. So, for everyone's sake, follow these traffic tips. BE PREDICTABLE to motorists. Surprises on the road can have painful results.







INFORMATION

for further information about the purchase of SPROCKETMAN; contact

Urban Scientific and Educational Research, Inc.
W20--002, MIT
Cambridge, MA. 02139

(or)

Urban Bikeway Design Collaborative
P.O. Box 2983
Stanford, CA. 94305

THE PROGRAMMER'S TOOLBOX

by marc le brun

Reprinted from PCC Volume 1, No.5, May 73

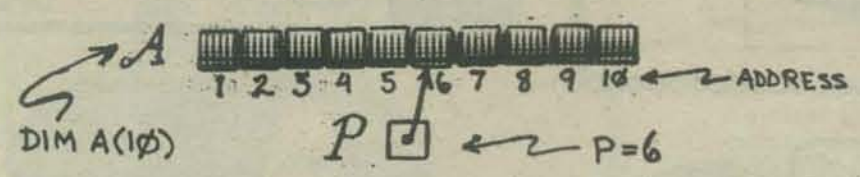
Data comes in different flavors. The two types of data that BASIC users are most familiar with are numbers and strings. Many BASIC systems also provide the user with a third data type; matrices. Occasionally there are other types as well, such as logical values, which are either zero or one, and various peculiar types such as are often associated with files. There is an important type of data however, which is not available on any BASIC system – the *pointer*. In this article we will discuss how to implement pointers in BASIC.

The pointer is the fundamental unit of *structural information*. Structures are so universal in computing that it is impossible to even begin to examine them in any detail in this article; the techniques presented here should be used as a basis upon which you can build more sophisticated programming practices.

Pointers are values which are used to indicate *relations* (or "connections") between other units of data. To create structures from this data each of the items in the structure must have a unique value associated with it, called it's location or *address*. For example, suppose that we wish to connect ten values stored in a one dimensional array in some sort of a structure. Then the integers 1, 2, . . . , 10 would be the addresses of those values. If the ten values were stored in a 2 by 5 array then the ordered pairs (1,1), (1,2), . . . , (1,5), (2,1), (2,2), . . . , (2,5) would be the addresses of those values, and so on. For the sake of simplicity, we will assume that the addresses we will be discussing can be represented as single numbers.

A pointer is simply a variable whose value is an address. Since we have assumed that the addresses we are talking about are single numbers we can use ordinary BASIC variables to represent pointers. Pointers can do only one thing; they can connect or "point at" data items. Pointers are *not* ordinary numbers; in particular adding, subtracting or doing other sorts of arithmetic with pointers has no meaning. Dividing a pointer by three, for example, makes as much sense as dividing a string by three. Pointers *just* point, and I think I have made my point . . . . . .

To avoid confusion with ordinary numbers pointers are often represented by arrows when they appear in diagrams. Let's call our array of ten values A, and let's say that the variable P is a pointer which is pointing at the sixth element in A. We would diagram it like this –



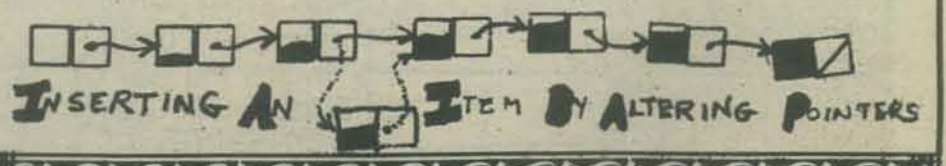
There is a special pointer value that is often very useful. It is called the *null pointer*. It is a pointer that doesn't point anywhere. In this article we will use the number zero to represent the null pointer. The null pointer is also often called NIL (usually in capital letters) with reference to the LISP language, which has contributed a number of other weird words to computer science, and which was one of the first computer languages to deal specifically with structures.

In diagrams, NIL is often represented as a diagonal slash through the box representing the pointer, with the slash in the same orientation as the slash through the numeral Ø (you do slash your zeroes don't you?!).

Since pointers are easily represented by numbers they may be stored in arrays, possibly in the same array as the rest of the data. For instance, in the example below, each complete row of the array A is considered a data item, the first element in the row is a number and the second elements in the row are pointers to other rows.

Now you know about pointers. Here is the example.
And remember the best things in life are sometimes the simplest.

The program on this page creates a list of N random numbers sorted in increasing order. It does this *without* moving the random numbers in the array. Data items consist of one number and one pointer. The pointer points to the *next largest* random number in the list. The largest number has a null pointer associated with it. Initially there is a special item at the N + 1 address containing a zero (smallest possible number) and a null pointer. When a random number is generated it is stored in A. Then the program searches down the list *following the pointers*. When it finds a number larger than the one just generated, it inserts the current number into the list prior to that item. If the search reaches the end of the list it attaches the new element to the end. Notice that these insertions are accomplished simply by changing the values of the pointers. Study this program until you understand how it works.




```
10  DIM A[100,2]
100  REM *** TALK TO HUMAN ***
110  PRINT "HELLO, HOW MANY VALUES ";
120  INPUT N
130  PRINT
140  A[N+1,1]=0
150  A[N+1,2]=0
200  REM *** GENERATE RANDOM VALUES ***
210  FOR I=1 TO N
220  A[I,1]=RND(0)
230  J=N+1
300  REM *** LOOP TO FIND PLACE TO INSERT ***
310  K=A[J,2]
320  IF K=0 THEN 400
330  IF A[K,1]>A[I,1] THEN 400
340  J=K
350  GOTO 300
400  REM *** INSERT IN LIST ***
410  A[I,2]=K
420  A[J,2]=I
430  NEXT I
500  REM *** PRINT THE ARRAY ***
510  PRINT "ORIGINAL ARRAY :"
520  PRINT
530  PRINT "ADDRESS","VALUE","POINTER"
540  PRINT
550  FOR I=1 TO N
560  PRINT I,A[I,1],A[I,2]
570  NEXT I
580  PRINT
600  REM *** PRINT THE LIST ***
610  PRINT
620  PRINT "SORTED LIST :"
630  PRINT
640  PRINT "ADDRESS","VALUE","POINTER"
650  PRINT
660  J=N+1
700  REM *** LOOP TO PRINT LIST ***
710  K=A[J,2]
720  IF K=0 THEN 800
730  PRINT K,A[K,1],A[K,2]
740  J=K
750  GOTO 700
800  REM *** SAY BYE BYE ***
810  PRINT
820  PRINT "BYE BYE HUMAN !!!"
830  PRINT
840  END
```

DON'T BE A DONUT... run it!

Letters And Other Numbers

APL News

APL Press is a new publishing house devoted exclusively to APL. Its first book, to appear this summer, is a high school text on elementary analysis by Iverson. Several other titles are planned for publication this year, and further manuscripts are being sought.

A newsletter is also planned, to present brief articles, problems, definitions of functions, reports on conferences, correspondence, and other items of interest to the APL community. The first issue, which is scheduled for July, will include a report by Professor Jenkins on a recent APL implementors workshop, an article on magic cubes by Professor Mauldon, and material on a new form of function definition excerpted from a forthcoming book.

Readers interested in receiving the newsletter and information on other publications, or in submitting material for publication, should write to APL Press Box 27, Swarthmore, PA 19081.

Dear Doctor -

Dear Dr. Inman:

Your recent article about Cabrillo College Peoples Computer Company Newspaper was exciting. We are planning to move to the Peninsula Area this summer. Would you please give me the address of Cabrillo College so I can sign up for a young boy who is interested in amateur radio, computers, etc.

Thank you very much.

Sincerely,

Joseph C. Sharp

2176 Apple Tree Lane
Schenectady, NY 12309

Dear Joe:

Thank you for the letter in response to my article on Cabrillo College. Cabrillo is located at 6500 Soquel Dr., Aptos, CA 95003. Aptos is a small community located a few miles south of Santa Cruz. It is not in the immediate Peninsula area but is on Monterey Bay. I am sure they would like to have you in one of their classes. Thanks also for the compliment of calling me Dr. Don Inman, but I cannot claim the title. I am a high school teacher at San Lorenzo Valley High as you can see from my other story on page 18 in May, PCC. I hope you will look me up when you get out here.

Your friend,

Don Inman

Star Trek / Space War Game

A version of the STAR TREK/SPACE WAR game is now available for the ALTAIR 8800. It is written in ALTAIR 4K BASIC and is being distributed by International Data Systems, Inc. The purchase price of $10 (checks OK) includes a complete program source listing, operational instructions, tips on how to "patch" the program to add your own features, a one year limited warranty against "bugs", and postage and handling. The limited warranty states that a corrected copy will be provided if any errors are identified. The limited warranty does not provide replacement for time or resources lost as a result of such errors. Orders should be addressed to: Star Trek Offer, International Data Systems, Inc., P.O. Box 593001-AMF, Miami, FL 33159.

See pages 23 and 32 for more STAR TREK information.

"It's a subset of APL!"

© DATAMATION ®

"I Want To Do Something"

Dear Bob:

I've written to you before under the name Cap'n Quirk. But, it's not Cap'n Quirk who's writing now; it's Paul Holbrook. We are two different people.

I've been reading through my March 1976 PCC and the page on Chris Moseley's "People's Software Factory," attracted my attention. I think it's fantastic that a high school student like myself could get out and really start something. I'm a high school sophomore, and I'm getting the urge to start something or do something, as well. I live in Pleasanton, and if Pleasanton wasn't so close to Menlo Park, I'd think of starting a center. I want to do something, I'm just not sure what. Do you have any idea's on what can be done by someone like me?

[Paul, if you really want to start a center, do it! The Dragon.]

Moving on to another subject, in the May PCC I noticed your thing about writing readable programs. I think this raises some questions. Now I agree whole heartedly that people should try to write readable programs. I've been guilty of writing some pretty unreadable stuff. You may remember I sent you a program to punch characters on paper tape a while back. Reading through it again, I doubt anyone could ever figure that idiot thing out. You probably took one look at it and gave up on it. Now here's my point: In big, disk based systems, there is really no reason not to write readable programs. You usually have (for all practical purposes) unlimited room and programs can be loaded very quickly.

But what about using a small memory mini or micro? Here, one just cannot afford the space or the time needed to load such things through 10 cps teletypes. Take my case. The system I use is an EDUSYSTEM 20C. We have 16K and 4 users. Our school has one on-line teletype. Here it really is impractical!!! Why does your listing need all sorts of comments if your program is debugged? *[So people can read it and find out how it works.]*

I also question some of the programming techniques used. Do multiple statements per line have any place in a readable program? *[Definitely. Especially when they let you put a complete "thought" on one line.]*

One thing that my programming style books tell me is that GOTO's should be used as little as possible. Mac's method results in more GOTO's!!! For instance, he often replaces things like:

```
10 IF X=0 THEN 100    - with 10 IF X = 0 THEN 30
20                           20 GO TO 100
                             30
```

This bugs me!! Maybe I'm wrong. I've probably been schooled in all sorts of bad habits by the need to crunch code down to fit into our machine. This will also be a problem for many people first learning programming on micros.

