

PEOPLE'S COMPUTER COMPANY

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STAR TREK

Edited by "MELLOW FLASH"

STAR TREK DOCUMENTATION by Michael Lampi

GENERAL INFORMATION:

STAR TREK is a BASIC program designed to simulate a former television series of the same name. It has been limited in this version to a simple simulation of an all-out war between the Federation and the Klingon Empire, with you acting as the sole guardian of the Federation's safety in the position of Captain of the Starship Enterprise. In light of the peace treaty the Organians had imposed on the various civilizations inhabiting the galaxy, you are given a limited period of time with which to drive out or destroy the invaders; otherwise the Organians will again intervene with a peace treaty—one not nearly as favorable as the previous one.

To execute your duties as Captain of the Enterprise, you have nine possible commands at your disposal; sensors with which to detect objects around your ship; a helm to maneuver throughout the galaxy; phasers and photon torpedoes to battle the enemy warships; a tractor beam to tow ships with; an energy distribution command; and finally, a computer with various functions to aid you in locating ships and determining the ship's status. Each of these commands will be described in detail later on.

The galaxy in this game has been depicted as a 10 x 10 grid, the divisions of which have been called 'quadrants.' Each of these quadrants contains empty space, a few stars, perhaps a Federation Starbase or a few 'random' objects and possibly a number of Klingon or Romulan cruisers. The location of these objects inside a given quadrant is easily determined by dividing the quadrant into another 10 x 10 grid, the divisions of which are known as 'sectors.' Thus, the location of any object can be exactly determined within the galaxy when given both the quadrant location (X,Y) and the sector location (x,y).

Command 0—Quick Status Report.
The Quick Status is a new feature which enables a relatively knowledgeable player to quickly determine his situation without resorting to the full-length status report given by the library computer and a long-range sensor scan. The format of the Quick Status is as follows:

LOCATION: Qx, Sx, Qy, Sy
ENERGY: nnnnn
SHIELDS: nnnnn
KLINGONS: n
or
ROMULANS: n (entry omitted if no enemy ships are in your quadrant)

"Qx,Sx" and "Qy,Sy" are defined as follows:
Qx and Qy—Quadrant location parameters (x,y)
Sx and Sy—Sector location parameters (x,y)
where x and y are coordinates on the map of the galaxy similar to cartesian coordinates on a graph.
"ENERGY" indicates the amount of energy available for phasers, warp engines, life-support, and the various ship functions.
"SHIELDS" indicates the quantity of energy presently contained in your shields.
This command uses none of the ship's energy.

```
-----
: 7 : 103 : 19 :
: 304 : 216 : 5 :
: 1 : 12 : 8 :
-----
```

Long-Range Sensor Scan showing info in 9 quadrants. Enterprise is in center quadrant.

Command 1—Long-Range Sensor Scan
This command scans the nine-quadrant area surrounding the Enterprise

and prints a table indicating the number of major objects in each quadrant. A sample Long-Range Scan is given below:

Key: One's digit—number of stars in quadrant
Ten's digit—number of Starbases in quadrant
Hundred's digit—number of Klingon or Romulan vessels in quadrant
Note: The Enterprise is always depicted as being in the central quadrant
This command uses 10 units of energy.
Command 2—Short-Range Sensor Scan
This command will type a map of the quadrant in which the Enterprise is located—using various characters to denote each object. A sample map of the quadrant shown in the description of Command 1 above is given below with a key identifying each character.

	0	1	2	3	4	5	6	7	8	9
0 :		*				+				()
1 :										
2 :										,
3 :										
4 :	@			**						
5 :					*	+		.		%
6 :*							**			
7 :										
8 :							*	*		
9 :										

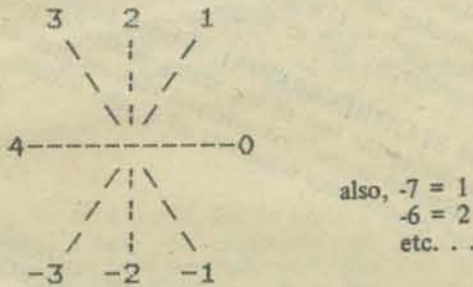
Key : @ - The Enterprise
+ - A Klingon battle cruiser
- A Federation Starbase
* - A star
** - A binary star system
() - A nova
, - A neutron star
. - A comet
% - A hulk, a dead cruiser
% - A cargo ship

This command uses 5 units of energy.
Command 3—Maneuvers
The Enterprise is equipped with two methods of propulsion—impulse engines and a warp drive. The impulse engines are relatively low-speed and require a fairly large quantity of energy for travelling even short distances. The primary use of this drive is for docking with a Starbase for refueling and for emergency maneuvers when the warp drive is damaged. The maximum distance the impulse engines can propel the Enterprise at any single time is 4.5 sectors at a speed of 0.99999.
The warp drive is the primary propulsion unit of the Enterprise mainly due to the ability of the drive to move the ship over distances greater than 5 sectors at once without the problem of collision with stars, novae, etc. However, the quantity of energy used is not a linear function of the speed as it is with the impulse engines; it changes exponentially with the speed you request. For example, a speed of warp 2 uses 20 units of energy, whereas a speed of warp 6 requires 125 units of energy. If the amount of energy re-



remaining for use in the energy pool is lower than that required for moving at some particular speed, the Enterprise will be moved as far as the remaining energy will allow and the quantity of energy which would have been normally used to travel the entire distance is still removed from the energy pool and, probably, causes some stress on the dilithium crystals which supply the power for the entire ship. If there is no energy for either the warp or impulse engines, the Enterprise will not move and no stress will be placed on the crystals. The maximum warp speed is 9.

