

# People's Computer Company

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And thanks to the roaring multitudes, without whose aid and abetting this issue should be as yet unborn.

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## IN THIS ISSUE

With this issue, PCC begins introducing novices and intermediates of all ages to the new mini-and micro-computers. These small, powerful "home" computers are now dramatically cheaper than they have been and are increasing in popularity all over the country. Our tutorial series will help you teach yourself and/or kids in schools or at home... we'll explore both the high and low points of what's on the market, what other people are in to, where you can get materials for your system and hopefully, suggest new ways to creatively use the new calculators (practically micro-computers themselves!).

Our generous Dragon shares his treasures with you in discussions of Games for you to Program (page 13) and Tiny BASIC (page 14) and Make Believe Computers (page 18). These articles will prove especially useful to those of you just beginning to learn about programming and computers, as will Don Inman's articles, pages 2-6. Don tells how lots of kids and teachers are building their own cheap (how's \$500) computers! Our PILOT article (page 10) begins a series on a computer language that's easy-to-learn and easy-to-use and seems particularly suitable for question-and-answer instruction in many fields.

The PCC Bookstore section has grown (by leaps and bounds?) so much that we are running it as a pull-out in the center section (surrounded by a new, improved two-page FORTRAN MAN).

PCC now has a brace of co-editors to replace one over-ripe dragon now retired to Dragon Emeritis status. The Dragon is still lurking though he's spending his time breathing smoke and fire (both in and out) and gloating over his treasures.

PCC will, of course, continue to be a forum for you to share with the universe what you're up to and how your program works and there'll still be the usual flights of fantasy and fits of insanity to keep things spicy.

Your new co-editors want a sense of who you are and what you want from PCC - so PLEASE complete and return enclosed questionnaire - we want to know as quickly as possible what you'd like to see on these pages in the future. THANKS!



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Dr. Dobb's Journal, our sister publication, is the reference journal for home computer users. It offers free or low-cost software and "all-meat" contents without display ads. DDJ carries complete systems and applications software, lots of soft and hardware projects, independent consumer information, reprints, directories, hot news, and all sorts of other good stuff. DDJ is published 10 times a year.

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# The INMAN REPORT: ★ ★ ★ ★

High School math teacher Don Inman is on sabbatical this year to share his experience with schools in the whole San Francisco Bay Area. His articles deal with the new technology in schools. Don's son, Kurt, is PCC's Senior Systems Programmer.



## Sunnyvale intermediate school students to work with computers

Students at Sunnyvale's three intermediate schools will be working with computers this fall. Benner, Madrone and Mango youngsters will share two microcomputers, which are presently being assembled at the district office.

The computers come in kit form. The machines weigh up to 50 pounds when assembled and cost about \$2,500 each. One model is capable of dealing with 8,000 words and the other can be programmed with 12,000 words.

The computers, which are funded by the district's Mentally Gifted Minors (MGM) program, will rotate throughout the year among the three intermediate schools. Students will be able to write their own programs for solving math and science problems as well as create "simulations" for studying social problems such as population density and pollution.

A father and son team from Scotts Valley is assembling the computers. Don Inman and his 12-year-old son, Kurt, are working on the project as representatives of People's Computer Company of Menlo Park, which is acting as consultant for the district's program.

Don and Kurt have been working on the two computers since July.

According to Inman, the idea of actually bringing small computers into the classroom is a relatively new concept, and Sunnyvale is one of the first districts to become involved. He feels that the project is very

important because it will allow youngsters to become familiar with the machines and learn what they can and cannot do.

by NANCY CAHNERS, Community Information Technician, Sunnyvale School District  
Reprinted from *The Valley Journal*

### COMPUTERS AT SUNNYVALE

by The Old Tar

The Sunnyvale School District MGM (Mentally Gifted Minor) program acquired two IMSAI computers this summer along with two Lear-Seigler ADM-3 terminals and three National Multiplex recorders. The two systems were bought in kit form and are configured for 8K and 12K bytes of memory. The systems will operate with MITS ALTAIR 8K BASIC and will be shared by Madrone, Mango, and Benner Intermediate School MGM students. The following interview was conducted with Don Inman and his son, Kurt, who assembled the systems for the district (see reprint from the *Valley Journal*).

The Old Tar (TOT). Don, why does an elementary district school need or even want a computer?

Don. The computer field is growing at a tremendous pace. The microcomputer is being purchased and used by thousands of hobbyists. Computer applications are

spreading to every job field and even into the home. It is unthinkable that a student can pass through our public school system without some knowledge of what computers can and cannot do. Some knowledge of how they work, and a development of computer vocabulary is certainly necessary. The sooner this education begins in the student's life, the better he will be prepared for his future.

TOT. Couldn't all this be taught without actually purchasing a computer?

Don. If a picture is worth a thousand words, a "hands on" device (such as the computer) must be worth a thousand times that. The computer is not only a tool to solve complex problems, but it is a mental stimulator which will do for the mind what the wheel has done for mechanical devices. As such, the schools become the most important user of the computer.

TOT. I know that some schools share time on other people's computer rather than buying expensive equipment. Why not do that?

Don. In those cases, the student sees and handles only the terminal. The terminal is only a means to communicate with the computer. As such, it is fine for teaching computer programming. However, if the student is to learn about computers, he should be exposed to the whole thing and not just the communicating end. In addition, time-sharing costs are recurring whereas a personal computer is a one-time expense. The student acquires a close, warm and personal relationship with the complete computer. A terminal provides a cold, distant acquaintance with some computer way out in fantasyland.

TOT. Kurt, how long have you been interested in computers?

Kurt. Oh, ever since I was in the fifth grade, I guess. I read everything I could about computers in the books my dad brought home from his school.

TOT. What grade are you in now?

Kurt. Seventh grade this year.

TOT. Did you enjoy working on this project?

Kurt. Yes, but my dad didn't let me do enough. I put together a good part of the chassis. It was all screws, nuts, bolts and stuff. Then I helped Dad with all the parts lists. He did all the soldering though. I helped when he needed another hand for holding things. What I've really been waiting for is the BASIC tape to get operating. Then I'm going to write some programs that the Sunnyvale students can use.

TOT. Have you written computer programs for other equipment?

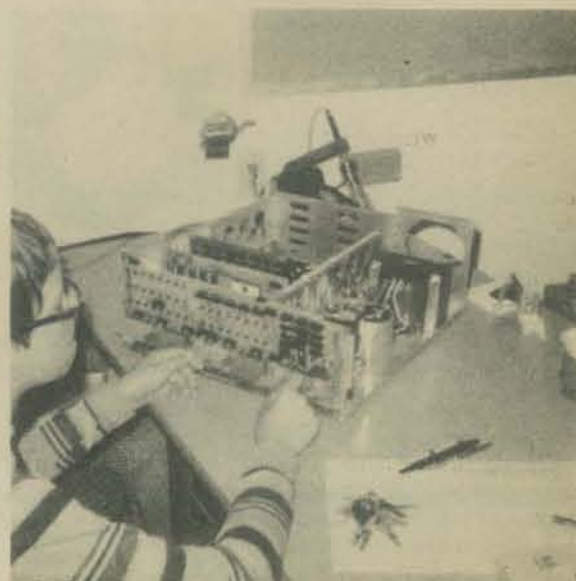
Kurt. I started on a WANG 2200 and Hewlett-Packard 9830. I've also used a Digital Equipment PDP-8, and Altair 8800 as well as the IMSAI 8080 like the ones we put together. I've also used programmable calculators. I've studied languages such as BASIC, FORTRAN, COBOL, and DIBOL from books and reference manuals.

TOT. Do you think you'll be a programmer when you get out of school?

Kurt. I don't know. I'm pretty sure I'll be working with computers in some way.

TOT. Don, how will the Sunnyvale schools use these computers?

Don. They'll start by studying textbooks on programming and games. They will begin by putting into their



computer the games and programs listed in the books, and then later develop their own programs to suit their own needs. Various hobby publications also publish recreational and practical computer programs as well as "how to..." articles. The idea of small, personal computers is so new that the area of practical use has only been touched. The possibilities are unlimited. What the Sunnyvale teachers and students accomplish will only be limited by their imagination.

TOT. As a final question, what do you think the future holds for educational computers?

Don. The computer will revolutionize the education of youngsters much as the wheel spurred the mechanical revolution. It will stimulate mental activity and expansion. It will affect all facets of education as soon as we learn to use it in an effective manner. The cost of microcomputers in relation to their usefulness will continue to decline so that it will be possible to have at least one in every classroom. The personal computer will take its place alongside the pencil sharpener and blackboard. ■

## LET THE KIDS DO IT!

by Don Inman

That's the message I received from the Modesto City School District, particularly from the Fred C. Beyer High School Mathematics Department on a recent visit.



How would your school like to have an IMSAI 8080 computer with 16K bytes of memory, a 3P+S Processor Tech I/O board, a keyboard, paper tape reader, Teletype, Video interface, cassette interface, and even Cromenco's Bytesaver? How would you like to be one of the lucky high school students putting the whole thing together? How would you like to have a teacher who believes that his students are capable and willing to perform the detailed assembly — one who believes that students have the ability to maintain the hardware and write software utility programs as well as higher level language programs. Look at that plexiglas cover on the IMSAI. Visitors to the computer center can see the works inside, but are protected from the voltages. Strictly a Modesto innovation. I like it. A great idea!

All this is happening at Beyer School in Modesto under the supervision of Amberse Banks as a part of their mathematics program. Typical of "Amby's" approach is his response to a remark of mine as we viewed an old Model 15 Teletype in one corner of the room. I mentioned the availability of IC chips to convert computer ASCII codes to the Baudot of his Teletype. With a twinkle in his eye and a chuckle in his voice he asked, "Why not let the students learn to write the conversion in software?" Thus a subtle understanding began to develop between the two of us. Here was a man after my own heart who believed in student power.

The atmosphere prevalent throughout the whole Beyer school is one of openness. Students have access to their teachers. While sitting in the Math Department Office, I observed a steady stream of students moving freely in and out of the area. Individual problems and assignments were being discussed throughout the day.

An individual study area adjoins the Math Dept. office area. Students who are not scheduled for a specific class at some given time may work in this

area. One or more math teachers are available to offer individual assistance to the students.



The method of scheduling at Beyer High School make this type of communication possible. It is called Daily Demand Scheduling. All students meet with a first period teacher to choose from a master schedule how, when and which classes they will attend in order to satisfy the requirements of their program. If a student attends a Geometry class one day at 9 AM, it does not mean the geometry class will be offered at the same time the next day. The master schedule for the particular day lists all classes available along with their times. This master schedule changes from day to day. Thus the student makes the decisions necessary each day as to when he will attend a particular class.

The typical 10-15 minute study time allowed at the end of the traditional school period is thrown out. It is given back to the student as time to utilize in the best way possible. Thus, the typical class period is shorter, but more periods are offered per day. The student carrying a normal 6 period schedule has a few blocks of time during the day which he may use as he wishes. The system enhances the opportunity for the student to meet many decision-making situations. Teachers, under a normal 6 period load, have time to meet with individual students outside the classroom setting.

The computer area, which adjoins the math office, is one place which provides for individual work outside the classroom. The IMSAI project started this past summer. Mr. Banks and several students began the initial construction. The computer has grown, and is still growing, through the individual study approach.

Most of the students taking part have little, or no, background in electronics. They were all new to computer hardware although some had taken programming courses. The quality of work which they have done is very good — better than some work I've seen by more experienced adults.

The Beyer High School Computer System is an interesting blend of the old and the new. The IMSAI and the PC boards it contains are new, but the keyboard, Teletype, and various TV's have seen considerable use. The older parts are being recycled to a new and higher level use than they have seen in the past.

Mr. Banks sees the computer being used in many educational settings at Beyer in the future. It will provide learning situations for construction, maintenance and update. Software utility programs will be developed in machine language; and programming in assembly language as well as BASIC will be accomplished. It will also serve as a tool in mathematics, science, social studies and other areas.

The math department also possesses several programmable calculators. Among these is a Model 1785 Monroe which has a printer and mark-sense card reader. Because of the ingenuity and "Why not try it?" attitude shown by Banks and his students, I wouldn't be a bit surprised to see this piece of equipment wind up as an IMSAI peripheral device in the future.

Thanksgiving has been set as the target date to have the system "completed" but at the rate the students have been working, that date may be moved forward.



Let's take a look at the gang behind the project. Here's Ricky Freeburg, a senior, working with a meter scrounged from an automatic TV tuner. It will be attached to the tape reader. Ricky has worked on 2 or 3 of the PC boards.



Paul Belvoir, another senior, is a software specialist, although he too has worked on the hardware. Paul is interested in writing his own high level language interpreter.



Jim Kaufman, a junior at Beyer, has worked on the MPU board and the tape reader. Jim is shown here testing the papertape reader.



Leith Leedom, a senior, has provided two TV's to be used for either parts or as a monitor. Although not involved in the construction as yet, his fascination for the computer "beast" is evident.



Robert Spiva, a sophomore, is now working on an IMSAI 4K RAM board. A beginner in electronics at the beginning of the year, he has worked on several of the PC boards. He is shown here inspecting a memory board.



Jason Yohannon, a junior, was a computer beginner this year. He worked on the Mother Board this summer and may take on a memory board soon. Here he is programming from the front panel. Note the plexiglas cover on the computer.

Scott Poddig has also been working on the project. On the day of my visit, he was not available. His "free" time for the day was being used in the athletic area as he is the school's football manager.

Mike Sorter and John Dickman attend another high school in the district, but both contributed to the project this past summer. Some of the students involved in this project are also taking part in computer programming. Other students are involved in programming, but did not take part in the IMSAI project.

All of the work on the school's computer is being done by students on an individual study basis. The school's scheduling method has certainly contributed to the success of the project. The project is the first, that I am aware of, that has allowed the student to get involved in the construction as well as the use of computers. I believe that more of this kind of thing should be done. That's what education is all about. If you know of similar projects, let me know.

by Don Inman

## SAN JOSE TEACHERS PREPARE FOR THE FUTURE

What does the future hold for the educational use of computers? The answer to this question is up in the air, but a group of twenty-five San Jose City Schools' teachers are planning to prepare themselves for whatever the future may bring. The group met for the first time October 18 at their Regional Vocational Center to construct and learn to use a small one-board microcomputer system from Western Data Systems. Western is composed of a small group of local electronic engineers. Operating out of 3650 Charles St., Suite G, in Santa Clara, they produce the Data Handler.

Nine two-hour sessions are planned for the teacher training course being directed by Dr. Peter Grimes, Mathematics and Science Coordinator of the San Jose

District, and conducted by Don Inman of People's Computer Company. The principal objective of the course is to train teachers in the construction, operation and use of a small computer system. The knowledge and experience gained will provide teachers with the necessary background to teach their students the fundamentals of computer science. The Data Handler was chosen as a vehicle for the course because of its low cost and also its expansion possibilities. It provides a keyboard for entry and LED display for output as an integral part of the system. An inexpensive 5 volt power supply is all that's necessary in addition to the single board to operate in machine language.

The San Jose City Schools are in the forefront of the "personal" computers for education movement. Beside "big brother" computers in the school system, San Jose has or is acquiring 10 IMSAI 8080 computers, plus a Polymorphic 8080 system. The addition of 12 Data Handlers presents a wide range of educational opportunities for their students.



## DESCRIPTION

The DATA HANDLER is a complete microcomputer system on a single PC board combining the MOS Technology 6502 microprocessor with the latest state of the art technology. Superior design enables the DATA HANDLER to operate at very high speeds as a stand alone microcomputer or dedicated controller for even such high speed devices as disk peripherals. External TTY or terminals are not needed since the DATA HANDLER contains 26 keyboard switches for full function hardware front control. Personal expandability of the system is achieved by using the Altair/IMSAI peripherals, any one of which may be used directly on the DATA HANDLER PC board. Further system expansion may be accomplished with the use of the Altair mother board.



The DATA HANDLER Bare Bones Kit which includes the DATA HANDLER PC board, PC board stand, 26 keyboard switches, and a complete documentation package is being offered at a price of \$89.95.

The complete kit is priced at \$179.95. This includes the DATA HANDLER PC board, PC board stand, 26 keyboard switches, the complete set of IC's, 1 6502 MOS Technology microprocessor, sockets, LED's, resistors, capacitors, 500 ns memory, and a complete documentation package.

## PRELIMINARY PROPOSED COURSE FOR TEACHERS IN COMPUTER SCIENCE

**Objectives:** To train teachers in the construction, operation, and use of a small computer system. The knowledge and experience gained will provide them with the necessary background to teach their students the fundamentals of computer science in the future.

**Methods:** A combination of lecture and laboratory sessions with the main emphasis on the laboratory. A small computer, such as the Data Handler (Western Data Systems), will be constructed. Enrollees will then use this computer to study the instruction set of the central processor, such as the MOS Technology 6502. Through the use of the instruction set, enrollees will learn how the computer accomplishes its tasks. Programs will be written, discussed, and used.

**Organization:** A series of two hour sessions given once a week for approximately two months.

### Course Outline:

**Sessions One and Two:** Begin construction of the kit. Work on the kit at home as an assignment. A second construction session will be used to complete and debug the kit.

**Session Three:** Discussion of computer notation

- a) binary
- b) octal
- c) hexadecimal

**The Transfer of Data**

- a) within the machine
- b) input to machine
- c) machine to output device
- d) specific application to the Data Handler

**The Arithmetic Logic Unit**

- a) arithmetic operations
- b) carry and overflow
- c) logic operands
- d) applications using the computer

**Session Four:** Flags and Status Registers

- a) what they are
- b) how they are used in Branch and Jump instructions

**Concepts of Program Sequence**

- a) Branching
- b) Testing

**Session Five:** Addressing Techniques

- a) use of memory for Input/Output control
- b) different types of addressing
- c) demonstration and writing brief programs using material covered
- d) running the program on the computer

**Session Six:** Index Register Instructions

- a) loading data
- b) storing data
- c) incrementing and decrementing
- d) comparing with memory
- e) transfer of data to accumulator

**Session Seven:** Stack Processing

- a) general use
- b) use in subroutines
- c) implementation
- d) use by the programmer
- e) Push and Pull using the stack

**Session Eight:** Shift and Memory Instructions

- a) Shift and Rotate
- b) Read/Modify/Write
- c) Increment/Decrement memory

**Session Nine:** Peripheral Programming

Discussion of 6520 or 6820 chip

**Loader Programs**

- a) why used
- b) examples of how used
- c) use with an Input/Output device



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PCC will provide future articles on the developments of this and other projects in education. Watch for them. Comments and suggestions on educational uses are requested; send them to:

Don Inman

PCC

Box E

Menlo Park, CA 94025



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## HOMESTEAD HIGH ON COMPUTING

by Don Inman



A visit to the Homestead High School computer room is enough to make a math teacher on sabbatical drool. Four-teletypes, a Tektronix graphics terminal, time-sharing services to three outside facilities, a Compucorp Beta



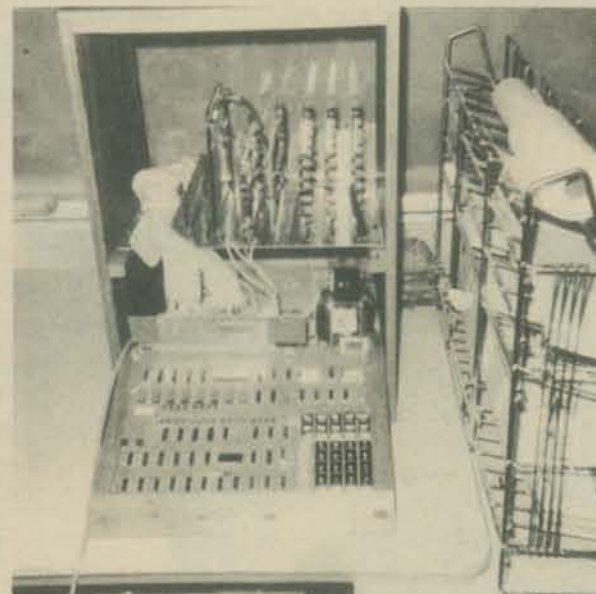
326 Scientist w/Teletype and Cassette interfaces, a HP 2007 and a room full of enthusiastic students keeping all the equipment busy. An overwhelming sight to a small school teacher from the backwoods.



Steve Headley, math teacher at Homestead High, is in charge of the computer room and the instruction of the school's computer program. The facility adjoins his math classroom and can be supervised through two large windows in their common wall. Steve teaches a computer programming class during the first period of the day. The class is composed of eighteen students, 15 beginners learning BASIC plus three advanced students using time-sharing accounts with outside sources.



While Steve is teaching other classes during the day in the classroom, advanced students have access to and use the computer facilities. The equipment is also in use before school, during lunch, during brunch, and after school.



The Homestead High School Computer Club is an active group of approximately thirty members. Chris Espinosa, a Homestead junior, wrote the article on the next page about the club's homebrewed computer system.



In a short talk with Chris and other students in the computer room, the evidence of knowledge and the thirst for more fairly exuded from their conversation. Chris described his first awareness of what was happening in the world "outside" with microcomputers. He and a buddy were taken to a California Computer Show by his dad. They watched in awe as Paul Terrell demonstrated an Altair 8800. ZAP! They were hooked. The next day they searched up and down El Camino Real searching for his new Byte Shop which was opening. Although they were a day early, they finally discovered it. From this day on their interest was honed for the fast developing personal computer area. They found that something more than the "Big Brother" world of IBM, CDC, DEC, HP, etc. existed in the outside world.

The piece of equipment in the Homestead Computer Room which impressed me most was the homebrew system described on the next page. The Data Handler is something that ALL schools can afford. It can be used immediately upon completion of construction with the keyboard input and LED display. It is flexible and expandable. The Homestead club had their add-on mother board ready by the time their Data Handler arrived in late August. The kids have assembled "the works", and Steve constructed the cabinet enclosure. Future articles and programs will be forthcoming as club members explore imaginative innovations with this tool.



Steve Headley has another project in the mill which will probably be underway by the time you read this. He has up for approval a course for twelve MGM (mentally gifted minor) students. The group will meet for an hour after school three times a week. They will be given instructions and materials to build a microprocessor CPU board with an additional 4K bytes of RAM memory. Students will work in small groups and be directed in the construction of the microcomputers. Three computers are proposed. Lectures will be presented concerning microprocessor technology and programming. Upon completion of construction, students will learn to design programs in assembly and machine language for the specific processor used (6502). This is a perfect example of the unique opportunities offered by the kit-building approach. Schools can capitalize on several applications of education. Construction, instruction, and use can be coordinated to provide all aspects of this fascinating area of study.

Much of the equipment at Homestead High has been donated by generous manufacturers. This is true at most schools which offer a computer course of any kind. Schools are starved for funds for new programs such as this. Steve has asked me to emphasize that DONATIONS OF EQUIPMENT are needed and are always welcome. If you have something to contribute, contact:

Steve Headley  
Homestead High School  
21370 Homestead Road  
Cupertino, CA 95014

# The Homestead High School Homebrewed Computer System

by Chris Espinosa

## The Homestead High School Computer System

We purchased the parts to this system in June of 1976 to add to the facilities available to our high school computer club. We were then composed of approximately 30 members, a Hewlett-Packard 2007 minicomputer system (2114 CPU, 8K bytes of core x 16 bits, teletype, high-speed punch and reader) which was working in Educational BASIC, an on-line ASR33 teletype, an on-line 300 baud Tektronix graphic CRT, and Compucorp Beta 326 super programmable calculator with TTY interface and cassette drive. The majority of our members could only program in BASIC, and their activities centered around homework and games. Most of our equipment was donated as a tax write-off for the donating companies, and was at least 10 years old. We wanted to get into what was happening now, learn about microprocessors and assembly language, talk to other schools and hobbyists, and discover what the real world was doing with computers.



The reasons we chose this particular system are many. There were three main objectives: cost, compatibility, and expansion. The Altair and IMSAI systems offered great compatibility and expansion, but the cost for even a basic system (CPU, power, front, panel, memory) was above \$900, and we wanted a lot of peripherals and memory. The Apple computer was the best complete system we saw (and we may get one eventually) but the cost was still too high and expansion seemed difficult. After observing most of the available systems on the market, we set down some solid priorities: S-100 (Altair) buss for memory and peripheral expansion (so we were not locked into a specific manufacturer's options and prices), a hardware front panel (we would be working much in machine language, and the single-step and debugging options are better than in a monitor-based system), a popular processor, a reasonable library of compatible programs, and a CPU/Front panel/power supply price of under \$300.

After much thought, we purchased the system you see outlined in the next column. The only delivery problems we had were with the CPU, power supply and the Tarbell interface. These were all factory supply problems and the retailers (Byte Shops 1 and 2) were very helpful with supplying the other components, as well as offering assistance and advice.



We intend to use this system mostly for assembly language programming, and store subroutines for I/O, bootstrapping, floating point math, etc., in PROM. After we have mastered that (HA!) we might write our own language, programs, etc. We also will modify Apple Basic for use with VDM and Tarbell. We are thinking of getting more CPU's and having students do individual work, transferring programs to the main system by tape when they are finished.



CPU: The Western Data Systems "Data Handler", a 6502-based microcomputer on a single 13.75" x 10.5" PC board. It is fully compatible with the S-100 (Altair/IMSAI) buss structure and will support all other compatible boards. The CPU board also has some other features that are described below. In kit form, \$169.95.

Front Panel: A full-function hardware front panel is included on the CPU board itself. Entry is in hex, display from data and address busses is binary. Push-button operation of run, halt, single cycle, single instruction, reset (initialize), examine (incremental), deposit (incremental).

System Buss: Processor Technology 16-slot mother board, fully compatible with S-100 buss. With edge connectors, \$125.00

Memory: 1K on CPU board, and 3 Processor Technology 4KRA memory modules, \$417.00.

I/O: 8-bit parallel port on CPU board is currently being used for decimal display, sense switches.

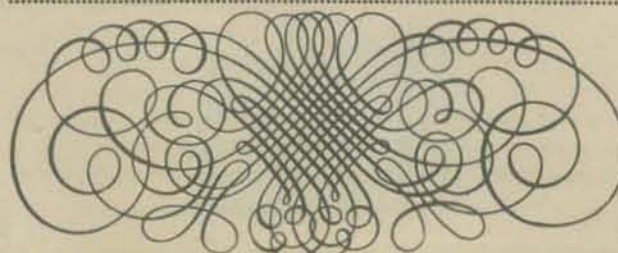
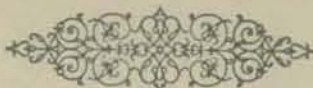
Other peripherals: Processor Tech. VDM 16x64 video board, \$160.00; Tarbell Cassette Interface, \$120.00; Oliver Audio OP-80A Paper tape reader, \$74.50; Processor Technology 3P+S, \$141.00; and a keyboard we scrounged from somewhere.

ROM: Processor Technology 2KRO using 1702's. We do not have the 1702's yet: \$65.00.

Power supply: an IMSAI PS-28 power supply with all needed voltages (+10,  $\pm 18$ ). The CPU board gets its single +5v supply via an LM322K 5 amp regulator, complete, \$110.00.

Miscellaneous: Blastmasters Extender board/logic probe, \$35.00; Solid State Music extender board used to connect mother board and CPU, \$8.00; IC sockets for everything, \$50.00.

TOTAL SYSTEM COST: \$1475.45



AND NOW  
FOR SOMETHING  
ALMOST  
COMPLETELY  
DIFFERENT

\*\*\*\*\*

JEAN & HER  
FRIEND:  
THE COMPUTER

\*\*\*\*\*

We have received all sorts of interesting material on computing in schools from Jean Rice. Jean teaches a community college course called "Do Not Bend, Spindle or Mutilate" and has had extensive experience working with grade school kids in Edina, Minnesota.

If you are thinking of doing something at the grammar school level, I would suggest dropping Jean a line and asking for a copy of the report on her project in the Edina Elementary Schools. She worked with fifth graders:

"The class met for 12 sessions of 45 minutes each with each student having additional time at the terminal scheduled at other times during the school day."

Instruction and learning took place in a variety of modes including short discussion sessions on various aspects of a computer system (equipment, programs, computer usages, personnel, etc.); reinforcement of these discussions using interactive programs; playing simulation games at the terminal; interviewing people working with computers; taking a field trip to a computer company; and viewing a film on the history of computers.



Other activities the students took part in were making computer scrapbooks; making paper tapes; coding messages in an 80-column card; collecting newspaper and magazine articles on computers; making flow charts; writing short computer programs in BASIC and writing computer book reports."

The class was organized around Jean's textbook *My Friend the Computer* which is written in a non-threatening style and covers what computers are, applications, history and programming. The table of contents is not unusual, but the low key presentation and the instructors' guide which is chock full of preprinted ditto master and overhead transparencies ready to use in the classroom are unique.

Jean's address is 5132 Tifton Dr., Edina, MN 55435, and her publisher is T.S. Denison & Co., 5100 West 82nd St., Minneapolis, MN 55437. If you write Jean for her report, it would be nice to send an 8 1/2 x 11 self-addressed stamped envelope with about \$.23 postage.

\*\*\*\*\*

*My Friend the Computer* is available from the PCC Bookstore.

# chip talk

by LEE FELSENSTEIN

## SEMICONDUCTOR

When electricity will pass through a substance without creating much heat, the substance is called a conductor of electricity. If electricity won't pass through the substance at all, it's a non-conductor. Halfway between are the semi-conductor elements, usually metals with strange names.

We can get a clue about how semi-conductors work when we notice that some substances can be either conductors or non-conductors. Graphite, for example, which is used in pencil leads, is the conductor while diamond is a non-conductor. Both are made of the same thing — carbon! The difference is in the way their atoms line up with each other — called the crystal structure.

Semi-conductors become useful when people start monkeying with their crystal structure to get the substance conducting better or not as good. What we come up with are little dabs of metal which can be changed from conductors into non-conductors and back again under commands from small controlling electric currents.

Semi-conductor devices are good for allowing small currents of electricity control much larger currents. They're very small, never burn out if they're not mistreated, and don't make much heat as they work.

## CPU

What makes a computer different from a pocket calculator?

Well, every computer has something very much like a pocket calculator as part of it. In fact, the real difference has to do with how the instructions are fed to this internal calculator, which is called the Central Processing Unit, or CPU. The instructions are stored in part of the computer's memory and can be changed by the computer.

The CPU has to remember where to look in the memory for the next instruction, and has to be able to provide temporary storage places for the numbers it is dealing with. These storage places are called registers and are usually given one-letter names (like C-register.). The CPU has to be able to move numbers between different registers and do different things to these numbers as they move, like adding or subtracting two of them. It also has ways of getting numbers to and from devices outside the computer, usually through what's called the I/O (Input/Output) channel, and that's about all.

Back when computers were million-dollar machines, the CPU was very large, very expensive and had to do everything. Now that the CPU's can be put on cheap integrated circuit chips, it's becoming reasonable to use several of them in a single computer, each one taking charge of a different part of the computer. This kind of co-operative approach is going to do away with the big-boss approach, and eventually won't have anything left to call a Central Processing Unit.

## BITS, BYTES and NIBBLES

Just about the simplest electrical device is the switch. It's either turned on or turned off — there is no in between. A switch is a lot simpler than a light dimmer, and it's much easier to tell if a lamp is turned on or off than it is to tell how bright a lamp is.