All things considered, whenever I get other people's programs I'll crunch wildly, but when I write my own, I'll try to make them understandable. Maybe I'll send you a readable version of my tape punch program. Making a program readable also can show how bad or good it is, so maybe I won't.

By the way, on your Synergistic Beer Drinking, what if you don't drink beer? Does that mean you shouldn't drop by? *[How about serendipitous buttermilk?]*

So much for my ravings.

Paul Holbrook

6104 Craterlake Ct.
Pleasanton, CA 94566

MORE LETTERS -

A Satellite For The People ?

The average non-profit organization in the U.S. with 10,000 or more members today spends more than $160,000 for communications services. The 900 such organizations known to exist across the country, ranging from such diverse groups as the League of Women Voters, the National Education Association, the Sierra Club, the Consumers Union to the National Police Officers Association of America spend close to $145 million: $53 million for national and regional conferences, $18 million for long-distance telephone, $13 million for mail campaigns, $4 million for data transmission, and $3 million for radio and TV.

These figures were unearthed by a study just filed with the Federal Communications Commission by the Public Interest Satellite Association (PISA). The study provides information for policy decisions currently being made by the FCC concerning the future uses of satellite communications technology. These decisions, which are being made for the World Administrative Radio Conferences scheduled to take place in 1977 and 1979, will establish the ground rules for the international and domestic growth of satellite communications services until the year 2000.

According to Bert Cowlan, a Co-Director of PISA, "With satellites, we stand at an historic crossroads in telecommunications. The data in this study shows clearly that the non-profit sector has a need for low-cost means to serve its telecommunications requirements and that it may very well be able to afford the use of a satellite communications system designed to meet its specific needs and purposes. Unless policy makers take these needs into account now, the public sector stands to lose out on the benefits of its multi-billion dollar investment in space technology."

The use of satellites for communications is hardly new. The military has been using them for the past 15 years. There exists an international, commercial telecommunications satellite system (INTELSAT) serving business and government interests in more than 80 countries. The use of satellites for commerce at home has begun to flourish. These systems, though, consist of low-powered synchronous orbiting satellites that can transmit signals only to extremely large (30 to 90 foot diameter dish antennas) and expensive ($500,000 to $5,000,000) earth stations. Only the largest and wealthiest entities in the communications field have been in a position to use satellites.

This may soon change, thanks to a series of major breakthroughs that promise to greatly reduce satellite hardware and operating costs. New, experimental satellites are capable of transmitting telephone, data, radio and TV signals to small (three to ten foot diameter dish antennas), inexpensive ($2,000 to $10,000) ground receivers. This newer satellite hardware may become within reach of non-profit organizations, if policy options are left open with respect to its continued development.

PISA was formed in the Fall of 1975 as a non-profit organization to help spearhead the effort to encourage the development of low-cost communications satellite technology. "Our survey is an important first step in this direction," said Andrew Horowitz, PISA's other Co-Director. "It's important because it is the first serious attempt ever taken to demonstrate that the non-profit community is gaining an awareness of communications needs, and that it is organizing itself to assure that technological and regulatory policies reflect these needs."

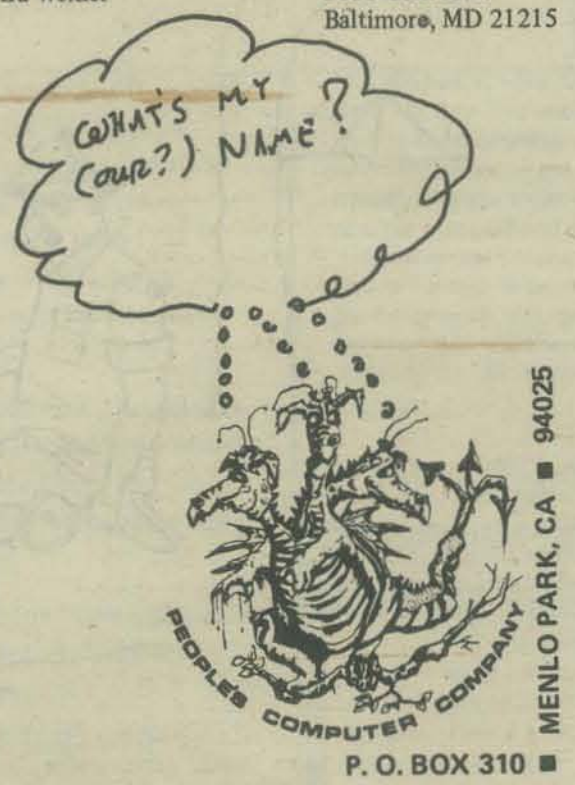
The survey was commissioned by PISA from Melvin A. Goldberg, Inc., an independent marketing and communications research organization. Copies of the 130 page report are available from PISA, 55 West 44th St., New York, NY 10036, for the cost of reporduction and mailing ($7.50). Information about PISA's future plans is also available upon request.

Name The Dragon

Dear PCC,

How about a name the dragon (the one with 3 heads) contest?

Ira Wexler
3031 Glen Ave.
Baltimore, MD 21215



Information Please -

Good Morning:

We are working on a plan for a series of "information stories" that would require computerization for large-scale information flow. Our plan involves store-front access points, an open catalog of information available, and economic self-sufficiency through both mass marketing of information and "per-bit" charges for both input and output information.

Ultimately, the plan would involve utilization of the information for specific problem-solving assignments, on-going studies of attitudes and values, selective dissemination of information and analysis to political figures and others likely to be influenced toward implementing the public good, and much more.

The plan has been compared to giving the human race a nervous system complete with a brain.

Please send us any information you can that relates to this task, and let us know if you would like to get more involved in what we are doing.

Robert A. Moskowitz
403 West School House Lane
Philadelphia, PA 19144

The best source for this info is The Journal of Community Communications, *published now and then by Lee Felsenstein, LGC Engineering, 1807 Delaware St., Berkeley, CA 94703.*

Bugbook 3 Reviewed (?)

Bugbook 3 was apparently written as a not very successful attempt to meet these 3 pressing needs of all professors:
PUBLISH OR PERISH!, Money, No available book to meet the needs of the course.

It apparently was written as a laboratory manual for Jr? College Chemistry Students and as such might be barely acceptable. As a self help book I consider it to be of NEGATIVE value. (I sent my copy back to the bookstore for a refund.)

BB3 is very disorganized making it virtually useless for reference.

to up right

from down left

BB3 is so redundant as to be absurd. If a student has to be told 43 times (I didn't actually count them) not to plug something in backwards there would seem to be some question as to whether he (or she) belongs in the course at all.

The authors apparently assume that you are going to draw your computer board and interface boards from the supply room and therefore you don't really need to know much about how and why they work.

A good deal of the book is taken up with extolling the virtues of BUBBOOKs Present and future. Ditto with the Mark 80 computer and the interface boards.

In my opinion, the beginner or the expert will get far more out of the INTEL 8080 Microcomputer Systems User's Manual @ $5.00 than he could ever get out of Bugbook 3.

K. Billings
R 2
Champaign, Il 61820

●

And I have to agree. BB3 is just not a good book. You can learn from it, and there is a lot of information there, but the style and presentation just does not make it. It's thick – but there is a lot of white space that would be better filled with information. You can do much better. (But BB1 and BB2 are useful books!)

D Allison

Send A Dragon To Switzerland

INTERNATIONAL MINICOMPUTERS-MICROCOMPUTERS-'77

Europe's first full-scale exhibition and conference devoted exclusively to these versatile devices, will be presented on May 24-26, 1977, at the Palais de Exhibitions in Geneva.

Visiting engineers will be able to examine and compare an unprecedented variety of mini and micro computers, microprocessors and peripheral devices. They will be able to discuss first hand with exhibitors the ways in which these instruments may be applied to their individual requirements in such areas as test and measurement instrumentation, industrial controls, office and business machines, data terminals, communications equipment essentially any equipment using digital electronics. This sweeping range of applications is expected to attract a broad cross section of the European technical fraternity.

An additional attraction will be an extensive Technical Program conducted by an international team of top computer experts from the United States, Europe, England and Japan. The Program will delve into the major areas of activity associated with these types of computers, including Design and Development; Selection Guidelines; Commercial, Industrial, Engineering, Scientific and Military Applications; Testing; Programming Techniques; and Input/Output Requirements.

Further information regarding INTERNATIONAL MINICOMPUTERS-MICROCOMPUTERS-MICROPROCESSORS '77 may be obtained from Joseph C. Maurer at ISCM, 222 W. Adams Street, Chicago, IL 60606—phone (312) 263-4866. Or contact Ron Avis at Kiver Communications, Ltd., 149/155 Ewell Rd. Surbiton, Surrey, KT6 6AW England - phone, 01-390-0281.

Dragons Of Probability

For those who wish to pursue a study of the relationship between dragons and computers, may I recommend a delightful story entitled "The Third Sally, or The Dragons of Probability" contained in a collection by Stanislaw Lem titled "The Cyberiad" (Avon paperback, 1976).

Tim Rand
386 Browns Rd.
Storrs CT 96268

AND MORE LETTERS

Pocket Astrodynamics

Dear PCC:

Possibly some PCC readers will be interested in an article, "Pocket Astrodynamics", appearing in the March 1976 issue of the Journal of the British Interplanetary Society. This lists three programs written for the HP-65:

(1) Lunar Flyer with a Terminal Guidance System

(2) Orbit Plotter

(3) Lunar Mission Simulator (it solves a coplanar, restricted 3-body problem!).

Single copies of the Journal are available from:

The British Interplanetary society
12 Bessborough Gardens
London, SW1V 2JJ, England

at $3 per copy.

Norman F. Stanley
P.O. Box 723
Rockland, Maine 04841

Maybe these are available from the HP-65 users club? Their address is: 2451 W. Camden Pl. Santa Ana, CA 92704.

A Predicament

Dear Dragons and Dragonettes,

Hope you haven't forgotten me! It's been a long time since I've written, but I'm in a predicament and I desperately need your help. Nearing the finish line in my race to build a TV-Typewriter (I rub my lucky dragon's foot hoping it will work when it's complete) I need an acoustic coupler or modem or whatever the heck it is to connect it over phone lines to computers. PLEASE – can you tell me exactly what I need, and who sells the cheapest. I'm sure this info will be useful to other dragons too!

Bob Zeidman
9801 Clark St.
Philadelphia PA 19115

PS. Where do you dig up those weird 18th century sketches that find their way into the dep, dark corners and gaps between paragraphs and abysses between stories in your paper?