The table below indicates the bearings and their corresponding heading numbers. The bearings given by Computer Function 3 are the same as these headings.



Note: Bearings and Headings may be any positive or negative value within +8 and -8, where (see diagram) -7 corresponds to +1. If the Heading typed in is out of these bounds, you will be returned to Command mode.

Table of Engine Energy Consumption

Warp Factor	1	2	3	4	5	6	7	8	9
Energy Used	18	20	30	50	89	167	319	625	1242

Command 4-Phaser Control

This command enables you to fire an amount of phaser energy that you specify at a target of your own choosing. If the computer is functional and there are enemy cruisers in your quadrant, the computer does the aiming. If the computer is damaged or there aren't any cruisers in the quadrant, then you manually aim the phasers. Computer directed phaser fire hits the target(s) 90 to 99 percent of the energy fired, reducing an enemy's shield strength that amount. If there is more than one enemy cruiser in the quadrant phaser power is divided equally among the cruisers. When firing, each enemy cruiser fires upon the Enterprise before your phasers fire unless you manually firing them. Manual firing results in a 5 to 99 percent energy summing you aim correctly. The percentage hit in both automatic (computer directed) and manual firing mode is determined by distance to the target and a random factor. Manual phaser firing allows you to aim at any point in the quadrant and, depending on what the object is you hit, either your phaser beam will affect or be affected by the object in some way.

Command 5-Photon Torpedo Launch

This command allows you to disable enemy battle cruisers by firing photon torpedoes at them. Computer function 3, when the computer is functional, can compute torpedo trajectories for you or you can figure out the bearings. Each torpedo is the equivalent of a 575 unit phaser hit. Photon torpedoes can be created through the energy distributor; however, this takes 700 units of energy for each torpedo. The best source of photon torpedoes is a starbase—just dock and you are replenished with 500 torpedoes.

If there is an object in the path of the torpedo it will react with it in any possible ways and, usually, end the torpedo's journey there. If the object happens to be a star, there is a 30% chance that it will explode and a 6% chance that it will supernova the star. If there is a novaed star it may cause a chain reaction of novae. A nova will usually but not always disable an enemy cruiser, depending on the shield strength of the cruiser. When firing torpedoes you get a 50% chance of a phaser launch before the enemy starts returning fire. The torpedo can be terminated by inputting a bearing greater than 8 or less than -8 and by using up all available torpedoes.

Command 6-Tractor Control

This command allows the user to attract any artificial object in the quadrant. The Enterprise is located to the Enterprise. The speed of attraction

is dependent upon the amount of energy allocated divided by the distance between the object and the Enterprise raised to some power. Therefore, the more energy allocated or the closer the Enterprise is to the object in the beam, the faster the object moves toward the Enterprise. Docking with Starbases is possible in this way.

If anything comes between the Enterprise and the tractor-beamed object, the beam is disrupted and the tractor generator is shut down, redirecting its energy allocation to the energy pool.

If the Enterprise moves in the quadrant, the tractor-beamed object remains in its location but the direction of attraction is changed to account for any change in bearing. If the Enterprise leaves the quadrant at impulse speed, the object breaks free and remains behind. If the Enterprise leaves a quad at warp speed, the object is carried along and the amount of energy required to move is double if the object is a Klingon or Romulan, quadruple for a Starbase, and anywhere between 1.5 and 6 times for a random object. Starbases cannot be brought into a quadrant already containing another Starbase; a Klingon/Romulan ship cannot be brought into a quadrant containing 4 Klingons/Romulans, nor into Romulan/Federation space. Nothing can be pulled across the Galactic Barrier.

Command 7-Energy Distributor

This command allows you to allocate the Enterprise's energy from the matter-antimatter pods directly to the shields, torpedo launch, tractor generator, impulse engines, or indirectly to all other devices by underallocating the available energy and permitting the excess to be directed to the energy pool. Energy cannot be drained from a given device or reserve unless the dilithium crystals are shattered—then you are effectively on battery power and the energy allocated is then directly drained from supplies and not on the timed units-per-stardate arrangement as when the dilithium crystals are in working order.

If the energy allocated to a given device causes the reserve storage for that device to become greater than its capacity, the excess energy is channelled to a secondary device to prevent an overload. Thus, if you were to allocate 1000 units/stardate (the maximum possible) to the shields, once the shields reached 1500 units the excess energy would be shunted to the impulse reserves, and then to the torpedo launch if the impulse reserve was also filled.

If a dilithium crystal fractures, each allocation is reduced by a factor of the number of crystals fractured divided by the number of crystals existing before the fracture.