Almost all computers use this on-or-off (digital) way of representing numbers. You name these choices A and B, Herman and Joan, or give them numbers like 1 and 0 (that's what mathematicians like best). Then think up a code which can make larger numbers out of these little choices which are called bits. (You have to admit that a number which can only choose between two things is pretty small, and deserves to be called a bit.)

There are a lot of possible codes which can use bits to make up larger numbers, and computers use several different codes (BCD, Excess-3, Gray Code, and others, each with its own reason for being used). But the code which uses the smallest number of bits to make a larger number is called Binary, and it is used in almost all computers.

Letters and symbols like those on a typewriter can be expressed in binary code, too. You just give each letter a number and use binary code to translate that number into a bunch of bits. When you do this, you have to keep the bunches of bits which represent each letter separate from each other, so you know where the next letter begins.

A bunch of bits which has to be kept separate from the next bunch is called a Byte. Usually it is 8 bits long. The name is pronounced "Bite" and in one computer where numbers were handled in chunks of four bits the designers called those chunks "nibbles."

## ROM? RAM? PROM?

These are kinds of memories. (That's what the M stands for — memory). Every computer has a way of remembering numbers and instructions. If the list of numbers or instructions will never change, it can be stored in a ROM, or Read-Only Memory. A ROM is like a phone book — the computer looks for a certain name and gets a number back. The name is called the address, and like everything else in a computer, it's made up of numbers.

But you can't change what's in a phone book — you have to wait for next year's edition. Or you can call information and get the latest number for someone. That's like a RAM — Random-Access Memory. It is possible for the computer to write a new batch of numbers into any address as well as read those numbers out. Until recently, computer memories (RAM or ROM) worked by magnetic principles. Magnetic tape, or magnetic drums, or magnetic cores, for example. Now chips are being made that use electronic principles to store numbers. For ROMs the pattern of numbers is usually cooked in during the manufacturing process.

Sometimes people need to have just one ROM made up, and fast. Then they can use PROMs, Programmable Read-Only Memory. These let the user store a pattern of numbers inside by burning out little sections of the chip. Once this is done, those burnt-out sections can't be put back the way they were, so a mistake makes the whole chip worthless.

There is another kind of PROM called an Erasable PROM. It doesn't work by burning out sections of the chip, but by storing bunches of electrons in places where they can't get out. This device has a transparent quartz window over the chip, and you can erase the entire memory by shining a high intensity ultraviolet light at it for several minutes! The main use for Erasable PROMs is in trying out microcomputer programs and finding out what changes have to be made.

## WHAT'S A CHIP?

Sometimes when people talk about a "chip" in electronics they are pointing to an "integrated circuit" that looks like a tiny domino with a fringe of flat metal pins along the edges. The actual chip is buried inside, though, and it's never more than a quarter inch on a side. It was made as part of a wafer of silicone three inches across, and was broken off when the manufacturing process was over, so that's where the name came from.

Hundreds or even thousands of identical chips are made on one wafer by some pretty complicated processes, involving very high temperatures, vacuums, and so forth. It's not something you could do in a kitchen oven. Even when it's over, not all of the chips made on the wafer come out right.

## TTL? MOS? CMOS?

Names of integrated circuit types have gotten so long that people who use them all the time use abbreviations. MOS, for instance, stands for Metal Oxide Semiconductor. What it means to people who use it is that it's a process which allows a lot more stuff to be cooked onto a chip than any other process (yet). So MOS is good for making LSI (Large Scale Integration) chips. LSI packs a whole lot of stuff on a single chip. You never get anything for free, though, so MOS chips are slower operating than the other kind.

That other kind is called bipolar logic, and the main kind that's used today is TTL, or transistor-transistor logic. It's not good for LSI because it makes too much heat and takes up too much space. It is used mainly for MSI (Medium-Scale Integration) and SSI (guess what the S stands for) devices.

CMOS will someday be as cheap, although not as fast as TTL. CMOS stands for Complementary MOS. It's a way of making MOS chips that use almost no power, and are faster than MOS. CMOS is not very good for LSI, but great for uses like electronic watches where power has to come from a battery.

A word of caution — MOS chips are incredibly sensitive electrically. The amount of static electricity you can generate from just wearing nylon clothing is enough to destroy a chip internally if you touch it. This is especially true of microcomputer chips and their memory chips. So don't be too quick to handle a MOS chip if you aren't sure about the safety precautions!

# Story, SNAKE AND PACK1

By Joanne Koltnow Verplank

STORY, SNAKE, AND PACK1  
Some reading games and a games package

by Joanne Koltnow Verplank  
Community Computer Center

GAME? STORY

\*\*\*STORY\*\*\*

WHAT IS YOUR NAME? MARY JANE  
WHO DO YOU LOVE? JANICE  
WHAT ARE YOU AFRAID OF? SNAKES  
WHAT IS YOUR FAVORITE COLOR? PURPLE  
WHO IS YOUR BEST FRIEND? MICHAEL

THANKS! HERE IS YOUR STORY

ONCE UPON A TIME MARY JANE AND MICHAEL  
WENT TO THE DESERT ON A PURPLE DINOSAUR  
NOBODY COULD BELIEVE IT. THEY PARKED THE DINO-  
SAUR AND FOUND A CAVE. THEN THEY HEARD THE  
SOUND OF SNAKES. SNAKES ALMOST ATE THEM, BUT  
JANICE CAME AND SCARED SNAKES AWAY. THIS IS  
THE END. GOODBYE.



```
5000 ISTART STORY HERE
5005 &:&:&
5010 INPUT"WHAT IS YOUR NAME";NS
5020 INPUT"WHO DO YOU LOVE";LS
5030 INPUT"WHAT ARE YOU AFRAID OF";AS
5040 INPUT"WHAT IS YOUR FAVORITE COLOR";CS
5050 INPUT"WHO IS YOUR BEST FRIEND";FS
5060 &:&:&"THANKS! HERE'S YOUR STORY":&:&:&
5065 RANDOMIZE
5070 V=INT(3*RND(0)+1)
5071 L=INT(3*RND(0)+1)
5072 T=INT(3*RND(0)+1)
5075 VS(1)="HORSE";VS(2)="DINOSAUR";VS(3)="PIG"
5080 LS(1)="BEACH";LS(2)="MOUNTAINS";LS(3)="
    "DESERT"
5085 TS(1)="CAVE";TS(2)="HOLE";TS(3)="SHACK"
5090 &"ONCE UPON A TIME "NS" AND "FS
5091 &"WENT TO THE "LS(L)" ON A "CS" ";VS(V)
5092 &"NOBODY COULD BELIEVE IT. THEY PARKED THE
    "VS(V)
5093 &"AND FOUND A "TS(T)". THEN THEY HEARD THE
    SOUND OF "AS
5094 &AS" ALMOST ATE THEM BUT "LS" CAME
    AND SCARED".
5095 &AS" AWAY. THIS IS THE END. GOODBYE."
5096 &:&:&:&:&:&:&:&:&:&:&:&:&:&
5097 GO TO 5000
5098 END
```



Jim Garson and I designed and wrote STORY because we realized that all the introductory and easy computer games we used were math-y. We wanted a game that emphasized reading. We'd noticed that kids liked doing mad-libs and, although we didn't particularly like them, we thought the reading and writing requirements were worth exploring.

After deciding that our program would be at the intellectual level of NUMBER, and would take about five minutes to play, we first had to change the format

*And here she is now!*

of the conventional mad-lib. Mad-libs ask the player for parts of speech ("give me four verbs"); we were going to have our program ask direct questions. Since Jim and I are both influenced by Sylvia Ashton-Warner's idea that words of high personal value are easy to learn, we constructed our questions, and our story outline, on themes of love, friendship, fear, and escape to safety (adding a touch of the ridiculous with the colored animal).

Kids love STORY. Beginning readers really do learn new words quickly — both because the story is so personal and because it's almost the same each time through. Unlike other games, there is no win, and definitely no lose.

Players at various ability levels have fun with it. Beginners seem to enjoy the sheer personal quality — this is *their* story. More advanced players start exploring. Both the flexibility of the program and the absence of string size limitation make this an attractive program for exploration with the computer. Players discover that the stories all follow a basic pattern and also that the computer uses their answers without comment or correction. They begin to create the stories they want by judicious answering of the questions.

Our particular system, a PDP-11/15 running RSTS BASIC, allows seemingly endless strings — 255 characters. This game would not have worked well at all on our old computer with its 6 character string limit.

\*\*\*STORY\*\*\*

WHAT IS YOUR NAME? JOANNE  
WHO DO YOU LOVE? JIM  
WHAT ARE YOU AFRAID OF? NOTHING  
WHAT IS YOUR FAVORITE COLOR? ROYAL BLUE  
WHO IS YOUR BEST FRIEND? SANTA CLAUS

THANKS! HERE IS YOUR STORY

ONCE UPON A TIME JOANNE AND SANTA CLAUS  
WENT TO THE MOUNTAINS ON A ROYAL BLUE PIG  
NOBODY COULD BELIEVE IT. THEY PARKED THE PIG  
AND FOUND A CAVE. THEN THEY HEARD THE SOUND OF  
NOTHING. NOTHING ALMOST ATE THEM, BUT JIM CAME  
AND SCARED NOTHING AWAY. THIS IS THE END.  
GOODBYE.

We generally like to encourage players to try "being the computer" and to do the game from that point of view. STORY lends itself well to that turn-around. I suggest that the kids write a few questions and a story outline into which they'll fit the answers the "player" gives. The "computer" can then go to a friend, ask the questions, fill the answers in on the prepared form, and provide the friend with a "computer story." Naturally the authenticity of this whole process is enhanced if both friends have actually played STORY on the computer.

STORY as a computer game provides reading and spelling practice in a personal and whimsical context. It promotes creativity and exploration. The student-as-computer version also requires reading, writing, and spelling, as well as ingenuity and some juggling so that the answers to the questions fit well.



Joanne Verplank is Director of  
Community Computer Center, 1919  
Menalto Ave., Menlo Park, CA 94025

\*\*\*\*GOBBLE\*\*\*\*

WHAT IS YOUR NAME  
? JOANNE  
WHO DO YOU LIKE  
? MY FRIENDS  
WHAT IS YOUR FAVORITE APPLIANCE  
? TOASTER OVEN  
WHAT DOES THE TOASTER OVEN DO WHEN IT IS  
WORKING  
PLEASE USE A -ING WORD?  
? WARMING  
WHAT IS YOUR FAVORITE FOOD  
? PIZZA

THANK YOU, HERE IS YOUR STORY.

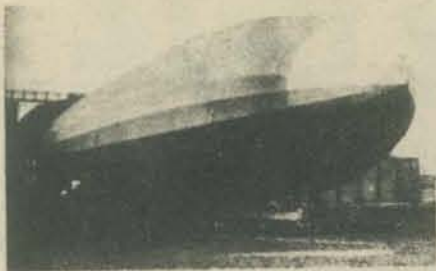
ONE DAY JOANNE AND MY FRIENDS WERE EATING  
PIZZA. SUDDENLY THE TOASTER OVEN GOBBLED  
THEM UP! THEN THE TOASTER OVEN STARTED  
WARMING THEM. THEN THEY WERE BACK TO EATING  
THEIR PIZZA AND WERE RATHER DISCOMBOBULATED.

SO LONG!

Teaching STORY, both on and off the computer, is  
also a good beginning for introducing programming.

RUNJUNGLE  
WHAT IS YOUR NAME  
? LITTLE RED  
WHO IS YOUR BEST FRIEND  
? GRANNY  
WHAT IS A YUCCHY COLOR  
? BLUE  
WHAT IS A WIERD PLANT  
? CACTUS  
WHO IS ANOTHER GOOD FRIEND  
? TIMMY  
WHAT IS YOUR FAVORITE COLD DRINK  
? COKE  
WHAT IS YOUR FAVORITE FOOD  
? PIE





# PILOT



**T**raditional programming languages are often stumbling blocks to teachers who don't want to learn to program but want to use computers to teach particular subjects via instructional dialogues. Many people have found that PILOT 73 is a way around the problem. The language is compact and powerful, well-suited for computer assisted instruction (CAI) which requires little computing facility. Even first graders have learned to write their own story-generating programs in PILOT.

Home and school microcomputers are proliferating at a rapid rate; now is the time to get easy-to-learn and easy-to-use languages onto cheap computers and into the hands of students and teachers. Are you familiar with the cheap computers in the \$1000-\$2000

range? If not, you can start learning with this issue: see the articles by Don Inman, and use the list of computer stores to locate the one(s) nearest you. Take a look at the Altair, the IMSAI, the Data Handler, etc.; get as broad an overview as you can. Next issue we'll define some possible microcomputer systems on which a PILOT-like language could be implemented.

PCC will start now and continue to discuss PILOT-like languages on a regular basis. We're trying to coerce Dennis Allison into writing an intermediate language so something like PILOT can be implemented on micros. We want our "TINY PILOT" (for lack of a better name, at this point) written interactively, so that users don't need to learn to use an editor in order to use it. Just think what a wealth of transportable CAI materials we could generate and share! So get your cards and letters in

to TINY PILOT, Box 310, Menlo Park, CA 94025, requesting an IL (intermediate language) for an interactive easy-to-use PILOT-like language.

This is a reprint from an earlier PCC of PILOT 73 "core" instructions, selected by makers of the language. We hope this mini-tutorial will give you a sense of what an easy-to-use language looks like.

PILOT is currently available for a number of systems, but not, to our knowledge, in an interactive form. For more information, you can join the PILOT Exchange, \$6 per year:

Gregory Yob  
PILOT Exchange  
LO\*OP Center  
8055 Old Redwood Highway  
Cotati, CA 94928  
(707) 795-0405

## Talking Computer

To make the computer talk, you use the T: instruction (for TYPE). When you run this program

T:HELLO

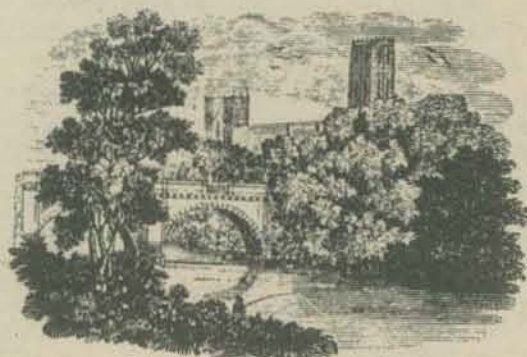
the computer says

HELLO

(T: is just like BASIC "PRINT")

You can use the T: to make the computer print pictures!

```
T:
T:
T:
T:
T:
T:
T:
+++++++
)  -  (
  (O O)
  [  A  ]
  [ #=# ]
  [    ]
  \>#<//
```



Or to tell stories, etc.

T:THIS IS THE STORY OF THE DOWNFALL OF THE  
T:NINX

(The program is left for your completion. Use extra pages if you wish.)

TALKING TO THE COMPUTER:

To get the computer to let you get in a word or two (or more), you use the A: instruction (for ANSWER). When you run this program

A:

the computer says

?

then waits for your response. After you have typed in something and pressed the RETURN key, the computer will continue with the rest of the program (if any).

Here's a short program

?????  
?????

T:THIS IS THE QUESTION  
T:WHAT IS YOUR BIRTHSIGN  
A:  
T:THAT'S NICE

When you run this program, here's what happens:

THIS IS THE QUESTION  
WHAT IS YOUR BIRTHSIGN  
?

Then the computer waits for your answer .... If you then type

CAPRICORN (followed, of course, by the RETURN key)

the computer continues with

THAT'S NICE



# You Do It

Now, you do it: write a PILOT program using T: and A: which "behaves" like the interviewer on a TV "talk show" (like Cavett, Carson, etc.). That is, it asks question after question, without paying attention to the answers at all.

Or, if that's not your cup of T:, try simulating Mother Goose. Here's a typical MG, telling a story to her children

WHEN SHE HEARD THIS, THE WICKED WITCH JUMPED ON HER BROOMSTICK, AND HEADED AS FAST AS SHE COULD FLY BACK TO HER HOUSE IN THE WOODS.  
AND WHAT DO YOU THINK SHE DID WHEN SHE GOT THERE  
?ATE UP THE KIDS  
?NO, SHE JUST CHASED THEM  
?OOOO, THE WICKED WITCH!  
WELL, WHEN SHE GOT THERE, THE FIRST THING SHE DID WAS ...

(Well, what was the first thing she did?)

## Some More Talk

THE COMPUTER TALKS SOME MORE:

WHAT IS YOUR NAME  
?FEARLESS FRED  
HELLO, THERE, FEARLESS FRED

How did the computer do that? By using an *answer label*. Here's the program:

T:WHAT IS YOUR NAME  
A:\$NAME ← this is an answer label  
T:HELLO, THERE, \$NAME

Let's look at some more computer talk:

T:WHAT'S YOUR NAME  
A:\$NAME  
T:HOW OLD ARE YOU (IN YEARS)  
A:\$AGE  
T:WHERE DO YOU LIVE  
A:\$LIVE  
T:SO, YOUR NAME IS \$NAME, AND YOU LIVE  
T:IN \$LIVE, AND YOU ARE \$AGE OLD.

See how answer labels work? The \$ means "the next characters are an *answer label*". When the computer sees

A:\$NAME

it labels the response with the label "\$NAME." Then when it sees:

T:SO YOUR NAME IS \$NAME

the computer types the first part

YOUR NAME IS

then it looks for the A: line which contains the label \$NAME. If it can find such a line, it will type the response which was given there. If it can't find the line, or if that line hasn't been reached yet (in the program), the computer types the label.

WHAT'S YOUR NAME  
?CLEOPATRA  
HOW OLD ARE YOU (IN YEARS)  
?2500  
WHERE DO YOU LIVE  
?EGYPT  
SO, YOUR NAME IS CLEOPATRA, AND YOU LIVE  
IN EGYPT AND YOU ARE 2500 YEARS OLD.



## Jumping

What next? JUMPING!

\*HERE T:I AM HERE  
T:I AM THERE  
J:\*HERE (This is a line label)

When you RUN this, the computer says:

I AM HERE  
I AM THERE  
I AM HERE  
I AM THERE  
I AM HERE

etc., until you stop the computer (BREAK key on some systems). You use a *line label* (like \*HERE, \*LABEL, \*START, etc.) to tell the J: instruction (for JUMP) where to jump.

\*HERE T:I AM HERE  
J:\*THERE  
\*WHERE T:WHERE AM I?  
J:\*HERE  
\*THERE T:I AM THERE  
J:\*WHERE

will produce the same result as

\*BEGIN T:I AM HERE  
T:I AM THERE  
T:WHERE AM I?  
J:\*BEGIN

What is the result?

Here's a "fancy" way to jump (or, here come subroutines):

\*BEGIN T:HERE'S THE START  
U:\*MIDDLE  
T:THIS IS THE END  
J:\*END  
\*MIDDLE T:THIS IS THE MIDDLE  
E:  
\*END T:GOODBYE  
E:

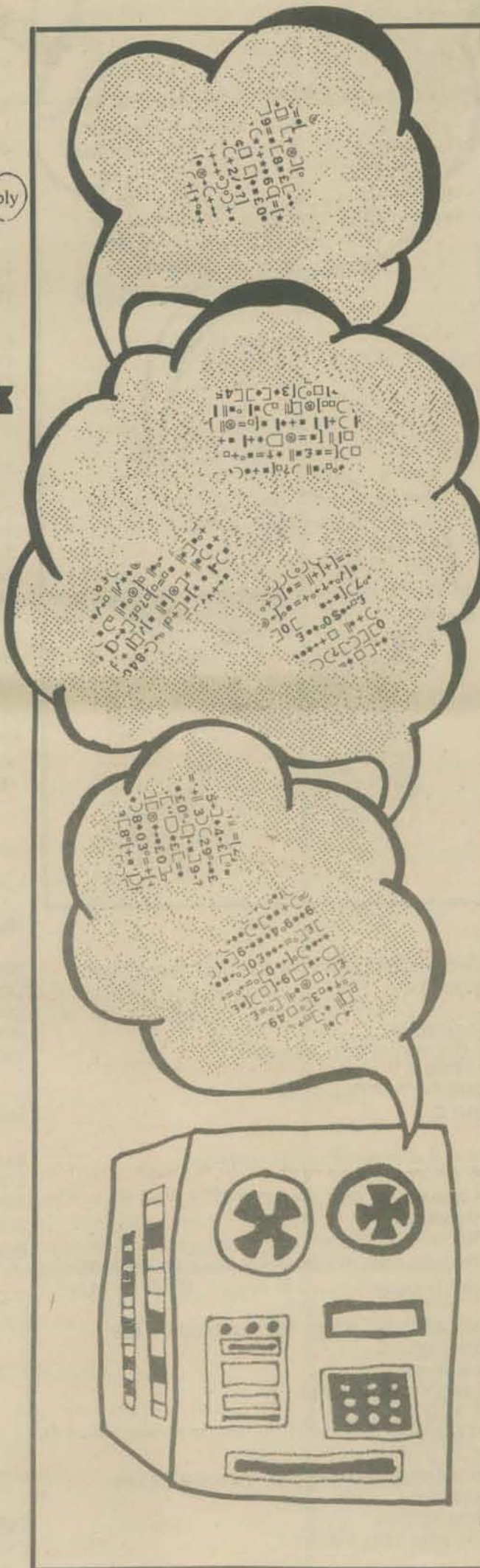
?RUN

HERE'S THE START  
THIS IS THE MIDDLE  
THIS IS THE END  
GOODBYE

So,

U: (for USE) acts just like J: (jumps to a label)  
E: (for END) does two things

- (1) Ends the whole program (like BASIC "END"). The last E: in the program above does this, right after the label \*END.
- (2) If a U: line has been executed, E: returns the computer to the line following the U:. The first E: above, right after the label \*MIDDLE, does this. When the computer reaches this instruction, it automatically jumps back right after the U: instruction.



# The World of



The M: instruction (for MATCH) is used to make the computer a little "smarter." LOOK HERE

T: DO YOU KNOW WHAT DARWIN IS FAMOUS FOR  
A:  
M: EVOLUTION, SPECIES, BEAGLE  
TY: FOUND A MATCH!  
TN: NO MATCH

?RUN

DO YOU KNOW WHAT DARWIN IS FAMOUS FOR  
?

Now, if the responder types in one of the three M: items, a "match" will be found.

If a match is found, the value of M: is "YES"(Y).

If no match is found, the value of M: is "NO"(N).

M: executes a *character by character* string comparison of the response given to A:, with each of the M: items, one item at a time. (In other words, a "moving window" comparison.)

M: takes everything literally. Suppose we run the above program.

DO YOU KNOW WHAT DARWIN IS FAMOUS FOR  
?NO *an honest answer*  
NO MATCH

M: is NO

Again:

DO YOU KNOW WHAT DARWIN IS FAMOUS FOR  
?INVENTED SPESES  
NO MATCH

(M: is NO 'cause the responder can't spell.)

Once more:

DO YOU KNOW WHAT DARWIN IS FAMOUS FOR  
?THEORY OF EVOLUTION  
FOUND A MATCH!

(M: is YES, since the A: matches one of the M: items.)

To get the computer to "ignore" irrelevant spelling errors and/or extra text, the M: items may consist of a few consecutive characters of the desired response, for example:

M: EVOL, SPE, BEAG

You may get in a little trouble with the approach. Consider:

DO YOU KNOW WHAT DARWIN IS FAMOUS FOR  
?THE SEXUAL REVOLUTION

If the M: line is

M: EVOL, SPE, BEAG

then M: will find a match, because REVOLUTION contains one of the M: items.

This should help you to figure out how M: works. That's only the first part. Next, let's do something with the value of M:. Look at this program:



T: WHAT AMERICAN WAS THE 'FATHER OF HIS  
T: COUNTRY'

A:  
M: GEO, WASH  
TY: GOOD FOR YOU, SMARTY.  
JY: \*END  
T: SORRY, THAT'S NOT IT  
\*END E:

If M: is Y after execution, the instructions

TY: GOOD FOR YOU, SMARTY.  
JY: \*END  
\*END E:

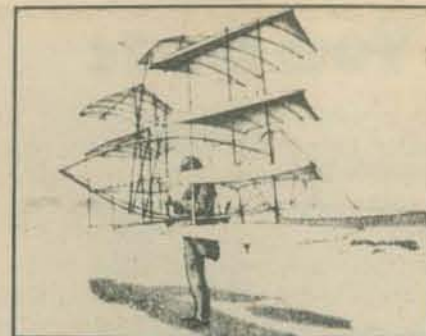
will be performed. If no match is found, M: will be N, and all Y: instructions will be skipped. Here's the RUN:

WHAT AMERICAN WAS THE 'FATHER OF HIS  
COUNTRY'  
?SAM SPADE  
SORRY, THAT'S NOT IT

Let's try again

WHAT AMERICAN WAS THE 'FATHER OF HIS  
COUNTRY'  
?WASHINGTON  
GOOD FOR YOU, SMARTY.

Because M: is YES, the JY: instruction jumps to the line labeled \*END.



Any PILOT 73 instruction can be made "conditional" on the last M: line executed by adding Y or N to the instruction.

Examples:

AY JN MN UY EN MY

A few other details:

- (1) M: looks at the last A: executed.
- (2) M: lines can contain as many items as you can fit in a line.
- (3) TY: can be written as just Y:
- (4) TN: can be written as just N:
- (5) Each time a new M: line is executed, the value (that is, Y or N) of any previous M: line is erased.

Example:

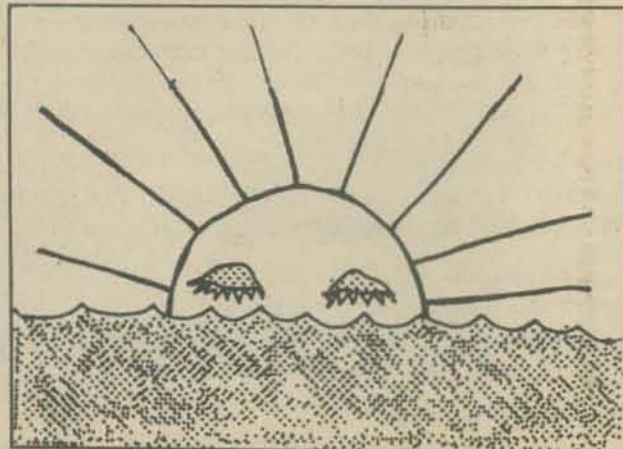
T: WHERE IS THE LARGEST STOCK MARKET  
T: LOCATED: NEW YORK, MOSCOW, OR  
T: LONDON  
A:  
M: NEW, YORK, NY  
Y: RIGHT ON  
JY: \*END  
M: MOS  
Y: THE RUSSIANS AREN'T CAPITALISTS (YET)  
JY: \*END  
MN: LON  
Y: SORRY, THE SUN HAS SET ON THE EMPIRE  
\*END E:

?RUN

WHERE IS THE LARGEST STOCK MARKET  
LOCATED: NEW YORK, MOSCOW, OR  
LONDON  
?MOSCOW  
THE RUSSIANS AREN'T CAPITALISTS (YET)

?RUN

WHERE IS THE LARGEST STOCK MARKET  
LOCATED: NEW YORK, MOSCOW, OR  
LONDON  
?LONDON  
SORRY, THE SUN HAS SET ON THE EMPIRE



NUMBER is one of the simplest of computer games. In playing NUMBER, the player tries to guess the computer's secret number, using clues supplied by the computer after each guess. PCC published a program to play NUMBER in our very first issue, Volume 1, Number 1, October 1972. Later, in the November 1975 issue (Volume 4, Number 3), PCC published several NUMBER programs illustrating programming methods in HP2000 BASIC, DEC EDUSYSTEM BASIC and ALTAIR BASIC. You will also find NUMBER in What To Do After You Hit Return, PCC's First Book of Computer Games. It's the first game in the book.

But, in case you don't know how NUMBER goes, here is a RUN of a play of NUMBER.

RUN  
I'M THINKING OF A NUMBER FROM 1 TO 100.  
GUESS MY NUMBER !!!  
YOUR GUESS? 50  
TOO SMALL. TRY A BIGGER NUMBER.  
YOUR GUESS? 75  
TOO BIG. TRY A SMALLER NUMBER.  
YOUR GUESS? 62  
TOO SMALL. TRY A BIGGER NUMBER.  
YOUR GUESS? 68  
TOO SMALL. TRY A BIGGER NUMBER.  
YOUR GUESS? 72  
TOO SMALL. TRY A BIGGER NUMBER.  
YOUR GUESS? 73  
YOU GUESSED IT!!! LET'S PLAY AGAIN.  
I'M THINKING OF A NUMBER FROM 1 TO 100.  
GUESS MY NUMBER !!!  
YOUR GUESS?

lots of BELLS

Bells here

## GAMES FOR YOU TO PROGRAM

We will suggest several variations of NUMBER as programs for you to write. We will publish some "solutions" next issue — hopefully, your solution. Send your programs to the PCC Dragon... if possible, send us a paper tape so we can make nice black and white copies on our TTY.

### SIMPLE VARIATIONS

(1) Make the range smaller (for example, 1 to 10) or larger (say, 1 to 1000).

(2) Make the range easily adjustable by the programmer.

N = 100 + change this line to change range  
X = INT (N \* RND(1)) + 1

(3) Let the player select the range (1 to N)

RUN  
LET'S PLAY A NUMBER GUESSING GAME. I WILL THINK OF A NUMBER FROM 1 TO N WHERE YOU TELL ME (BEFORE WE PLAY) THE VALUE FOR N.

WHAT IS N? 1234

I'M THINKING OF A NUMBER FROM 1 TO 1234.

GUESS MY NUMBER!!!!

YOUR GUESS? etc...

After the player guesses the number, the computer might say LET'S PLAY AGAIN, then ask again for the value of N. You may wish to put constraints on the acceptable values for N, perhaps requiring that N be a positive integer  $\geq 10$  and  $\leq 999999$ , or something like that.

(4) Instead of 1 to 100 or 1 to 1000 or 1 to N, why not -100 to 100 or 123 to 1000, or some such range. How about L to U?

L = -100 .....  
U = 100 ..... range is -100 to 100, inclusive  
X = ..... you do this part.

(5) Let the player select L and U. First, explain to the player what L and U are, then ask for values of L and U.

WHAT IS L? -37

WHAT IS U? 125

I'M THINKING OF A NUMBER FROM -37 TO 125.

GUESS MY NUMBER !!!

YOUR GUESS? etc...

### THE TEMPERATURE GAME

RUN

I'M THINKING OF A TEMPERATURE FROM FREEZING (-32 DEGREES FAHRENHEIT) TO BOILING (212 DEGREES FAHRENHEIT)

GUESS MY TEMPERATURE !!!

YOUR GUESS? 50

TOO COLD. TRY A WARMER TEMPERATURE.

YOUR GUESS? 200

TOO HOT. TRY A COLDER TEMPERATURE.

YOUR GUESS? and so on...

Here are some variations of the temperature game.

(1) Change the range: from absolute zero (-460° F) to the combustion point of paper (Fahrenheit 451).

(2) Use Centigrade (Celsius?) instead of Fahrenheit.

### NUMBER THEORY VARIATIONS

Instead of an integer in some range, let the computer number be some interesting subset of integers.