Bob –

Get the March 1976 issue of Popular Electronics. Read about "Pennywhistle Modem." Then get one! Complete kit is $97.50 from M & R Enterprises, P.O. Box 1011, Sunnyvale CA 94088. Lee Felsenstein, who designed it, sez you will need access to a freq. counter to adjust your Pennywhistle. Try the local computer club or store. Those wierd sketches are from a book of graphics you can use published by Dover. Art stores carry them

The Dragon

Pearls From PCC

Hail Dragon,

I am dismayed at the thought that owners of your earlier issues may discard them without regard to us latecomers. I can only imagine what pearls of programs and gems of graphics inhabit the missing issues of Volumes 1 – 3. However, no practical means of recirculation comes to mind.

Anyway thanks for your work so far.

W.G. Brown

Chin-up, W.G.! We will reprint the best stuff from out-of-print PCCs now and then. Look for "Programmer's Toolbox" and "Basic MUSIC" in this issue.

The Dragon

New Ways To Work

If you don't really like your work and think there should be a better way to do it, you are not alone. New Ways to Work, a community vocational resource center in Palo Alto, sees over 2000 people like you every year – people looking for more satisfying, meaningful or flexible work or just plain looking for a job. We don't have all the answers, but we do help people realize their own potential and skills and support their job search by means of group and individual vocational counseling. We do have contacts with people trying experimental work ventures and we do have some job listings. We have a special training program for people who want to learn job sharing techniques. And we do have a Youth Employment Service which has summer, temporary and part-time jobs for young people. We also talk with employers and governmental agencies about alternative work patterns.

New Ways to Work was established in December, 1972 by three women, Sydney Brown, Barney Olmsted and Suzanne Smith, who had learned from their experience in a minority employment service and the peace movement that a community-based employment center could start from scratch and help people find jobs. From the beginning, NWW has been open to all kinds of job seekers and people who felt that existing patterns did not fit their needs. The distinction was not in whom to serve, but in NWW's approach to them and the world of work. The center is somewhat like a travel agency–there are all kinds of ways to get where you would like to go, and we can provide advice and information about the process.

New Ways to Work has grown tremendously in its 3½ years of existence, from a small, all-volunteer group to a staff of 17-25 (part-time, full-time and volunteer staff), three project areas: the Job Sharing Project, the Work Center, and the Youth Employment Service, and a budget of almost $80,000 this year. We have gotten money from foundations, individual contributions and CETA, the Comprehensive Employment Training Act, but our existence never seems assured for more than six months at a time. For more information, send for "Starting a Work Center in Your Community", a practical and joyful booklet by Sydney Brown, which will be available in September from NWW at 457 Kingsley, Palo Alto, CA 94301.

For more information on job sharing, a new work pattern in which two or more people divide responsibility, salary and fringe benefits of one full-time job, contact the Job Sharing Project of New Ways to Work. It is funded for one year by CETA to help assist the many people who need to work less than full time, but find permanent part-time possibilities unavailable. The project's purpose is to convince employers to make a policy of allowing full-time jobs to be shared and help employees become effective sharers. Employers find that people who work fewer hours are more efficient and have higher energy levels. Sharing has also been shown to reduce absenteeism and turnover and provide for greater coverage during peak periods. When full-time workers who prefer to work part-time cut back hours, new positions can be offered for Affirmative Action hiring; layoffs can be avoided in times of tight budgets.

The New Ways to Work Job Sharing Project holds a series of workshops for people interested in this type of work schedule. Potential sharers learn techniques of pairing, joint interviewing and ways to respond to the concerns employers often express. Introductory meetings on job sharing are held every Wednesday morning at 10 at NWW (Call 328-4974 for information). In San Francisco, call 653-1017 for meeting times. To get a publication list on job sharing, including the NWW booklet "Job Sharing in the Schools" and the Stanford University ARLO study of the City of Palo Alto's job sharing, write to NWW Job Sharing Project, 457 Kingsley Ave., Palo Alto, CA 94301.

Elektrik Muzik

I just finished reading Malcolm Wright's *Alpha-Numeric Music With Amplitude Control* and also Gilbert Trythall's *Principles and Practice of Electronic Music.* Wright's booklet, though brief, does contain information useful to the computer musician. Trythall's book, on the other hand is much lengthier but does not attempt to cover the subject of computer music in any detail, although the existence of such music is mentioned. Trythall is primarily concerned with devices such as the Moog and Buchla synthesizers rather than computers. (De gustibus non est disputandum.)

Don Lancaster's *TTL Cookbook* has a few valuable tips on computer music, such as using a 1,943.04 kHz crystal for better pitch. He also mentions using the Mostek MK5024P chip as a multi-note generator, but doesn't explain how to do it! No doubt, someday, somebody will publish an encyclopedic computer music cookbook. In the meantime, everyone will have fun re-inventing the pianola.

None of the books I have seen so far (except Malcolm Wright's) presents infromation in sufficient detail to be of practical use to the hobbyist. Still, all of them do give an introduction to the field, although they tend to concentrate rather heavily on the keyboard synthesizers and batch systems incapable of real-time synthesis. I would love to see a book giving concrete examples of sophisticated hybrid systems, complete with diagrams and program listings!

Recent articles indicate that computer-controlled synthesizers are definitely the current trend in electronic music. See:

"Music Modules to Build Your Own Synthesizer" by Don Lancaster, *Popular Electronics,* June '76.

Jim Day
17042 Gunther St.
Granada Hills, CA 91344

For My Kids

I am considering the acquisition of a micro-computer system for my personal use. In my quest for information as to what is available I wrote to several of the manufacturers (Sphere, Altair, etc.) requesting information and prices. I also stated that I was not a programmer and while I could learn I was more interested in acquiring existing programs and wondered what they either had available or whether they knew of any sources. I received a lot of information about hardware, very little about software, and nothing about application software concerning games, education, etc. I am having a difficult time justifying the acquisition and subsequent cost of a computer to my wife when I explain that I can't seem to find any programs.

My main concern is for my children. They range in age from 10 to 14 years old and our local educational system is anti-computer. (For a number of questionable reasons) I have spoken to people who have had kids play with computers and their kids seem to be getting more than mine. My thought is that if my kids can relate to a computer (they are not relating to teachers) and go at their own speed they will hopefully like learning more and school less. At the risk of redundancy; I can't get any informatio on programs educational or otherwise can't afford DEC or IBM where I know a lot of the program are.

Any help you can give me would be greatly appreciated.

John G. White
216 E Fifth St.
Port Angeles, WA 98362

More Elektrik Muzik

Dear People,

I'm especially interested in the computer music area and meeting others who are also. I'm presently involved in a project to interface an 8800 to a bunch of synthesizers (musical) and would like to know what's been done in this area.

Michael Smith
Vacaville, CA 95688

SOME MORE LETTERS

John Lees On Tools

Dear Bob,

From the reaction to my first letter I can see that my brief comments on tools caused more of confusion than of anything else. I intend in the future to say rather a lot more on the subject, in a more organized manner, in *Creative Computing*. For now I'll say this much in defense of my position:

No, no one understands any tool exactly. It can be shown that it is not possible to understand any tool, or any physical object for that matter, exactly or totally. No, no human being is ever going to totally comprehend any portion of the universe. The very act of trying to comprehend a part of the universe, which includes yourself by virtue of the fact that you are trying to comprehend it, puts you immediately into an infinite recursive loop. But enough of such nihilistic metaphysical bullshit. None of that has anything to do with what I am talking about!

I was speaking of tools in a functional sense and of understanding in the sense of retaining some control over our future and I will continue to question whether we really understand what we create using tools we don't understand.

Existence is a continuous process; everything is intertwingled with everything else, a fact which is far too often ignored. Ends cannot be considered independently of means! There are many ways to produce the "same" hammer. The person who uses the hammer to build a house may not be aware of the details of its production, but the world he lives in is defined by such little details. The same things is true of home computers. And, yes, whether you like it or not, your home computer is intertwingled with the starving children in India. This planet is a closed system, ecologically and socially: your actions do affect others! To ignore that interaction is to ignore your ethical responsibilities as a human being.

The "Old Soldier" is not concerned that inherently incomprehensible technology "has been the rule rather than the exception ever since the discovery of fire." Living in California, I'm surprised that it hasn't occurred to him that he might be able to breathe more easily if an attempt had been made to understand what happens when a few hundred million people start their cars every day on the same planet.

As for being guided by "close enough" and "our continued survival indicated (sic) that we have done pretty well in that department so far," as far as I and many others are concerned, our continued survival is still in doubt. I would also like to point out that "so far" has been an incredibly short time. When you think of tomorrow, try thinking in terms of five or ten or a hundred thousand years. Thinking in such time spans leads one to wonder why we are in such a hurry to do everything "quicker."

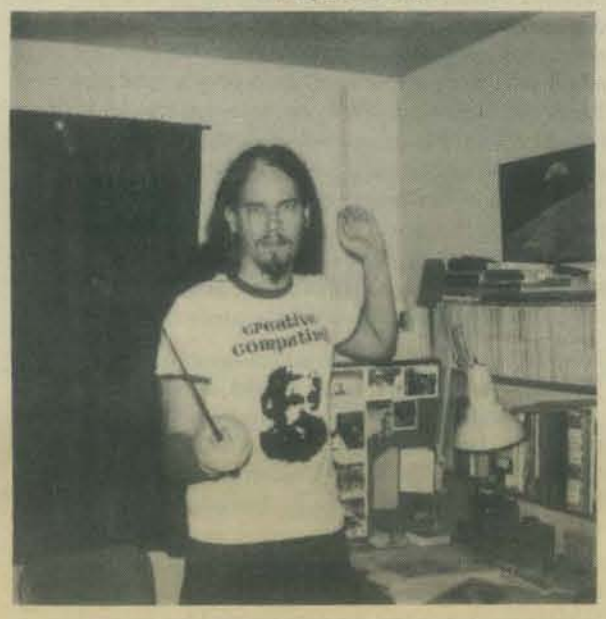
Remember, too, that technology is not just something that 'happens to us' out of the blue. Why be so defensive of technology that most people don't understand? Must computers remain black boxes? Must the public forever fall farther and farther behind in understanding the devices with which it is manipulated? What are all those boxes with "blinky lights" going to be used for? Can we have an understandable computer technology? Can we use computers to bring about useful social change? Are we really doing something useful in terms of the future of this planet? These questions are going to be answered. Are we going to be the ones to answer them?

I'm going to close with a quote from Joseph Weizenbaum's *Computer Power and Human Reason*, an excellent book which I encourage every concerned person to read:

But just as I have no license to dictate the actions of others, neither do the constructors of the world in which I must live have a right to unconditionally impose their visions on me. Scientists and technologists have, because of their power, an especially heavy responsibility, one that is not to be sluffed off behind a facade of slogans such as that of technological inevitability. In a world in which man increasingly meets only himself, and then only in the form of the products he has made, the makers and designers of these products – the buildings, airplanes, foodstuffs, bombs, and so on – need to have the most profound awareness that their products are, after all, the results of human choices. Men could instead choose to have truly safe automobiles, decent television, decent housing for everyone, or comfortable, safe, and widely distributed mass transportation. The fact that these things do not exist, in a country that has the resources to produce them, is a consequence, not of technological inevitability, not of the fact that there is no longer anyone who makes choices, but of the fact that people have chosen to make and to have just exactly the things we have made and do have.