Command 8-Library Computer

The Library Computer of the Enterprise has four specific capabilities available to the user, in addition to assisting in the direction of phaser fire. In command order,

- 1) Ship Status Report. This gives information as to the present levels of energy, i.e., number of torpedoes left, amount of impulse energy available, and the level of the energy pool. In addition, values for the number of Klingons and Starbases left and the present and final Stardates are printed, as well as the status of all damaged devices. This option consumes no energy from the energy pool.
- 2) Map of the Galaxy, or Record of Long-Range Sensor Scans. Presents a much compressed map of the galaxy in the same format as the Long-Range Sensor Scan, except the format is a 10 x 10 quadrant grid rather than a 3 x 3 square. Also, the position of the Enterprise, if located inside the galaxy, is indicated by a hyphen preceding the normal 3-digit number for that quad. If the Enterprise should have the misfortune of encountering a magnetic storm, the computer becomes damaged and the Map of the Galaxy is replaced by the Record of Long-Range Sensor Scans where each 3-digit number is changed to zero until a Long-Range Sensor Scan is taken in that area. The grid is then updated only when the scans are taken. However, if the Enterprise docks at a Starbase, the Map is restored and all computer functions return to normal. This computer option uses 10 units of energy.
- 3) Bearings. Computes bearings to each artificial object in the quadrant in which the Enterprise is situated. This option uses 5 units of energy.
- 4) Self-destruct. Allows you to destroy the Enterprise in order to prevent its capture by the enemy; also permits you to end the game if you run out of energy, are damaged too severely to continue, or you are hopelessly lost outside the Galaxy. To self-destruct, you must type in the self-destruct number given to you at the start of the game—any other response returns you to 'Computer function:'. If you decide to abort the self-destruct sequence after you have typed in the number, type either a carriage-return, rubout, or altmode/escape key and the countdown will abort and return you to command mode. This option, if aborted, uses no energy.



Command 9—Resignation

This command, when responded to with 'YES,' allows the user to end the game and get the final statistics of the player's performance. This command can be aborted with any response other than 'YES.'

Random Objects

The program currently has 4 classes of random objects: unidentified objects, monoliths, comets and cargo ships. Three of these objects—cargo ships, monoliths and unidentified objects—are affected by phasers, tractor beams and supernovae. All are affected by torpedo fire. When fired upon, unidentified objects and monoliths may return fire, vanish or pursue some other course of action. Cargo ships are destroyed or they can transmit distress signals to Starfleet Command (if in Federation territory) or to the Romulan fleet (if in Romulan space). Monoliths have an additional feature: if the Enterprise moves under impulse power on a collision course with a monolith, the ship's location will change from the quadrant it was in to a random location in some other quadrant upon entering the monolith. This effect is designed to simulate 'holes' in space or 'star gates' with a touch of '2001: A SPACE ODYSSEY.' Comets are just part of the scenery.

Papertape versions of the program will be offered for sale at effective cost. Interested users should contact:

Michael Lampi
2729 No. Farwell Ave.
Milwaukee, WI 53211

Write-ups of the program, papertapes, listings, and DECTape copies are also available. Updated versions will also be provided at slight extra cost as they become debugged.

Prices: Papertapes—\$4, Listings—\$3, DECTapes (using your DECTape)—\$4, DECTapes (using our new DECTape)—\$20, Cards—\$20. In addition, there is a \$5 charge for each order for service and handling. Each papertape and DECTape is guaranteed to be error-free at our installation.

A STAR TREK CONTEST AT THE UNIVERSITY OF WISCONSIN—MILWAUKEE

by David Levine

This is a report on a STAR TREK computer contest which was held on February 28 and 29, 1976, at the Engineering and Mathematical Science Building at the University of Wisconsin—Milwaukee. The project was sponsored by the Electrical Department of the University and was a huge success. The whole thing started with a giant STAR TREK game programmed in BASIC by Mike Lampi and Mike Fischer, students at the University majoring in computer science. This massive set of programs contained over 3500 lines and required 14 BASIC programs chained together. It was so large it could not be run during normal hours as it took up too much computer time and disc space. The program contained dozens of functions not found in the standard game such as tractor beams, neutron stars, U.F.O.s and black Monoliths as well as very elusive Klingons and Romulans. Once the game has caught on at the University, it seemed only natural to play it competitively.

Each level of the tournament was more difficult to get a good score in as the galaxies were created specially for each game by Mike Lampi. Each pair of competing players had identical galaxies at the start of the game, and were handed sealed envelopes containing a printout of their initial galaxy. The winner of a round was the player who destroyed the most Klingons before either time or his luck ran out.

On Saturday morning, the terminals and CRT's were set up at a fairly large lecture-laboratory room on the second floor of the computer instruction area. In this space there were several dial-in terminals. This room was selected because it had enough telephones to dial in all the terminals we were using to the computer, a DEC PDP-8e TSS-8 located on the seventh floor of the building. Due to the high drain on the CPU by the programs, the system, normally open to the public, was closed out for the weekend.