(1) I'M THINKING OF AN ODD (OR EVEN) NUMBER FROM 1 TO 1000. etc...

(2) I'M THINKING OF A PRIME NUMBER FROM 1 TO 1000. etc...

(3) I'M THINKING OF A PERFECT SQUARE FROM 1 TO 1000. etc...

(4) I'M THINKING OF A FIBONACCI NUMBER FROM 1 TO 1000. etc...

(5) I'M THINKING OF A PALINDROME FROM 1 TO 1000. etc...

### THE YES-NO GAME

I WILL THINK OF A NUMBER FROM 1 TO 100. YOU MAY ASK ME QUESTIONS LIKE THE ONES SHOWN BELOW.

> 50? (BUT WITH \*YOUR\* NUMBER AFTER >)

< 75? (BUT WITH \*YOUR\* NUMBER AFTER <)

= 37? (BUT WITH \*YOUR\* NUMBER AFTER =)

WHEN I ASK FOR YOUR QUESTION, YOU MAY ASK ANY ONE OF THE ABOVE THREE TYPES OF QUESTIONS. THEN, I WILL ANSWER 'YES' OR 'NO'.

I'M THINKING OF A NUMBER.

YOUR QUESTION? > 50?

YES

YOUR QUESTION? > 75?

NO

YOUR QUESTION? < 62?

NO

YOUR QUESTION? > 68?

YES

YOUR QUESTION? 72?

I DON'T UNDERSTAND. ASK AGAIN.

YOUR QUESTION? < 72?

NO

YOUR QUESTION? = 72?

NO

YOUR QUESTION? = 73?

YES. THAT'S IT!!! YOU GUESSED MY NUMBER.

I'M THINKING OF A NUMBER.

YOUR GUESS? and so it goes.

### THE RATIONAL NUMBER GAME

I'M THINKING OF A RATIONAL NUMBER BETWEEN 0 AND 1. MY NUMBER CAN BE WRITTEN AS A FRACTION N/D WHERE N AND D ARE POSITIVE INTEGERS AND D IS LESS THAN 100. FOR EXAMPLE, MY NUMBER COULD BE 1/2 OR 13/16 OR 2/25 OR 98/99 BUT COULD \*NOT\* BE 37/100 or 7/1000.

I'M THINKING OF A NUMBER.

YOUR GUESS? 1/2

TOO SMALL. TRY A BIGGER NUMBER.

YOUR GUESS? 3/4

TOO BIG. TRY A SMALLER NUMBER.

YOUR GUESS? and so on.

By the





# tiny basic

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Tiny BASIC a la Dragon  
 ... a computer language for tiny kids  
 ... and teachers of tiny kids  
 ... at home, or at school

by The Dragon

Almost two years ago, we published an article called "Build Your Own BASIC." One small corner of the article suggested a computer language for small children, a language called Tiny BASIC.

TINY BASIC (from PCC, Vol. 3, No. 4, Mar. 1975)

Pretend you are 7 years old and don't care much about floating point arithmetic (what's that?), logarithms, sines, matrix inversion, nuclear reactor calculations and stuff like that.

And ... your home computer is kinda small, not too much memory. Maybe it's a MARK-8 or an ALTAIR 8800 with less than 4K bytes and a TV typewriter for input and output.

You would like to use it for homework, math recreations and games like NUMBER, STARS, TRAP, HURKLE, SNARK, BAGELS, ...

Consider then, TINY BASIC.

- Integer arithmetic only — 8 bits? 16 bits?
- 26 variables: A, B, C, D, ..., Z
- The RND function — of course!
- Seven BASIC statement types

INPUT  
 PRINT  
 LET  
 GO TO  
 IF  
 GO SUB  
 RETURN

- Strings? OK in PRINT statements, not OK otherwise.

Keep tuned in. More TINY BASIC next time, including some GAMES written in TINY BASIC.

WANTED — FEEDBACK! Your thoughts ideas, etc. about TINY BASIC urgently requested by the PCC Dragon.

\*\*\*\*\*

Tiny BASIC caught on ... our mailbox overflowed with Tiny BASIC information, too much to publish in PCC. So we started a new periodical originally called Dr. Dobb's Journal of Tiny BASIC Calisthenics and Orthodontia. DDJTBC & O quickly expanded beyond Tiny BASIC and is now known simply as Dr. Dobb's Journal of Computer Calisthenics and Orthodontia.

The saga of Tiny BASIC is chronicled in the first few issues of Dr. Dobb's Journal. Several versions of Tiny BASIC are described, all different from one another, all different in some way from the original Tiny BASIC. Each implementer of Tiny BASIC added interesting and useful enhancements to the original language. Some form of Tiny BASIC is now available for

almost every personal computer. Unfortunately they are all different — so it is difficult to write programs, games, books, instructional materials so that tiny beginners can learn to use Tiny BASIC.

So, beginning right here on these pages and continuing in PCC (and perhaps elsewhere) for quite a long time, we will define Tiny BASIC a la Dragon and develop it as a language for kids, and teachers of kids, at home or at school. Although we will call it Tiny BASIC, keep always in mind that there are now several different Tiny BASICs — most of them differ in some respects from ours. But once you understand Tiny BASIC a la Dragon you'll be able to learn other Tiny BASICs without much effort. And if all of us understand and write programs in Tiny BASIC a la Dragon then we'll have a common language in which to write and share programs, even though our computers use different Tiny BASIC versions.

\*\*\*\*\*

Tiny BASIC (a la Dragon) is intended especially for:

- Simple computer games
- Mathematical recreations
- Elementary school arithmetic, from first grade on
- Low-speed control applications. Yes, Tiny BASIC will have "real time" abilities.
- and more ... as they occur to us, or to you.

Again, we emphasize, we will explore the use of Tiny BASIC for kids and teachers, at home or at school.

Two versions of Tiny BASIC already exist that are close to our Tiny BASIC a la Dragon.

Tom Pittman's Tiny BASIC is almost identical to the original version published in PCC. It is available for the Motorola 6800, the MOS Technology 6502 and (soon) the RCA 1802 (COSMAC) microcomputers. For information, write Tom Pittman, Itty Bitty Computers, P.O. Box 23189, San Jose CA 95153.

National Tiny BASIC is available for the National SC/MP (pronounced "SCAMP"). It is almost identical to Tiny BASIC a la Dragon. For information, write Phil Roybal, National Semiconductor, 2900 Semiconductor Drive, Santa Clara 95051.

In this article, we will briefly describe Tiny BASIC a la Dragon in its simplest form. In future articles we will publish programs, games, instructional materials, extensions to the language, and reports on Tiny BASIC in use at home and in elementary schools.



Now, a word about BASIC.

BASIC, Beginners' All-purpose Symbolic Instruction Code, was initially developed in 1963 and 1964 by Professors John Kemeny and Thomas Kurtz of Dartmouth College, with partial support from the National Science Foundation under the terms of Grant NSF GE 3864. For information on Dartmouth BASIC publications, get Publications List TM 086 from Documents Clerk, Kiewit Computation Center, Dartmouth College, Hanover NH 03755. Telephone 603/646-2643. Try these: TM028 BASIC: A Specification \$3.15  
 TM075 BASIC \$4.50

# tiny basic

15

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For you people who know BASIC, here is a brief description of Tiny BASIC a la Dragon. In the next issue, we will begin a series for people who don't know BASIC.

- ARITHMETIC OPERATORS: + - \* / (but not ↑)
- Tiny BASIC does INTEGER ARITHMETIC in the range -32768 to 32767, inclusive. If a result falls outside this range, an error message occurs.
- STATEMENTS: LET, GOTO, GOSUB, IF, INPUT, PRINT, REMARK, RETURN, LIST, NEW, RUN
- LINE NUMBERS: 1 to 32767
- VARIABLES: A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z
- FUNCTIONS: RND (So far . . . we will add more later)

We will show you, teach you, Tiny BASIC — mostly by example. So, here are some examples illustrating features of Tiny BASIC.

You type: PRINT "MY HUMAN UNDERSTANDS ME" and press RETURN.

Tiny BASIC types: MY HUMAN UNDERSTANDS ME

You type: PRINT 2 \* 3 + 4 \* 5 and press RETURN

Tiny BASIC types: 26

Statements without line numbers are executed immediately. Nice way to learn!

But, of course, you can store programs and RUN them, just as in good old BASIC.

```
NEW
10 INPUT A, B
20 PRINT A + B, A - B, A * B, A / B
```

```
RUN
```

```
? 9, 5
```

```
14 4 45 1
```

1 • Tiny BASIC computer integer quotient  
5/9  
5  
4 • Tiny-BASIC doesn't compute the remainder.

OK, here is a more complicated example.

```
100 REMARK *** TINY BASIC IF STATEMENT DEMO
110 PRINT
120 PRINT "GIMME A NUMBER"; (ending PRINT with ";" does
    not generate a carriage return, so the input will be requested
    on the same line)
130 INPUT X
140 IF X < 0 THEN PRINT "YOUR NUMBER IS NEGATIVE"
150 IF X > 0 THEN PRINT "YOUR NUMBER IS POSITIVE"
160 IF X = 0 THEN PRINT "YOUR NUMBER IS ZERO"
170 GO TO 110
```

```
RUN
```

```
GIMME A NUMBER? 7
YOUR NUMBER IS POSITIVE
```

```
GIMME A NUMBER? 0
YOUR NUMBER IS ZERO
```

```
GIMME A NUMBER? and so on . . .
```

Tiny BASIC permits two or more statements per line. They are separated by colons (:) as in Line 110, in the next program.

```
100 REMARK *** TINY BASIC MULTIPLE STATEMENTS PER LINE
```

```
110 PRINT: PRINT "GIMME A NUMBER"; : INPUT X
140 IF X < 0 THEN PRINT "YOUR NUMBER IS NEGATIVE"
150 IF X > 0 THEN PRINT "YOUR NUMBER IS POSITIVE"
160 IF X = 0 THEN PRINT "YOUR NUMBER IS ZERO"
170 GO TO 110
```

Tiny has a nice RND function. See Line 110.

```
100 REMARK *** THE GAME, NUMBER, IN TINY BASIC
```

```
110 X = RND (1, 100)
```

```
120 PRINT: PRINT "I'M THINKING OF A NUMBER FROM 1 TO 100."
```

```
130 PRINT "GUESS MY NUMBER!!!"
```

```
140 PRINT: PRINT "YOUR GUESS"; : INPUT G
```

```
150 IF G < X THEN PRINT "TRY A BIGGER NUMBER": GO TO 140
```

```
160 IF G > X THEN PRINT "TRY A SMALLER NUMBER": GO TO 140
```

```
170 IF G = X THEN PRINT "THAT'S IT!!!" GO TO 110
```



See page 13  
for info on the game,  
NUMBER.

RND (1,100) generates  
random numbers in the range  
1 to 100, inclusive.



How about a "drill and practice" game that encourages guessing?

```
NEW
```

```
100 REMARK *** COMPASSIONATE DRILL AND PRACTICE
```

```
110 A = RND (0, 9): B = RND (0, 9)
```

```
120 PRINT: PRINT A, "+", B, "=", : INPUT C
```

```
130 IF C < A + B THEN PRINT "TRY A BIGGER NUMBER": GOTO 120
```

```
140 IF C > A + B THEN PRINT "TRY A SMALLER NUMBER": GOTO 120
```

```
150 IF C = A + B THEN PRINT "THAT'S IT!!!" GO TO 110
```

```
RUN
```

```
3 + 8 = ? 11
```

```
THAT'S IT!!!
```

```
9 + 7 = ? 15
```

```
TRY A BIGGER NUMBER
```

```
9 + 7 = ? 16
```

```
THAT'S IT!!!
```

```
0 + 6 = and so on . . .
```

We begin. Please help. Send in your ideas about languages for Tiny Kids. We want languages that can be done on incredibly low cost computers. We are quite sure that Tiny BASIC a la Dragon could be made available on a cheep computer (\$500 or less\*) that would include: (1) a micro-processor type computer on a chip, (2) Tiny BASIC in ROM (Read Only Memory), (3) a keyboard, (4) a cassette interface so you can store programs on cheap magnetic tape cassettes, (5) 4096 bytes of memory for Tiny BASIC programs, (6) a pair of wires to attach to any old TV set for output. WOULD YOU LIKE TO SEE SUCH A COMPUTER? If so, send your desire to Tiny BASIC Cheep Computer, P.O. Box 310, Menlo Park, CA 94025.

Yes, that's what he said . . .  
does that mean Tiny BASIC  
is for us birds?



\*How much less depends on how many of you want it!

# FROGS

By Mac Oglesby



WELCOME TO THE GAME OF FROGS!

FOR INSTRUCTIONS, JUST PRESS 'RETURN'.

\*\*\*\*\* I I I I

1 2 3 4 5 6 7 8 9 7

YOU START WITH 8 PIECES ON 9 SQUARES (NUMBERED 1 THRU 9).  
THE OBJECT IS TO REVERSE THE TWO SETS OF PIECES IN THE FEWEST  
POSSIBLE MOVES (24). THE STARS (\*) MUST END UP IN SQUARES  
6 TO 9 AND THE PERCENT SIGNS (%) IN SQUARES 1 TO 4.

AT EACH MOVE YOU MAY SLIDE OR JUMP ONE PIECE. A SLIDE IS A  
MOVE OVER TO AN ADJACENT EMPTY SQUARE. A JUMP MEANS TO HOP  
OVER AN ADJACENT PIECE TO THE EMPTY SQUARE NEXT TO IT.

FOR YOUR MOVE YOU MUST TYPE 2 NUMBERS. THE FIRST NAMES THE  
PIECE YOU WISH TO MOVE; THE SECOND, THE SQUARE TO GO TO.  
FOR EXAMPLE, 57 MEANS THE PIECE AT SQUARE 5 JUMPS TO SQUARE 7.

TYPE YOUR MOVE AFTER THE QUESTION MARK.

\*\*\*\*\* I I I I

1 2 3 4 5 6 7 8 9 7 5 4  
YOU CAN'T MOVE AN EMPTY SPACE!  
INPUT IGNORED.

\*\*\*\*\* I I I I

1 2 3 4 5 6 7 8 9 7 6 5  
\*\*\*\*\* I I I I 7 4-6  
\*\*\* I I I I 7 3-4  
\*\* I I I I 7 7 3  
THAT'S TOO BIG A JUMP!  
INPUT IGNORED.

\*\*\*\*\* I I I I

1 2 3 4 5 6 7 8 9 7 5 3  
\*\*\*\*\* I I I I 7 7 5  
\*\*\* I I I I 7 8 7  
\*\* I I I I 7 6 8  
\* I I I I 7 2 4  
SORRY, BUT SQUARE 4 IS OCCUPIED!  
INPUT IGNORED.

\*\*\*\*\* I I I I

1 2 3 4 5 6 7 8 9 7 4 6  
\*\*\*\*\* I I I I 7 2 4  
\*\*\* I I I I 7 1-2  
\*\* I I I I 7 3 1  
\* I I I I 7 5 3  
\*\*\*\*\* I I I I

1 2 3 4 5 6 7 8 9 7 7 5  
\*\*\*\*\* I I I I 7 9 7  
\*\*\* I I I I 7 8 9  
\*\* I I I I 7 6 8  
\* I I I I 7 4 6  
\*\*\*\*\* I I I I

1 2 3 4 5 6 7 8 9 7 2 4  
\*\*\*\*\* I I I I 7 3 2  
\*\*\* I I I I 7 5 3  
\*\* I I I I 7 7 5  
\* I I I I 7 6 7  
\*\*\*\*\* I I I I

1 2 3 4 5 6 7 8 9 7 4 6  
\*\*\*\*\* I I I I 7 5, 10 5 4  
\*\*\*\*\* I I I I

\*\*\* CONGRATULATIONS \*\*\*  
YOU'VE REVERSED THE FROGS IN 24 MOVES  
TYPE RUN TO PLAY AGAIN

100 NAME: FROGS\*\*\*

105

110 BY: MAC OGLESBY ON 12/01/74

115

120 DESCRIPTION: PROVIDES A REVERSING GAME IN WHICH THE PLAYER  
125 STARTS WITH TWO SETS OF PIECES ON A BOARD NINE SQUARES LONG.  
130 THE OBJECT IS TO REVERSE THE TWO SETS OF PIECES IN THE LEAST  
135 NUMBER OF MOVES.

140

145 INSTRUCTIONS: TYPE "RUN" FOR COMPLETE INSTRUCTIONS.

150

155 CATEGORY: GAMES\*\*\*

160

165 LANGUAGE: BASIC

170

```

175 INDEX LINE:
180 A REVERSING GAME WITH TWO SETS OF PIECES
190
195
1000 LET T=5
1010 LET E=8
1020 FOR J=1 TO 4
1030 LET P(J)=ASC(*)
1040 NEXT J
1050 LET P(5)=ASC( )
1060 FOR J=6 TO 9
1070 LET P(J)=ASC(%)
1080 NEXT J
1090 PRINT "WELCOME TO THE GAME OF FROGS!"
1100 PRINT
1110 PRINT "FOR INSTRUCTIONS, JUST PRESS 'RETURN'."
1120 PRINT
1130
1140 'PRINT THE BOARD, NUMBERING SQUARES ONLY AT THE BEGINNING,
1150 'AFTER ERROR MESSAGES AND AFTER EVERY T MOVES.
1160 FOR J=1 TO 9
1170 PRINT " " ; CHR$(P(J)) ;
1180 NEXT J
1190 IF M=24 THEN 1350
1200 FOR J=1 TO 4
1210 IF P(J)=ASC(%) THEN 1230
1220 GOTO 1350
1230 NEXT J
1240 FOR J=6 TO 9
1250 IF P(J)=ASC(*) THEN 1270
1260 GOTO 1350
1270 NEXT J
1280 PRINT
1290 IF M=24 THEN 1310
1300 PRINT "*** CONGRATULATIONS ***"
1310 PRINT "YOU'VE REVERSED THE FROGS IN";M;"MOVES"
1320 PRINT "TYPE RUN TO PLAY AGAIN"
1330 PRINT
1340 STOP
1350 IF INT(E/T)<>E/T THEN 1390
1360 PRINT
1370 PRINT
1380 PRINT " 1 2 3 4 5 6 7 8 9"
1390 LET E=E+1
1400 PRINT " " ;
1410
1420 INPUT C$
1430 IF LEN(C$)=8 THEN 1710
1440 IF LEN(C$)<>2 THEN 1650
1450 CHANGE C$ TO C
1460 IF (57-C(1))*(C(1)-49)<8 THEN 1650 'LOOK FOR A DIGIT FROM 1-9
1470 LET C(1)=C(1)-48
1480 IF (57-C(2))*(C(2)-49)<8 THEN 1650
1490 LET C(2)=C(2)-48
1500 'SEE IF LEGAL MOVE
1510 IF P(C(1))=32 THEN 1630
1520 IF P(C(2))<>32 THEN 1610
1530 IF ABS(C(1)-C(2))>8 THEN 1590
1540 'TALLY AND IMPLEMENT MOVES
1550 LET M=M+1
1560 LET P(C(2))=P(C(1))
1570 LET P(C(1))=ASC( )
1580 GOTO 1160 'CONTINUE THE GAME
1590 PRINT "THAT'S TOO BIG A JUMP!"
1600 GOTO 1670
1610 PRINT "SORRY, BUT SQUARE";C(2);"IS OCCUPIED!"
1620 GOTO 1670
1630 PRINT "YOU CAN'T MOVE AN EMPTY SPACE!"
1640 GOTO 1670
1650 PRINT "TO MOVE A PIECE, TYPE 2 DIGITS (BUT NOT ZERO).";
1660 PRINT "FOR INSTRUCTIONS, JUST PRESS 'RETURN'."
1670 PRINT "INPUT IGNORED. PLEASE TRY AGAIN..."
1680 LET E=8
1690 GOTO 1160
1700 'INSTRUCTIONS
1710 PRINT
1720 PRINT "YOU START WITH 8 PIECES ON 9 SQUARES (NUMBERED 1 THRU 9).";
1730 PRINT "THE OBJECT IS TO REVERSE THE TWO SETS OF PIECES IN THE FEWEST";
1740 PRINT "POSSIBLE MOVES (24). THE STARS (*) MUST END UP IN SQUARES";
1750 PRINT "6 TO 9 AND THE PERCENT SIGNS (%) IN SQUARES 1 TO 4."
1760 PRINT
1770 PRINT "AT EACH MOVE YOU MAY SLIDE OR JUMP ONE PIECE. A SLIDE IS A";
1780 PRINT "MOVE TO AN ADJACENT EMPTY SQUARE. A JUMP MEANS TO HOP OVER";
1790 PRINT "AN ADJACENT PIECE TO THE EMPTY SQUARE JUST BEYOND IT."
1800 PRINT
1810 PRINT "FOR YOUR MOVE YOU MUST TYPE 2 NUMBERS. THE FIRST NAMES THE";
1820 PRINT "PIECE YOU WISH TO MOVE; THE SECOND, THE SQUARE TO GO TO."
1830 PRINT "FOR EXAMPLE, 57 MEANS THE PIECE AT SQUARE 5 JUMPS TO SQUARE 7."
1840 PRINT
1850 PRINT "TYPE YOUR MOVE AFTER THE QUESTION MARK."
1860 GOTO 1680
1870
1880 END

```



# SMRT REVISITED

In the May 1976 issue of PCC we introduced you to SMRT, Single Message Rate Timing, a product of AT&T's department to raise revenues. SMRT, which is now being phased into California's metropolitan areas, assesses a surcharge of approximately 1 cent per minute on all calls over 5 minutes. The dial-up, time-sharing set up that presently costs you about \$7.50 a month to make local computer calls could increase to as much as \$80 a month, based on a 6-hour/day usage. Here's a followup to bring you up to date. You may want to reread that article to refresh your memory.

Ed Yasaki reports in the June 1976 issue of *Datamation* that SMRT was originally called Single Message Unit Timing but was changed because of company concern over the acronym that was sure to be used. He also reports that SMRT has been around for two years in selected New England locations and will come to YOU soon!

We were wrong, SMRT *does* apply to residential customers, but only those with measured or limited service. A fast appeal to the California Public Utilities Commission excluded so-called "lifeline" customers from the wrath of SMRT. If you have limited residential service, it may be worth your while to switch to unlimited service when SMRT SMARTS your neighborhood.

We looked at hardware designed to help us out of our SMRT problems and decided to use a multi-point lease line with Frequency Division Multiplexing (FDM) equipment. We were disappointed to find only two vendors provide FDM equipment on the west coast, General DataComm and Prentice Electronics (nothing against them, we were just hoping for more competition). Both are experienced in data communications with existing FDM customers whom we were able to call for reference and recommendation.

Prentice and GDC FDM's will allow six, 300-

baud channels to share one lease line. GDC claims as many as 19 110-baud terminals can share one line while Prentice claims only 18. Both will allow for 300 and 110-baud units on one line. GDC specifies that their equipment will only require standard voice grade lease lines while Prentice recommended the use of "conditioned" phone lines. Retail prices were about the same. There are other differences which the salesman will be happy to explain to you.

Our bid specs did a thorough job of explaining our "situation" and requested that vendors



reply with their best effort to minimize our phone costs. Our specs also required:

1. 15 or more 110-baud terminals to share one line
2. capability to mix 110 and 300 baud terminals on one line
3. compatibility with HP 2000 computer
4. ability to deliver over unconditioned phone lines
5. We asked the vendors to offer us something for the trade-in of our old, used equipment (curiosity motivated that requirement)

Prentice responded to the bid offering their M110 FDM unit at \$430 each with a rack mounted unit for the computer end which would cost \$350 each (excluding rack). They offered us \$25 apiece for our 'working' Prentice couplers. Prentice indicated in their bid a need for conditioned phone lines, rather than standard lines. It was the cost of line conditioning and Prentice's inability to guarantee service on regular lines that caused their bid to be rejected (see box).

GDC offered their model 1151 FDM subset at \$451.25 each, with channel card CM-2 for the computer end at \$369.30 each plus one common card at \$199.50. They also offered us \$25 each for our working acoustic couplers and modems. Though slightly more expensive than the Prentice bid, GDC's bid was accepted, because they guaranteed service over standard telephone lines with no line conditioning requirements.

The switchover from dial-up to lease lines is now complete and things are smooth (we had visions of complete pandemonium). It cost us \$15,000 but we figure we will save that much in SMRT phone charges in 12 months.

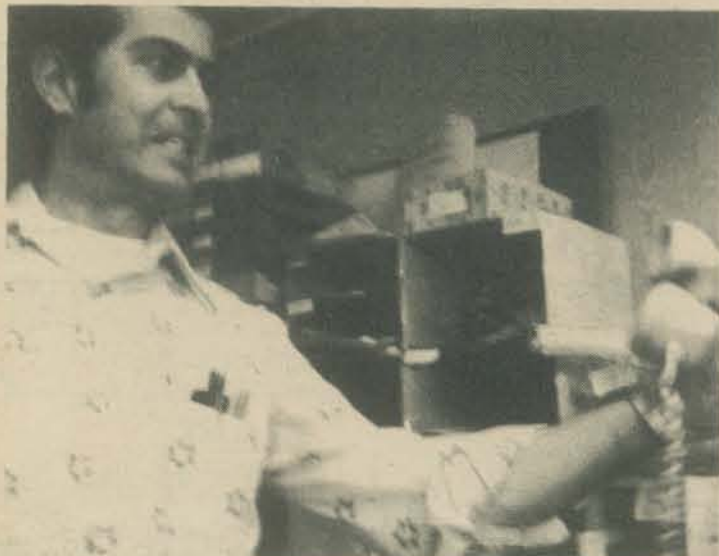
A large Southern California school district converted their communications system off dial-up at a cost of \$100,000. Nonetheless, they will break-even (SMRT-wise) within 30 months.

For the oversubscribed time-sharing system with more terminals than computer ports, a solution is eminent. What you need is a lease line port selector that will allow many terminals than computer ports to "contend" for 32 ports on a first-come, first-served basis. The INFOTRON 450 port selector 'may' do the job for you. Check it and its price out. Two companies indicated an interest in using a microcomputer system to front-end a mini to do the port contending job but no one has done it yet. Such a system could be put together for little money . . . but who will be the first to develop it??

GOOD LUCK TO YOU AS SMRT COMES YOUR WAY.

—LeRoy Finkel

➡ **SEE** LeRoy attack his telephone BELOW left.



## Line Conditioning

A conditioned phone line is a lease line of "better than voice grade" quality. Ma Bell guarantees the removal of extraneous noises and distortion so they will not interfere with data transmission. Line conditioning is a MUST for high speed (600 and up) data transmission. For 110 baud and 300 baud it should not be necessary.

Line conditioning is costly. A C1 quality (one level better than voice grade) costs you an additional \$10 per month for a point to point lease line going through only one central

office. For multi-point lines (many locations) the cost is \$20-25 per month PER LOCATION. In our case, five schools, C1 conditioning would have cost much more than \$100 extra per month since our lease lines had to go through three different central offices.

C2 conditioning, necessary over greater distances, faster speeds and in areas of weak service, costs \$38 per month for point to point and \$48 per month per point on a multi-point lease line.

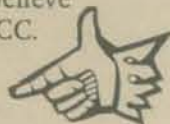
Add it all up and line conditioning costs too much!

\*All charges listed above are California tariffs for October, 1976.

# Make Believe Computers

And so we begin a series of articles called *Make Believe Computers*, wherein we "invent" computers that could, but as yet don't, exist. We hope that you out there will create your own make-believe computers and share them with us and with readers of PCC.

### Send a Make Believe Computer to the PCC Dragon



Our first realizable fantasy is a hand held computer designed to do the following things.

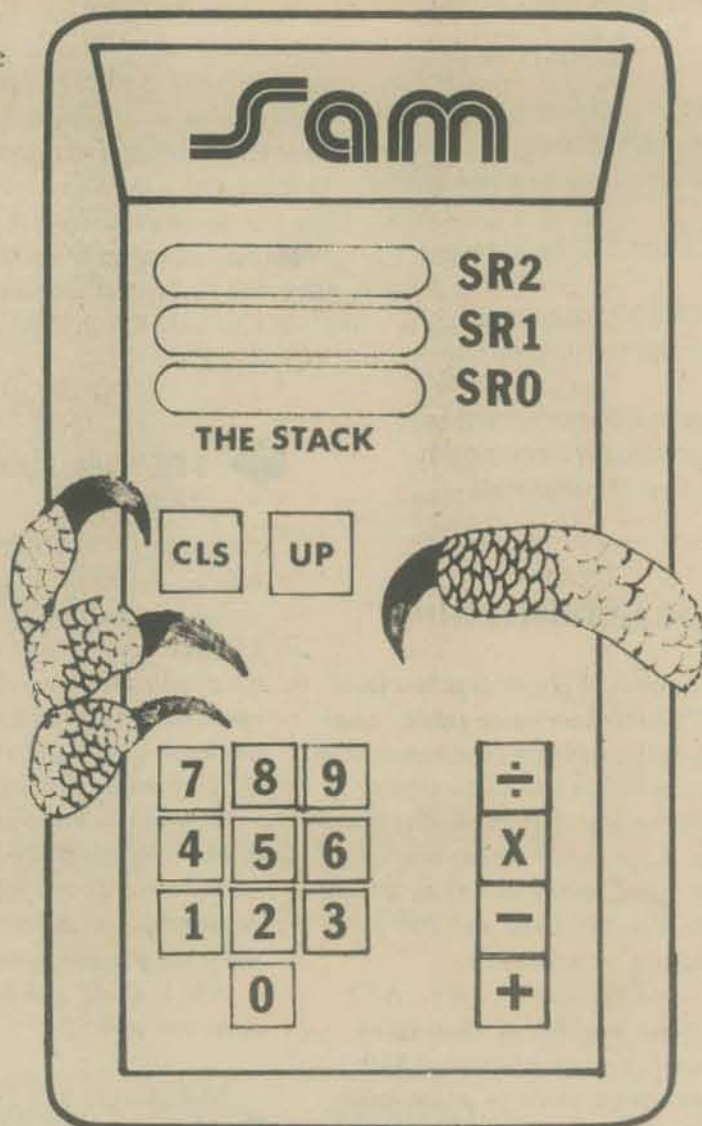
- Help you learn to program computers or calculators that use *stacks* and Reverse Polish Notation.
- Play games and do mathematical recreations.
- Help young children learn to “do arithmetic.”
- Solve problems in elementary number theory, especially the kind found in elementary school math books.
- Stuff we haven’t thought about yet . . .

[illegible]

This computer may never be built, may never exist. So . . . we will try to give you enuff information about this imaginary machine so that you could program it, should it someday exist. Also . . . we hope that you can transfer our ideas to computers and calculators that do exist, especially widely used calculators such as the NOVUS Scientist and the HP35, HP45, HP55, etc.

We will start with a very simple "calculator" and gradually build it up into quite a powerful computer.

Our first machine  
looks like this



We call it SAM

## By the Dragon



... it came to pass that the Dragon, having tired of real-life pursuits such as editing PCC and playing with computers as they were, began relinquishing his former duties to other creatures and turned his mind even more to realizable fantasies.

We will start by telling you about THE STACK. It consists of three *registers*. In the diagram above and below, the registers are labelled SRO, SR1 and SR2.