Think about it.

John R. Lees, Jr. P.O. Box 1543
Rolla, MO 65401



en garde yourself, Old Soldier!

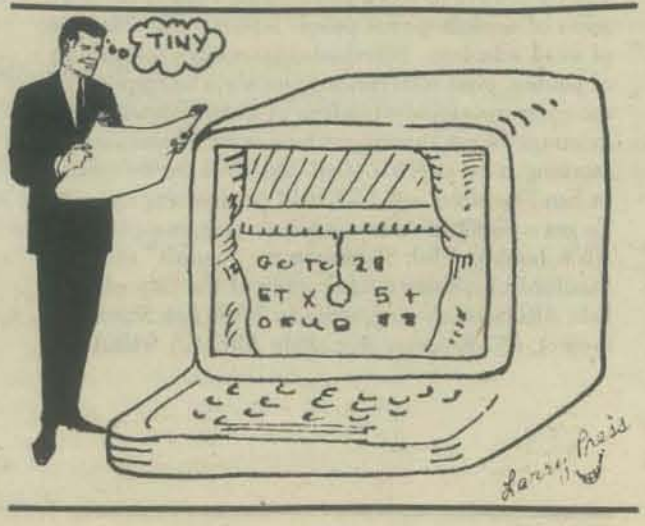
Hoboken ComPuter Works

Dear Dragon People,

The Hoboken Computer Works is another small, friendly computer store in the metropolitan New York area. A stroke of luck (and a memorable name) put us right on the front page of the N.Y. Times.

I can't end this note without expressing my personal appreciation for what PCC has been doing for the last few years. Obscurantism, ego-tripping, and elitism have dominated the world of computers for too long. And even tho I note lingering evidence of these nasties in some of your letters, I think you're doing a marvelous job of opening up these musty rooms to a little fresh air.

Bob Radcliffe
Hoboken, NJ



TinY Timesharing ?

I would like to get readers to start thinking about the possibilities of constructing multiple-user or time-shared systems using table-top hardware.

The development which I think makes this possible is the Video Display Module VDM-1 by Processor Technology Corp., 6200 Hollis St., Emeryville CA 94608. I happen to have designed it, in part for the money, but also so that people more skilled in software than I (and that's almost anyone) could put together multi-user systems.

The VDM-1 is a memory module (1024 bytes) with a window (the video monitor screen). It has an upper/lower case character set which includes control characters (128 characters). There is a video inversion cursor which can be set at each character by setting the high-order bit of that character. This effectively doubles the character set to 256. Display format is 64 characters by 16 lines.

Since it is memory, the processor can read from the VDM as well as write to it. This means that information specific to a given user can be stored in that user's VDM, pulled out for use when desired, modified, and put back in. This can happen in a memory area which is masked from the view of the user by the "window shade." As its name implies, this is a blanked area of the screen which can be "pulled down" from the top to blank a maximum of 15 text lines. The CPU determines the length of the shade through a status byte which it outputs to the VDM through an OUT instruction.

Suppose that Tiny Basic (or Tiny Algol or Tiny Fortran or whatever) is set up in the CPU's main memory area. Several users with VDMs could be building programs, the object code of which is stored in the first few lines of their screens. (Here my ignorance of systems software will probably become laughably apparent. It's the vision that counts.) The CPU runs through a schedule in which it pulls out the object code and tables of parameters in a user's screen, runs the program until a convenient point is reached, stuffs the code and new parameters back under the window shade, and goes on to the next user. One of the parameters would obviously be the location on the screen of the cursor. If the total number of bytes used for this storage were 512 per user, that would still leave 8 lines of 64 characters. These could be configured as two columns of 32 characters, having a total length of 16 lines.

The more ambitious a user got, the lower the window shade would go as the hidden area filled up with stuff. This would provide a "negative feedback" effect which might serve to keep the user reminded of the limited nature of the machine resources. Users of Incredible Big Monster machines will throw tantrums at the thought of this, but they will have to be brought into the real world somehow, whether they like it or not.

I have been talking about multi-user operation, in which several people use the same program. True time-sharing requires (I think) that each time the CPU steps to the next user, it be able to call up the program (meaning Tiny Basic or Tiny Algol) which that user wants. Clearly these programs cannot be kept under the window shade, but if they are tiny enough there should be enough RAM available on a full-blown 65K system (providing the power supply holds out.)

Incidentally, it might be a tickly to keep object code and parameters on the screen without pulling the window shade down over them. They would appear to flicker, sparkle and otherwise rearrange themselves in operation. This would be a much better show than black screen, and might serve as a debugging aid, together with a chart of the binary equivalent of the character set.

That's about as much as I can offer, except for help in interpreting the VDM-1 manual, which is available for $4 from PTCO. It's a pretty good manual, so I don't think there will be too much call on that score.

Do it!

Lee Felsenstein
LGC Engineering

1807 Delaware St.
Berkeley, CA 94703
(415) 845-4736

EVEN MORE LETTERS

Bob Leedom Visits Earth

Dear Bob and People,

It's been nearly a year since I last corresponded with you, and quite some time since I've been able to spend any time at a terminal – I've neither written nor played any computer games (well, hardly any) in all that time.

If you recall, I wrote to you a couple of Septembers ago to tell of my extension of Mike Mayfield's STAR TREK game. That led to Dave Ahl's publication of my version in his great mag, *Creative Computing*, which in turn has led to my receiving much mail from computer game freaks of all ages from all over the country, plus England. However, the mail has trickled off to about one letter/month, the reduction being surely due to my marked propensity towards procrastination and sloth, and consequent unpunctual epistolary intercourse - I'm too lazy to write back.

My other excuses were that of (a) building a new house (please note new address, pen pals), and (b) working strange hours on our successful competition to win the contract for the Air Force's F-16 radar. (I bet you didn't know Westinghouse makes great radars for the military! However, in case you saw publicity shots in various publications like May 24th Electronic Design magazine, that's ME kneeling underneath our flight test radar - also see picture on p.13 of Westinghouse stockholder's 1975 Annual Report. Caution– wear sunglasses to avoid glare from top of RCL's head!)

What, you may ask(and are about to find out, ask or no) has brought me out of my hole to write again? The answer lies in the fact that I am a closet Trekkie. That is, I've been to a couple of conventions, I've got the Tech Manual and Enterprise blueprints plus the "Making of" and "Worlds of" books, but.... I fight it. I don't watch all ten episodes a week available in this area (Baltimore/D.C.) - only two or three. I refuse

to buy all eleven of Blish's novels, or the Klingon *Battle Cruiser blueprints*. And I'm not that good at Star Trek Trivia.

However, I dearly wanted to take the time to write virtually the identical comments that you just printed by Bill Crow (In PCC Vol. 4, No.6, pp. 6-7) addressing Bill Campbell's so-called "Ultimate STAR TREK Game," Bill Crow's comments were solidly locked on target, and were, I notice, seconded in the same issue (p.37) by Steve North (with whom I briefly corresponded about "my" STAR TREK program). Anyhow, my message here is simply, "YEAH, YEAH! (Wish I'd said that...)"

Also, Bob, I'd like to attempt a mini-review of a book that nearly any PCC reader will devour.

THE SHOCKWAVE RIDER, by John Brunner. Harper & Row, Publishers, Inc. NY 10022. Paperback by Ballantine Books, NY 280 pp. $1.50.

This is a story of a future that, to us computer hackers who see what kinds of cybercrud are being wrought in the name of progress these days, is not totally improbable. Or rather, this is the story of one remarkable man's experience in said future. The man, born Nickie Haflinger, was educated in a government think tank which ostensibly would make the most of the talents and aptitudes of Nickie and others who have a gift for cybernetic sciences. But Nickie came to differ with the government's concept of just how his gifts should be used. So he escaped.

Using his astounding skill at entering an hour's worth of data at a terminal keyboard without a single error, plus his knowledge of government identity codes and data formats, Haflinger could sit at any public or private veephone and enter a brand new identity for himself into the national data network. He was the perfect fugitive.

However, the first two-thirds of the novel is told in flashback – following Haflinger's capture by the government. The results of his encounter with the government interrogators produce a satisfying, exciting, and slightly frightening ending.

The allusions to software technology are intriguing- how would you write a "tapeworm" program into a data net to attack the files of someone you have a grudge against? [Or the virus program that searches for, finds and attacks time-sharing systems - see When Harlie Was One by David Gerrold. The Dragon]

And there are references to a complex game called "Fencing", with complex rules. Actually, the game is rather simple in statement of rules, but the game sounds as if it has analogies to GO, which also is simply-described (but which takes decades in which to achieve proficiency). Please note that the copyright statement in the front of the book goes to the trouble of saying, "No part of this book, including the imaginary game of "fencing" may be used or reproduced in any manner whatsoever without written permission except in the case of brief quotations embodied in critical articles and reviews." I don't know if that would prohibit someone's programming a computer to play the game.....

The book is very thought-provoking. In fact, after leafing through it again for this review, I've decided not to mention any of the other delights and surprises, and I think I'll read it again.

As far as getting myself a home computer, I just can't bring myself to do it. I waited and waited after the HP-35 hit the market - and sure enough, two years later, there was the dandy HP-21, in my price range. I bought one. Poof! The HP-25, programmable appeared. I bought a Heathkit color TV in December 1969, thirty-three days before Heath announced price breakthrough, on color picture tubes, followed by solid state models. So you see, sure as I buy an Altair, Bill Godbout or somebody will come out with an el cheapo copy of a PDP-11, with floppy disc and bubble memory for under $500. I'll probably teeter on the edge of indecision for years, till my oldest boy (now four years old) asks for an IMSAI for Christmas.....

Oh well, I guess I'll just keep on reading BYTE and turning green with envy until something snaps..... (How I've rambled on!)

Robert C. Leedom
14069 Stevens Valley Ct.
Glenwood MD 21738

CAI For $24.95

Now! For $24.95 you can free up a port on your HP 2000 or other CAI drill and practice machine.

QUIZKID II – A timed series of 10 arithmetic problems appear automatically in the display. The child, dragon or other learner is required to key in the answer to the problem shown in the display. Over 1200 problems are automatically generated by the calculator. A slow/fast speed control key adjusts time allowed for the user to enter the answer. Suggested retail, $24.95. Also available is an optional game adapter which connects two QUIZKID II's for a contest.

National Semiconductor QUIZKID III – Has all the abilities of QUIZKID II plus games for over 6,500 additional problems. Contains amateur and pro keys for adjusting complexity of problems, and a complex key for problems to be automatically displayed with one of the factors missing but with the answer given. This model is being test marketed.

For info, contact National Semiconductor, 2900 Semiconductor Dr., Santa Clara CA 95051, (408) 737-5000.