The basic format of the room was this: two hard copy terminals (DECWRITERS) faced each other on a raised dais at the front of the room. These terminals were used at the input stations for the players, who were each playing a separate game. Beneath these and facing the rest of the room were three CRTs. Two were hardwired to the DECWRITERS, giving the audience a view of what the players were doing. This eliminated the problem of people looking over the players' shoulders. The third CRT was located between the other two and was logged in the system running a monitoring program which constantly displayed the status of each player (energy level), Klingons remaining, ship's functions out of order, and the

like). About 20 seats were arranged before these screens in fan form. The area behind the CRTs was a mess of wires that would have made one envious.

The first contest began on Saturday morning at about 9:00 AM. One player was vaporized by Klingons almost immediately. The other went to the semifinals. Later in the day, reporters from a local TV station showed the contest got five minutes on the news that night. All in all, about 100 people attended, either to watch or to play.

First and second place winners were to receive a gold model of the Enterprise encrusted with diamonds and a silver model of the Lexington with rubies, respectively. However, the great weight of these models made them rather unwieldy and they were dropped in favor of gold and silver painted plastic starships.

Of the 16 players who participated in this event, all but one were not programmers. Most had never had any previous experience with a computer whatsoever. Most of the audience were similarly introduced through this game to such amusing uses of otherwise intimidating machines. Games such as this have been used at U.W.M. to bring the University and its surrounding community together, as well as to gain publicity for the University and its functions.

A second STARTREKARNIVAL is being prepared to be run later this year, perhaps during the end of the spring semester. It is our hope that it will be as successful as the first one and that no mob of Trekkies wanders in to change the contest into some sort of a sales exhibit.

ANOTHER TINY TREK

Ron Williams at the Community Computer Center (1919 Menalto, Menlo Park CA 94025) has a SR*R TR*K in MITS BASIC. It features: 20 commands, easily modifiable for small systems, comes complete with Battle Manual. It is a modification of a FORTRAN program from the University of Texas and is available for the cost of reproduction (\$4-\$5).

ST*R TR*K FEEDBACK

Dear PCC,

First, about Bill Crow's letter:

His major argument against the Star Trek game devised by Msrs. Harris and Campbell is that it doesn't conform with what he considers to be the guidelines set down by Mr. Roddenberry. First, were such guidelines ever set down? If so, how can I obtain a copy?

Then, he continues to berate a number of programmers as a whole for the "abortions" they have committed upon "his" (Roddenberry's or Crow's?) universe. In my opinion, one of the major messages that "Star Trek" (the TV show) brought across is the sheer magnanimity of the Universe, which can be exemplified in the show's opening lines. Now, a universe—any universe, be it "Roddenberry's" or the "natural" one—is, by definition a system which contains not only itself (which is no mean feat in itself), but all possible changes to it. Now, just because some people have incorporated changes or modifications that were not in the "original," albeit limited universe, Mr. Crow insists on calling them "gross bastardizations"!! What the real gross thing is is Crow's attempt to try to limit Star Trek programmers to what (small) information can be gleaned from re-runs of the TV series.

Okay, I agree with point 3: To call *any* development, not only a program as Mr. Crow says, "final," is premature. As proof, in the late 1800's the patent office said that anything that can be invented already was!

Now, as for his "boast": If Mr. Crow has indeed accomplished all he says he has—or is in the process of doing it—more power to him. However, it is all too easy for those with more equipment and better language processors to look down and sneer at those of us who have to make do with (gasp!) an old ASR33, maybe a mass-storage device, and *very* limited storage. Come on, man, Shape up!

Damage control. In my opinion, this is one of the most lacking parts of the game. Either something works or it don't. Has anyone coded something that has a damaged-but-you-can-try-it-although-the-results-are-unpredictable aspect? Also, every time you go somewhere, there's a chance that something'll get fixed—at least partially—or damaged. If the warp engines are damaged, how come you can still go warping about at speeds above .2?

Why do the Klingons always get to shoot first? How about at least a 50-50 chance? And when you go somewhere, why doesn't your warp factor influence the chance that they'll get you?

Why would someone ask for a status report? What does it tell him that he doesn't already know? Why not take all that junk out of the short range scan, and put it down in the report, where it really belongs?

Also, why do you get a scan everytime you move? This is fine for those of us with CRTs and time, but lousy for those of us who have to squeeze in time in bits and drabs.

To make the game more "realistic" (realistic??) why not insert some things which cause each command to use both time and energy. This forces you to think a little more before you do anything.

That's enough for now, I spose. People! If you've got *any* Star Trek programs, ideas, or whatever, please write! Whoever you are, I'm sure there's a lot we can teach each other.

Richard Salz
Phantom Unlimited
8 Glenby Lane
Brookville, NY 11545

[Editor: Richard Salz also has many ideas on how to better implement these programs in BASIC.]

Dear PCC,

Having just seen Vol. 4, No. 5, I would like to make a few comments, although they may be a bit late. I agree wholeheartedly with Bill Crow.

I cringe whenever someone claims to have the "ultimate" Star Trek game, usually replete with features that Gene Roddenberry would shake his head in puzzlement at. While you did publish one article of this type, SCCS "Interface" has been averaging 2 or 3 per issue, one reason why I really do not like that magazine.