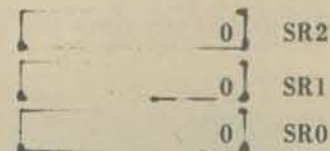
- Each register can hold one number at any one time.
- The number must be an *integer*. SAM is an integer machine.

[illegible]

Pretend that you are holding SAM in your hand.

➡ Press **CLS** This “clears the stack.”

The stack has been "cleared to zero" Each register now contains the number, 0.



TO CLEAR THE STACK, press **CLS**

Simple arithmetic. We begin by showing how to use SAM to add two numbers. Glance at the following example then read on.

PROBLEM:  $9 + 5 = ?$

➤ Press the keys shown below in left to right order. After you do this, the stack will appear as shown on the right.

Press CLS 9 UP 5 + 0 SR2

and the answer appears here

Same problem, but this time we show the keys from top to bottom instead of left to right. AND... we also show the stack after each key is pressed.

$9 + 5 = ?$

KEYS	THE STACK			
<div>CLS</div>	<div>0</div>	SR2		The stack is cleared. Each register now contains zero.
	<div>0</div>	SR1		
	<div>0</div>	SR0		
<div>9</div>	<div>0</div>	SR2		The 9 goes into SR0.
	<div>0</div>	SR1		
	<div>9</div>	SR0		
<div>UP</div>	<div>0</div>	SR2		The 9 in SR0 is copied UP into SR1.
	<div>9</div>	SR1		
	<div>9</div>	SR0		
<div>5</div>	<div>0</div>	SR2		The 9 is still in SR1. The 5 goes into SR0.
	<div>9</div>	SR1		
	<div>5</div>	SR0		
<div>+</div>	<div>0</div>	SR2		Here is the answer.
	<div>0</div>	SR1		
	<div>14</div>	SR0		

Well, if you don't quite understand what happened, hang on. We will explain exactly what happens in the stack as each key is pressed.

Press **CLS** and the stack now looks like

0	SR2
0	SR1
0	SR0

When we key in a number, it goes into SR0.

Press **1 2 3** and the number 123 goes here

0	SR2
0	SR1
123	SR0

- UP** When we press the UP key, SAM
- (1) moves the number that was in SR1 to SR2, then
  - (2) copies the number in SR0 into SR1. This number is now in both SR0 and SR1.

Wait a minute! What's that? Slow down, please (we hear you cry). OK, follow along as we press UP twice, starting with the stack as shown above.

Press **UP**

0	SR2
123	SR1
123	SR0

Press **UP**

123	SR2
123	SR1
123	SR0

Your turn. If we press the following keys in left to right order, what will the stack look like?

Press **CLS 3 7 UP UP**

	SR2
	SR1
	SR0

Write your answers here

THE STACK

Follow along as we put three different numbers in the stack.

Press **CLS** to clear the stack

0	SR2
0	SR1
0	SR0

Press **1** then press **UP**

0	SR2
0	SR1
1	SR0

Press **2** then press **UP**

0	SR2
1	SR1
2	SR0

Press **3**

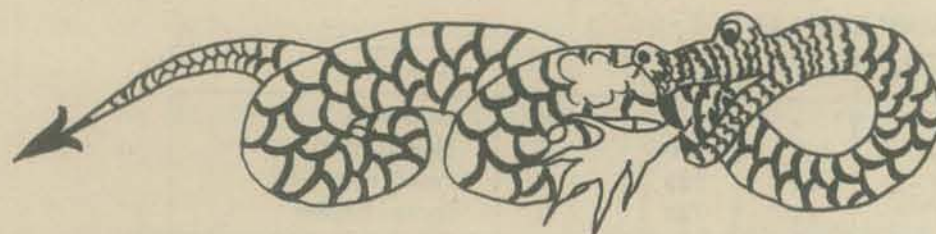
1	SR2
2	SR1
3	SR0

We now have 3 different numbers in the stack.

From now on, we will omit the horizontal lines between registers

For your further reading pleasure, here are some BEFORE and AFTER examples. We show the stack BEFORE pressing UP then AFTER pressing UP.

BEFORE	AFTER							
<table><tr><td>5</td></tr><tr><td>-2</td></tr><tr><td>37</td></tr></table>	5	-2	37	<table><tr><td>-2</td></tr><tr><td>37</td></tr><tr><td>37</td></tr></table>	-2	37	37	SR2 SR1 SR0
5								
-2								
37								
-2								
37								
37								
BEFORE	AFTER							
<table><tr><td>1</td></tr><tr><td>2</td></tr><tr><td>3</td></tr></table>	1	2	3	<table><tr><td>2</td></tr><tr><td>3</td></tr><tr><td>3</td></tr></table>	2	3	3	SR2 SR1 SR0
1								
2								
3								
2								
3								
3								



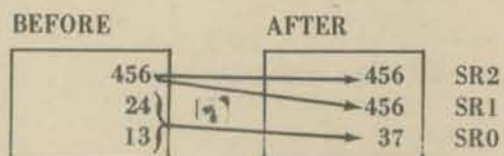
- +** When we press this key, SAM
- (1) Adds the number in SR0 to the number in SR1 and puts the sum in SR0
  - (2) Copies the number in SR2 down into SR1.
  - (3) Keeps the number in SR2 in SR2.

Go on →

BEFORE                      AFTER

Register	Before	After
SR2	1	1
SR1	2	1
SR0	3	5

The diagram illustrates the state of three registers (SR2, SR1, SR0) before and after a swap operation. In the 'BEFORE' state, SR2 contains 1, SR1 contains 2, and SR0 contains 3. In the 'AFTER' state, SR2 still contains 1, SR1 now contains 1, and SR0 now contains 5. A box labeled '2' is shown between the 'BEFORE' and 'AFTER' states, indicating the value of SR1 before the swap.

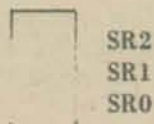


PROBLEM:  $9 + 5 = ?$

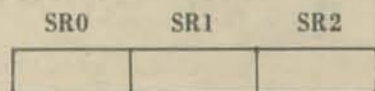
KEYS	SR0	SR1	SR2	REMARKS
CLS	0	0	0	The numbers in SR0,
9	9	0	0	SR1 and SR2 are the
UP	9	9	0	contents of these
5	5	9	0	registers after the key
+	14	0	0	on the same line is
				pressed.

**Answer**

Instead of showing the stack vertically



We show it horizontally with SR0 on the left and SR2 on the right.



Except! For numbers of more than one digit, we will show the number keys on the same line.

PROBLEM:  $123 + 95 = ?$

KEYS	SRO	SR1	SR2	REMARKS
CLS	0	0	0	Clear stack
123	123	0	0	First number
UP	123	123	0	Push it up to SR1
95	95	123	0	Second number
+	218	0	0	Answer in in SR0

[illegible]

PROBLEM:  $a + b = ?$

KEYS	SR0	SR1	SR2	REMARKS
CLS	0	0	0	Clear the stack
INP a	a	0	0	Key in the value of a
UP	a	a	0	Push a up to SR1
INP b	b	a	0	Key in value of b
+	a + b	0	0	Value of a + b in SR0

"INP b" means key in the numerical value of b"

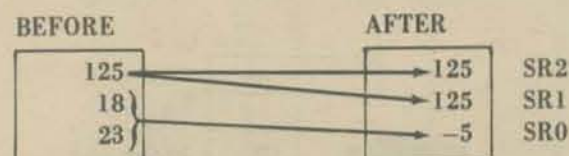
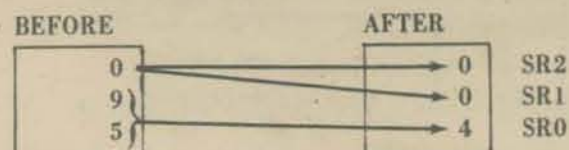
This is a  
program to  
compute  
 $a + b$

CLS
INP a
UP
INP b
+

A *program* (for the time being) is a sequence of keys to solve a problem.

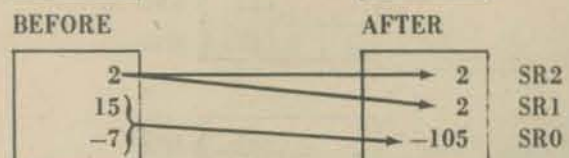
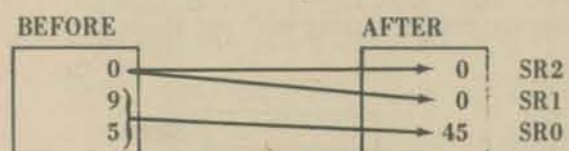
— When we press this key, SAM

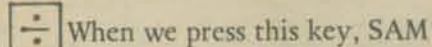
- (1) Subtracts the number in SR0 from the number in SR1 and puts the result (difference) in SR0.
- (2) Copies the number in SR2 down into SR1.
- (3) Keeps the number in SR2.

$$\begin{aligned} & \# + \circ [+^{\circ} \circ] \square \square \mid \square \mid \# \sqrt{(\otimes) +^{\circ}} \star \# = + \mid \alpha \parallel \circ [\# [\# =] [\# \square \mid] ] = \sigma + \#^{\circ} \circ = \\ & [\alpha + \# \star = \parallel \mid \star \circ] = [\sigma = \#^{\circ} \circ] \circ 395 \mid \# = \# + \sqrt{\otimes 8 \circ} = \square \parallel \mid \mid \alpha [\# \# ?] = \sqrt{\end{aligned}$$


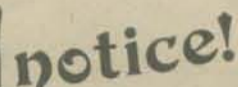
**X** When we press this key, SAM

- (1) Multiplies the number in SR1 by the number in SR0 and puts the result (product) in SR0.
- (2) Copies the number in SR2 down into SR1.
- (3) Keeps the number in SR2.





- (1) Divides the number in SR1 by the number in SR0 and puts the integer quotient in SR0.
- (2) Copies the number in SR2 down into SR1.
- (3) Keeps the number in SR2.



Did you notice? On dividing 9 by 5, SAM gave the integer quotient, 1.

1 ← ... Quotient. SAM does this.

5  $\overline{) 9}$

5

4 ← ... Remainder. SAM doesn't do this.

Here are programs to subtract, multiply or divide two numbers.

PROBLEM:  $a - b = ?$

PROGRAM	SR0	SR1	SR2	REMARKS
CLS	0	0	0	Clear the stack
INP a	a	0	0	Key in value of a
UP	a	a	0	Push a up to SR1
INP b	b	a	0	Key in value of b
—	a - b	0	0	Answer is in SR0

PROBLEM:  $a \times b = ?$

PROGRAM	SRO	SR1	SR2	REMARKS
CLS	0	0	0	Clear the stack
INP a	a	0	0	Key in value of a
UP	a	a	0	Push a up into SR1
INP b	b	a	0	Key in value of b
X	a x b	0	0	Answer is in SR0

PROBLEM:  $a \div b = ?$

PROGRAM	SR0	SR1	SR2	REMARKS
CLS	0	0	0	Clear the stack
INP a	a	0	0	Key in value of a
UP	a	a	0	Push a up into SR1
INP b	b	a	0	Key in value of b
÷	a ÷ b	0	0	Answer is in SR0



## Important Notice!



**IMPORTANT NOTICE!!!** If we key in a number immediately after pressing +, -, X, or  $\div$ , the number pushes the numbers already in the stack up one place. The number being keyed in goes into SR0. Here are two examples.

PROBLEM:  $a + b + c = ?$

PROGRAM	SR0	SR1	SR2	REMARKS
CLS	0	0	0	
INP a	a	0	0	Stack not pushed up
UP	a	a	0	
INP b	b	a	0	Stack not pushed up
+	a + b	0	0	
INP c	c	a + b	0	Stack is pushed up
+	a + b + c	0	0	Answer is in SR0

PROBLEM:  $a^2 + b^2 = ?$

PROGRAM	SR0	SR1	SR2	REMARKS
CLS	0	0	0	
INP a	a	0	0	Stack not pushed
UP	a	a	0	
X	a <sup>2</sup>	0	0	
INP b	b	a <sup>2</sup>	0	Stack is pushed
UP	b	b	a <sup>2</sup>	
X	b <sup>2</sup>	a <sup>2</sup>	a <sup>2</sup>	
+	a <sup>2</sup> + b <sup>2</sup>	a <sup>2</sup>	a <sup>2</sup>	Answer in SR0

#□|| [■□)□□C@3875[·|| | ‡'□|| | ?)P♦†09#|| □=■+⑧□♦C†  
 \*'=|| | +■√=|■|√=□[†@°)♦| | ♦Q| @□#|| || ■+°C♦C■[+| ‡□|| |



## REMEMBER

If we key in a number immediately after pressing UP, the stack is not pushed. The number keyed in goes into SR0, but SR1 and SR2 are not changed.

If we key in a number immediately after pressing +, -, X or  $\div$  the stack is pushed. The number that was in SR1 is pushed into SR2 and the number that was in SR0 is pushed into SR1.



## What? Homework, too?!

NEXT TIME, we will add some new keys to SAM and work on some fancier problems. In the meantime, try your hand at writing programs to tell SAM how to do these problems.

- (1)  $ab + cd = ?$
- (2)  $(a+b)(c+d) = ?$
- (3)  $ax^2 - by^2 = 0$
- (4)  $ab + cd + ef = ?$
- (5)  $x^3 + y^3 = ?$
- (6)  $a \times 8^2 + b \times 8 + c = ?$
- (7) Write a program to compute the quotient and remainder on division of a by b.

We will publish solutions next time, hopefully your solutions. Send us some solutions. Or . . . send some problems!

AND... SEND A MAKE-BELIEVE COMPUTER TO  
THE PCC DRAGON

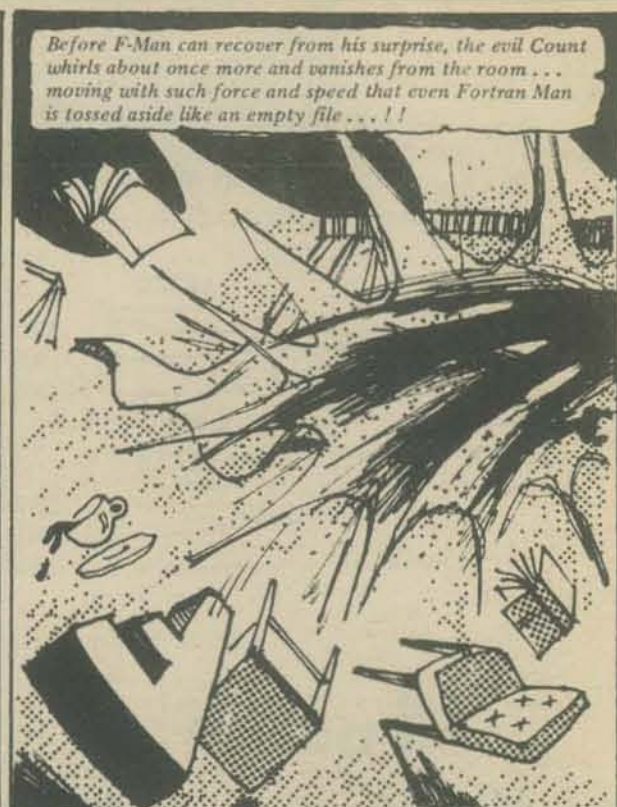
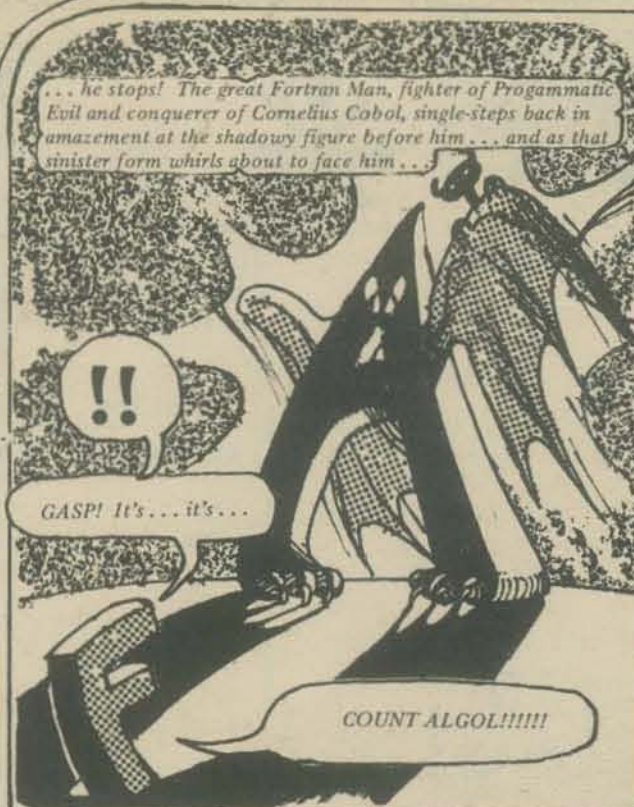
Please!



# FORTTRAN MAN

By Lee Schneider  
& Todd Voros

\*\*\*\*\*  
In our last episode, Forttran Man completed the long, multi-cycle journey down from the channel from 360 City, relocating himself from his native home to the 'Old Country' of Transistoria... There, past the Great Core Planes and beyond to the very edge of the Monolithic Mountains, he is once again re-united with his oldest friend and ally, Herr Doktor Debug, with whom he joins forces to combat the mysterious plague which has struck the land, leaving file after file terminated most unnaturally — drained of life-giving bits!  
On the assumption the plague is the work of a demented program, Forttran Man and the Doktor compile a plan. With the aid of the Doktor's beautiful daughter Parity, they seal off the town, checkpointing every address with pass words known only to them...  
Only the Doktor's resident address remains unchecked, and here F-Man and the Doktor wait...  
Suddenly, a noise from the next room alerts them! With his usual speed, F-Man branches into the room, but them...



An instant later, Doktor Debug appears in the doorway to investigate the sudden oscillations taking place in his daughter's room...

Good heavens, F-Man! What happened in here?

Did you see who it was?

Oh, I saw all right — and I still don't believe it! And neither will you when I tell you... it was — Count Algol!



The Doktor and F-Man return to the living room, and there is immediate discussion of the startling discovery which F-Man has made...

No, F-Man — I'm really not that surprised... you might even say I sort of expected it! But... I thought Count Algol was only a legend!

No, F-Man... when you have spent as much of your life as I have in the Old Country, you know that Count Algol is no legend!

But... who is he? Where did he come from?



Yes... I do recall studying the House of Algol... some of my own ancestors were of that house... but, what of the Count? What happened to him to make him from a respectable compiler into the evil destroyer he is today?

The Count is one of the oldest of the Algol lines, F-Man, and in his own time he was most respectable!



And, as computation goes, his time came to be phased out — replaced by newer versions!

But the Count would not go! Thrown out of Europe, deprived of his own files, he now lives off others!



The discussion continues long into the late cycle, as the Doktor gives Forttran Man the background of his newest and perhaps his most formidable opponent...  
F-Man learns how the Count wandered across Europe from system to system, always keeping one step ahead of the updates which would phase him out... and how, with each move, the Count would absorb the contents of one innocent file after another, growing stronger with each input...  
And, among the discussions, F-Man and the Doktor begin the compilation of another plan, this time a plan which is oriented directly towards the termination of the Count...  
On the rising edge of the next cycle, Forttran Man and Doktor Debug relocate themselves to the lower boundary of the data field, where they are met by Parity (who has spent the previous cycle staying safely at the local Job Controller's office...)

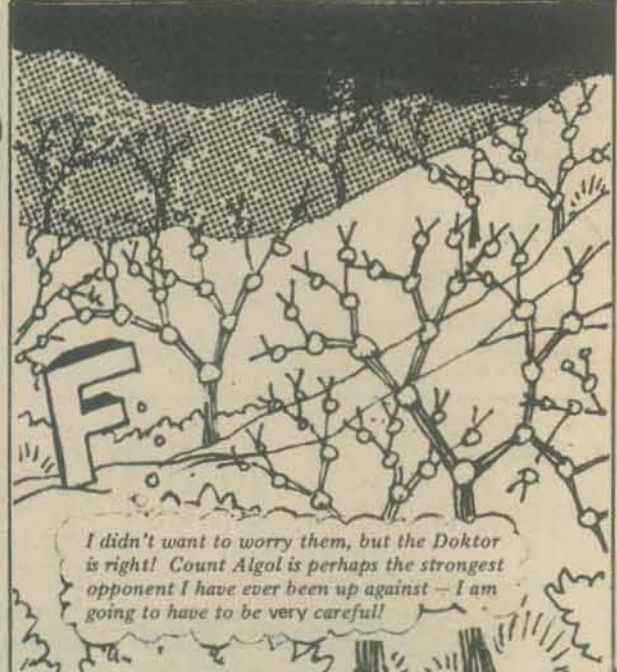


Are you sure you don't want me to accompany you, F-Man... after all, after an encounter with the Count, you may be needing my services...!

No, Herr Doktor, we've discussed all that already... you should know by now that for things like this, I never run parallel process — it's a case of stand-alone processing.....

Well, be careful then! The Count is a dangerous opponent! I want you to RETURN with all of your variables intact..!

Me too, F-Man! Promise me you will be careful!



Leaving the Doktor to mind his Parity once more, Forttran Man climbs over the wall of file-control blocks and enters the data field... moving directly for the castle of his foe...

Crossing the great open DIMENSIONS of the data field, F-Man encounters a small-scale hardware bug, warning itself on one of the many outcroppings of silicon.....



Nothing to worry about... a hardware bug never misbehaves while someone is watching it...

After the lengthy but interesting journey across the data field, Fortran Man stands at last at the entrance point of Count Algol's castle... the once dynamic structure crumbling into useless bits from lack of refreshing...



This place certainly has a feeling of abnormal termination about it...

Looping around the falling blocks of data, Fortran Man passes through the entry point of the castle and enters into the domain of the evil Count... and F-Man CALLS his opponent out to face him...



COME ON OUT, COUNT!

YOUR NUMBER IS UP!

For a moment, there is only the sound of the echoes of F-Man's signal dying away... Then, with incredible speed, the entry point of the castle slams shut! F-Man spins about, and once again is face-to-face with... Count Algol!



Aha! So there you are!

Prepare to meet your match, you despoiler of innocent files!

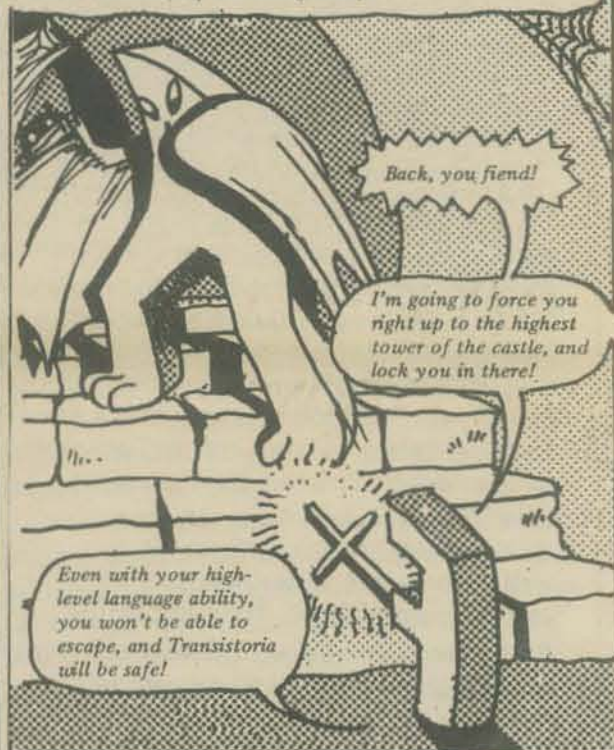
But Count Algol is confident in his power, and with the blinding speed which is his trademark, he lunges straight for F-Man! Fortran Man, however, shows speed of his own, reaches into his matrix, and pulls out...



A CROSS ASSEMBLER, Count!

This is one thing which even your power cannot stand against!

Holding the cross-assembler towards his foe, Fortran Man drives the count up the voltage ramp...



Back, you fiend!

I'm going to force you right up to the highest tower of the castle, and lock you in there!

Even with your high-level language ability, you won't be able to escape, and Transistoria will be safe!

Slowly, increment by increment, Fortran Man ups the Count, until finally they reach the top of the castle's highest data structure... but then, as fate would have it...



All right, Count! Now we... OW!

clink!

uh-oh...

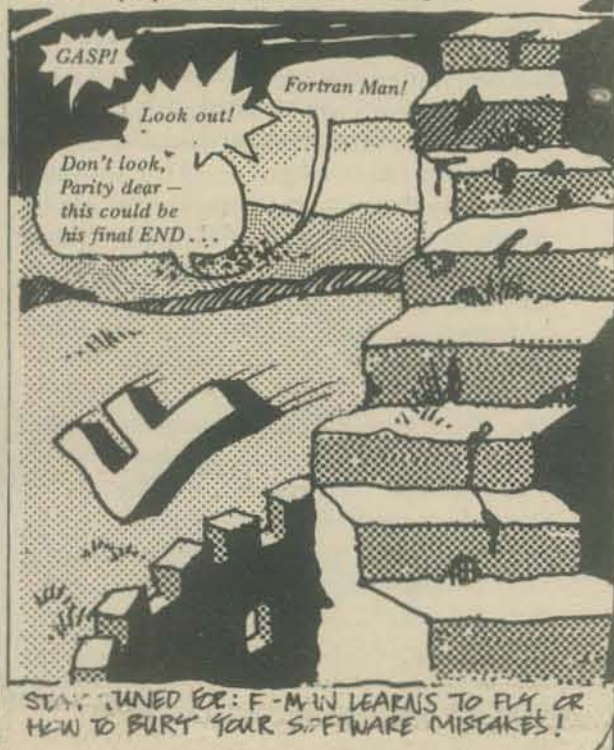
Seeing his chance to escape imprisonment, Count Algol leaps at Fortran Man before the cross assembler may be recovered...



ACK!

F-Man steps back to avoid the attack, but the decaying data structure crumbles beneath his weight, and...

And at this moment, from a vantage point far from the castle, the townspeople are witness to a terrible sight...



GASP!

Look out!

Fortran Man!

Don't look, Parity dear - this could be his final END...

STAY TUNED FOR F-MAN LEARNS TO FLY, OR HOW TO BURY YOUR SOFTWARE MISTAKES!

WIN an MAI Video  
Terminal or JOLT Kit!!

Microcomputer Associates Inc. (MAI) is  
sponsoring a Tiny BASIC game contest!

- 1st Prize: VT-200 terminal with resident  
Tiny BASIC and JOLT assembler  
2nd Prize: VT-100 terminal  
3rd Prize: JOLT 4K system kit  
4th - 10th Prize: JOLT CPU kits

## TINY BASIC

### CONTEST RULES:

- All entries must be postmarked by April 1, 1977.
- All entries must be submitted as follows:
  - JOLT Tiny BASIC source program as paper tape with CR, LF and four (4) rubout characters terminating each source statement.
  - Running instructions, game description and at least one example of game play - all in typewritten form on 8 1/2" x 11" white bond suitable for printing.
- All entries must run on an MAI VT-200 equipped with 4,096 bytes of RAM storage, OR on a JOLT 4K system equipped with Tiny BASIC.
- All entries must run correctly and be sufficiently well documented to enable a non-technical person to enter, run and play the game as directed by the running instructions. Entries which for any reason do not run or are not sufficiently well documented to enable easy entry and play will be **DISQUALIFIED**.
- All decisions by MAI with respect to acceptance, disqualification, and winners will be final.
- MAI employees and their families are not eligible to enter.
- This contest is void where prohibited by law.
- All entries become the property of MAI and will not be returned.
- Contest winners will be notified by registered mail no later than 60 days from contest closing date of April 1, 1977. Contest Winners will also be published in the Microcomputer Digest and the JOLT Users Newsletter. Contest Winners may also be obtained directly by sending a stamped self-addressed envelope to MAI no earlier than May 1, 1977 and no later than July 1, 1977.
- The JOLT Tiny BASIC language summary is available at participating computer stores. The language summary may also be obtained by sending \$1.00 cash, check or money order for postage and handling to MAI Tiny BASIC, P.O. Box 1167, Cupertino, CA 95014. A paper tape form of JOLT Tiny BASIC complete with documentation is available by sending \$5.00 cash, check or money order to ITTY BITTY Computers, P.O. Box 23189, San Jose, CA 95153.

\$ CONTESTS \$\$



DAZZLER  
SOFTWARE  
CONTEST  
\$\$1000 in Prizes!

Sponsored by People's Computer Company  
P.O. Box E, Menlo Park, CA 94025



- FIRST PRIZE:** \$500 certificate for hardware from CROMEMCO
- SECOND PRIZE:** \$250 certificate for hardware from CROMEMCO
- THIRD PRIZES:** 10 - \$35 certificates for hardware from CROMEMCO
- HONORABLE MENTIONS:**  
16 copies of *What to Do After You Hit Return*, PCC's First Book of Computer Games

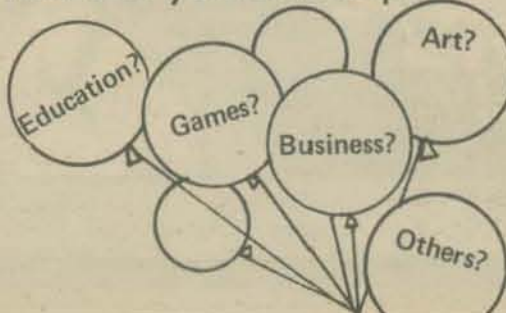


### \*OBJECT:

Develop a program resulting in a new and interesting display using the Cromemco TV Dazzler. (The Dazzler is an interface that permits a home color TV set to be a graphic terminal for certain microcomputers.)

Microcomputers can be incredibly versatile. The Dazzler adds the dimension of full-color graphic display to the microcomputer.

### What can you develop?



### \* RULES: \*

- Submit as many entries as you like:
- All entries must use the Cromemco Dazzler display and must not require more than 20K of computer memory. You can arrange with any of these San Francisco Bay Area places to use a Dazzler: PCC - call John Snell at (415) 323-3111  
Byte Shop No. 1 - call Boyd Wilson at (415) 969-5464  
Byte Shop No. 5 - call Bob Moody at (415) 327-8080  
or call your local Byte Shop or computer hobbyist store (see the list in this issue) and see what arrangements you can make.



- All entries will be judged by People's Computer Company on
  - Originality
  - General user appeal
  - Clarity of documentation
- Entries should include source code and object code on punched paper tape. A listing of an appropriate bootstrap loader should also be provided.
- Software should be compatible with MITS REV 1 serial I/O port convention for I/O requirements (i.e., data transfer is on port 1, bit 7 [active low] of input port 0 is used to indicate transmitter empty, and bit 0 [active low] of input port 0 is used to indicate receiver ready).

### SEND ALL ENTRIES TO:

People's Computer Company  
P.O. Box E  
Menlo Park, CA 94025



**EXTENDED DEADLINE:** Entries must be received by December 31, 1976.

# Personal Computers for Education

A Conference Section

in

## THE FIRST WEST COAST COMPUTER FAIRE

A Conference & Exposition on

Personal & Home Computers

PALO ALTO, CA — For the first time, a major conference activity of national scope will focus on the educational uses of so-called "personal" or "hobby" computers in home and school environments. The "Personal Computers for Education" Section of the First West Coast Computer Faire, to be held in San Francisco on April 15-17, 1977, appears certain to be one of the largest Conference Sections of the entire convention. This Section is expected to include two full days of papers, panel sessions, and tutorials. These will present ideas, information, and experiences concerning the use of these very low-cost, general purpose digital computers for educational activities.