PCC Is Great, BUT-

PCC is great! But, please don't use space for unrelated thing like "Sprocket Man!" There are lots of other places in the world where such could be put. Otherwise, Vol. 4, No. 6 was fine.

Tom Burke
Tech Hifi
150 Church St.
Burlington VT 05401

Thanks for your note to PCC. I'd like to respond briefly. With Dr. Dobb's picking up more detailed programming articles, PCC newspaper is in a position to broaden its interest. Without foresaking the computer hobbyists, we would like to include other topics, for several reasons. We'd like to expand our readership so we may add more pages and content to the paper. We'd like to give exposure to people doing things our readers may be interested in, or who deserve wider notice. And we'd like to share our interests and excitement in the broad range of useful and entertaining things happening in the world. We want to share our belief in the need and enjoyment of maintaining broad fields of interest.

Please, tell us what you would like to see in PCC. Without detailed and ongoing feedback from our readers, we've often been stabbing in the dark. So any comments and contributions will help align the paper's content with our readers desires.

Thanks, Dean Kahn, PCC

POLYGRAPHIA

We propose to establish a new journal devoted to mathematical cryptology: POLYGRAPHIA. We hope to publish this journal bimonthly and to orient it towards a readership interested in the application of mathematics and electronic computation to cryptology and related fields.

No rigid policies or formulations of format are appropriate at this time, but POLYGRAPHIA should certainly include:

Articles of original work in mathematical or computational cryptology
Survey and state of the art articles
Education notes, ideas and experiences
Historical materials for solution or resolution using modern concepts
Ciphers to analyze and solve
Bibliographies
Queries
Computer programs and design philosophy
Communications to the editors

We are currently seeking material for the first issue. If you want to contribute material (and we hope you do) please send two single spaced, typed copies to us. (One of these should be reproducible by photo-offset.) DO NOT paginate. Authors should adhere to the style and spirit of the AMS author's manual. Please enclose a brief biographical sketch of yourself after the final references.

Send material for publication to:

Polygraphia
Department of Math
Albion College
Albion, MI 49224

Help Make It Smart

Although I'm new to the computer game and in fact to digital electronics I've had several (over 15 years) of on again, off again, experience with analog electronics.

Presently . . . I have a dumb black box . . . sitting on my kitchen table! Help me make it smart. hee hee It has 8K of working memory . . .and another 4K I'm trying to debug ... . I'm using the SWPTC M6800 computer with a CT-1024 TV Typewriter. Also have a model 15 TTY machine I use on the Ham radio bands which I hope to be able to use to communicate with the M6800 for hard copies . . .

By the way . . . I have a nine year old daughter – who loves to sit down and play games with computers. I hear your Tiny BASIC was designed just for the kids . . . so she's liable to steal my toy – er – tool.

Dale L. Pucket
3230 Krem Ave.
St. Ann, MO 63074

Yes! Tiny BASIC is for kids. So share your toy . . . er . . . tool.

Still More Letters

Don Inman Tells All

Mr. Bruce Hicks
University of Illinois
Department of Secondary Education
Urbana IL 61801

Dear Mr. Hicks:

Thank you for your letter and inquiry as to my work here at San Lorenzo Valley Unified Schools. The information which you enclosed (the Illinois Series) will be of great help to me. I would appreciate hearing of any further developments in this series.

I don't know how much help I can be to you at this stage. My work is still in the formative stage. Everything is rather experimental due to the severe nature of several externally imposed constraints. I have no funds to work with, limited facilities, but lots of ideas. What I have done and am planning to do is probably unique because of these constraints. A background of the problems at SLV High School was indicated in PCC letters and articles dating from the January 1976 issue – Vol.4, No.4, page 26– to the present.

I should insert a word here about the San Lorenzo Valley Unified School District. We are small-three elementary, one intermediate, and one high school. The high school houses 800-900 students and is highly overcrowded. Bond issues and over-rides have repeatedly failed. We lie in a coastal redwood valley and are unincorporated with no industry and a limited tax base. Hence, the financial problems. We are close to Santa Cruz which is a coastal recreation-oriented city.

After an attempt to teach computer programming without a computer, I felt forced to delve into the hardware area. There is no way our school system is going to be able to purchase or lease either a computer or computer services. Therefor, three individuals (including myself) created the Mountain Digital Group (see PCC March 76) to finance and promote same. We are developing an Altair 8800 system with our own money for use in the schools. It now has a keyboard, TV monitor, cassette external storage, and 1K of memory. We will purchase more memory and a BASIC language software package this summer. We should be ready for applications in the classroom this fall.

The main emphasis of my work has turned, out of necessity, to building micro-computers for use in the classroom. I now view this approach a God send. I think we have all been missing the boat. With the proliferation of inexpensive microcomputer kits now flooding the market, what more natural opportunity can be found for the education of our young people? Let the hardware type student build the computer in the science laboratory. Let the programmer types learn to program these computers in the math laboratories. Let the other departments use the facilities thus generated, in their own classrooms. Then tie the whole package together as an integrated school project.

The computer hobby field is growing at a rapid rate with retail stores opening in almost every area of the country. These stores and the computer hobby clubs provide an excellent opportunity for teachers to become familiar with what's available in the field. They also offer a chance for teachers to increase or initiate their own computer education. Fellow club members are very helpful in getting others started. The retail stores offer assistance in the successful completion of kit projects. There's no longer any excuses for us to plead innocence due to lack of knowledge.

During the past year, as I said, we have been developing our Altair system. We have used it mainly for demonstration in high school math classes and adult evening classes—to show binary-octal-hexadecimal-decimal relationships and to familiarize the students with the appearance, the make-up, and the machine language use of a computer. We have also used it in classes for youngsters at our local community college and at the California State Science Convention in an attempt to promote the philosophy that the computer can be used by all. My own 12-year old son programs the computer in our demonstrations while I give my sales pitch. The demonstrations have been enthusiastically received each time.

I have no had the time to sit down and document all that we have done, but I am enclosing the outline of the adult class which we are offering this fall. It is a very conventional appearing outline, but the heart of the course will be in student development of their own applications. We are hoping to interest local business people, teachers, and hobbyists.

As mentioned earlier, we are just beginning to implement our programs. The results are impossible to predict. Much is happening. I feel caught up in some giant whirlwind of activity. It's delightful-but highly unorganized. A new Byte Shop (retail computer store) opened this week in Santa Cruz. I will be working with the owner in the areas of teacher encouragement and club activity. I will also be devoting much effort through PCC. This work has yielded much in return. *Our school just received a small microcomputer from a Hewlett-Packard employee this week. It seems the donor had seen one of my articles in PCC and felt we were deserving of this donation.*

As you can see, my operation is highly dynamic- maybe too much so. However, I guess this is a part of my educational philosophy. I think that we sometimes spend so much time organizing, documenting, and justifying that we don't get around to doing. Some day I'll sit down down and organize what has been going on here, but the action seems more important to me, at this time, than the organization.

I hope you can make some sense out of this, Bruce. Once again, I appreciate the materials which you sent. We need people like you to keep us headed in the right direction. The only apparent philosophical difference seems to be in the implementation of the hardware. We can't afford turn-key equipment. *Student involvement should be in the construction, as well as, the selection of equipment.*

If you are interested in further developments here or if you have projects in which we can contribute, let me know.

Sincerely,

Don Inman 350 Nelson Rd.
Scotts Valley CA 95066

Computer Manpower Supply & Demand By States – 1975

Everything you ever wanted to know about computer manpower educational programs . . . where college computer programs (2 year and 4 year), numbers of students involved, and lots more. Plus – an analysis of the demand for computer personnel broken down into specific professional job titles.

An enormous amount of data, available by state. Prepared by John W. Hamblen, University of Missouri – Rolla. Those of you who are working on research projects dealing with supply or demand for computer personnel, send $10 to Information Systems Consultants, R.R. 1, Box 256A, St. James, Missouri, 65559.

Flying Buffalo, Inc.

Flying Buffalo Inc. has a RAYTHEON 704 Computer, and we are interested in buying any surplus memory boards (or peripheral equipment) from anyone who has a 704 they are getting rid of. A new board just costs too much. We are not interested in other kinds of memory boards, as no one here has the technical ability to interface the memory to our computer.

I'm sure somewhere someone is getting rid of his 704 at a fraction of its original cost, because he no longer needs it. I just wish I could find him.

Flying Buffalo, Inc. (602)994-9104
P.O. Box 1467, Scottsdale, AZ 85252

Mystery Of Man

This contest will involve attempts to write a dispassionate program that compares Evolution, Religion and the new compromise between these two concepts. This new compromise is best understood by glancing through two well known books. They are *Chariots of the Gods* by Erich von Daniken and *Mankind-Child of the Stars* by Flindt and Binder (currently published in America in paperback, also, available worldwide, in the English language along with other very closely related books). The contest seeks, deliberately, to solve the very ancient "Mystery of Man," using brand new theories and the magic of the computer. Please send stamped self addressed envelope and ten cents, for xeroxing, to the address below;

Computer Contest
Ms. Bonnie Palmer, Director,
P.O. Box 469
Central Valley, CA 96019

SAMPLE SYNOPSIS OF A POSSIBLE PROGRAM

For evolutionary references the contestant may use the works of any recognized anthropologist or professional researcher, etc. For religious references contestants may use facts obtained from the Bible or other religious writings plus corroborative data from writers who lived before or after Jesus. Preferable sources of data for the "compromise theory" are given above and may include data from *The Naked Ape* (Morris). Contestants are not limited regarding sources of data excepting that facts are preferred rather than beliefs. "Weighting" of facts (if used) will be a matter of individual preference.

Completion date and prize announcement information

The contest will start officially on the Fourth of July 1976, and will end six months later with approximately three months reserved for judging. The first prize is $100.00 and hopefully may be increased if certain computer manufacturers decide to "sweeten the kitty" (in order to encourage use of their particular products and methods). Additional information may be obtained from the address above.

Star Trek Down Under

The dragon is alive and well in Western Australia. I am circulating your PCC Newsletter to as many people as I can. I hope to stimulate some interest for your publication here. Also, thanks to your listing in the January 1976 issue of the PCC, STARTREK is alive and well on the DEC 10 system at the Regional Computer Centre in Western Australia.

Bruce D. Keepes
Western Australian Institute of Technology
Hayman Rd.
South Bentley 6102

NEW STUFF

ALPHA BRAIN WAVES
Jodi Lawrence, 1972, 255 pp, $1.25.

This is a description of what the alpha condition is, how it can be controlled and its potential uses in medicine, education, and psychiatry.
Here is a partial table of contents.

Listen to the Music of Your Mind
Stress: The Civilized Killer
Alpha's Role in Tension Reduction

PROF. E. McSQUARED' S CALCULUS PRIMER (PART 2)
Swann & Johnson, 1976, 103 pp, $ 2.75.

The same delightful and edifying format of the original Original, Fantastic, and Satisfying Calculus Primer (Part 1).

"INCREDIBLE...