I think it might be helpful to draw a distinction between Star Trek games and Space War games. By insisting upon using the name "Star Trek," many people find themselves locked into a universe too limited for their own imagination. The usual response to this is to just start adding features, without worrying about how they fit in with the real (?) Star Trek world. If you can't bring yourself to limit your game to Star Trek as Bill suggests, then perhaps the Star Trek name should be dropped altogether. By doing so you gain a great amount of freedom of design, but do lose the "Star Trek mystique" which plays a big role in attracting many newcomers to this type of gaming. If you must include some Star Trek, I think it would be sort of a "tip of the hat" to Gene to include Klingons. Of course, in salute to others you could include Kzinti, Osnomians, Pak, and other of those godless hordes of space.

On sources of information for Star Trek; Bjo Trimble is in the process of revising and improving the *Star Trek Concordance* for Ballantine Books. Because of this, the original *Concordance* has become something of a collector's item and hard to find. John and Bjo still had a few copies to sell at Westercon (July so you may still be able to get a copy from them. The latest date I heard the Ballantine edition was September. This should be available just about anywhere when it does come out, same as the Ballantine version of the Enterprise Blueprints.

Blueprints of a Star Fleet freighter have become available recently. These produced by Interstellar Associates and are available from T-K Graphics Box 1951, Baltimore, MD 21203) for \$3.25. T-K also stocks the Enterprise and Klingon battle cruiser blueprints, along with lots of other Star Trek stuff. They also carry a huge selection of general science fiction and fanzines. They even pay postage on all books. Be sure to get their catalog. Enough advertisements for one day.

Sincerely,
Currier

P.O. Box 2174
Newport Beach, CA 92663

In the July 1976 issue (Vol. 4, No. 6) you printed two letters that commiserated with Bill Campbell's and another guy's STAR TREK game. They both were particularly upset at Mr. Campbell for calling his game the 'Ultimate' STAR TREK game. The authors seemed to think he was committing some horrible crime. I was just being enthusiastic! When I write a game, it's *always* the best (I write another one).

In the letter writers specifically stated that calling one's own game 'the ultimate' of its caliber was 'not only premature, but very close-minded.' He went on to say that his own game ARMAGEDDON was 'the ultimate' beyond the current rash of STAR TREK games. Now what's the point? He did go overboard in his strict adherence to the show Gene Roddenberry created, not just a show about the exploits of the Enterprise, but a look at a universe of the future. The point is to show interesting new people and places, and to pretend that

they showed them all is close-minded. To restrict your game writing to just those shown is nostalgic stagnation. To say that STAR TREK people act in such-and-such a way is ridiculous. STAR TREK is more a family of games, rather than a species. I refuse to stifle my imagination, and I'm surprised the author of the above-mentioned letter had enough to think of the game he is planning to write. For example, he insists that the Eminians haven't waged war for 500 years, and the Klingons can't battle due to the Organian Peace Treaty. Who says that your game must take place at the same time that the show did? Why not 500 years before? How about one episode before the peace treaty was signed? Speaking of close-minded!

I do agree with him, though, about Campbell's misuse of the Horta. Artistic license is not a license to butcher and maim!

On the subject of his game, I have found that it is difficult enough for two people to get free time to play 2-person games for a few hours, much less 24 people as he plans! And what's this about needing training to play his game? His input sessions must be pretty convoluted if you need to read a book to understand them.

On a different subject, Jonathan Williams, a friend, has asked me to send along the instructions to his game 'STRTRK'. It has intelligent enemies (both Klingons AND Romulans), 3 planets (Earth, Klingon and Romulan), Traders for the economically inclined, and real-time battles. The user specifies his own ship symbol. The game is run on an HP2000 ACCESS system, and is programmed for a particular terminal but can easily be adapted to any kind of CRT. There is far more strategy than in a game like TREK73, and if you run out of time, you can save your game and come back later. It doesn't work perfectly yet (still a few bugs). If you want a copy, write to him:

Jonathan Williams
342 Lexington Ave.
Iowa City, IA 52240

Well, that's all I have on my mind for now. You have my permission to do anything you like with this letter—fold, spindle, mutilate, burn or enshrine it. Even print it.

Joe Altmaier

R. R. 1
Riverside, IA 52327

To Bill Crow, systems and graphics analyst, Univ. of Vermont,

This is a commentary on your recent article in PCC (Vol. 4, No. 6) about a new 'STAR TREK' program soon to be completed at Vermont. I felt that an article stating as many facts as yours deserves at least this much:

- 1) Battle with the Klingon Empire is not impossible; all out war since the Organian peace treaty is.
- 2) Dilithium is mined in the crystalline state, supposedly one of the hardest substances known to man—definitely not mined in the state of 'ore.'
- 3) Protecting installations from attack and following enemy cruisers and destroying them and their installations is not 'chase the enemy and blow them up'??
- 4) Attack patterns in the TV show STAR TREK were manually controlled—not computer controlled, with the only exception of the episode with M-5. Computers merely 'locked' weapons onto target.
- 5) Photon torpedoes, which supposedly have their source of energy in matter-anti-matter reactions, could conceivably nova and possibly supernova stars provided, of course, the stars were unstable to begin with—a situation not too uncommon in our galaxy. The remains of these novae and supernovae can range from empty space (or dust clouds) to black holes and neutron stars to white dwarfs as well as 'normal' stars. So, the idea of torpedoes causing such stellar disruption is not out of the question.
- 6) A program which generates 'very nice solar systems, not unlike those which have been observed in space' must indeed be a software marvel considering that our solar system is the only one within telescopic range other than the 1 or 2 nearby stars which indicate the presence of super-super-giant planets (or sub-stars) 5 to 10 times the size of Jupiter. Get a good book on astronomy!
- 7) Your game appears to be a slightly more sophisticated rock-em-sock-em-robot game with each battle situation a dry statistic controlled by the computer—not at all in the form of an interactive game requiring split-second determination as a good multi-keyboard game can be.
- 8) In remaining true to Gene Roddenberry's creation, the Federation did not make a practice of disrupting the Romulan Empire either by breaking supply lines or by battling with every Romulan you come in contact with.
- 9) With all the involvement of the computer in controlling complex attack situations one would think that the same computer would be quite capable of plotting courses between star systems and devise the most efficient freighter routes. In addition, I fail to recall any episode where any personnel aboard any starship used star charts to plot ship courses—they always used the ship's computer to 'lay in a course.'
- 10) Armageddon, in all its supposed complexities, is not by any means 'genera-

tions beyond the current Trek games. The University of Wisconsin-Milwaukee has several Trek programs which, while not multi-keyboard versions, are among the most complex programs on campus with regards to both programming and content. Several students have been able to use these programs as senior theses in return for as much as four years' effort.

As you can see, Mr. Crow, yours is not quite the program you described it to be. If one must make claims about one's program being better than another's, one must be ready and able to back it up.

Cordially,
Michael Lampi 2729 N. Farwell Ave.
Senior Programmer and Analyst Milwaukee, WI 53211
University of Wisconsin-Milwaukee

SCIENCE FICTION GAMES

There's a booklet by Harvard McLean and Michael Raymond called "Design Your Own Game" and it supposedly contains a "wealth of pragmatic" information along with examples. It costs \$1.75, and you can get it from (a dirty glass? Ouch!) The Simulation and Gaming Association, R.R. No. 2, Greentree Road, Lebanon, OH 45036. I'll let you know more when my copy arrives.

Computer games in general. By these, I mean the more advanced games; the ones that tend to fall into the simulation-type category. I think it was in one of your previous issues that someone pointed out that very few computer/simulation games that are in circulation were really designed for computers in the first place. Almost always, they're just transposed from a playing board. Also, all the games I'm acquainted with—with the possible exception of a couple—have one flaw in common: they don't take place in real time. Everything is nice, orderly, and in turns: you go, I go, the Klingons fire, I phire (oops!), etc. In real life (sic!), it just don't work that way!! Unfortunately, real-time programming is hard—if not downright impossible—for some users. This means having a dedicated computer—probably a mini—and not being able to program in a high-level language, since none of the common ones can handle two or more teletypes on an interrupt basis. The only way to do this would be to program in machine language or assembly language, using an interrupt, TTY: I/O flags, switches, etc. . . . HELP!!

Another alternative would be to write your own high-level language. The initial difficulty would be great, but future programs of this type would be a lot easier. I've included a copy of some of my scribbles on that idea.

Foundation Trilogy. I don't think so. The good Doctor's masterpiece I must admit, left me a little underwhelmed. The only thing I can think of is possibly something based on Selson's history-prediction math/science, but what kind of shape that would take, I've know (oops!) idea. When/if I get any idea of where to start I'll let you know.

Colossus could be interesting. One person takes the role of the U.S.'s Colossus, the other would play the part of the U.S.S.R.'s Guardian. They'd battle, plead, bargain, and bluff for the control of whatever's left of the world. A third person could play Forbin although what his role would be I don't know. Possibly a mediator/pacifier? *The Fall of the Colossus* (which isn't nearly as good) could be used as a basis for adding in another party: The Fellowship (an underground anti-Colossus group) and the Martians (they have the same goal, so they'd work as one). Another party, albeit a much more minor one, is the Sect (Colossus-worshippers), although I don't know what role they'd play. Spies? Traitors? Saboteurs? Hmmmm. . . .

Cage a Man, by F' M' Busby is another possibility. It would be a very glorified hide-and-seek. One man is trapped on a planet of lobster-like creatures called the Demu (honest!) who to—for humanitarian (sick! (Oops, did it again!)) reasons—turn him into a replica of them. (A pseudo-Demu?)

The Lensmen Series by E. E. "Doc" Smith. This neo-classic space opera should provide some ideas. A Contest of good (Arisia) against evil (Eddore), with the lesser races (humans, Rigelians, etc.) used sort of as tools, and pawns. There's a wealth of information here (seven paperbacks of 150-plus pages each!), including such things as blasters, hypnosis, thought screens, drugs, nuclear vortices, the "Guardians of Civilization," anti-matter planets, and lenses (I can't explain the last, you'll just have to read one of the books).