This article is intended to be both a call for papers and participants for this Conference Section, and also an announcement of some of the topics expected to be discussed in this Section of the Faire.

Those wishing to present papers, conduct tutorials, participate in or organize panel sessions, or offer suggestions concerning Personal Computers for Education should contact:

Marvin Winzenread

3360 Tonga Lane, Alameda CA 94501  
(415) 521-2119, 881-3414 [message]

or Don Inman

350 Nelson Road, Scotts Valley CA 95066  
(408) 335-3360, (415) 323-3111 [message]

Those wishing to present papers, etc., in other areas of the conference should contact:

Jim Warren, Faire Chairbody

Box 1579, Palo Alto CA 94302  
(415) 851-7664, 323-3111

### Some of the Topics

The following are some of the topics expected to be included in the conference section on Personal Computers for Education, and for which papers are being actively solicited:

- Choosing very low-cost computer equipment for use in the classroom
- Computer-based games and simulations of particular educational value
- Educational uses of computer-driven television and graphics displays
- Uses of computers in teaching numeration systems, and Boolean arithmetic & algebra
- Use of low-cost computer speech synthesis and video output for pre-readers
- Uses of computers to maximize conceptual learning while minimizing drudgery
- Facilities for individualized computer-aided instruction (CAI) on very low-cost computers
- Uses of personal computers & computer kits

in science and vocational classes

- Experiences with using personal computers and computer kits in the classroom
- Educational uses of computers in the home and so on. Note that this Conference Section is *not* expected to be concerned with: data processing for education, expensive educational time-sharing systems, nor any educational uses requiring expensive computers.

### University Course Associated with the Conference Section

A 2 quarter-unit professional course "Computers for Education" is available through the University of California. The course has no prerequisites and will include 6 hours of pre-conference tutorials, attendance at specified Conference Sessions, and a post-conference summation and report. For local residents, the pre-conference tutorials will be held on April 12 and April 14, the Tuesday and Thursday evenings preceeding the Conference. Participants not living in the San Francisco Bay Area may, instead, attend a pre-conference tutorial on Friday, April 15, from 9 AM - noon and 1 - 4 PM. The post-conference summation will be held Sunday afternoon, April 17, making it possible to complete the course attendance during the three-day weekend (April 15-17, 1977).

The \$70 cost of the course covers admission to the Faire and some instructional materials. To receive a descriptive brochure and application form, request information on course X402b, "Computers for Education," from Bonnie Stiles

University Extension, 2223 Fulton St  
Berkeley CA 94720; (415) 642-1061.

The Computer Faire will include a considerable number of other Conference Sections and activities which are also likely to be of interest to educators concerned with computers. These include: Computers Graphics with Personal



Computers, Computer-Driven & Computer-Assisted Music Systems, Personal Computers for the Physically Handicapped, Speech Synthesis Using Home Computers, a number of sessions concerning equipment and programming standards, and others directed towards computer club leaders. There will also be an exhibit of "homebrewed" personal computer systems with prizes being awarded to the most outstanding such systems. Additionally, there will be several banquets and a luncheon, for which there will be speakers of major prominence. Both the banquets and several "social centers" located around the convention facility will offer the opportunity to leisurely meet with others having similar interests from throughout the United States and Canada.

The Computer Faire is expected to draw 7,000 to 10,000 people. Nearly 100 Conference Sessions are planned, and over 200 exhibitors are expected for the Exposition portion of the Faire.

The Exposition portion of the Computer Faire will provide ample and perhaps unique opportunities to examine virtually all of the available kits, systems, and peripherals that are currently being marketed to users of personal and home computers. Because this Computer Faire is expected to be the largest convention of the year that is exclusively devoted to personal computing, one may reasonably assume that virtually every manufacturer of low-cost computer equipment will be exhibiting their wares.

General purpose digital computers have been a consumer item for only about 22 months. Available for \$100 to \$800 and more, about 20,000 of these machines have been purchased for personal and home use. Because of their extremely low cost and general capabilities, a rapidly increasing number of them are finding their way into elementary and secondary school classrooms. Additionally, the computers found in homes are as much a source of fascination for children as they are for adults.

In the home or school, these "personal" computers have found a broad potential for subtle and overt educational uses. This potential is noticeably enhanced by the ease with which they may be connected to television sets to provide alphanumeric and graphic output. Additionally, the availability of new, low-cost speech synthesis peripherals provides — for the first time — the capability for complex interaction with pre-reader children.

To date, there has been little if any opportunity for those who are using these low-cost systems for educational purposes to meet and exchange ideas, experiences, and information. In particular, there has been no national conference activity focusing explicitly on the topic of personal computers for education. The Computer Faire will provide that opportunity. You are encouraged to attend and participate, and to prominently post the enclosed flyers describing the Faire.



# QUARK!



## THE 1976 NOBEL PRIZE IN PHYSICS: SYMMETRY AND THE BIRTH OF THE CHARM QUARK

by Dr. Minh Doung-Van  
Stanford Linear Accelerator Center

In October 1976 a joint Nobel Prize in Physics was awarded to two American physicists: Burton Richter of SLAC (Stanford Linear Accelerator Center, Stanford University) and Samuel Ting of MIT. The discoveries of the  $J$  or  $\psi$  particle independently performed here at SLAC and at BNL (Brookhaven National Laboratory) confirmed the predicted existence of the CHARM QUARK, proposed by James D. Bjorken of SLAC and Sheldon L. Glashow of Harvard. The main motivation for invoking the existence of this fourth quark was based solely on an aesthetic consideration: the symmetry of the subnuclear world.

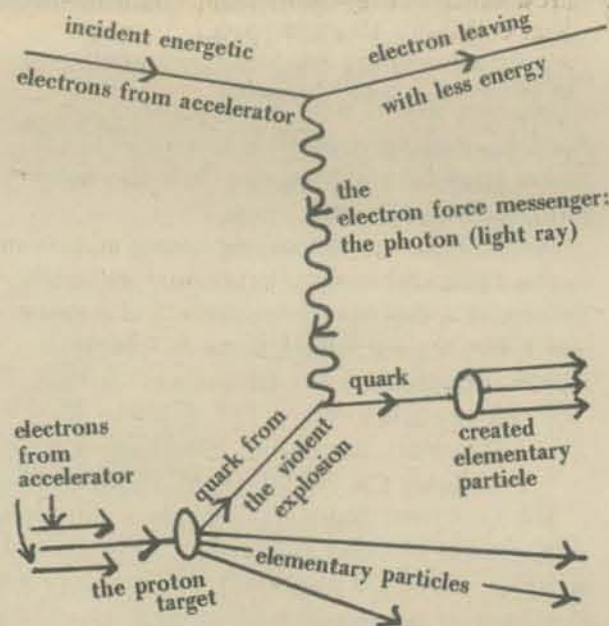
Symmetry is always fascinating to the human mind. Nature in its own beautiful and simple way, often exhibits certain kinds of symmetry: the crystals of rocks, the petals of flowers, the perfect body of a beautiful woman . . .

What is symmetry? The noted mathematician, Herman Weyl, who contributed greatly to the works of group theory gave a good definition: a thing is symmetrical if there is something we can do to it so that after we have done it, it looks the same as it did before. The symmetries of the physical laws in the subatomic level manifest themselves in the most profound and beautiful way. In quantum mechanics, a branch of science devoted to subatomic level, we have discovered that for each of the rules of symmetry, there is a corresponding entity which is conserved: for example, the symmetry in the translation in space corresponds to the conservation of momentum, the symmetry in time corresponds to the conservation of energy. In the subatomic world, we have discovered several more dimensions like space and time that manifest these symmetries and correspondingly, we discovered several more entities which are conserved. Unfortunately, these symmetries which appear in this subnuclear world have no classical analog. And out of these symmetries, however abstract, the CHARM QUARK was born.

What are QUARKS? In 1810, John Dalton proposed that matter cannot be infinitely divisible, and the ultimate divisibles should exist and they are called atoms. It turns out that atoms are far from being elementary; an atom consists of a small nucleus that carries most of the mass, swarmed with a cloud of electrons. The nucleus itself is not even fundamental; it consists of "elementary" particles called protons and neutrons. The lightest nucleus is the hydrogen atom nucleus, consisting of just one proton. At

SLAC, what we have done is to peel off the electrons from the atoms and accelerate them down the two-mile linear accelerator by pumping energy onto them until they reach the maximum available energy of 21.5 GeV (21.5 thousand million electron volts) and bombard them upon a liquid hydrogen target. With the impact of these highly energetic electrons, the hydrogen target nucleus explodes, and out of this violent explosion, other elementary particles reveal the physical laws that these elementary particles obey. This crude method of investigation is perhaps analogous to banging two watches together in order to learn about what makes them tick from the flying gears and springs. However crude the method, the created particles do follow a pattern. J. D. Bjorken from SLAC and Richard Feynman from CalTech predicted and concluded from the SLAC "single-arm" experiment that the proton is indeed not elementary, and the particles produced are actually the decay products of more elementary entities: the QUARKS.

Symbolically, the process looks like this:



Following a series of important experiments at Stanford conducted by Wolfgang Panofsky and Robert Hofstadter, the 1969 experiment headed by Richard Taylor at SLAC confirms that the proton target does not interact with the electrons as a whole, but only as one basic building block of the proton is responsible. These building blocks are the quarks.

The concept of quarks was invented earlier (1962) by Murray Gell Mann and George Zweig of CalTech. They proposed that the hadrons (see Chart 1) are composed of quarks, and Gell-Mann supplied the name quarks, from a line in James Joyce's *Finnegan's Wake*: "Three quarks for Muster Marks!" By that time there were several dozen elementary particles; it was not known if they had any fundamental relation to each other. The immediate inspiration for the

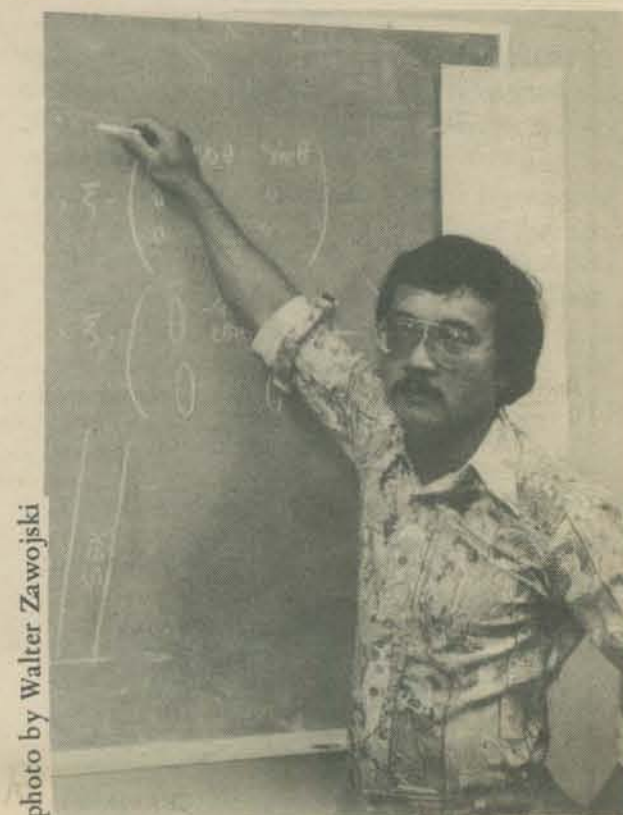
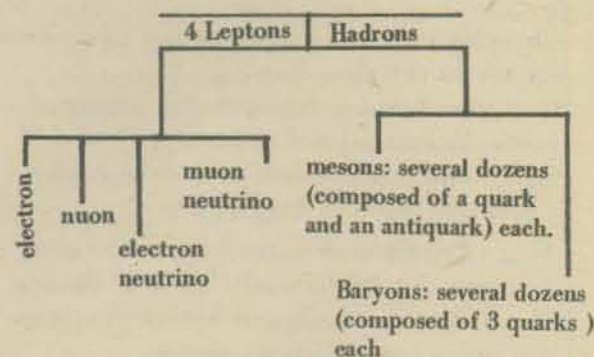


photo by Walter Zawojski

Dr. M. Doung-Van is a physicist from SLAC. He is currently investigating experimentally and theoretically the process whereby a quark and an antiquark annihilate each other into pure energy out of which a lepton pair is spontaneously created (the Drell-Yan Process).

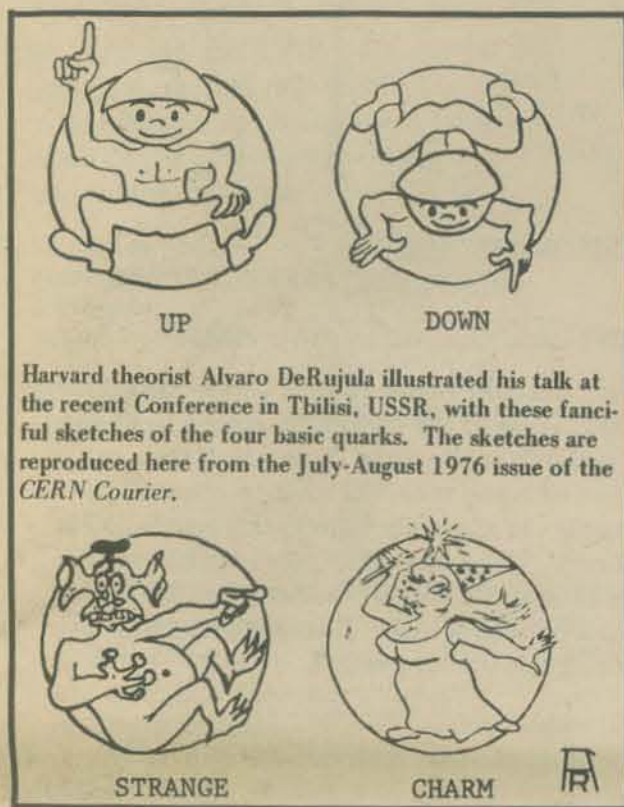
quark hypothesis was the postulate by Gell-Mann that all the hadrons can simply be grouped into families of a few members each. The properties which are used to classify them are called *quantum numbers*.

Chart 1. SOME ELEMENTARY PARTICLES



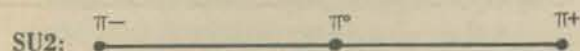
The quantum numbers are: *electric charge*, the *baryon number*, and the *strangeness number*. Another quantum number is the *spin angular momentum*. All baryons are grouped together in multiplets of the same spin angular momen-

tum. Within each multiplet, the members are distinguished from one another by two other quantum numbers: the *isotopic spin* and the *hypercharge*. The hypercharge is determined by the electric charge of these particles, their baryon numbers and their strangeness. The classification of particles within a multiplet is based on a special branch of mathematics called group theory, and the basic members in this theory are the quarks. Gell-Mann proposed that there need to be only three quarks to build the whole structure of several dozens of mesons and baryons. He named the three quarks the up (u), the down (d), and the strange (s) ones.



Harvard theorist Alvaro DeRujula illustrated his talk at the recent Conference in Tbilisi, USSR, with these fanciful sketches of the four basic quarks. The sketches are reproduced here from the July-August 1976 issue of the CERN Courier.

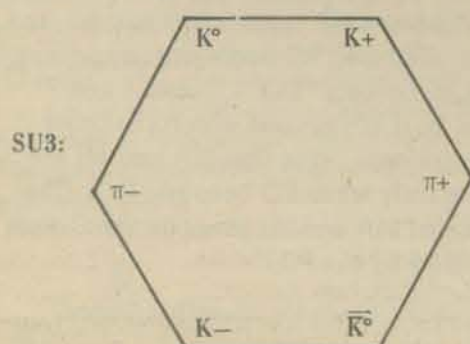
Prior to 1955, no strange particles were observed and the special group SU2 was suggested to describe all the existing hadrons and mesons. For example, all the spin 1 mesons, the pions, then can be accommodated in a multiplet in one dimension:



Only two quarks were needed: the UP and DOWN quarks and their antiquarks (for every matter, there is antimatter).

The  $\pi^+$  is composed of an up and a down quark ( $u\bar{d}$ ), while the  $\pi^-$  is composed of a down and an antiup quark ( $\bar{u}d$ ).

After the discovery of the strange particles (for example, the KAONS), we needed a larger symmetry group, and the most obvious extension is SU3. The simple line above extends into a plane of two dimensions and we now need 3 quarks (and their antiquarks) to accommodate the known mesons. Since the mesons are made up of a quark and an antiquark, and there are three of each, from group theory, we have  $3 \times \bar{3} = 8 + 1$  multiplets. We have a group of 8 (octets) and a single (singlet). The octet looks like this:



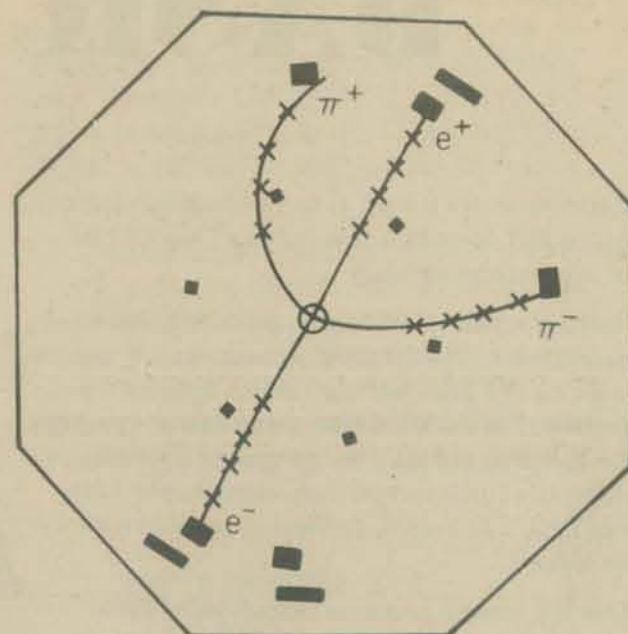
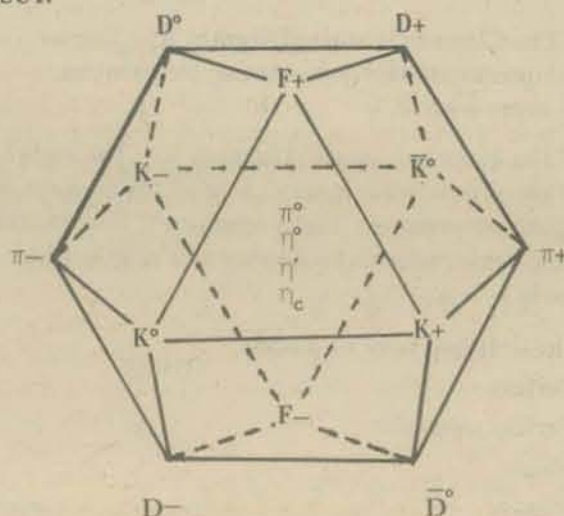
Eight mesons now occupy a 2-dimensional figure whose vertical dimension is a measure of the new quantum member, the *strangeness*.

In addition to the pions, the kaons are simply accommodated. The  $K^+$  contains an up and an anti-strange quark ( $u\bar{s}$ ) while the  $K^-$  contains an antiup and a strange quark ( $\bar{u}s$ ). We enjoyed the success of this SU3 until 1974: more than a decade ago, two young physicists, J.D. Bjorken of SLAC and S. Glashow of Harvard looked at the pure aesthetics of this description and they felt uneasy for the lack of beauty in the present concept. They argued that, since the leptons and quarks are the fundamental entities of matter, and since there are four leptons (electron, muon, electron neutrino, muon neutrino) and there are only three flavors of quarks (up, down, strange), the symmetry is not perfect. To build a unified theory of *weak* (involving leptons) and *strong* (involving quarks) interaction, they asked if there should not be four flavors of quarks as well. Boldly they went ahead with the invention of the fourth flavor which they called *charm* and were fascinated and pleased by the symmetry it brought to the subnuclear world. (Perhaps when more leptons are discovered, they ought to invent new quark flavors like *beauty*, *sex*, etc.)

By the spring of 1974, most physicists were convinced of the necessity of a *charm* quark to explain some otherwise paradoxical aspects of elementary particle physics. Then the first exciting event took place when S. Ting was at a physics meeting at SLAC. After conferring with the team of physicists from SLAC and Berkeley, he and Roy Schwitters jointly announced the discovery of the J or  $\psi$  particle. The same particle named J was discovered at BNL by Ting and collaborators by observing a resonance in  $e^+e^-$  pairs from a hadron-hadron collision. The same particle, named  $\psi$ , was simultaneously produced by annihilating an electron and its antimatter, the positron, producing the resonance  $\psi$  which decays into hadrons. This newly discovered J or  $\psi$  particle turned out to be a bound state of the charm and anti-charm quarks ( $c\bar{c}$ ). In physics, anything not forbidden should be compulsory and, in this scheme, there should exist mesons (or hadrons) that contain an old quark and the new one. In the same colliding beam at SLAC, Burton Richter and George Pearl at SLAC and Gerson Goldhaber and Martin Perl of Berkeley discovered the long-awaited charm mesons, the  $D^+$  ( $c\bar{d}$ ) and the  $D^-$  ( $\bar{c}d$ ). The charm jackpot was hit.

The innocent octet adds to itself one more dimension, the *charm* one, and rises to become a 14-sided object with 12 corners having 4 equal sides joining at each corner: (a cube-octa-hedron)

SU4:



Drawing shows the excited mode of the  $\psi$  named  $\psi'$  which decays into a pair of mesons,  $\pi^+$  and  $\pi^-$ , and  $\psi$  which subsequently decays into a pair of leptons,  $e^+$  and  $e^-$ .

There are 4 quark sides (u,d,s,c) and 4 anti-quark sides ( $\bar{u}, \bar{d}, \bar{s}, \bar{c}$ ). The new charm meson  $D^+$  is on the  $c\bar{d}$  joint of the c and  $\bar{d}$  sides. The familiar octet is now only a center cut of this complex object. The new symmetry group describing these new particles is SU4.

This is where the dimensions stop for now. Perhaps in the near future, we will have to continue inventing new dimensions and the symmetry group will become SU6, SU280 . . . , perhaps leading us to wonder if the quarks are truly elementary since there may be so many of them.

I wish to conclude this article with R. Feynman's lecture in physics given at CalTech in 1953.



So, our problem is to explain where symmetry comes from. Why is nature so nearly symmetrical? No one has any idea why. The only thing we might suggest is something like this: There is a gate in Japan, the gate in Neiko, which is sometimes called by the Japanese the most beautiful gate in Japan; it was built in a time when there was great influence from Chinese art. The gate is very elaborate, with lots of gables and beautiful carvings and lots of dragon heads and princes carved into the pillars, and so on. But when one looks closely, one sees that in the elaborate and complex design along one of the pillars, one of the small design elements is carved upside down. If one asks why this is, the story is that it was carved upside down so that the Gods will not be jealous of the perfection of man.

From our past experiences in the search for forces governing the physical laws, and the devastating nuclear forces is an example, perhaps one should leave this perfect symmetry in the hands of the gods.

# BASIC MUSIC

In this issue, we'll look at some practical music theory and describe a few "utility" algorithms for music programming.

The first article in this series described chromatic scales. The 12-tone chromatic scale is based on the 2nd overtone, which is twice the frequency of the fundamental or base frequency. The tones of the scale are generated by multiplying the fundamental frequency by the 12th root of 2, 12 times in succession (ending with the value 2).

Here is a general program for tempered (proportional) scales.

By PETER LYNN SESSIONS

Reprinted from PCC Vol. 1



```

100 REM *** TEMPERED SCALE FREQUENCY GENERATOR ***
110 PRINT
120 PRINT "AT WHAT OVERTONE SHOULD I BEGIN REPEATING?";
130 INPUT R
140 PRINT
150 PRINT "HOW MANY TONES IN THE SCALE?";
160 INPUT T
170 PRINT
180 PRINT "WHAT IS THE BASE FREQUENCY?";
190 INPUT F
195 PRINT
200 LET L=LOG(R)/T
210 PRINT "TONE", "FREQUENCY"
220 PRINT
230 FOR I=0 TO T
240 PRINT I+1, F*EXP(I*L)
250 NEXT I
260 PRINT
270 END
  
```

If you input:

R = 2 (octave of the fundamental)  
T = 12  
F = anything

you obtain the frequencies of a chromatic scale (abbr: C-scale) on frequency F. In our diagrams, we have labeled the tones of the C-scale with the first twelve integers. The C-scale thus contains tones 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12. Tone 13 is written as tone 1.



All arithmetic in C-scale music is performed "mod 12" — here's a useful mod 12 reducer

DEF FNM(X)=X-INT(X/12)\*12



## DEFINITIONS AND ABBREVIATIONS USED IN THIS ARTICLE —

C-scale: The Chromatic scale (Diagram A). Twelve tones with proportionately increasing frequencies, repeating every octave.

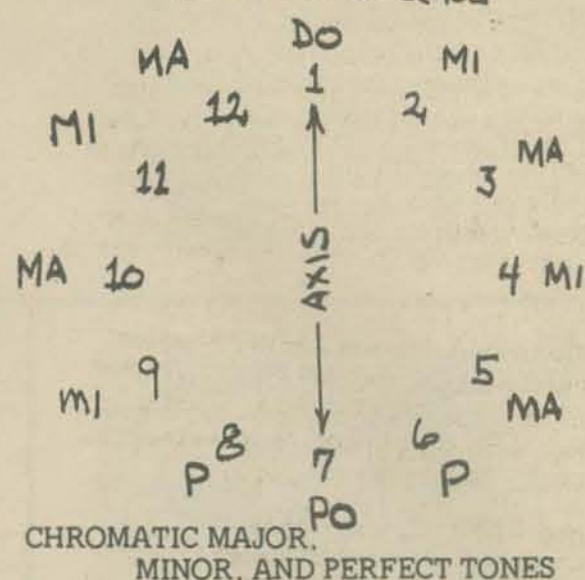
H-scale: The Harmonic scale (Diagram B). The eighth tone of a chromatic scale is very close to the frequency of an important overtone (the 3 overtone). The H-scale is just the C-scale redrawn to display this relationship more clearly.

DO: the defining tone of a scale  
P: Perfect  
PO: Perfect opposite  
MA: Major  
MI: Minor

Given the C-scale as the UNIVERSE, how are SUBSETS (patterns with fewer than 12 tones) with predictable properties to be selected?

Here is a simple model to help us.

DIAGRAM A: C-SCALE



CHROMATIC MAJOR,  
MINOR, AND PERFECT TONES

Chromatic tones fall into four classes:

1) The DEFINER, and the octave of this tone (DO). One of the 12 tones is chosen to be the "definer" of any scale. Since the C-scale can start with any tone, DO must be chosen arbitrarily. In all our diagrams in this article, DO is tone 1. The octave of DO is equivalent to DO, of course. We include the octave of DO in the scale because it makes it possible to use symmetry as a tool of analysis.

2) MAJOR TONES (MA) Major tones are "upward moving" with respect to DO. MA tones sound happy in a pattern (scale or melody) with DO as the definer.

On the H-scale or cycle of 5ths (see box on this page for a description of the H-scale), MA tones are all clockwise of DO.

If DO=1, MA tones are 3, 5, 8, 10 and 12

3) MINOR TONES (MI). Minor tones are "downward moving" with respect to DO. MI tones sound sad in a pattern based on DO. On the H-scale, MI tones are all counterclockwise of DO.

If DO=1, MI tones are 2, 4, 6, 9, and 11.

4) PERFECT TONES (P, PO). If DO = 1, tones 6, 7, and 8 are called perfect tones. This is partly traditional, partly modern.

a) Tones 6 and 8 are very close (in the C-scale) to the 2/3 and 3/2 intervals which were used by Pythagoras to define the "diatonic" (7-tone) scale (see PCC 1:3). They are honored with the title "perfect," although 6 = MI and 8 = MA by their positions on the H-scale.

b) Tone 7 is the "Perfect Opposite" (PO) of DO. When the PO appears in a pattern, the pattern is reversible, PO becoming (when it is played) a competing "DO." Tones 1 and 7 thus form an AXIS around which the other tones are defined. Note that MA and MI are reversed exactly when PO becomes DO. The alternation of MA and MI tones on the C-scale is interrupted by the PO.

As we shall see presently, there is a "good" reason for treating tones 6, 7, and 8 as a class.

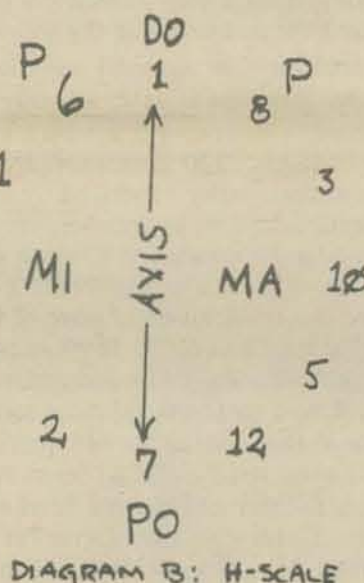


DIAGRAM B: H-SCALE

## SELECTING SEVEN-TONE SCALES

Seven-tone scales, including the familiar diatonic (major, minor) scales, are subsets of the C-scale. How is the subset specified? It turns out that there are several ways to do this. Each way leads to a somewhat different selection algorithm.

I) First, the seven tones could be selected completely at random, like dealing seven cards from a deck of 12 cards. This algorithm is left to the reader. For the moment (i.e., this article), let's look only at 7-tone patterns with somewhat even distribution (purposely omitting scales like 1-2-3-4-5-6-7-1).

II) MA, MI, and P(PO). You can use the distribution of MA, MI, and P tones to select 7-tone scales with predictable properties, based on the properties of the tones themselves. Here is one set of rules of selection:

1st location (DO) = 1 (always)  
 2nd location = 2(MI) or 3(MA)  
 3rd location = 4(MI) or 5(MA)  
 4th and 5th locations = 6(P) or 7(PO) and 7(PO) or 8(P) [2 out of 3]  
 6th location = 9(MI) or 10(MA)  
 7th location = 11(MI) or 12(MA)

Diagram C shows the scale locations and which tones can occupy each location. The diagram also shows how the properties of each of the tones would affect the melodic tendencies of the scale. Major tones tend to progress upward, minor tones downward.



DIAGRAM C: 7-TONE SCALES

LOCATION	TONES	
	MI	MA
8		1
7		12↑
	11↓	
6		10↑
	9↓	
5		8↑
	7↓	
4		7↑
	6↓	
3		5↑
	4↓	
2		3↑
	2↓	
1		1

Note that selection of locations 2, 3, 6, and 7 is binary; selection of locations 4 and 5 is 2-out-of-3. No tone can be used twice. No location can be occupied by more than one tone. There are  $1 \times 2 \times 2 \times 3 \times 2 \times 2 = 48$  different 7-tone scales formed by this algorithm. Choice of MA vs. MI may be independent from location to location.