THE PSYCHOLOGY OF CONSCIOUSNESS
Robert E. Ornstein, 1972, 269 pp, $ 1.95.

What is consciousness? This revolutionary book says that an answer is possible - but only if we consider both reason and intuition. Pushing beyond the purely scientific, Robert Ornstein shows how a synthesis of these two sources of knowledge can bring about " a more complete science of human consciousness with a extended conception of our own capabilities."
Here is a partial table of contents.

Two sides of the Brain
The education of the intuitive mode.
Techniques of Self Regulation
"Ordinary" Consciousness

ADVANCED BASIC
James S. Coan, 1976, 184 pp, $ 6.95.

This book just barely made it in the door before press time.

Advanced Basic is all about what to do after Basic BASIC
(also by James S. Coan -- see "old" books, page 46)
This book starts with a review of BASIC.
The following list is a partial Table of Contents to tantalize all of you BASIC fans out there in Dragon Land.

Strings
Files
Plotting on the Terminal
Some Extended Features of BASIC
Sequences and Series
Matrices
Some Topics of Statistics
Simulation and Games

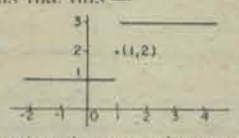
FUNCTIONS THAT ARE NOT CONTINUOUS

In their search for a logical way to prove things about the intuitive notion that graphs of functions are smooth and squeezed together near a point, mathematicians came up with the $\epsilon - \delta_{(\epsilon)}$ limit-machine idea. It seems to do the trick; at least no one has yet proposed any other scheme that works as well. Functions with straight lines or parabolas or cubics as their graphs certainly LOOK continuous, and it does turn out to be possible to construct suitable limit-machines for these functions.

A further test of how well the limit-machine idea really fits our intuitive sense of "continuous" can be made by supposing that a function comes along whose graph is obviously NOT smooth and squeezed together near some point.

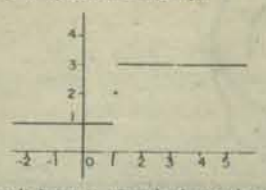
It had better NOT be possible to construct an ϵ-$\delta_{(\epsilon)}$ limit-machine for such a function. Because if it were possible, mathematicians would find that they had legislated themselves into the awkward logical position of having to say that the function IS officially continuous, even though everyone could see that, from an intuitive point of view, it clearly is NOT continuous.

So mathematicians, having invented limit-machines in the first place, now set about to find a way to logically DEMOLISH any limit-machine that turns up CLAIMING to show that functions like this —



are smooth and squeezed together near points like (1, 2). They found a way to do this and that was enough to show that the function is not continuous.

The function with graph



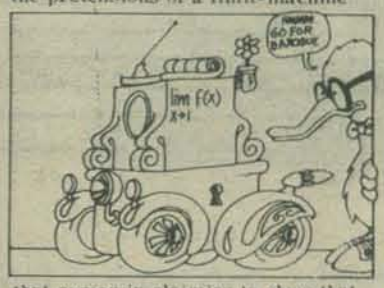
doesn't have a simple formula with parentheses to define it: The usual definition for f( ) is

$$f(x) = \begin{cases} 3 & \text{IF } x > 1 \\ 2 & \text{IF } x = 1 \\ 1 & \text{IF } x < 1 \end{cases}$$

The demolition plan for showing that f( ) is not continuous goes like this:

Limit-machines are in the business of being challenged with error-tolerance ϵ -challenges and producing guaranteed $\delta_{(\epsilon)}$-responses.

Since any guaranteed limit-machine is supposed to be able to produce a guaranteed response $\delta_{(\epsilon)}$ for ANY $\epsilon > 0$, the only way to logically DEMOLISH the pretensions of a limit-machine



that comes in claiming to show that f( ) is continuous at x = 1 is to figure out some specific error-tolerance ϵ that clearly has NO guaranteeable response $\delta_{(\epsilon)}$. So

PROGRAMMING AND METAPROGRAMMING IN THE HUMAN BIOCOMPUTER
John C. Lilly, 1970, 173 p. $1.95

BASIC ASSUMPTIONS

1. The human brain is assumed to be an immense biocomputer, several thousands of times larger than any constructed by Man from non-biological components.

The numbers of neurons in the human brain are variously estimated at 13 billions (1.3 times ten to the tenth) with approximately five times that many glial cells. This computer operates continuously throughout all of its parts and does literally millions of computations in parallel simultaneously. It has approximately two million visual inputs and one hundred thousand acoustic inputs. It is hard to compare the operations of such a magnificent computer to any artificial ones existing today because of its very advanced and sophisticated construction.

The offices here at Peoples Computer Company have been seething with accelerated activity. Suddenly the volume of orders thru the bookstore has more than doubled. Suddenly nearly every ma jor city in America has at least one computer store, and if it doesn't, some other city has two or three. Suddenly, computer hobbyists are wanting one each , at least, of everything we got.

And we're striving valiantly to streamline our systems for making sure you receive your order quickly. Jim Warren, alias Dr. Dobb, has offered the use of his "new" computer to process bookstore orders and keep a running inventory. All we gotta do is whip up a little TV Typewriter,some glitch-less software , and train this old pencil pusher to type faster.

I appreciate the (sometimes) extreme patience that some customers must have mustered while waiting for the goods to arrive. We are catching up though, even though processing of all of our orders is by human bio-computers.

D.R.

THE CENTER OF THE CYCLONE
An Autobiography of Inner Space
John C. Lilly, 1972, 237 p. $1.95

"Within the province of the mind, What I believe to be true is true or becomes true, within the limits to be found experientially and experimentally. These limits are further beliefs to be transcended. This is the major thing to be said about all inner trips, by LSD, by meditation, by hypnosis, by Gestalt therapy, by encounter group work, by dreaming, by isolation-solitude-confinement."

This fascinating story of one mans experiences of inner space. An exploratory autobiography in the seemingly limitlessness of consciousness.

"GAMES WITH THE POCKET CALCULATOR"
By Sivasailam Thiagarajan and Harold D. Stolovitch
Dymax, $2.00

Reviewed by Walter M. White

This book is one of the most exciting I've read in a long time—exciting because of the creativity reflected in the text. Perhaps it can best be described by reprinting a couple paragraphs and a game from the book:

"The calculator revolution is spreading rapidly. The popularity of these handy devices has caused a profound shift in the way we teach, learn, and use numbers. Almost every day there is an article in some magazine commenting upon this phenomenon. Many books have appeared on the market, including some which deal with calculator games. However, on closer inspection, these "games" turn out to be tricks and puzzles. In contrast, the games in this book fall within the classical definition of interactive activities. All involve an element of conflict and competition, with rules for making moves and ending the game. In addition, the two dozen games described in this book share these features:

1. You do not need an expensive calculator. A cheap "four banger" with a six-digit display will work fine. However, if you have a sophisticated and expensive gadget, you can come up with variations which provide more exciting options.

2. You do not have to be a mathematician to play these games. All the games permit people at different levels to compete on satisfactorily equal grounds.

3. You don't need one calculator for each player. You can share a single instrument with all your friends and opponents.

4. You do not have to wait a long time before your turn. The games are fast-paced and permit immediate replay without loss of interest.

5. You do not have to play the same game again and again. The two dozen games have sufficient variety to intrigue those who love numbers and those who hate them. Although most of them require devious strategy, some have an exciting element of chance. And, all of the games permit variatons so that you can add your own personal touch to come up with exciting new combinations.

A review from INTERFACE

FOR "OLD BOOKS" SEE PAGES 46 AND 47

DRAGON SHIRT
Nancy Hertert, 1974, $ 4.00

The lovable three-headed dragon is now on bright yellow shirts, in green ink.We have sizes to fit all — S, M, L, XL, and childrens 8, 14, and 16.

TO ORDER—

name _____

address _____ **zip** _____

Quantity	Item	Price Each	Total
		CALIF. SALES TAX	
		POSTAGE & HANDLING*	
		Total	

pcc P.O. Box 310 Menlo Park, Ca. 94025

*PLEASE ADD $1 FOR ORDERS UNDER $10, AND $2 FOR ORDERS $10 AND OVER.

THE TEXTBOOK OF VIDEO GAME LOGIC VOL. 1

Joel Miller, 1976, 112 pp, $ 14.95.

Have you ever wondered how video games *really* work? After all, how *do* they get those images on the TV screen and move them around so realistically?

The *Textbook Of Video Game Logic* not only describes how the video game computer itself works, but also the operation of all basic digital logic devices. The book is primarily oriented to video game designers and technicians, but anybody interested either in video games or in digital logic applications will find a great deal of valuable material.

The first chapter deals with the operation of common small scale digital integrated circuits (the basic gates) and medium scale devices (flip-flops, counters, shift registers, multiplexers, etc). The logic symbol, schematic and truth table for each device is carefully explained in simple, basic terminology that requires no previous digital or computer experience to fully understand the material presented.

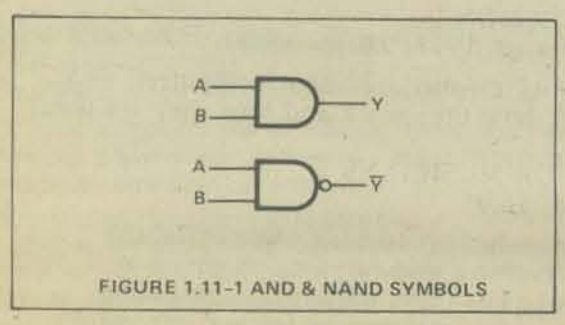


FIGURE 1.11-1 AND & NAND SYMBOLS

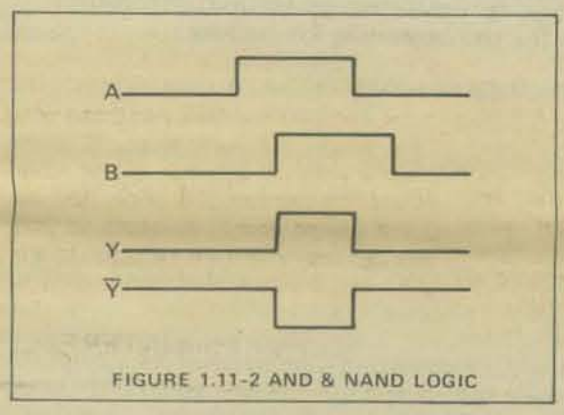


FIGURE 1.11-2 AND & NAND LOGIC

Considerable time is spent showing exactly how more complex devices such as counters are built from the simpler digital building blocks (gates).

Chapter 2 deals with the theory and operation of TV monitors. This is a basic explanation of how the circuitry of the TV monitor generates the pattern of lines (the *raster*) on which are displayed the various images. There is even a nice little section describing how to turn any regular TV into a TV monitor capable of taking direct video input.