Cities in Flight by James Blish is a collection and repackaging of four of his earlier novels, in an opus of about 600 pages. The novels tell of the history of the Earthmanist culture, from the near future to the end of the universe (4004). The two "biggies" which form the basis of the book, as it were, are the development of anti-agathic drugs which stretch lifespans into the centuries and "spindizzies"—gravity neutralizers which enable whole cities to leave Earth, from whence comes the title. Oh, yes, and these things happen in a world where the Scientific Method no longer works (Hoo ha!), that's 1994. I've enclosed a z-stones (z-rocks . . . xerox . . . ouch!) of the after-which you might find interesting. This makes the book sound silly, but

it's not—it's fantastic!!

Okay. The next five might not spark any programs, but contain so many facts (facts??) that they oughta be red (oops!) anyway.

Stand on Zanzibar. Life in the 21st Century. It's a fantastic novel. Unbelievable—or rather, *too* believable! It paints a very real and very spook picture of a possible direction our society will take.

Dune. A classic. I can't explain it in a few lines, and you probably know of it already. Also, to a lesser extent there's *Children of Dune*, and *Dune Messiah*.

The Sheep Look Up. What could happen to us very soon (it's set in the 1980's) if we don't stop polluting our own next. Frightening. It might be possible to base an ecological program on it, but I've got not idea of where to start. Any suggestions?

For those who would be interested in something of social interactions (along the lines of Huntington II's *POLICY*?) there's the classics *Brave New World* and *1984*.

Okay, back to the scenarios/suggestions.

Harlan Ellison's "I Have No Mouth and I Must Scream." One person plays a man (or woman, I'm not picky) who's trapped in the bowels (literally) of a world-wide computer who's trying to escape. The computer can do just about anything to him (i.e., sensory distortion, etc.) and to the environment (blizzards in 100-degree weather, etc.) to try to get him to kill himself/go crazy (how would you program that?)/give up/get killed in an accident. But, the computer can't kill the man outright. A little "balancing" would have to be done, since it seems that the computer has all the advantages.

Satan's World by Poul Anderson has some possibility, too. You try to set up a working mining installation on a rogue planet which is following a comet-like course towards a sun, and is just starting to thaw, making the minerals, ores, etc. more accessible. You can make a lot of money, but the dangers are great, too. (Brainscrubs, aliens, earthquakes, and . . . (gasp!) your competitors).

Enough for now, I'm running out of ideas. (How about a few more general things?) Thought you'd never ask.

Okay, so you've got an idea of galactic scope, but no galaxy to put it in? "4000 A.D." by John Waddington, Ltd. is a unique bored—er, *board* game. It's got a lot of info to help you set up your own playing area. (See the xerox of the rules and the strategy booklet.) I'll be more'n happy to send a copy to anyone who'd like one (a copy, I mean) for the price of a stamp and the xerox fees. You have your choice of English or French.

Another thing on the back burner is a real-time dogfight between two spaceships without using TV screens. If you like, I'll send some details later.

Also, have you noticed that all sensors tell you precisely what object is where? Wouldn't it be more realistic (realistic?) to have mass-, size-, and radiant energy-detectors? Then *you* figure out what it is. This'd also have little things like background radiation, solar interference, etc, and the enemy could "hide" behind a planet, or cut down his energy consumption.

Also, (what? Another also?) why do SF and computers seem to go together? Does one lead you into the other? Maybe it's a phase-locked loop kind of thing. You get shunted back and forth between the two faster and faster, with no chance of escaping . . . HELP! Maybe it's a commie plot!

Once we're distracted with computers and SF they'll come in AND TAKE OVER!!!

Richard Salz
Spokesman

Phantom Unlimited
8 Glenby Lane
Brookville L.I., NY 11545

THOUGHTS ON ST*R TR*KING AND SPACE GAMING

from the Mellow Flash

I believe that it is time to draw the ST*R TR*K gaming controversy that has appeared in the pages of *PCC* to an end. Using the label "STAR TREK" has primarily served as a marketing device that mooches on the glamour of the real thing. Watching the show recently, it appears that a great deal is left out of the computer games; the basic premise of encountering the unknown, helping civilizations survive, communication problems with aliens, the problem of non-destructive intervention in alien cultures, the on-going tension between the sharp and cold intellect of the left-hemisphere dominated Dr. Spock and the soft and feeling intuition of the right-hemisphere dominated Dr. McCoy. Why don't we let the TV show be itself and get on with the business of creating more open-ended gaming ventures that provide a medium for our needs to make manifest our own fantasy worlds. If this activity must be labelled, call it simply Space Gaming (watch for the Don Quixote Starship . . . see page 8)

The following are some thoughts on designing the interactive dialogue of games and command languages:

1) *No talking down!* Avoid a tendency to convey information about the game

in a condescending manner that makes the program seem like an omniscient handing out tidbits of knowledge. The same applies to requesting information or actions from the player/user.