In the following program (program 2), locations 2, 3, 6, and 7 are independent. Location 5 is conditional on the outcome of location 4 (see Table for Program 2). The conditional assignment of location 5 plus the need for two different formulas makes this RANDOM selection a sloppy algorithm. Can you improve it?

```

100 DIM D(7)
105 RANDOM
110 D(1)=1\D(8)=1
120 FOR I=2 TO 7
130 R=INT(2*RND(0))
140 IF I>4 THEN 170
150 D(I)=R+2*(I-1)
160 GO TO 210
170 IF D(4)=6 THEN 200
180 D(5)=8
190 IF I=5 THEN 210
200 D(I)=R+2*(I-1.5)
210 NEXT I
220 PRINT
230 FOR I=1 TO 8
240 PRINT D(I);
250 NEXT I
260 PRINT
300 END
  
```

### Why do we need a definer?

The definer (from Ta Chuan/The Great Treatise on the I Ching, or Book of Changes)

In the Book of Changes a distinction is made among three kinds of change: nonchange, cyclic change, and sequent (non-cyclic) change. Nonchange is the background, as it were, against which change is made possible. For in regard to any change there must be some fixed point to which the change can be referred; otherwise there can be no definite order and everything is dissolved in chaotic movement. This point of reference must be established, and this always requires a choice and a decision. It makes possible a system of coordinates into which everything else can be fitted. Consequently at the beginning of the world, as at the beginning of thought, there is the decision, the fixing of the point of reference. Theoretically any point of reference is possible, but experience teaches that at the dawn of consciousness one stands already enclosed within definite, prepotent systems of relationships. The problem then is to choose one's point of reference so that it coincides with point of reference for cosmic events. For only then can the world created by one's decision escape being dashed to pieces against prepotent systems of relationships with which it would otherwise come into conflict. Obviously the premise for such a decision is the belief that in the last analysis the world is a system of homogeneous relationships -- that it is a cosmos, not a chaos. This belief is the foundation of Chinese philosophy, as of all philosophy. The ultimate frame of reference for all that changes is the nonchanging.



(I)	R	D(I)	FORMULA	CONDITIONS
(1), (8)	not computed	1	1	always 1
(2)	1 or 0	2 or 3	$R + 2*(I - 1)$	none
(3)	1 or 0	4 or 5	$R + 2*(I - 1)$	none
(4)	1 or 0	6 or 7	$R + 2*(I - 1)$	none
(5)	1 or 0	7 or 8	$R + 2*(I - 1.5)$	$D(5) = 8$ if $D(4) = 7$
(6)	1 or 0	9 or 10	$R + 2*(I - 1.5)$	none
(7)	1 or 0	11 or 12	$R + 2*(I - 1.5)$	none

RUN  
 1 2 4 6 7 10 12 1

READY

RUN

1 3 5 6 7 9 11 1

READY

RUN

1 2 5 6 7 10 11 1

READY

RUN

1 3 4 6 8 10 11 1

READY

RUN

1 3 4 7 8 9 12 1

READY

We said that there are 48 different scales possible by this method. This statement neglects the phenomenon of inversion. A scale is an inversion of another scale if

1) it uses the same tones, but assigns a different number the role of DO. E.g., 1-3-4-6-8-10-11-1 is an inversion of 11-1-3-4-6-8-10-11, the bracketing tones being DO in both scales.

2) the pattern of intervals is the same, but beginning with a different interval. We'll explain this further in a later article; try to work it out for yourself in the meantime.

How many of the 48 scales are inversions of one another? Conversely, how many really unique patterns are possible with these rules?

One further question, likewise with future significance: How many of the scales generated by this method are symmetrical? For example, 1-2-5-6-8-9-12-1 is symmetrical (look at Diagram C). Is this of any importance?

# 30 COMPUTER STORES

## ARKANSAS

AR

Computer Products Unlimited  
4216 W. 12th St.  
Little Rock, AR 72204

## ARIZONA

AZ

Bits and Bytes  
Computer Shop  
6819-C North 21st Avenue  
Phoenix, AZ 85015

Byte Phoenix  
813 N. Scottsdale Rd.  
Tempe AZ 85282

## CALIFORNIA

CA

Applied Computer Technology  
2465 Fourth St.  
Berkeley, CA 94610

A-Vid Electronics Company  
1655 East 28th St.  
Long Beach, CA 90806

Bargain Electronics  
2018 Lomita Blvd.  
Lomita, CA 90717

Bits Bytes & Pieces  
6211 Quincewood Cir.  
Citrus Heights, CA 95610

Bits 'n' Bytes  
679 D.S. State College Blvd.  
Fullerton, CA 92631

Byte Berkeley  
1514 University Ave  
Berkeley, CA 94703  
415/845-6366

Byte Shop Campbell  
2559 South Bascom Ave.  
Campbell, CA 95008

Byte Citrus Heights  
6041 Greenback Lane  
Citrus Heights, CA 95610

Byte Lawndale  
16508 Hawthorn Blvd.  
Lawndale, CA 90260

Byte Shop Mountain View  
1063 El Camino Real  
Mountain View, CA 94043

Byte Palo Alto  
2227 El Camino  
Palo Alto, CA 94306  
415/327-8080

Byte Pasadena  
496 S. Lake Ave.  
Pasadena, CA 91101  
213/684-3311

Byte San Diego  
5375 Kearny Villa Rd.  
San Diego, CA

Byte San Fernando Valley  
18424 Ventura Blvd.  
Tarzana, CA 91356

Byte San Jose  
155 Blossom Hill Rd.  
San Jose, CA 95123  
408/226-8383

Byte San Mateo  
1200 W. Hillsdale Blvd.  
San Mateo, CA 94403  
415/341-4200

Byte San Rafael  
509 Francisco Blvd.  
San Rafael, CA 94901

Byte Santa Barbara  
3 West Mission St.  
Santa Barbara, CA 93101

Byte Shop Santa Clara  
3400 El Camino Real  
Santa Clara, CA 95050

(Whew! Quite a list, and there're more to be added everyday.  
Here's your big chance to learn the two-letter abbreviations  
for states! We'll update this list next issue.)

Byte Shop Santa Cruz  
1225 Ocean St.  
Santa Cruz, CA 95060

Byte Thousand Oaks  
2705 Thousand Oaks Blvd.  
Thousand Oaks, CA 91360

Byte Walnut Creek  
2989 N. Main St.  
Walnut Creek, CA 94596  
415/933-6252

Byte Westchester  
8711 La Tiera Ave.  
Westchester, CA 90045

Byte Westminster  
14300 Beach Blvd.  
Westminster, CA 92683

Casual Bedding  
37433 Centralmont Pl.  
Fremont, CA 94536

Channel Radio and Electronics  
18 E. Ortega St.  
Santa Barbara CA 93101

The Computer Center  
8205 Ronson Rd.  
San Diego CA 92111

Computer Components Inc.  
5848 Sepulveda Blvd.  
Van Nuys CA 91411

Computer Kits  
1044 University Ave  
Berkeley CA 94710

Computer Mart of LA  
625 W. Katella No. 10  
Orange, CA 92667

Computer Power & Light  
12321 Ventura Blvd.  
Studio City CA 91604

Computer Shack  
22634 Foothill  
Hayward CA 94541

The Computer Store  
820 Broadway  
Santa Monica CA 90401

The Computer Store of San Francisco  
1093 Mission St.  
San Francisco CA 94103

Computer Systems Unlimited  
18886 Hesperian Blvd.  
San Lorenzo CA 94580

Computer Way Inc.  
15525 Computer Lane  
Huntington Beach CA 92649

Coyote Computer  
1405 Alder Pl.  
Davis CA 95616

CTI Data Systems  
3450 East Spring St.  
Long Beach CA 90806

The Data Center  
136 N. Maryland Ave  
Glendale CA 91206

The Data Center  
c/o Program Consultants  
3400 Wilshire Blvd.  
Los Angeles CA 90010

Electric Brain Computer Store  
7000 Village Parkway Suite L  
Dublin CA 94566

Kentucky Fried Computers  
2465 Fourth St.  
Berkeley CA 94710

Metatic Corp  
2211 Fountain Oaks Dr.  
Morgan Hill CA 95037

Micro Byte  
c/o Guy Hall  
183 East 8th Ave.  
Chico CA 95926

Proko Electronics  
439 Marsh  
San Luis Obispo CA 93402

Rainbow Enterprises  
10723 White Oak Ave.  
Granada Hills CA 91344

The Small Business Computer Co.  
400 Dewey Blvd.  
San Francisco CA 94116

Sunny Sounds  
927 B E Las Tunas Dr.  
San Gabriel CA 91776

Sunshine Computer Co.  
9 Palomino Lane  
Carson CA 90745

New store opening. For  
location, etc. contact:  
David Mayotte  
Fountain Valley CA 92708.

Larry Plate  
735 State St.  
Santa Barbara CA 93101  
805/962-1990  
Digital Group Dealer

## COLORADO

CO

Byte Colorado  
3464 S. Aloma  
Englewood CO 80110

Computer Country Inc.  
18 Alameda Sq.  
2200 W. Alameda  
Denver CO 80223

Gateway Electronics  
2839 W. 44th Ave.  
Denver CO 80211

Intermountain Digital  
c/o Douglas M. Woodard  
1027 Dellwood Ave.  
Boulder CO 80302

J. B. Saunders Co.  
3050 Valmont Rd.  
Boulder CO 80301

## CONNECTICUT

CT

The Computer Store  
63 S. Main St.  
Windsor Locks CT 06096

Heuristic Systems  
c/o Susan Gilpatrick  
244 Crystal Lake Rd.  
Ellington CT 06029

JRV Computer Store  
3714 Whitney Ave.  
Hamden CT 06518

## FLORIDA

FL

The Computer Store  
c/o Comprehensive Systems  
P.O. Box 251  
Pensacola FL 32502

Douglas Computer Systems  
710 Oaks Plantation Dr.  
Jacksonville FL 32211

Elecon Corp  
The Computer Store  
4921 - 72nd Ave N.  
Pinellas Park FL 33565



Marsh Data Systems  
5405-B Southern Comfort Blvd.  
Tampa FL 33614

Microcomputer Systems Inc.  
144 So. Dale Mabry Hwy.  
Tampa FL 33609

## GEORGIA GA

The Computer System Center  
3330 Piedmont Rd.  
Atlanta GA 30305

## ILLINOIS IL

itty bitty machine co  
1318 Chicago Ave.  
Evanston IL 60201

Chicago Computer Store  
517 Talcott Rd/Hwy 62  
Park Ridge IL 60068

## INDIANA IN

Data Domain  
111 S. College Ave.  
Bloomington IN 47401

Quantum Computer Works  
6637 Kennedy Ave.  
Hammond IN 46323

## IOWA IA

New store opening. For  
location, etc. contact:  
Gerald P. Greelis  
28 Swan Rd.  
Council Bluffs IA 51501

## KENTUCKY KY

Cybertronics Inc.  
312 Productions Ct.  
Louisville KY 40299

Logic Systems  
324 W. Woodlawn Ave.  
Louisville KY 40214

## LOUISIANA LA

Executone Microcomputer  
6969 Titian Ave  
Baton Rouge LA 70806

## MASSACHUSETTS MA

Computer Mart  
473 Winter St.  
Waltham MA 02154

The Computer Store, Inc.  
120 Cambridge St.  
Burlington MA 01803

Computer Warehouse Store  
584 Commonwealth Ave  
Boston MA 02215

## MARYLAND MD

[take your pick: probably one  
address is old]

The Computer Workshop  
11308 Hounds Way  
Rockville MD 20852

The Computer Workshop Inc  
5709 Frederick Ave  
Rockville MD 20852

## MICHIGAN MI

Compumart, Inc.  
254 S. Wagner Rd.  
Ann Arbor MI 48103

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

## MINNESOTA MN

Byte Minnesota Inc.  
1434 Yankee Doodle Rd.  
Eagan MN 55121

## MISSOURI MO

Gateway Electronics  
8123 - 25 Page Blvd.  
St. Louis MO 63130

## NEBRASKA NE

Welling and Associates  
529 North 33 St.  
Omaha NE 68131

## NEW JERSEY NJ

The Computer Room  
451 Simons Ave.  
Hackensack NJ 07601

The Computer Mart of New Jersey  
151 Kline Blvd.  
Colonia NJ 07067  
201/574-2173

Hoboken Computer Works  
56 Second St.  
Hoboken NJ 07030

William Electronic Supply  
1863 Woodbridge Ave.  
Edison NJ 08817

## NEW MEXICO NM

The Computer Shack  
3120 San Mateo NE  
Albuquerque, NM 87110

## NEW YORK NY

Audio Design Electronics  
487 Broadway, Ste. 512  
New York NY 10013

Byte Long Island NY  
2721 Hempstead Turnpike  
Levittown NY 11756

Computer Corner  
White Plains Mall  
200 Hamilton Ave.  
White Plains NY 10601

Computer Enterprises  
(mail and phone order service)  
P.O. Box 71  
Fayetteville NY 13066  
315/637-6208

Computer Mart of Long Island  
2072 Front  
East Meadow NY 11554  
516/794-0510

Computer Mart of New York, Inc.  
314 - 5th Ave.  
New York NY 10001

Synchro-Sound Enterprises  
193-25 Jamaica Ave.  
Hollis NY 11432  
212/468-7067

## PENNSYLVANIA PA

Byte Philadelphia  
1045 W. Lancaster Ave  
Bryn Mawr PA 19010

The Computer Room  
c/o Carol Groves, Castle Systems Co.  
1028 Spruce St.  
Philadelphia PA 19107

JB Industries 610 W. Olney Ave.  
Philadelphia PA 19120

Lectro-Media Ltd.  
2nd & Pine  
Philadelphia PA 19147

Martin J. O'Boyle Assoc.  
P.O. Box 9094  
Pittsburgh PA 15224

Personal Computer Corp.  
Frazer Mall  
Frazer PA 19355

## OHIO OH

ELS Small Computer Center  
2209 Taylor Road  
Cleveland Heights OH 44112  
216/249-7820

Ridgeway East  
Retail Computer Center  
161 Bell St.  
Chagrin Falls OH 44022

## OREGON OR

Byte Portland  
2033 SW 4th  
Portland OR 97201  
503/223-3496

The Real Oregon Computer Co.  
205 West 10th  
Eugene OR 97401

## RHODE ISLAND RI

Computer Power, Inc.  
M24 Airport Mall  
1800 Post Road  
Warwick RI 02886

## TENNESSEE TN

Byte'ronics  
5604 Kingston Pike  
Knoxville TN 37919

## TEXAS TX

The Bit Barn  
1111 Burke No. 313  
Pasadena TX 77506

Digitex  
2111 Farrington  
Dallas TX 75207

Electronic Specialty Co.  
2006 San Sebastian B-232  
Houston TX 77058

The Micro Store  
643 S. Central  
Richardson TX 75080

Polaris Computer Systems  
3311 Richmond, Sta. 200  
Houston TX 77006

Rondure Company  
2522 Butler St.  
Dallas TX 75237

## VIRGINIA VA

Computer Hobbies Unlimited  
9601 Kendrick Rd.  
Richmond VA 23235  
804/276-5056

Media Reactions Inc.  
11303 S. Shore Drive  
Reston VA 22090

Microsystems  
6605 A Backlick Rd.  
Springfield VA 22150

## WASHINGTON WA

Microcomputer Applications  
6009-B 13th Way SE  
Lacey WA 98503

Retail Computer Store  
410 NE 72nd  
Seattle WA 98115

## WISCONSIN WI

The itty bitty machine co., inc.  
2221 East Capitol Drive  
Shorewood WI 53211

Lauerman Dept. Store  
Marinette WI 54143

Milwaukee Computer Store  
6916 West North Ave.  
Milwaukee WI 53213

## UTAH UT

The Computer Room  
1455 So. 1100 E.  
Salt Lake City UT 84105

## OTHER

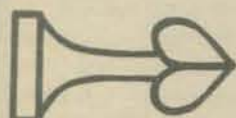
WHK Electronic & Scientific Instru.  
P.O. Box 147 St. Albans Victoria  
AUSTRALIA 3021

Canadian Microcomputer Systems  
& Associates, Ltd.  
861 - 11th St.  
Brandon, Manitoba  
CANADA R7A 4L1

Computer Hobby Shop  
4812 - 16th St. S.W.  
Calgary, Alberta T2T 4J5  
Canada


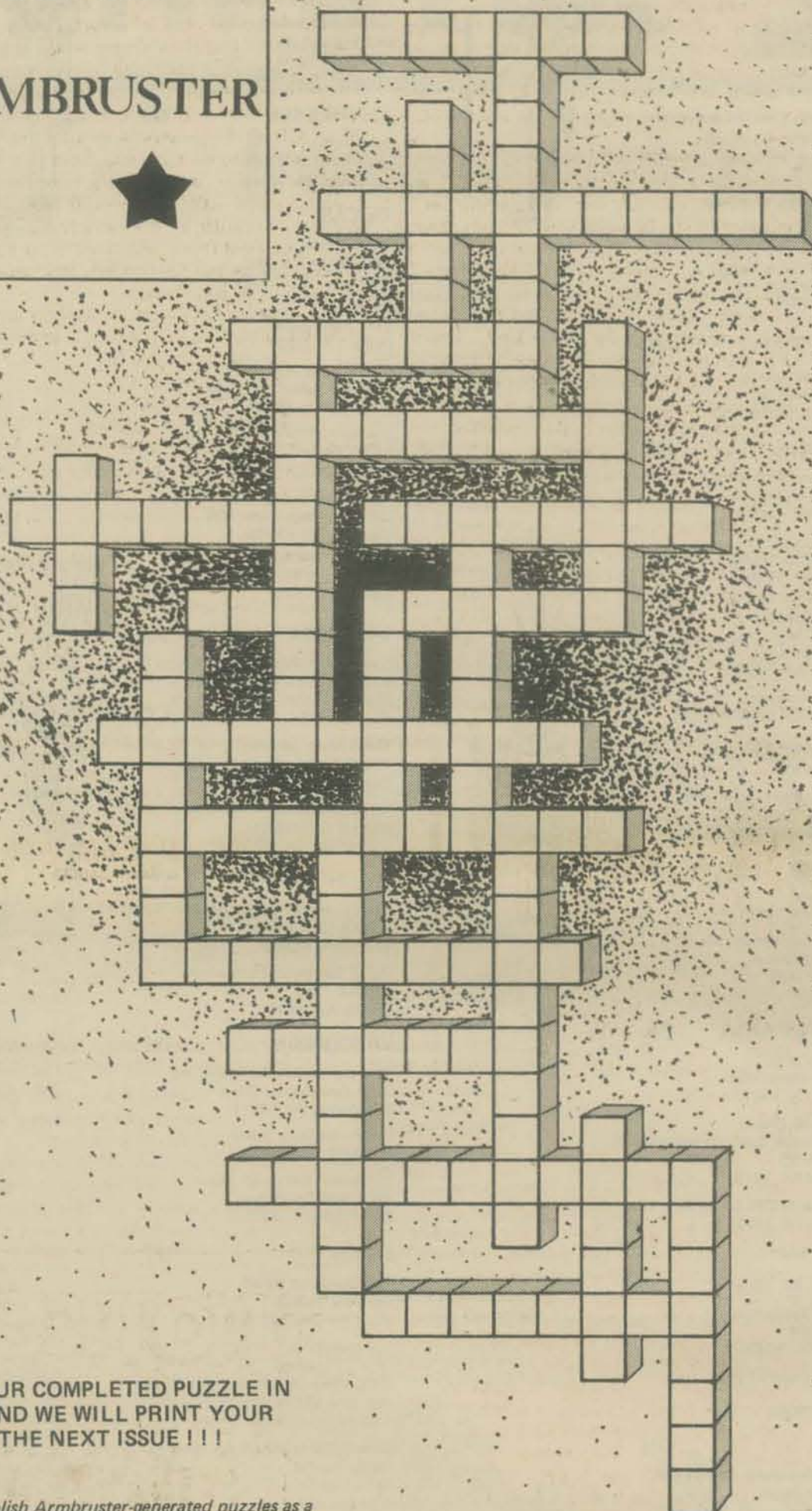
Communications S.A.  
APDO 703  
San Jose, COSTA RICA 23-47-12

PMI  
13, Chemin du LeVent  
01210 Ferney-Voltaire  
Ain, FRANCE 050-416222



# CROSSWORD PUZZLE

by  
**F  
A  
R  
M  
B  
R  
U  
S  
T  
E  
R**

SEND YOUR COMPLETED PUZZLE IN  
TO PCC AND WE WILL PRINT YOUR  
NAME IN THE NEXT ISSUE !!!

PPC will publish Armbruster-generated puzzles as a  
regular (insofar as we're ever regular) feature. Want to  
submit puzzle clues for his program to chomp on?  
Here're guide-lines:

1. Use the latest issue of PCC as a source. Please  
include details as to where the words are found  
(i.e., page number).
2. 20 - 50 words and clues is the range to aim for.
3. Having only one word of a given length makes the  
puzzle easier, multiple words of a given length  
make it harder.

The program that produces the puzzle isn't available to  
the public - Frank is hoping to eventually use it as a  
commercial vehicle for generating puzzles.

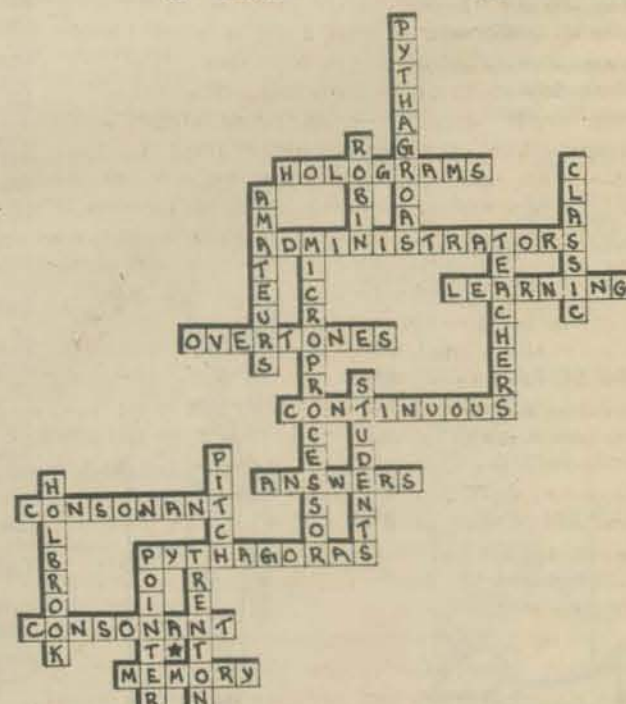
## CLUES

(All the words were taken from last  
PCC, Vol. 5, No. 2.)

1. two Federation enemies
2. a low-speed engine for docking and  
emergency measures
3. Flash
4. she plays lots of computer games
5. "any kind of plan for your guessing"
6. you try to shoot it.
7. GM
8. sometimes associated with dungeons
9. theoretical length of D & D adventures
10. a prime requisite for clerics
11. accumulation of these points gives power
12. they're associated with Fortran Man
13. some are 8-billion light years away
14. estimated number of bits a brain can acquire
15. Hyden worked with this acid
16. fear of dark
17. apparently their cannabilistic diet  
was instructive
18. he makes cross words
19. puzzle construction strategy (omit  
the hyphen)
20. author of a 3-headed T-shirt
21. a style Lancaster is partial to
22. for instructors dealing with bugs
23. it's not about bugs
24. it deals with video game logic
25. turning on the power of your mind

## ANSWERS TO PUZZLE IN LAST ISSUE

Answer	(Page)
1. microprocessor	(2)
2. classic	(2)
3. students	(3)
4. teachers	(2)
5. administrators	(2)
6. Trenton	(2)
7. amateurs	(2)
8. pitch	(6)
9. overtones	(6)
10. Robin	(15)
11. learning + memory	(15)
12. Holbrook	(37)
13. continuous	(7)
14. Pythagoras	(7)
15. Pythagoras	(7)
16. consonant + consonant	(7)
17. holograms	(10)
18. pointer	(36)



# ACM

## IS IT FOR YOU?

by Willard J. Holden

The Association for Computing Machinery (ACM) is generally acknowledged to be the foremost professional society in the world for those persons in the fields of computer programming and science and related areas of discipline; in other words, those persons who consider themselves computer professionals.

Professional societies such as the ACM are usually organized for the following purposes:

1. The handling and interchange of technical information;
2. Providing a unified voice for those professionals in their field;
3. Maintenance of professional and technical skills through the dissemination of periodicals and publications;
4. Maintaining and raising the ethical and technical standards of their members;
5. Providing a means of personal contact among persons in their profession via meetings, conferences, and symposiums both on the national and local level

A bit of history may be of help in understanding ACM and its formation. On January 10, 1947, at a symposium being held at the Harvard Computation Laboratory, Professor Samuel H. Caldwell of MIT spoke of the need for an association of those interested in computing machinery and the need for communication between them. Thus it was that the spring of 1947 was the beginning; MIT, Harvard, and Columbia Universities were sponsoring many meetings concerned with electronic computing machinery and its design. By June a mimeographed (no Xerox yet!) sheet entitled 'Notice of an Eastern Association for Computing Machinery' was sent to a number of people known to be interested in electronic computers. The first meeting, September 15, 1947, was held at Columbia University and attended by 76 persons. From that relatively modest beginning ACM has grown to what it is today, an interna-

tional society of over 32,000 members. The word 'Eastern' was dropped from its name in 1948 and soon the membership will vote to change the name to 'The Association for Computing', retaining the acronym 'ACM'.

The purpose of ACM is to advance the arts and sciences of information processing and computation and to promote the free interchange of information concerning them. In addition, it aims to develop and maintain the integrity and competence of the individual engaged in the practice of these arts and sciences.

Among its many activities ACM conducts its Annual National Conference in October, holds the Annual Computer Science Conference in February, and participates in the organization of the National Computer Conference. In addition, annual conferences and symposia are held in many of its 12 regions. Among its over 240 chapters, both local and student, meeting and programs are held, usually on a monthly basis. Thirty Special Interest Groups and Committees, in a variety of disciplines, offer ACM members and other interested persons the opportunity to become further acquainted with their field of interest and each other. The Special Interest Groups publish newsletters and sponsor meetings in their technical areas. Many of the chapters also sponsor local Special Interest Groups and Committees.

Currently, ACM publishes six periodicals on a regular basis. The Communications of the ACM (sent to all members) and Computing Reviews are published on a monthly basis, the remaining periodicals are published on a quarterly basis. They are The Journal of the Association for Computing Machinery (its archival publication), Computing Surveys, Transactions on Mathematical Software, and Transactions on Database Systems.



To be qualified as a full voting member of ACM a person must (a) subscribe to the purposes of ACM; (b) have attained professional stature as demonstrated by intellectual competence and ethical conduct in the arts and sciences of information processing; (c) have earned a bachelors' degree or academic equivalent, or have four years' full time experience in information processing; and (d) be endorsed by two voting members of ACM. A student member must be an individual registered in an accredited educational institution on a full time basis. To become an associate member one need only subscribe to the purposes of the ACM. Costs range from \$11 to \$35 per year, depending on the membership category.

A subsequent article will describe the Special Interest Groups and Committees, their areas of interest and how to join them.

If you desire further information concerning ACM or how to join it you can obtain it by contacting:

Mr. Sidney Weinstein  
ACM  
1133 6th Avenue  
New York, NY 10036

[Amongst other things Willard Holden's activities have included:

Pacific Regional Representative to ACM Council, 1970-1975

AFPIPS Board of Directors and Executive Committee, 1974-1976

Entered Computing Field in 1956 after 10 years as an educator in Hawaii]

AND! Member of Board of Trustees of PCC]

USED CARS • LAND • WHISKEY • MANURE • NAILS  
FLY SWATTERS • RACING FORMS • ZIPPER BAGS

Willard Holden  
ENTREPRENEUR & GREEK DANCER  
PALO ALTO, CALIF.  
(415) 324-8434

WARS FOUGHT  
REVOLUTIONS STARTED  
GOVERNMENTS RUINED  
UPRISINGS QUELLED  
WOMEN DELIGHTED

TIGERS TAMED  
BARS EMPTIED  
ROOMS RENTED  
EXCUSES VERIFIED  
ORGIES OBSERVED

## ON SUBROUTINES... BY JEF RASKIN

The secret of our civilization is the division of labor and the fragmentation of major works into small jobs. Consider so small a task as building a house. A detail of that: the front door. It is a simple door, with hinges and a lock. Why is this image simple. Why can I write "house", "door", "hinge", "lock" and have you picture them securely. Because you don't see the details of the lock, the small springs and tumblers, the screws and brass pressings, latch and strikeplates, the necessary assembly, the code numbers on the parts. You conceive of a lock whole and entire, and dismiss the details from your mind.

If I said "house" and you tried to truly grasp the house in all its detail, every wire and pipe, nail and stick of wood, each piece of flooring, each gadget in all its detail, and how each was made, how it is put together, and how it works by itself and with all the other parts of the house -- if you tried! You would find the house ungraspable. Beyond understanding. Could you build the lock? From the ground up? Mine the ores, wind the springs, use the metal lathe, build the multi-ton press for the door knob shell? You could. You are lucky to not have to.

You can grasp the house by viewing its major parts as wholes. You can conceive of doors and windows and walls and roofs and floors. You can organize it in your mind into rooms and levels. Then when you transfer your attention to the door you can think of it as

hinges, lock and the main piece of which it is made. When you think of the jamb, the pin that joins them, and the screws that hold it to the door and the jamb. When you consider the screw, you see it as the biting threads and the head with provisions for applying torque. And so on. But when you think of the house you do not think of applying torque to the head of the screw.

So it is with programs. When the computer is to do any task of substance and size, an attempt to start with the nuts and bolts of it is misplaced. Conceive the grand idea. This program is to build a house. Invoke, CALL, GOSUB, whatever your language calls for a wall, conjure up a roof, a floor. Don't worry how the subprograms are going to build up the parts, just call those subroutines even if they don't exist. Then write a wall subroutine. It calls a door subroutine--that doesn't yet exist. The door subroutine calls the hinge and lock subroutines. And finally, you might write a hinge pin subroutine all the way out.

A more computery task might be to write a text editor. Again conceive it grandly. Take in the raw typing, correct local errors, take in and distinguish commands to the editor, produce beautiful output. At some point you will have to search for substrings (particular words or phrases perhaps). Just call the subroutine that finds a match and tells you where it occurred. Ignore the fact that you might not know exactly how to do this subroutine. Yet. Then when the time comes

that you need the subroutine, you think that first you must find some matching character, and then see if there are subsequent matches. Write a routine for finding an instance of a character, and one for looking for a next match. Eventually, you will have written the text editor. Get it working and, unlike the house, throw it out and start over. You will do much better next time. □

**i NOTICE!**

☆☆☆☆

**DON QUIKOTE'S  
STARSHIP**

**IS  
TEMPORARILY**

**LOST IN HYPERSPACE...  
BUT IS SCHEDULED TO  
RE-EMERGE**

**IN JANUARY.. 1977..  
TERRA TIME!**

33

# dr. dobb tells all

An interview with Dr. Hiram Carmichael Dobb,  
Titular head of Dr. Dobb's Journal of you  
know the rest.

by Jef Raskin



WILL THE REAL DR. DOBB  
PLEASE SPEAK UP?