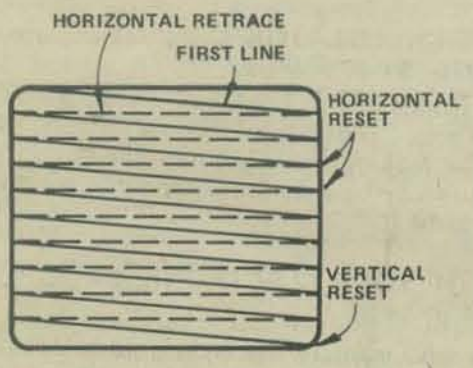
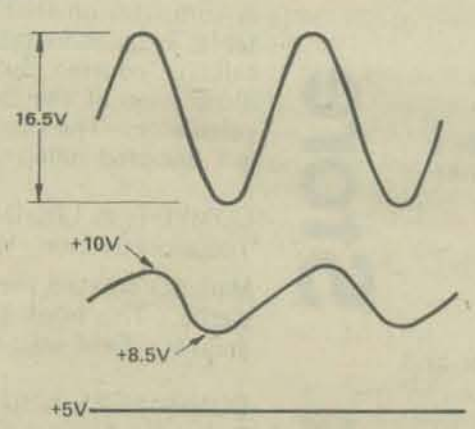


FIGURE 2.7-1 NON-INTERLACED RASTER SCAN This type of scan is used in almost all video games since it is a bit easier to implement than the interlaced 525-line variety used in TV broadcasting. Although only 262 lines are scanned, the resolution is generally adequate for the amount of information needing to be displayed for a video game.

Once the reader has gained a basic understanding of digital circuitry and TV monitor operation, the following chapters on video game computer circuitry are easy to understand. The next chapter deals with general video game architecture, meaning the different techniques by which a game can be created.

Chapter 4 is a thorough discussion of video game power supplies (and power supplies in general). Using actual oscilloscope photographs, this section graphically illustrates how raw AC power is processed into a completely regulated DC source.



After dealing with all this basic information, the book gets a lot more interesting. For you TV terminal freaks, chapter 5 will be quite fascinating since it goes into an in-depth explanation of synchronization and timing circuitry. It describes in detail the differences between interlaced and non-interlaced raster scans and precisely how the image is synchronized with the electron beam so it is displayed in the right place.

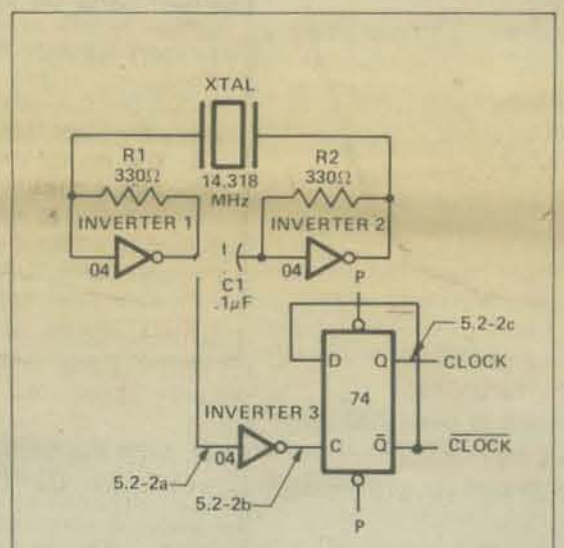
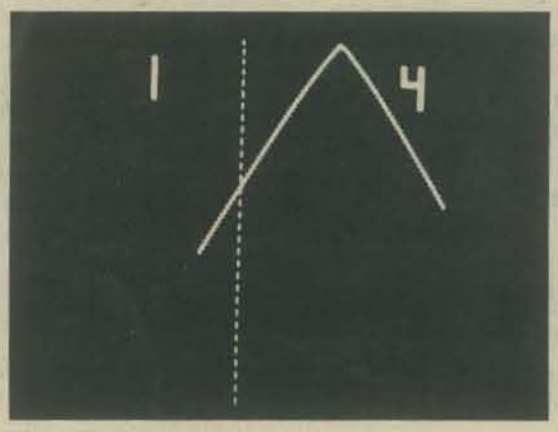


FIGURE 5.2-1 A CRYSTAL-CONTROLLED OSCILLATOR This simple oscillator circuit is used in almost every video game to generate the master timing signal known as the CLOCK.

Successive chapters are concerned with how images are generated and moved. Chapter 6 is exclusively devoted to the subject of motion and uses examples from various games to show how the game designer controls the direction and velocity of a moving image.



Probably the most interesting section however is the chapter on creating images (chapter 7). Images can be created by either of two techniques: *generated* images and *stored* images. The generated images are produced by individual circuits composed of small random logic elements, however stored images are held in a special type of semiconductor memory known as a ROM or Read Only Memory. The ROM allows a game designer to enter an image directly into the device. This chapter explains not only how this is done, but also how the image is then read out of the ROM and displayed on the TV screen.

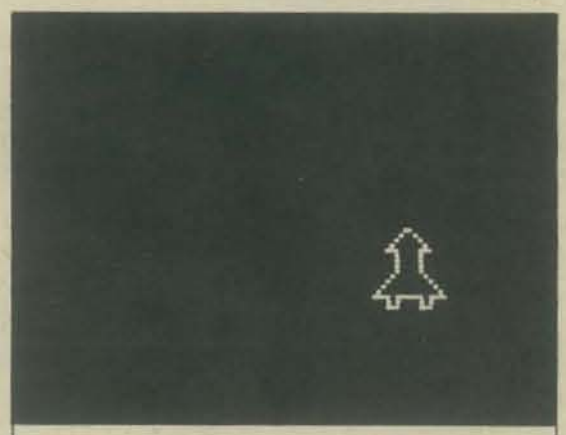


FIGURE 7.7-1 A DIODE MATRIX IMAGE Any simple image such as the one above can be stored in a diode matrix – the earliest form of read-only memory. The memory is scanned and the data read out by two sets of counters. The vertical counter selects each line of the image while the horizontal one scans each point along the line.

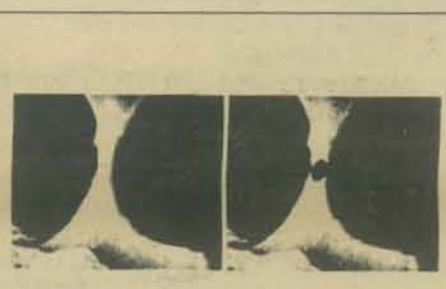
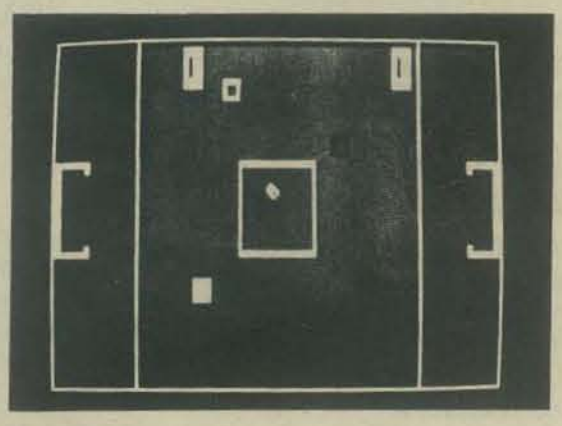


FIGURE 7.9-1 PROGRAMMING A PROM These two photographs show a single fuse of a PROM before and after programming. A special set of pulses fed into the PROM's outputs "blow" the addressed bit.

The final two chapters describe score and paddle circuitry. Every video game must have some sort of score circuit and this section shows how numbers are placed on the TV screen and changed as the player gains more points. The paddle section illustrates how paddle images are created by a special circuit and controlled by turning a potentiometer on the game cabinet.



The *Textbook Of Video Game Logic* is produced by **Laurel Publications** and distributed by **Kush N Stuff**, 60 Dillon Ave., Suite D, Campbell, Ca. 95008. Phone (408) 379-7180.

Book Store

ACTIVE FILTER COOKBOOK
Don Lancaster. 1975. 240pp. $14.95.

This book shows how to select and design the filter type you want. Using simple math, you can design basic filters, operational amplifiers, tunable filters. Get this book and activate!

ADVANCED APPLICATIONS FOR POCKET CALCULATORS
Jack Gilbert. 1975. 304pp. $5.95.

At last! A book to help you use all those funny looking keys on scientific calculators such as the Hewlett-Packard HP-45 and Texas Instruments SR-51. Includes simple stuff like cosine law solutions and Saturn Maneuver calculations.

ALPHA–NUMERIC MUSIC WITH AMPLITUDE CONTROL
Malcolm T. Wright. 1975. 23pp. $2.00

Program the Altair 8800 computer or any 8080 CPU chip for a complete 6 octave music system with tempo and duration control and DAC (digital-to-analog converter) for playback. Far out music! Or, far in!

BASIC
Albrecht, Finkel and Brown. 1973. 325pp. $4.95

A self-teaching text with self-tests at the end ot each chapter and answers that refer back to the frame numbers in each chapter. You need no special math or science background to learn BASIC from this superb text. Includes strings, files, matrix operations, and invisible incantations.

Basic BASIC
James S. Coan. 1970. 256pp. $3.95.

This book is an attempt to incorporate computer programming, using BASIC and the teaching of mathematics. The first seven chapters may be studied concurrently with a first year algebra course. Chapters 8 through 13 are applications oriented, covering many of the popular topics of precalculus mathematics, with all of the required algorithms developed in the text.

BASIC PROGRAMMING
Kemeny and Kurtz. 1961. 1971. 150pp. $6.95.

On the first day, Kemeny and Kurtz invented BASIC. Then they wrote a book. We don't recommend this book for *learning* BASIC but we do, do, do recommend it as a reference guide, applications resource, and idea generator for people who already know a little BASIC.

THE BEST OF CREATIVE COMPUTING, VOL. 1
David Ahl, editor. 1976. 328 pp. $8.95.

The diversity here is staggering. Volume 1 has articles and fiction about computers, games for calculators and computers, cartoons, graphics, and book reviews. Over 170 authors represented in over 200 separate articles.

BIOFEEDBACK AND THE ARTS
Edited by David Rosenboom. 1976. 162pp. $12.95 (Hardbound)

This book sent me spinning off in new directions. It reports on work done by artists . . . dancers . . . musicians . . . researchers in biofeedback and the arts and neurological information processing related to aesthetic experience.

BIOFEEDBACK: TURNING ON THE POWER OF YOUR MIND
Marvin Karlins and Lewis M. Anderson, 1973, 190 P., $1.25

The spirit of adventure in the blossoming biofeedback field is well expressed by this widely read classic. It remains the best full field introduction.

BODY TIME
Gay Gaer Luce. 1973, 411 p., $1.25

"An absorbing and fully-detailed treatment of a subject we're all at least vaguely aware of--the physiological, social, and emotional rhythms in our lives. While there are enough studies and experiments to boggle the brain, the author retains the proper perspective between detail and readability.

Read the book and you cannot help but gain a greater awe, appreciation, and respect for the beautiful complexity of the human body--leading to greater care of/for and understanding of your own."