## Introduction

We were invited to the elusive Dr. Dobb's residence high on a stone bluff overlooking the pacific ocean in the small town of Pollo Del Mar, California. Pollo Del Mar is said to have the highest number of computers per family of any place in the world as well as having a sewage treatment plant that ranks with any in the state. Dr. Dobb himself looks older and acts younger than he is. He says that is easier than looking younger and acting older than he is. We found such wisdom commonplace as we began our interview.

US: Dr. Dobb, so far you have managed to evade any public exposure or interviews, and we are honored that you have agreed to our request. May we ask why?

Dr. Dobb: Yes.

US: Why?

Dr. Dobb: Nobody else asked.

US: When did you start playing with computers? We hear you have been doing it for a long time.

Dr. Dobb: Where do people hear such things? But it's true, I started out in 1900, and, buster, that's a long time ago.

US: But the first computers weren't built until about 1946 or so!

Dr. Dobb: Did you come here to tell me history or to interview me?

US: But you were born in 1900!

Dr. Dobb: That's what I said: "I started out in 1900" and you interrupted.

US: Sorry.

Dr. Dobb: As I told Johnny...

US: You mean Von Neumann?

Dr. Dobb: You do keep interrupting. You think you have some kind of priority? Like I was saying, I told Johnny: "These computer thingies won't amount to much until you can have one in every garage, and a chicken in every pot." That phrase became famous, as you will remember.

US: We do remember something like that. Why, to change the subject, have you settled in Pollo Del Mar?

Dr. Dobb: This town has the highest number of computers per square head.

US: How did you come to be associated with the journal of which you are the titular head?

Dr. Dobb: You know, I like that title "Titular head," it does something for my image. But, actually, they had never heard of me when they named the journal.

US: No?

Dr. Dobb: It was named after my cousin Hilary Cynthia Dobb.

US: Hilary Cynthia Dobb?

Dr. Dobb: You do seem to have a case of echolalia! She is the expert for whom the journal is named. By the way, how much should each issue of Byte cost?

US: Tell us more about Dr. Hilary Dobb.

Dr. Dobb: Answer my question, I asked it first.

US: How should we know?

Dr. Dobb: Eight bits!

With this joke Dr. Dobb cracked up and was laughing so hard that we couldn't get anything coherent out of him. Just then a dignified woman came down the stairs. Her eyes seemed to look right through us, and she wore a brooch of pure silicon, its jet blackness gleaming against her green dress. Since she is also Dr. Dobb you will have to figure out which of them is speaking from context.

Dr. Dobb: Oh, Hiram, I bet I know what joke you just told.

Dr. Dobb: (still incoherent)

US: Dr. Dobb, we have just been told that it is you that Dr. Dobb's journal is named after.

Dr. Dobb: That may be the case. Some other things have been named after me.

US: Yes?

Dr. Dobb: Did you know that the color molded into IC's with plastic cases is known as "Dobb's Black" and that I invented the Dobb's code which is used by many electronic hackers?

US: (impressed) No, we didn't.

Dr. Dobb: You are familiar with the "ten" codes used by the CB people.

US: Slightly.

Dr. Dobb: You know 10-20 means "location" and so on. Well to save engineers and computer scientists time I set up a lot of codes so that they could talk more easily and snow anybody who might be listening.

US: Could you give us, and our readers some examples?

Dr. Dobb: Surely. The code for four 2-input nand gates is "zero-zero" or the code for a J-K master-slave flip flop is "seventy one."

US: And do you prefix these numbers with ten like the Hams and the CBers do?

Dr. Dobb: No, I use "seventy four." And those are called, properly, the Dobb code.

Dr. Dobb: (still incoherent).

Dr. Dobb: And to keep the military people happy I gave them their own code.

US: Can we guess? They use "fifty four?"

Dr. Dobb: For a magazine writer you seem awfully bright.

34

US: (blushing) Thank you.

Dr. Dobb: Have you been doing interviews for long?

US: About four or five years now.

Dr. Dobb: And how did you get to specialize in computer reporting?

US: It comes from an early interest in stopwatches. When I was four years old my aunt Hildamere gave me this stopwatch, and I began to time everything... hey, who is doing the interview?

Dr. Dobb: (sweetly) You are. What happened with the stopwatch?

US: I started to become an efficiency expert around the house, and compared different ways of washing dishes... you got me doing it again.

Dr. Dobb: Sorry, let me ask you a question.

US: O.K.

Dr. Dobb: (still incoherent)

Dr. Dobb: Where did you go to school?

US: The Wisconsin State School of Journalism. And where did you go to school?

Dr. Dobb: Wait a second, I'm doing the interviewing.

US: ?

Dr. Dobb: Ha! Ran a 7404 on you!

US: A 7404?

Dr. Dobb: Ran you through a hex inverter, turned the tables. You got to learn the codes if you want to talk to hackers.

US: Can you teach us a few more?

Dr. Dobb: Sure. What do you think we mean when we say that a couple is all 7471?

US: Tell us.

Dr. Dobb: It means you can't tell who is in control, a perpetual master-slave flip flop relationship. When you're sure you say that you're 7430. And that's an input positive nand gate, and that's pretty positive. To go into your house is to "open a 74100" you know, a bistable latch. A woman (or a man for that matter) who worries about their age is a 7490. A decade counter. And my son, James, we call a 7488 since he likes the library so much. He's got a read-only memory.

US: It seems that almost any situation can be represented by one of your 74-codes, Dr. Dobb.

Dr. Dobb: Thank you. I hope I've made a contribution to human communication. Even so obscure a situation as finding a snake when you come in through the fence has a 74 code.

US: Really?

Dr. Dobb: Sure. It's a 7480.

US: A 7480?

Dr. Dobb: A Gated Full Adder!

At this joke Dr. Dobb went into pleasant peals of laughter, and we found ourselves with two incoherent Dr. Dobbs. We decided to call it a day and make our way back from Pollo Del Mar. We would be back another day to continue our interview with the Drs. Dobb. Or maybe not.

About the author: Jef Raskin lives in Pollo Del Mar, where he is at the Pollo Del Mar Doctor's Hospital, where a team of experts are trying to get his tongue out of his cheek.

# QUESTIONS And ANSWERS



We've excerpted questions from letters to promote a better information flow among readers. Our "answers" — when we have any — are just a start. Feel free to communicate directly with the questioner or with PCC or both.

Q: I am in the process of compiling a list of references for teachers of Computer Science at the secondary level. This list will appear in a text which I am preparing; it will include: Text books (BASIC or FORTRAN); Filmstrips; Posters and/or pictures; Pamphlets; Games; Overhead transparencies; Educational kits; Puzzles; Films; Slides.

I would like to compile an accurate description of currently available references in order that teachers of Computer Science might have a single source available for their use. With Computer Science becoming a more popular area at the secondary level I am sure that many teachers will be interested in such information in setting up their respective courses. — Mr. Dominic Magno, 1529 E. Lincoln, Des Plaines, IL 60018.

Q: I am putting together a package to sell school districts, particularly administrators, on the need and use for computers in the elementary classroom. I would appreciate any suggested resources or information that might be of use. — Joseph Cannata, 381 Long Island Ave., Medford NY 11763.

A: The Computer Faire (see description in this issue) is hoping to have a panel of manufacturers discuss "how to sell to educators." Also see "Computers in Education Resource Handbook" published by the University of Oregon, Eugene OR 97403. And keep reading PCC!

Q: We're thinking about building a microcomputer either from a kit or from a published design (a la the intelligent terminal in Popular Science). From your experience, which kit is easiest to build (which I would take as meaning has the best layout circuit board) and gives the best overall performance (would support Basic or some subset). How can I get a "how-to-it" guide for builders of microcomputers from kits?

A: Community College electronics courses are good bets to provide basic skills needed to build a kit. Each manufacturer has his own set of instructions — some good, some bad, a flavor for everyone. If there's enough response from readers, PCC will put together letters from people who want to share their tips and experience in constructing various kits. *Steve Cavrak*

Q: I am a teacher of high school mathematics and presently I am attempting to revise and update a course in Computer Science. Any information that can be given concerning free materials or materials to be purchased that would aid in the teaching of a Computer Science course is welcomed.

It is hoped that some materials may be obtained in class size quantities while others may be used on a supplementary basis. — Dr. Wyman W. Dingwall, Mapleton High School, 601 E 64th Ave., Denver CO 80229.

A: In this issue, see the final section of Don Inman's article "San Jose Teachers Prepare for the Future" for an outline of a Computer Science Course for training teachers with emphasis on state-of-the-art microcomputers and low cost hardware. Don is a high school math teacher on sabbatical — currently conducting a computer teacher training course for the San Jose School District as well as working at PCC in an attempt to facilitate the exchange of information and ideas regarding computers and computer science courses. He is scouring surrounding schools to see what they are doing with results to be published in PCC — possibly a collection of his year's efforts will be published later. You might get in touch with Mr. Dominic Magno, 1529 E. Lincoln, De Plaines, IL 60018 who is collecting references of materials of this nature. In addition, see the PCC Bookstore Catalog enclosed in this issue of PCC.

Q: I'm building 4 COSMAC "ELFs" as published in Popular Electronics, using RCA's 1802 Microprocessor, in order to integrate computers into second year Electronics classes. I'd like to compare notes with other teachers, sharing our successes and our failures. Does anyone have a vehicle for this kind of information?

— Mike Epstein, Electronics, Newington High School, 605 Willard Ave., Newington CT 96111.

A: As ever, PCC will publish what we can, but don't let us discourage anyone else from getting into the act.

Q: How can computers really serve the people? I can see the potential in terms of helping people understand a technology like computers and in demystifying the whole industry, but I'm not sure what forms the progressive applications would take. — Steve Cavrak, Environmental Studies Program, Franconia College, Franconia NH 03580.

A: The answer(s) to this question are evolving through schools, computer clubs, PCC, etc., etc. Anybody else want to respond?

Q: Anyone have efficient routines to convert names and addresses entered via Teletype and stored on files to conventional upper and lower case character sets for printing purposes? I need things like "4th" and "IV", III, II, von Stuben, etc. etc. — James S. Coan, 630 W. Upsal St., Philadelphia, PA 19119.

Q: When is PCC's "Second Book of Computer Games" being published?

A: Stuff is in the works — hopefully within 6 months. *N.J. Dulay (see below)*

Q: How can I get cheap source listings and/or paper tapes for classroom simulations to run on a microcomputer — in particular an IMSAI 8080? — Al Stampfly, P.O. Box 218, Coloma MI 49038.

A: Manufacturers users' groups and computer clubs (see list in PCC, Vol 5, No. 1, p. 26) are good sources of such material. Community Computer Center (1919 Menalto, Menlo Park CA 94025) is serving as a clearing house for such materials, and will provide listings and/or paper tapes at a nominal cost. (Watch for lots of this stuff in future issues of PCC!) How well CCC does in such an endeavor depends on everyone sending in programs to share — so keep the tapes and listings rolling in programs to share — so the following available: Star Trek (Altair Basic); Tiny Basic Source; Casual (Hex); 8080 Monitor. Also see the BASIC Super Star Trek version described under "Announcements."

Q: Does anyone have listings of QUBIC, GOMOKU, or STTRI? I have tried to write a QUBIC program, but this plays to only level 3 and a bit... — N.J. Dulay, 96, Gramere Rd., Handsworth, Birmingham B21 0UN, Eng.

A: STTRI is in Jan '76 issue of PCC (Vol 4, No 4). Paper tapes of all three games are available (at very low cost) from Community Computer Center, 1919 Menalto, Menlo Park CA 94025.

Q: I'd like to receive information on computer-assisted instruction for the exceptional child. — Mary E. Harper, Hwy 105 and State Farm Rd, Rt 5, Box 288, Boone NC 28607.

A: THE Journal (Technical Horizons in Education) is a monthly, \$15/year magazine you might look at. It's published by Information Synergy, Inc., 100 Hayward Rd., Acton, MA 01720. AEDS, the Association for Educational Data Systems (1201 Sixteenth St., NW, Washington, DC 20036) may also be helpful. Community Computer Center (1919 Menalto, Menlo Park CA 94025) has hundreds, maybe thousands, of MGM (mentally gifted minor) kids visit each year: you may wish to contact Joanne Verplank at CCC. The Sunnyvale, CA program for computers in schools is geared for MGM; PCC is working with the Sunnyvale program and will be reporting on it in future issues.

Q: Does anyone have any checkers or chess programs?



# LETTERS

# to the DRAGON

## An Australian Newsletter . . .

Dear Sirs,

We have received an Innovations Grant from the Australian Government to develop a low-cost mini-computer system suitable for high school use. Part of this grant is for the publishing of a newsletter to act as a communication link between people interested in this field.

This newsletter will be non-profit, non-political and non-commercial. We have not yet finalized on the name, but it will probably be *COM-3*, for Community Computer Communication.

We will naturally take full responsibility for anything we reprint and will send you a copy. We plan to have a policy of a "free" advertisement for every magazine whose material we use. There is no other way that we can repay people like you for the help you have given us to reprint your material.

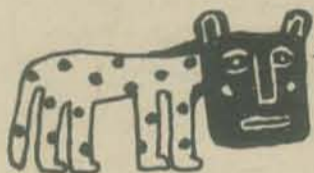
If everything works out according to plan, you will see a moderately strong influence of *PCC* in our newsletter. We hope to make it rather informal and as friendly as possible. I like your idea of writing comments in articles.

We are not really sure exactly where we are going with this newsletter, whether it will last, or whether there is even the interest to support it. Australia is a very funny country in this respect. There is a certain amount of conservatism and apathy among teachers in general and there is much less money for education. We think the time is ripe for our type of effort, but only time will tell. If nothing else, it will be fun!

We would appreciate any help and publicity that you could give us. We are complete novices in this field. We would also like to correspond with people who have a similar interest.

Thank you. I shall probably be writing to you again with a copy of OUR newsletter!

Sincerely,  
Timothy Mowchanuk  
P.O. Box 268  
Niddrie, 3042  
Australia



## BASIC brain benders . . .

How about this for a problem?

In comparing strings for order, BASIC compares the two strings one character at a time. So for non-equal strings, the first nonequal characters determine order. Therefore, when comparing such strings as '60' and '100', BASIC will evaluate '60' as greater than '100'. Write a program to overcome this flaw. Be sure to provide for proper ordering of strings like 'A6' and 'A10.'

This is problem 11 on page 39 and problem 8 on page 45 of *Advanced BASIC*. [Note: carried in the *PCC Bookstore*, as is *Coan's Basic BASIC*.] Of course the solution programs will depend on the computer, but I send along one for HP and one for GE. [PCC will publish these solutions in the next issue.]

Sincerely yours,  
James S. Coan 630 W. Upsal St.  
Philadelphia, PA 19119

## LSI-11 info . . .

Dear Bob and Jim,

At last count there were about 15 people in the S. Calif. area who were using the LSI-11. I understand that there are about an equal number in the Bay area. Other than those two groups I know of no other "large" bodies of hobbyists using the machine, although there are undoubtedly isolated people around the country who bought them from various distributors. Perhaps an announcement in *PCC* or *Dr. Dobb's* will help pull us together.

There is a common belief that the LSI-11 is too expensive for hobbyists. I don't agree. For about 1K, you can get a processor, 8K bytes of memory and a serial I/O card, and a backplane, fully assembled to industrial standards, that works when you plug it in. It took me 15 minutes to go from box to teletype. The machine has a very nice monitor, and for an extra \$100 or so you get hardwired fixed and floating point instructions, for those who are into that. Plus, you get the very elegant and powerful instruction set of the PDP-11, all of the system software that has been developed for the 11 (at a price, of course), and the DECUS library which is full of 11 software and is going to get a lot fuller. All in all, I think it's a pretty good deal.

There are also some disadvantages, of course. If the machine breaks you probably have to ship it back to DEC for repair. (DEC claims a very long MTBF, but who knows?). I don't know what a nominal repair charge would be. Until somebody builds an LSI-11-to-Altair bus interface we won't be able to use all the neat hobby peripheral cards. Memory is still somewhat more expensive than for hobby machines, although it too comes fully assembled and checked out from a variety of vendors. You have to supply your own power supply and box, although that isn't a big deal. Also, some of the most desirable software like the BASIC interpreter is still pretty expensive. I think DEC should consider releasing the papertape stuff to DECUS — probably they have recovered the cost by now! In all, though, I think that the LSI-11 has a lot to recommend it to the hobbyist, particularly to those who are more into programming than hardware.

So far no really creative applications for the machine have emerged from our group, since most of us are still working on developing auxiliary hardware like terminals and stuff. Peripherals include a few TVT's and TTY's, papertape readers and punches, and cassettes. Three of us have built the InteColor 8001 intelligent color terminal kit and are using it as our main I/O device (that's a story for another day). The peripheral that most of us would like to get is of course a floppy disk, but so far we haven't found anybody who makes an affordable controller for the LSI-11. That shouldn't be too far off, though.

Anybody who has an LSI-11 or is interested in one is welcome to write to me. So far there is no organized newsletter for the machine but undoubtedly one will emerge when enough people are interested. DEC will create a DECUS Special Interest Group (SIG) for hobby users of the 11 or 8 or both, which would take care of nuisances like printing and mailing, but we need a few more users before that becomes reasonable.

See ya,  
Jim McCord  
SysteMetrics, Inc.  
3710 State St.  
Santa Barbara, CA 93105



## Computer hobbyist books . . .

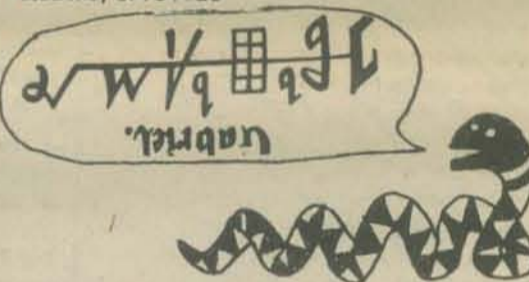
A valuable new book is available for the computer hobbyist. *Software Tools* by B. W. Kernighan and P. J. Plauger (Reading, Mass.: Addison-Wesley, 1976) presents programs for a test editor, file formatter, macro processor, librarian and language preprocessor while teaching structured programming. These are complete programs available from the publisher in machine-readable form (cost unknown) for a machine with a Fortran compiler. I've read the book, it's great. It starts with a simple echoing routine and builds very logically.

A Tiny Fortran compiler with integer arithmetic, character I/O, the IF statement and FUNCTION and SUBROUTINE subprograms could implement an impressive array of tools. Tiny BASIC could do it if it were compilable and could pass arguments as parameters to subroutines.

Implementation of these programs would be a big step toward having home computers help their owners do useful things; and home microcomputers are admirably suited to the word processing tasks the book presents.

It's sort of cheap too: \$8.95 in paper.

Bill Pearson  
Division of Biology  
California Institute of Technology  
Pasadena, CA 91125



## A computer club in the boonies . . .

Hi! Once upon a time (1937) my friend Ernie & I got our ham tickets in the 8th grade, in Kalispell, Montana. He had to retire because of a heart problem; built a little house on the shore of Flathead Lake. He's like isolated from the world of science & technology. I saw him this summer, got him onto computers; he wants to start a computer club: "Flathead Computer Society." Needs advice, etc. Maybe some of u guys have some handy handouts or such? Please send to:

Flathead Computer Society  
c/o Ernest Brooner  
Box 236  
Lakeside, Montana 59922  
Thanks: Douglas Penrod

## School computers . . .

The RFI from UC (*PCC*, Vol. 5, No. 2, Sept-Oct 1976, page 13) about stand-alone computers was very interesting. The need for such machines as part of the over-all computational services provided to academic users is undeniable. Obviously, single-user machines will not replace large-scale batch or time-sharing systems in those applications for which such systems continue to be cost-effective. I believe that the single-user machine will prove to be of particular value in applications that are not now being handled by other means. Thus, in most cases, the single-user machine would supplement existing services rather than replace them.



Although it is possible for several microprocessors to share such resources as primary or secondary storage, the low cost of RAM and floppy disk units make resource sharing unnecessary in most applications. There may be a few notable exceptions, such as CAI, in which the sharing of large programs by a number of microprocessors is more economical than a stand-alone mode. For such applications the IMSAI Hypercube architecture appears especially attractive, since it reduces the number of communications circuits needed.

The convenience and low cost of video display terminals, combined with the use of tape cassettes or floppy disks for long-term storage, make hard copy more of a luxury than a necessity. When hard copy is needed it can be produced most economically by dumping from tape or disk at a central facility. The ability to retain the original information in machine-readable form allows future editing or processing to be done quickly and economically.

Until recently, the usefulness of ordinary color TV picture tubes in video displays was limited by their rather low dot resolution. Newer types, such as the Zenith 100-degree 19-inch tube, have better resolution and can be used to provide high-quality color video displays.

Any of the popular microprocessors could be used as the basis of a stand-alone machine for academic use, but the state of the art is evolving rapidly. There is still room for improvement in the functional design of microprocessors, especially with respect to features useful in academic applications. The Z-80 extension of the 8080 instruction set is an indication of the probably direction of future developments in this area.

Many academic uses of small computers will require at least 32K of primary storage, although the loading of overlays from floppy disk under program control might reduce the primary storage requirement to about 16K.

On the other hand, there are a surprisingly large number of useful things that can be done with much smaller programs. Many classroom demonstrations could be handled neatly by a very small machine such as the 6502-based BABY! This microcomputer comes with 2K or 4K of memory, an ASCII keyboard, video display generator, and a speaker for computer-generated audio output. The whole thing is built into a small attache case, weighs about 10 pounds, and sells for less than \$1000.

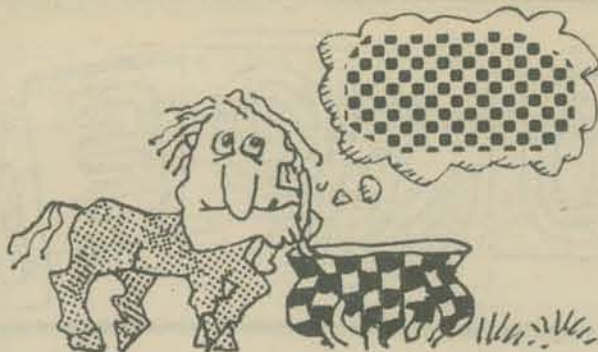
Sincerely,  
Jim Day  
17042 Gunther Street  
Granada Hills, CA 91344



am dolor sit amet,  
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uis nostrund exercitati  
consequat. Duis aute  
consequat, vel

## TINY HI

For the past eight months, I've worked on designing my own programming language, TINY HI. I've now conceived several clean and fairly powerful procedural languages. The simplest is described in *Dr. Dobb's Journal*, Volume 1, No. 9. I also expect to specify TINY LISP, and TINY SNOBOL in coming months. Core is cheap compared to people, and the major economy I want is in syntax, number of data types, and number of data structures seen by the user. One key to such economy is the elimination of the *multilevel approach* and the *specialization* that characterizes much existing system software. Software that is "OS dependent" is even less portable than machine code on many systems. I don't want the user to have to learn assembler, editor, JCL, file handling packages, etc. I want him to see conceptually, and syntactically integrated systems.



During the latter part of my spinning of imaginary languages, I've become dissatisfied with my previous definition of HI, as a procedural language which is both cleaner and more useful than PL/I, and incorporating associative retrieval, pattern matching, and list processing facilities. Several ideas have changed my direction:

1. A tiny language (or any language) should be *extensible*.
2. Most existing extensible languages (LISP, TRAC, FORTH) are limited by primitive syntax.
3. The concept of "set" or "relation" is powerful enough to include all the diverse data structures found in computer applications, and to manipulate them with common tools.
4. A further equivalence can be established between relations and functions; one is defined extensionally; the other is defined operationally.
5. The relational calculus is a powerful form for manipulating such structures. In the past, it has been restricted to data base operations (Codd's DSL ALPHA).
6. Declarations make it feasible for the user to see only a single data structure, ignoring the different *internal* representations of structures.

I'm attempting to design an extensible relational language with a context-sensitive grammar. Work is presently stalled by a 50 hour work week, 17 semester-hours of school, my home computer, and a promised article.

FORTH is a fascinating new language (\$1000 for 8080 systems). I've ordered manuals, and will report on what I find out.

DDJ is great; things like your floating point routines for the 6502 (which MOS Technology did not have available) really help.

Design for the future! In 5 years your home computer will be a 64K memory, 16 bit dynamically microprogrammable processor, four billion bytes of fast mass storage, and goodies I can't imagine.

Keep up the good work.  
Martin Buchanan  
2040 Lord Fairfax Rd.  
Vienna, VA 22180  
(703) 893-7978

## Another number-guessing game . . .

Thought you might like the following which I have run on Cyber and (earlier today) on SWTC 6800 with 4K BASIC.

```

* * * * *
10 REM A GAME OF NUMBER GUESSING
20 PRINT "THE COMPUTER HAS TWO NUMBERS IN";
25 PRINT "IN MIND, A BASE AND A JUMP"
30 PRINT "YOUR GOAL IS TO CATCH THE BASE";
35 PRINT "NUMBER WHICH WILL BE CHANGED"
40 PRINT "BY THE JUMP EACH TIME YOU GUESS.";
45 PRINT "JUMP IS 1-10."
50 PRINT "BASE IS 1-100"
60 PRINT "THE GAME IS WINNABLE, HAVE FUN"
70 A=RND(A)
80 B=RND(B)
90 S=INT(A*10)+1
100 T=INT(B*100)+1
110 PRINT "ENTER GUESS"
120 INPUT C
130 U=INT(C)
140 IF U=T THEN 200
145 PRINT T-U
150 T=T+S
160 IF T < 101 THEN 120
170 T=T-100
180 GO TO 120
200 PRINT "YOU WIN AT";U,S
210 GO TO 70
220 END

```

TYPICAL OUTPUT  
ENTER GUESS  
250  
11  
265  
3  
277  
-2  
282  
YOU WIN 82 7



Variations I have used: Using a different multiplier (than 10) for jump. (line 90). Turning around at 100 instead of jumping (lines 160-70).

```

170 T=200-T
175 S=S

```

ALSO NEED:  
155 IF T < 1 THEN 184  
184 T=T  
186 S=S  
188 GO TO 120

Making the direction of the jump depend on whether the difference is odd or even (not tried on 6800).

```

146 IF INT(2*((U-T)/2))=U-T THEN 150
147 REM ABOVE TESTS U-T THEN 150
148 S=S
149 REM CHANGE DIRECTION OF JUMP

```

(CAUTION, turn around tests — above — must also be implemented.)

Mike Firth  
4712 Northway Dr.  
Dallas, TX 75206



10/26/76

Sir:

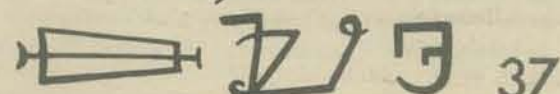
You might consider this a letter of both praise and reprimand. I find your articles in the *PCC* magazine very interesting and informative, but my gripe is the fact that although the programs you include look interesting I can't read them! If you want to please the subscribers of your magazine you must make these program listings more legible.

Thank you.  
James Parks, Teacher  
Walter M. Williams Sr. High  
1307 S. Church St.  
Burlington, NC

☆ ☆ ☆

We apologize for the unfortunate quality of some of our listings. From now on we will be using a different (and more expensive) reproduction process for them, which hopefully will result in some improvement. In addition, we are reprinting the unreadable listings from last issue in this issue. We can only work with what we get, however. If you send us a listing, be sure it's on good quality white paper, printed with a new ribbon. (It also helps to clean the TTY printhead first).

Casbiel.



# ANNOUNCEMENTS

## MUMPS

[is a highly communicable disease or a high level language/retrieval system mainly used in biomedical applications...]

The fifth MUMPS Users' Group Meeting was held on 29 and 30 September and 1 October 1976 in Madison, WI. The Meeting was packed with exciting presentations and live demonstrations of interactive applications developed using the MUMPS computer language. Among the topics of special interest were voice-computer interfaces, medical information systems, computer-aided instruction, on-line cataloging for the National Library of Medicine, and the formation of the MUMPS Users' Group Application Library to facilitate the transfer of MUMPS applications.

An introductory tutorial on programming in MUMPS was given, and was attended by administrators and physicians as well as programmers. A tutorial and a workshop on advanced MUMPS techniques were held for experienced MUMPS programmers. There were other workshops on such topics as computer-aided instruction and MUMPS application transfer.

Seven vendors of MUMPS applications and implementations participated in a vendors' forum. Two of the vendors that exhibited at the Meeting (namely, Artonix, Inc. of St. Louis, and Digital Equipment Corporation of Maynard) announced their completion of the NBS-defined Standard MUMPS which is now seeking approval as an ANSI standard.

There are now about 400 institutions around the world that use MUMPS, and this total is growing by about 80% per year. A variety of computers are used, including DEC's PDP-11, PDP-15 and PDP-10, Data General's Eclipse and Nova, Artronix' PC-12 and PC-16, Burroughs' B6700, and IBM's System/360 or System/370. For information on MUMPS, future MUG meetings, and MUMPS applications, contact the MUG Executive Secretary, Dr. Joan Zimmerman, Biomedical Computer Laboratory, 700 S. Euclid Ave., St. Louis, MO 63110.

## ICCH/3

The Third International Conference on Computers in the Humanities, co-sponsored by Universite de Montreal and University of Waterloo, will be August 2-5, 1977 at the University of Waterloo, Waterloo, Ontario, Canada. Send abstracts or papers on any topic regarding computers and their relation to the humanities to:

Professor Paul Bratley  
Departement d'informatique  
Universite de Montreal  
Montreal, Quebec  
H3T 1J4  
CANADA



The deadline for abstracts or papers is January 15, 1977.

## NEWS FROM COLA

The first meeting of the Computer Organization of Los Angeles (COLA) for the 1976-1977 academic year was held on October 14 at the Pacifica Hotel in Culver City. Following a testimonial dinner honoring Mr. Art Freier, Mathematics Supervisor for the Los Angeles School District, Professor Richard Ballard of the University of California at Irvine gave a fascinating slide presentation on "Computers and the Future of Learning."

An enthusiastic and highly innovative proponent of

computers in education, Professor Ballard outlined some of the current uses of computers at UCI and some possible applications of techniques now under development.

If the present trend toward larger classes and smaller budgets continues in American universities, computers may soon become the only cost-effective way of evaluating student performance. For example, at UCI all physics examinations at the undergraduate level are computerized.

Using a Xerox Sigma 7 timesharing system and other computers, UCI provides highly sophisticated computer services to both students and faculty. High-speed video terminals facilitate extensive use of coordinated text and graphics displays, and hard copy is available to students via coin-operated non-impact printers.



One of the exciting new developments at UCI is an incredibly versatile program that allows students to set up and perform an almost infinite variety of simulated physical experiments. Over 150,000 distinct functions are provided, and the progress of each simulation is monitored on-line by a graphic display of all of the variables requested by the student. Examples cited were the display of electric field intensity plots under varying conditions, and the display of planetary orbits in multiple star systems.

Another remarkable development is a CAI technique giving the student almost total freedom in his interaction with the computer. At any point the student can change the subject within reasonable limits, request clarification of a specific point, or ask the computer to cover the material in greater or lesser depth.

To implement the extensive graphics capabilities of these programs, UCI has added powerful graphics functions to high-level languages such as APL and BASIC.

Professor Ballard concluded his talk by saying that presently available APL interpreters are rather slow for some CAI applications but speculated that a highly parallel APL multiprocessor might be several orders of magnitude faster than any machine in use today.

## THEATER COMPUTER USERS

Support of a Theater Computer Users Group is being considered by Theater Sources, Inc., a non-profit, tax-exempt corporation. Persons who have developed programs for applications in the area of live drama are invited to contact TSI with suggestions, information, and requests to be placed on a preliminary mailing list. Write TSI-TCUG 4712 Northway Dr., Dallas, TX 75206.

The form of support has not been set, but may include a newsletter, reproduction of listings or decks on file, and/or meetings for exchange of information. Suggestions are welcomed. Costs of services will be covered by modest fees.

Uses of the computer in theater might include rather ordinary uses such as bookkeeping, accounting, and mailing lists, but can also be extended to ticket sales, seating charts, budgeting and artist records. Further extensions might include creation of buying and cutting lists for sets and costumes, visualization and modification of designs, and other interactions between artists and machine to ease the tedium of craft.

Theater Sources, Inc., is a non-profit corporation

under Texas law, created to "gather and distribute information about live theater" and granted a federal tax exemption. Its current activities include publication of PROLOG, a newsletter for playwrights, and THEATER ACROSS AMERICA, for community theater, and the National Theater File, timeshare access to theater information.

Mike Firth  
4712 Northway Dr.  
Dallas, TX 75206  
(214) 363-5003



## NEW COSMAC COMPUTER

At last, someone has come out with a microcomputer based on the RCA 1802 (COSMAC) and suitable for many hobbyists. Produced by Infinite, Inc. (Box 906, 151 Center St., Cape Canaveral, FL 32920), this machine has a 4-digit hex readout and integral hex keyboard. Standard on-board memory comprises 256 bytes of RAM, externally expandable to 64K. Additional features include DMA as well as serial and parallel I/O. Assembled and tested, the price is \$395 with case and power supply, \$249.95 for a complete kit, or \$179 for just the MPU board.

## "COMPUTER EXPERIENCE"

STONY BROOK, N. Y. — Free "Computer Awareness Experience" tours for children from local elementary schools and youth organizations will again be offered beginning later this month at the State University of New York at Stony Brook.

Dr. Peter B. Henderson, Assistant Professor of Computer Science, who will coordinate the tours, said they have been designed to give children a basic introduction to computers, including numerous opportunities to use computing equipment. The tours were instituted last spring by the Department of Computer Science. Because of the overwhelming response from schools and youth groups, the Department will be continuing the program this fall semester as a community service.

The tours will involve one-two hour visit to the Computer Science Department's computing facilities in the University's Light Engineering Building. Visiting children will be able to interact, "talk," with the University's new central Univac 1110 computing system using typewriter-like computer terminals. They also will be invited to experiment with a computer graphics system, playing games such as Tic-Tac-Toe by using a computer television display terminal which is part of the Computer Science Department's PDP-15 computing system.

Computer programs developed by the Computer Science Department will be used to demonstrate the various computing facilities. One of these computer programs, nicknames "FUN," gives the computer an almost human ability to ask simple questions, for example, "What is your name?", "How old are you?", etc. to which children will be able to type appropriate answers. The computer ("FUN") then responds to these answers in a seemingly intelligent manner. To illustrate some mathematical capabilities of the computer, "FUN" also can be used to add, subtract or multiply numbers supplied by children using the computer terminals.

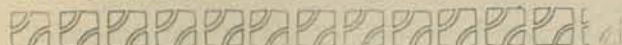
The computer television (graphics) display program will permit children to play Tic-Tac-Toe with the PDP-15 computer. Children will use a "light pen" to indicate a move on the display screen, with the game continuing

until either the computer or the child wins or the game is a draw.

Children will be able to use various auxiliary computing facilities including an IBM computer card punch (keypunch unit). They also will be encouraged to ask questions about computers.

Dr. Henderson said the tours, as presently constituted, are recommended only for children in grades one through six, in groups no larger than approximately 20 per tour, accompanied by adult supervisors, preferably with one adult available for every five children in the case of younger age groups.

Tour reservations may be made or more information on the program obtained by calling (516) 246-7146.



## CHURCHES AND MICROS

### The Enabler

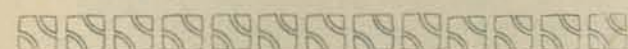
Using a microcomputer system to process information for churches? This was the idea proposed at the Center for the Study of the Future after finding the minicomputer system they wanted would cost \$70,000.

Information processing and networking between churches is a growing problem that has not been adequately approached by any denomination or institution. The rich diversity of today's church structures and vocabulary as well as the rapid growth of communities outside of the institutional church has created a larger number of *ad hoc* networks that seem to change constantly. The microcomputer system with its low initial cost and inexpensive mass storage medium (audio cassette) seemed ideal for meeting this networking problem. Files could be created by any church or community and stored on the inexpensive cassettes. Other local churches could search these files inexpensively using their own system on terminals to a regional computer. Job information, food distribution, clothing, and publications (on subjects as Bible teaching, nutrition, healing, and health) can all be networked easily between local churches or churches of similar environmental profiles (as two communities in different major cities).

### Interfacing the Selectric

Now that our system has become operational, we find ourselves as a pioneer in a new land. (This has probably been true of the majority of microprocessor applications?) Churches, we have discovered, like personalized printouts. Normal teletype output and high speed printers antagonize our people-oriented friends. The solution, we have discovered, was interfacing a Selectric mechanism to our system. The printout is conventional and personal. We can choose from a variety of typing elements. We have both upper and lower case letters, more than a hundred characters per line, high reliability, and a typing speed better than a teletype. It is inexpensive and easy to update our networking and information retrieval files from the latest information with the inexpensive cassettes. Everyone gets an original copy. Stencil preparation, newsletter composing, magazine article writing, mailing labels, and correspondence are only a few of the many additional applications we have discovered.

We would like to help others in getting Selectrics interfaced and so we have put together a manual with schematics, software, and other relevant information. You can order this *Interfacing the Selectric to the 8080* for \$12 prepaid from the Center (4110 N.E. Alameda, Portland, OR 97212). This manual was composed on our system. In addition, we will network information relevant to the Selectric between those purchasing the manual on our system for no additional charge. CHURCH queries are particularly welcome! Catalogs or newsletter samples are 25 cents.



## ANOTHER COMPUTER CLUB

The British Columbia Computer Society had its first meeting in September, '76 and since then has doubled its membership to 40. Meetings are at 8PM the first Wednesday of every month in Room 129 of the British Columbia Institute of Technology (BCIT). For further information, contact Karl Brackhaus, 1625 W. 13th Ave., Apt. 203, Vancouver, B.C., Canada V6J 2G9, (604) 738-9341.

# COMPUTER MUSIC JOURNAL

39  
NEW!

The *Computer Music Journal* will be devoted to the development of computer systems which are capable of producing high fidelity music. The following topics will be covered:

- \* composition of music using a computer
- \* production of natural sounding timbre or quality of tone
- \* design of real time playing instruments
- \* real time input controllers such as keyboards, joysticks, and new controllers
- \* circuit design of computer controlled oscillators
- \* review of hardware components
- \* homebrew computer music instruments
- \* digital signal processing
- \* analysis of acoustic instruments
- \* psychoacoustics
- \* music theory which would be more easily realized with a computer than with traditional music instruments
- \* descriptions of presently existing computer music systems
- \* reviews of books about computer music, acoustics of musical instruments, psychoacoustics, music theory, computer design, and electronics

The first issue of the journal will be about 50 pages in length. If enough people subscribe to pay for printing a larger journal and if people contribute more articles, the journal will increase in size. Since the journal will be published by PCC, a non-profit corporation, there will be no commercial advertisements. Therefore printing costs will be paid from the subscription fees of the few people interested in this esoteric topic. The journal will be published every other month starting December, 1976. The first issue will be mailed out during January.

Send \$14 for a one year subscription to the *Computer Music Journal*, PCC, Box E, Menlo Park, CA 94025.



## MINNESOTA COMPUTER SOCIETY (chapter of COMPUTER SOCIETY - SCCS)

A new chapter of the SCCS - Computer Society has formed in Minnesota - the Minnesota Computer Society. 75 people attended the first meeting held at Medtronic, Inc., 6120 Earle Browne Drive, Minneapolis, MN. Many expressed interest in bringing others to future meetings.

A survey filled out by members indicated a wide variety of interests with regard to future meetings. In addition to interests in building home computers, trouble shooting techniques discussions, group purchasing, and software development, many persons indicated an interest in computer effects on everyday life, future trends in computers, computers in the business world, how a computer works and programming a computer.

Of the surveys returned, slightly over half had some computer-related equipment at home; 60 per cent had access to some computer-related hardware.

In addition to serving as a club for computer hobbyists, the Minnesota Computer Society hopes to serve the needs of others by providing an opportunity to learn about computers. Possibilities for future plans include sponsoring classes, laboratory sessions for computer hobbyists, hardware and software displays, technical hardware presentations and general interest presentations.

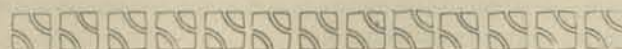
The September evening program featured Vic Merryman, INTEL, who discussed BEGIN THINKING ABOUT YOUR OWN HOME COMPUTER SYSTEM; Dave Walde-mar, Hennepin County Library, who spoke about the HENNEPIN COUNTY LIBRARY PUBLIC COMPUTER FACILITIES; and Dr. Otto Schmitt, University of Minnesota, discussing SOME OF THE MANY DISGUISES IN WHICH MICROPROCESSORS APPEAR.

The program for the October 25 meeting included Tom Jacobson and Dean Johnson, University of Minnesota, presenting "Zen and the Art of Microcomputer Design" and Betty McMillan, Hewlett Packard, Indianapolis and

Bob Severson, Texas Instruments, Minneapolis, presenting "Extensions of the Packet Calculator."

The November 22nd meeting will be held at Medtronic. Future meetings will be held in various locations throughout the Minneapolis-St. Paul area on the fourth Monday of the month with the exception of the December meeting. This meeting will be held December 13 at Roseville Towers, Fairview Avenue and Highway 36, Roseville, MN. 50 terminals are currently installed and will be available for use by members that evening.

For further information concerning the Minnesota Computer Society, contact:  
Jean Rice  
Minnesota Computer Society  
Box 35317  
Minneapolis, MN 55435



## MICRO STAR TREK TAPES

Here's a source for BASIC Super Trek, as described in "The Best of Creative Computing - Vol. I." It's optimized to fit in Altair 8800 with 16K total memory, including MITS 8K BASIC. It will also run with other systems. For \$3 you get a high quality paper source including a 15-page description of the game, program variables and routines. For \$6 you can get a MITS compatible tape cassette supplied on a Maxwell UD tape.

D.C. Mitchell  
28624 Mulberry Ct.  
Warrenville IL 60555

## THE CRUNCHER

### A Low-Order Community Memory System

The "Cruncher" project originated from an attempt to scale down previous Community Memory proposals to a level at which development could begin with resources on hand. As the idea developed it became apparent that the lowering of the scale of the system allowed an interactive process to occur in the development of the institutions of community communications which are a necessary part of any Community Memory. This lowering of the necessary intensity of interaction, together with the physical broadening of the base of usership brought about by mobile operation of the equipment, implies that a pilot system may be constructed with equipment now on hand which is also a true prototype for future expansion.

We call it the "Cruncher" because the system will be designed initially for batch sorting and merging, or what could be called "text crunching". The primary reason for this design compromise is that large-scale rapid-access storage devices are not available at acceptable price levels for this pilot device (which is being assembled half from the surplus equipment market, half from new microcomputer equipment).

Input of text will be through a multi-user intelligent terminal assembled from components newly available for the amateur microcomputer market. This device will be capable of supporting one or more video displays, keyboards, and communication devices such as modems or high-speed parallel interfaces. Persons using this input device will be able to compose text messages, edit them, add keywords and enter the messages to the main processor with the aid of prompts, field delineation, dictionaries of keywords and data base headings, and whatever other amenities can be provided by an 8080 microprocessor. The cost of a multiple user terminal of this sort will be less than that of a single standard unintelligent terminal.

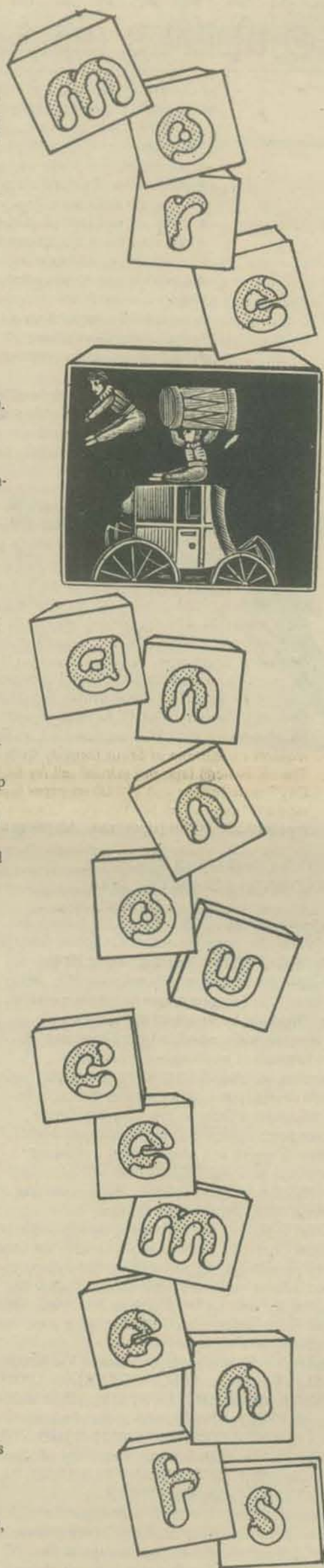
The main processor (an LSI-11 with additional memory), the disc (fixed head, 800K byte), and the tape drives (9 track 800 bpi) are mounted in a van-type truck. A medium speed printer is capable of operation connected to the main processor or the terminal. A portable power supply will enable operation at places remote from power lines.

In operation, the vehicle will arrive in a local area and set up the terminal in an adjacent community structure (school, church, meeting hall) or in the open air, protected by awnings which can be attached to the van body. A list of the existing keywords and data bases will be posted or otherwise circulated (ideally in advance of arrival). People will be encouraged to use the system as a bulletin board and to leave lists of keywords and data bases which they wish to have searched. Keywording will probably be based on a three-level tree structure which will expand in number of levels as the system is upgraded in the future.

At the end of the van's stay the terminal is taken down and the "crunching" begins. Tapes are mounted and the newly-acquired information is merged into them. At the same time the data bases on these tapes are searched for items having keywords which have been requested. Files of these "found" items are compiled on the disc and are then sorted into "directory" format. In this format the text of the items is listed first, with keywords, followed by a complete index of keywords. Each entry in the index contains the first line of the items to which a keyword has been attached along with the page and item number.

The directories thus generated are printed (where multiples of the same directory are required the printer can generate masters for various duplicating systems) and are left with local contact people for distribution. The cycle is now complete, with data bases updated, so that the system can move to the next stop on its circuit.

While the urban CM system allows "browsing" as an interactive process using the machine, the directories of the cruncher allow the user to browse through a range of secondary or "pointer" information delimited by rough keyword boundaries. Since the user cannot immediately return to the machine to conduct a new search as his/her interests wander, the keywording process must be set up so as to result in "finds" of areas rather than items. Additions of new keywords must occur through a process involving agreement with a "gatekeeper" who maintains familiarity with an area of the data base and who can attempt to prevent the keywording from proliferating beyond reasonable levels. Such gatekeepers, or librarians, none of whom will be considered to "own" an area of information, will play an increasingly important role in the operation of CM systems as they grow. Their function will be to act as "entropy reversers" by constructing and main-



taining their own indices and systems of reference.

Such systems with pluralistic indices will require more sophisticated hardware and software. The cruncher is relatively primitive in this respect, with its single index and long retrieval time. How will it grow from this initial level to a true CM system with minimal restrictions on the user and the information?

Initial contacts have already been made in the Northern California area with organizations interested in sponsoring the local operation of the system. It will be necessary for the initial run to have groups of people in each community where a stop is arranged who will handle the explanation of the system, the physical arrangements such as securing the space and structures for use during the stop, the provision of services for people who must travel inconvenient distances to use the system, and the other more synergistic events which can be affiliated with the "medicine show" mythology of the system.

These local groups can form the nuclei of local information centers. Starting on an informal basis, these groups will be encouraged to regularize their operations if the use of the system results in an expansion of low-level economic activity results from the existence of the directories and their timely update. If this happens the system can grow, and the local information centers will be the means through which this happens.

The intelligent terminal provides the means by which such a local information center can enter the direct operation of the system. Design of the terminal will be such that the block-formatted text which would ordinarily be passed directly to the main CPU can also be stored in serial format on audio cassette tape. If the users of a local area come to a point where they feel that the economic advantage given by the system warrants the cost, they will be able to purchase a terminal and put it into operation concentrating text onto cassette. Such cassettes may then be mailed or brought to the location where the system is currently located so that the frequency of the directories can be made shorter than the cycle of the vehicle on its circuit.

With the addition of a printer to the terminal and a modem the local terminal could concentrate text for telephone transmission to the main CPU. After sorting the results could be block-transmitted back where they would be buffered on cassettes and printed out at leisure. This upgrade would likewise wait until local users felt that it was justified.

When enough communities within a region come to this point, the next step would be for them to secure a central CM system configured for on-line interactive search and entry. Each intelligent terminal would be easily upgraded for multiple user operation at a relatively low incremental cost per user. By this time modes of use will have been well-established, so that such an investment would not be made on a blind basis.

Further steps might involve the establishment of small (10 Watt) FM radio stations at regional centers with Subsidiary Carrier Authorization (SCA) so that the ultrasonic portions of their bands could be used for unidirectional data trunks. (The regulatory status of this mode of operation has not yet been investigated). Another alternative to leased telephone lines as data trunks might be optical (laser) transmission — one unit is now being offered to \$3600 which claims 18 mile range through clear air at 9600 Baud.

The above development process is specific to a rural or otherwise non-urban area. The reason for this is that lower expectations obtain in non-urban areas as to rates of information exchange. This implies that the system will have more latitude for development of a favorable "myth" if it is first put up in a non-urban milieu.

This "myth" is perhaps best defined as the commonly-held set of understandings about the definition and modes of use of the system among the set of people who are likely to use it. Tools have individual myths which define the customary areas of their use. These myths are transmitted by language and are specified by the metaphors and similes used in the description of the tool. The process of the development of a myth is not well understood and is carried out intentionally within limited social and cultural areas by the advertising trade.

It will be necessary to cultivate a favorable and flexible myth for the CM system as it is built. To leave the mythic engineering to chance would be irresponsible and wasteful. We will be working on the development of the myth as conscientiously as if it were the most critical piece of hardware or software. Toward this end we invite comment and discussion.

On the grounds that performance is much less subject

to argument than speculation, LGC Engineering has embarked upon the design and construction of a pilot Cruncher system. The main CPU, disc, tape drive and printer are on hand. A stable income base exists to allow the purchase of further equipment. The hardware for the terminal already exists in low-cost kit form. A software development system is available. We expect to have the pilot system in service by the early part of 1977.

— Lee Felsenstein

(reprinted from *The Journal of Communication*, an irregular publication of LGC Engineering, 1807 Delaware St., Berkeley, CA 94703.)

## SYMPOSIUM

Symposium to Mark Tenth Anniversary of Dartmouth's Kiewit Computation Center, Nov. 30, Dec. 1-2

HANOVER, N.H. — The tenth anniversary of the dedication of the Kiewit Computation Center at Dartmouth College will be marked with a special symposium, "Man and the Computer," on Nov. 30 and Dec. 1-2, according to an announcement made here today by the conference program chairman, Thomas E. Kurtz, director of academic computing at the College.

The symposium will be opened with a keynote address by President John G. Kemeny, whose book, "Man and the Computer," furnished the symposium with its theme.

The subsequent four sessions will bring together a panel of leaders from the computer industry, business, government and education.

In discussing the planned program, Conference General Chairman John S. McGeachie, director of computing services at Dartmouth, commented, "When the Kiewit Center was originally dedicated on Dec. 2, 1966, the future of computing was one of intense speculation, and we celebrated the opening with a symposium which attempted to look into that future. Now, 10 years later, the rose-colored visions of 1966 have been tempered with some hard realities. With maturity have come new conceptions of how computing power can and should be used and its impact on society has become more pervasive than could have dreamed 10 years ago. We will attempt to address some of these areas in the symposium."

Speakers and their topics for the program include David Ahl, editor, *Creative Computing*, "Computer Power to the People"; Robert Bigelow, attorney, "Copyright vs. Copy Rights"; Ruth Davis, National Bureau of Standards, "Taking Risks with Computers"; James Emery, President, EDUCOM, "Networks — A Link to the World Around Us"; George Glaser, consultant, "Electronic Funds Transfer — Progress and Issues"; Dennis Meadows, associate professor, Tuck School and Tuck School of Business Administration, Dartmouth College, "World Models — Take Your Pick."

Also, Donella Meadows, associate professor of environmental studies, Dartmouth College, "Policy Making and Computer Modeling"; Donn Parker, Stanford Research Institute, "The Future of Computer Abuse"; Frank Ryan, director, House Information Services, U.S. House of Representatives, "Computing as an Aid to Political Effectiveness"; and Willis Ware, Rand Corp., "Public Policy Aspects for the Information Age."

An open forum will be conducted by members of the press in the final and closing session.

To insure effective interchanges between participants, registration to the symposium will be limited to 400. The fee of \$75 covers all sessions and includes meals. Further information may be had from the Conference Coordinator, Kiewit Computation Center, Hanover, NH 03755, (603) 646-2643.

## MICRO FLOPPIES

Complete Floppy Disk System for Altair/IMSAI: \$599

The North Star MICRO-DISK SYSTEM is a complete, high performance floppy disk storage system for use with any Altair/IMSAI compatible computer. The introductory price of \$599 includes all hardware and software needed to turn on the computer and start loading or saving programs and accessing on-line data files.

The disk unit is a compact version of the standard Shugart floppy (30,000 sold!). Drive capacity is approximately 100K bytes per diskette. Latency is 100ms. Track to track access is 40ms. The size of the unit (6" by 3" by 8") permits mounting of the drive inside the computer cabinet with specified cutout. The power supply requirements (.5 amps at +5 volts and .9 amps at +12 volts) permit utilization of the existing

computer power supply. If preferred, a cabinet and power supply are available.

The North Star controller is a single Altair/IMSAI compatible PC card which can control up to three drives. An on-board board PROM contains power-on bootstrap software. The controller operates with or without interrupts.

A file oriented disk operating system and a disk version of North Star extended BASIC are included. North Star BASIC has multiple-dimensioned arrays, multiple lined functions, formatted output, machine language interfacing, sequential and random disk file accessing, and much more.

The \$599 introductory price covers: The North Star controller kit (highest quality PC card and components, with sockets for all IC's), the Shugart mini-floppy drive (model SA-400), disk-to-controller cabling and connectors, two diskettes (one pre-loaded with the software), complete hardware and software documentation, limited warranty, and shipping. Additional drives are \$425 each, including cables. Diskettes are \$4.50.

Delivery begins late December or January. Orders are now being accepted, either cash in advance or 25% deposit with balance payable C.O.D. (including C.O.D. charges). BankAmericard accepted with signed order.

Write North Star Computers, Inc., 2465 Fourth St., Berkeley, CA 94710. Telephone (415) 549-0858.

## SWTP 4K AND 8K BASIC®

Southwest Technical Products Corporation has just released its 4K and 8K Basic® software. Both feature fixed and floating point math with a full 1.0E-99 to 9.999999999E+99 number range. In addition to the line number mode a direct (no line number) mode of execution is provided on most statements to create a calculator like mode of entry for short programs. Provisions have been made in both packages for saving and loading BASIC programs to and from either cassette or paper tape. A USER function is even provided for jumping to machine language subroutines.

Both packages have been written for the SWTPC 6800 Computer System. The 4K Basic® requires a minimum of 6K of memory with 8K recommended, while the 8K Basic® requires a minimum of 8K of memory with 12 recommended. The 4K Basic® tape and manual sell for \$4.95 on "Kansas City" cassette tape and \$10.00 on paper tape. The 8K Basic® tape and manual sell for \$9.95 on "Kansas City" cassette tape and \$20.00 for paper tape. All prices are postpaid in the US.

© Copyright 1976 by Southwest Technical Products Corp. 4K and 8K BASIC Version 1.0 program material and manual may be copied for personal use only. No duplication or modification for commercial use of any kind is authorized.

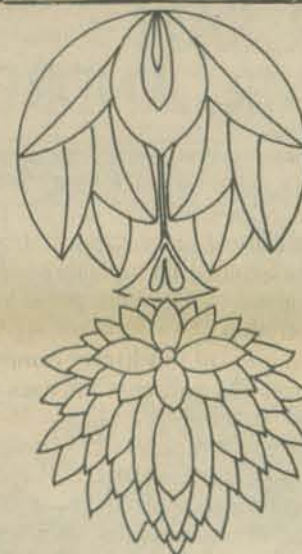
## STAR TREK WELCOMMITTEE

There is a central information center to answer fans' questions about STAR TREK and provide new fans with complete information about STAR TREK and STAR TREK fandom. Write to —

STAR TREK WELCOMMITTEE is a non-profit SERVICE organization (NOT a club to join) with 120 volunteer workers in 35 states who devote their time and efforts to answering questions about STAR TREK at no charge.

Few fans realize all that is really available in the world of STAR TREK: about 250 clubs, about 200 fan magazines, 25 books, several annual conventions, and many sales items. That's where STW comes in — we can give you information on all of this, plus much more: ST technology, ST actors, details on the making of ST (live action or animation), details of the various episodes, trivia, penpals, fans in your area, revival efforts, aid in forming clubs or publishing zines... whatever your question on STAR TREK or STAR TREK fandom, chances are we've got the answer — or can get it for you. Write us. Please enclose a self-addressed stamped envelope (SASE) when requesting information. STW's monthly report, *A Piece of the Action*, containing current STAR TREK and STAR TREK fandom news & info, STW business & occasional feature articles, is available for \$5.50 per year from —

STW's 28-page *Directory of Star Trek Organizations* (listing clubs, zines, books, sales items & conventions) is available for \$1.00 from —



STAR TREK WELCOMMITTEE  
c/o Shirley Majewski  
481 Main St.  
Hatfield, MA 01036



STW Monthly Report  
P.O. Box 19413  
Denver, CO 80219

STW Directory  
Allyson Whitfield  
P.O. Box 206  
New Rochelle, NY 10804

# THE GREAT SAN ANDREAS FAULT CAPER

All right, what's wrong? This idea about stapling the faults together is too wild? Or are you all too lazy to write me? So far I've only gotten one letter! Come on, you wouldn't be reading this paper if you weren't looking for crazy, wild ideas, and I don't think you all are lazy.

You don't really want to sit behind your computer, do you? Especially when you know that there are a bunch of people out on the fault somewhere singing, listening to music, having fun, enjoying the sunshine, and putting staples in the ground...

I don't think I'm asking too much. All I want is you to write me — so I know that there is someone else out there! Tell me what you think of the idea. And I need some help determining the size and shape of the staples. Plus when and where they should be put in. Also, what should they be made out of. Write to Tom Albrecht at PCC.

*Earthquake Person,*

*I think you're crazy, but like too many other things, it's something to do. I live in the Bay Area, and will join you at the site that you and PCC are going to be at.*

*I think the staples should be about 3 yards high, and 2 yards long. Also, they should be put in the ground at a 45-degree angle. They should be put in by 5 females and two males. It would cost too much to make them out of metal, so I think wood will do.*

*I have a couple of questions! How do you plan to put the staples in up north, where the fault is underwater? And do you supply the staples?*

— John Houghsby

John,  
First, I would like to thank you for writing! I'm trying to find a scuba club to staple the part of the fault that's underwater...  
Sorry, we don't supply the staples. But making them is half the fun — that way, you can even paint them the way you want!

— Tom

## MR. SAN & MR. ANDREAS of the FAULTS



STORY: TOM ALBRECHT • ART: ANN MIYA • CONCEPT: MS. FROG, Camden, 2922 Park Ave., Soquel, CA 95073



## The FIRST COMPUTER BY THE DRAGON

ONCE upon a time, thousands of years ago, an owner of sheep sat quietly, gazing upon her flock. Once the flock had been small and, every few days, she would match fingers to sheep, holding out one finger for each sheep. At the end of day, when flock-owners came together by the firelight, frequently this one, then that one, then another, would hold up her hands, showing the fingers that corresponded to sheep.

Time passed, and the flocks prospered.

On this day, the day of our story, she was troubled. She had matched fingers and sheep. All her fingers were extended, yet there were sheep for which there were no fingers. She tried again, taking the sheep in a different order, for they all had names. Still, with all fingers extended, there were still sheep not included. She remembered that, recently, when flock owners gathered in the evening, others showed all the fingers

of both hands. She wondered if perhaps they also had sheep for which there were no matching fingers.

For a long time she sat quietly, thinking on the problem. Slowly, an idea began to form. She picked up a small stone and gazed at it intently for a long time. Then, a smile burst unto her face and, without further hesitation, she again looked at her flock. One by one, she called out the names of her sheep... and... for each one, added a stone to the growing pile. Soon she was done, and for each sheep, she held a stone in her hand.

That night, as the sky darkened and the fires were lighted, she could scarcely contain her excitement. The flock-owners came together and, each in turn, told of her flocks. When her turn came, she took out a small bundle, the stones wrapped in a small sheepskin. Carefully, she spread the skin and arranged the stones. "Behold!" she cried, "This is my flock. For each sheep, a stone. For each stone, a sheep." She explained her method. At first, they were stunned... then, comprehension dawned and the smile grew into a circle of smiles around the fire.

And so, the flock-owners adopted her method. Time passed, and the flocks prospered. And, for each sheep there was a stone, for each stone, a sheep. The piles of stones grew higher and higher.

And to this day, when someone is high, we say she is stoned.

Here are some Dungeons and Dragon Magazines. See PCC Vol. 5 No. 2 if you don't know about the mind-boggling fantasy game of D & D.

The Dragon (bi-monthly)  
TSR Periodicals  
P. O. Box 756  
Lake Geneva, WI 1531



Dankendismal  
John Morrison  
327 Mayland Avenue  
Moorestown, NJ 08057



Evermist  
David Warren  
P. O. Box 27  
Labelle, FL 33935  
(\$2 for 5 issues)



Fire the Arquebusiers  
Greg Costikyan  
1675 York Avenue  
New York, NY 10028



Ryth Chronicle  
John van De Graaf  
37343 Glenbrook  
Mt. Clemens, MI 48043



Alarums & Excursions  
Lee Gold  
2471 Oak Street  
Santa Monica, CA 90405

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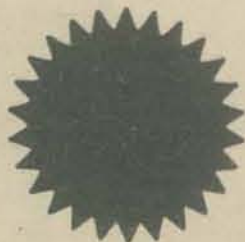
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