THE BUGBOOK I & II and INSTRUCTORS WORKBOOK
Rony, Larsen & Braden. 1974. two volumes plus workbook. $16.95

Ninety logic and memory experiments with TTL Integrated Circuits, with much of the 'dog-work' of putting the less glamorous sub-modulars together, already done.

THE BUGBOOK III
Rony Larsen & Titus, 1975, $14.95

The entire 8080 instruction set is discussed in detail. This big paperback is about interfacing the Mark 80 computer to the real world. (A controversey about BB3 is brewing — see letter page 38.)

CALCULATOR CALCULUS
George McCarty. 1975. 254pp. $8.95.

This book is about the calculus. What distinguishes it, however, from other books is that is uses the pocket calculator to illustrate the theory. A computation that requires hours of labor when done by hand with tables is quite inappropriate as an example or exercise in a beginning calculus course. But that same computation can become a delicate illustration of the theory when the student does it in seconds on his calculator. The machine is like a microscope, and its magnification is a hundred millionfold.

COMPUTER LIB/DREAM MACHINES
Theodore Nelson. 1974. 186pp. $7.00.

Man has created the myth of the computer as cold, oppressive and sterile. This book sees them as veritable panoply of things and dreams. Enuf info for 3 books.

COMPUTERS AND COMPUTATION
Scientific American. 1950 through 1971. 280pp. $6.00.

Twenty-six articles from Scientific American about computers, what they are, how they happened, how they work and how they are used.

ELECTRONIC PROJECTS FOR MUSICIANS
Craig Anderton. 1975. 134pp. $6.95

The first 4 chapters are an introduction to basic electronics, the fifth contains 19 projects including a preamp, metronome, 8-in one-out Mixer, electronic foot switch and ultra-fuzz, concluding with a section on trouble-shooting and access to further information. **The best book we have seen for the beginning kit builder.**

EYE AND BRAIN: the psychology of seeing
R.L. Gregory. 1973. 253 pp. $2.95.

Beautifully illustrated and easily understood, this book is it for learning how the eye and brain function together. This book sheds new light on looking-what you see isn't necessarily what you get.

FUNDAMENTALS AND APPLICATIONS OF DIGITAL LOGIC CIRCUITS
Sol Libes, 1975, 192 p. $5.98

Learn the basics of digital logic. Enough info to be used as a reference for deconfusing semiconductors, logic and logic classes, binary arithmetic, memory types, and analog-digital devices.

FUN AND GAMES WITH THE COMPUTER
Edwin R. Sage, 1975, 360 p. $5.95

An introductory text which teaches BASIC computer programming through games of chance and strategy. Most of the games in the text can be run on a minimum 4K computer and remainder on an 8K system.

GAMES ,TRICKS AND PUZZLES FOR A HAND CALCULATOR
Wallace P. Judd, 1974, 1974 100p., $2.95

This book is for anyone who owns or intends to purchase a hand calculator, from the most sophisticated to the basic "four banger." Also good clean fun.

GAMES WITH THE POCKET CALCULATOR
Thiagaragan & Stolovitch, 1976 54 p. $2.00

No tricks or puzzles, the 24 games in this book fall within the classical definition of interactive activities. They all involve an element of conflict and competition with rules for making moves and ending the game. Fast paced games that do not require being a mathematician or having more than one "four banger" per game.

GETTING THE MOST OUT OF YOUR ELECTRONIC CALCULATOR
William L. Hunter, 1974, 204 p. $4.95

A "how to" book for people who want to use electronic calculators for basic math, homework, unit pricing, grocery shopping, simple interest, income tax preparation, and running the modern kitchen.

INTRODUCTION TO MICROCOMPUTERS
Adam Osborne & Associates, Inc. 1975, 384 p. $7.50

People call PCC and ask for a book which is a good introduction to micro-computers. Previously we have had to say that there really isn't one— but now there is— and this is it.

MATH, WRITING & GAMES IN THE OPEN CLASSROOM
Herbert R. Kohl, 1974, 252 p., $2.45

A careful analysis of the ways in which games can be used for teaching. Descriptions of countless games and learning ideas that stimulate children's imagination so they can comprehend complex mathematical concepts, strategy and probability theory. Herb Kohl loves kids - and it shows in his book.

MICROPROCESSOR/MICROPROGRAMMING HANDBOOK
Brice ward 1976. 294 pp; $ 6.95

The cover blurb indicates this book is "an authoritative, practical guide to microprocessor construction, operation, programming, and applications!" It isn't! For the most part, it is simply a repackaging of the information found in specification manuals for the Intel 8080, Intel 4040, and Motorola 6800 LSI microprocessors together with a smattering of transition paragraphs and misinformation. Even the examples are identical to those found in the Intel 8080 and 4004 reference manuals.
Yet, the book is not that bad. If you want a compendium of machine reference manuals you could do worse.

MY COMPUTER LIKES ME WHEN I SPEAK IN BASIC
Bob Albrecht, 1972, 64 p., $2.00

This "learn by doing" workbook introduces BASIC to young or old, with no previous computer experience or knowledge or programming.

NEW MIND, NEW BODY; BIO–FEEDBACK: NEW DIRECTIONS FOR THE MIND
Barbara B. Brown Ph.D., 1974 523 pp., $2.50

A basic source for the technician, home or otherwise. This is the definitive text on biofeedback, presented simply and clearly, while retaining all the worth of traditional scientific methods.

101 BASIC COMPUTER GAMES

Editor, David Ahl, 1974, 250 p., $7.50

This book contains instructions for 101 games, all in BASIC. Most games are simulations of sports, card games, board games and games of chance.

PRINCIPLES AND PRACTICE OF ELECTRONIC MUSIC
Gilbert Trythall, 1973, 214 p. $6.95

The first few chapters are concerned with the relationship between waveform and sound quality, and with the elementary electronic concepts one needs to know in order to produce the desired waveforms. At this point the author begins to build, piece by piece, and electronic music studio--your own synthesis and recording facility. Uncle Gilbert tells how to translate conventional musical notation of all forms into synthesis instructions. Also included is a brief history of electronic music, how to get and protect a copyright and a 200 word glossary of electronic music terminology. Very elementary and nothing about computer music.

PROBLEMS FOR COMPUTER SOLUTION
Gruengerger & Jaffray, 1965, $7.95

After you learn to talk to computers, what do you talk about? If you want inspiration, this book has 92 problems, something for everyone -- easy stuff, hard stuff, math stuff, non-math stuff, all beautifully written.

PROBABILITY
D.J. Koosis, 1973, 163, p. $2.95

This book is for people who want to learn probability. Work your way thru this book before you take STAT. 1.

PROF E. MC SQUARED'S (ORIGINAL FANTASTIC & SATISFYING CALCULUS PRIMER)
Swann and Johnson, 1975 111 p., $2.95

Our original idea was this: if we would find characters for each mathematical concept in differential calculus, and set them all to work, the result would be far more lively and involving than the usual textbook trip. What happened along the way was that the characters acquired more life than we had expected and sometimes seem to charge off in their own directions. So, if they lead you astray, go back and re-read what you have already done. Try the exercises -- we have left room to work them out in the book, and the answers are in the back.

PROFESSOR GOOGOL'S MATH PRIMER

Sam Valenza Jr., 1973, 144 p., $3.25

This is a math text book with a sense of humor--an experiment in the visualization of mathematical ideas through cartooning. Effective and interesting communication of a sometimes unexciting subject. Mad, mad, visual stuff makes this great for all you kids, young and old.

PROGRAMMING PROVERBS
Henry F. Ledgard, 1975, 134 p. $5.95

Principles of good programming with numerous examples to improve programming style and proficiency. Examples in ALGOL 60, BASIC, FORTRAN and PL/1. Long section on programming the game KRIEGSPIEL CHECKERS.

PCC GAMES PROGRAM LISTINGS
PCC, 1974, 31 p. $2.00

This booklet contains the bare program listings of the computer games presented in Volumes I and II of People's Computer Company. They are written in HP 2000F time shared BASIC and may easily be modified for other systems.

SEEING WITH THE MINDS EYE: THE HISTORY TECHNIQUES AND USES OF VISUALIZATION
Mike Samuels, M.D. and Nancy Samuels, 133 p., 1975, $9.95

Two questions raised by brainwave work standout, what do I do when I've developed good Alhpa-Theta spaces, and how do I build expertise in these spaces from waking state. The text and visual imagery are super and far beyond medical shrouds you find in biofeedback material.

STATISTICS
D.J. Koosis, 1972, 282 p.. $3.95

This book is for people who want to learn statistics. Do this book before you take STAT 1.

TEACH YOURSELF BASIC VOLUMES 1 and 2
Bob Albrecht, 1970, 64 pp each, $ 1.95 each.

Written by a Dragon with a seventh grade mind, this book covers teletype fundamentals and BASIC instructions in Book 1 and more sophisticated instructions for the novice in Book 2. Slooow and easy learning.

TTL COOKBOOK
Don Lancaster, 1974, 328 p., $7.95

The author discusses what is required to understand and use transistor logic, assuming the reader is familiar with electronics up to and including transistors. Covers basics of construction and a discussion of the different types of TTL. An excellent instructional aid which doubles as a quick reference guide to the 7400 series.

TV TYPEWRITER COOKBOOK
Don Lancaster, 1976. 256 p., $9.95

Another fine "cookbook" from Don Lancaster! And it really is a cookbook, not just a recipe book. Although there are plenty of schematics, the emphasis is on what the problems are in designing a TV typewriter and various ways of solving those problems. I especially like the discussions of the advantages and drawbacks of different designs.

There is no complete plan for a TV typewriter here. It's up to you to put together the right pieces to get one that does what you want. You should have a fairly good understanding of digital circuitry to get the most out of this book.

II CYBERNETIC FRONTIERS
Stewart Brand, 1974, 96 p., $2.00

I. Both sides of the necessary Paradox (Conversations with Gregory Bateson)
II. Frantic Life and Symbolic Death among the Computer Bums (Space war freaks should check this one out.).

THE UNIVERSAL TRAVELER

The Universal Traveler, - a soft-systems guide to: creativity, problem-solving, and the process of reaching goals. By Don Koberg, and Jim Bagnall., 1974, 128 pp., $4.95

A definitive manual presenting a logical systematic approach to the Creative problem solving of everyday life, employing graphic visualization as well as statistical representation. Written in the belief that the same mathematical discipline used in solving complex world problems can be utilized in our everyday lives for the attainment of systematic and creative resolution of everyday problems.

WHAT TO DO AFTER YOU HIT RETURN or
P.C.C.'s First Book of Computer Games
PCC, 1975, 157 p., $6.95

All the games are run in HP 2000F BASIC. Why Computer Games? A simulation is a model of a real-life situation. The computer does the complicated bookkeeping - you create the initial conditions, manipulate the parameters, and analyze the results. The effects of each parameter can be isolated; the simulation can be repeated as often as you want.

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