- 2) *Games should be self-instructional.* The player should be able to request game descriptions, rules, lists of game commands, and status reports at will. These ideally should have varying levels of description from the terse to elaborations with examples.
- 3) *Who is in control?* Has the program been written in such a manner that the player is at its mercy, only able to react to its demands for input or does the player/user have relative autonomy in deciding how and when he will interact with the game? Give players as much autonomy as is possible.
- 4) *Controlled verbosity.* A composite of the reports he receives. A game can choose the length and style of the reports he receives. A player should at easily become boring if a player cannot filter out voluminous output.
- 5) *Provide feedback.* Unless purposely a part of the game, a player should be all times know what the computer program is up to. Does it acknowledge the reception of intelligible input? Does it let the player know whenever it is waiting for his input and what kind it is waiting for? Can the user find out if delays are caused by heavy computer phases or other players, etc.?

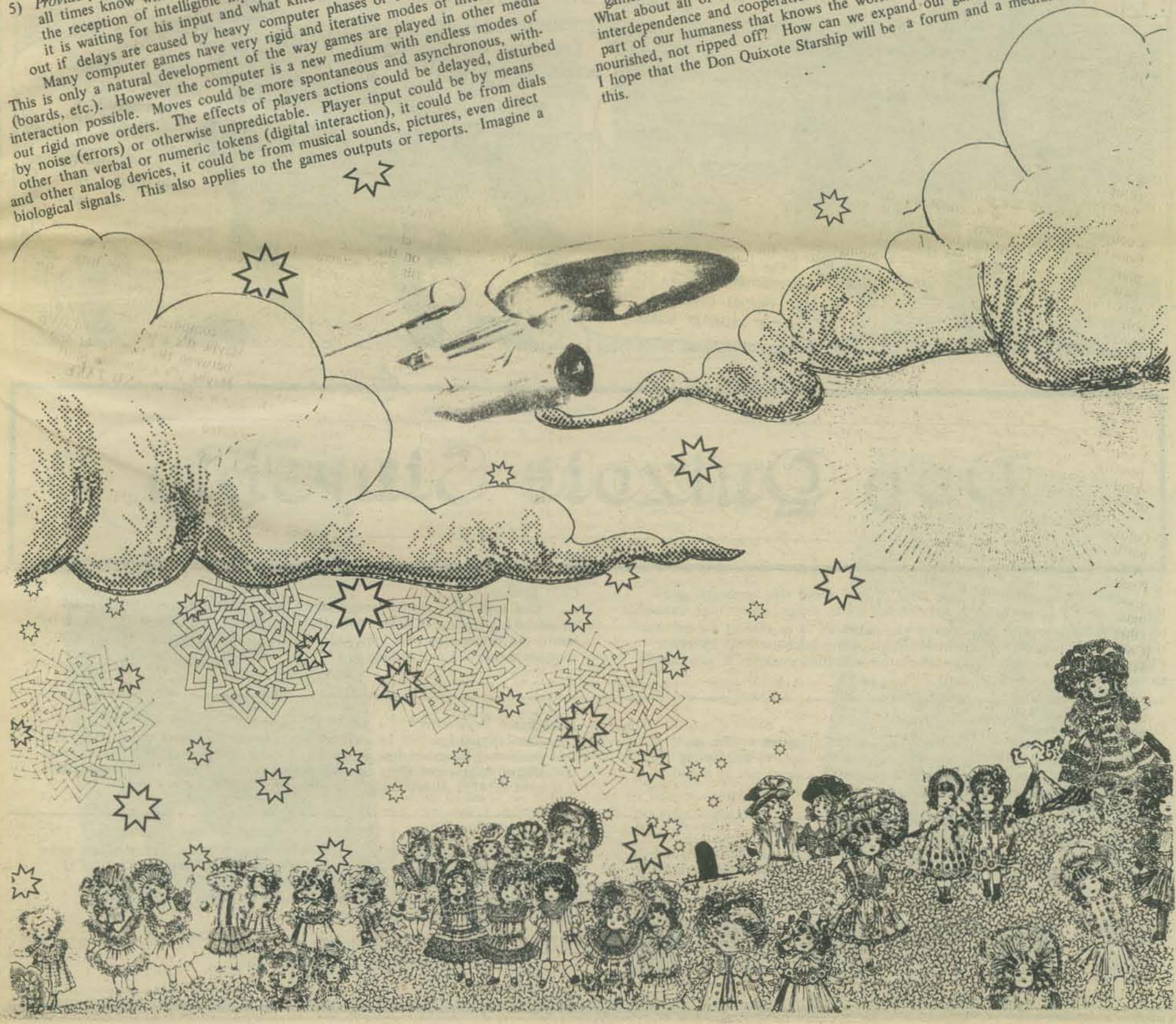
Many computer games have very rigid and iterative modes of interaction (boards, etc.). However the computer is a new medium with endless modes of interaction possible. Moves could be more spontaneous and asynchronous, without rigid move orders. The effects of players actions could be delayed, disturbed by noise (errors) or otherwise unpredictable. Player input could be by means other than verbal or numeric tokens (digital interaction), it could be from dials and other analog devices, it could be from musical sounds, pictures, even direct biological signals. This also applies to the games outputs or reports. Imagine a

game entirely run by sound. Another helpful feature would be to allow players to be previously created programs. A player could write programs that embodied various tactics or strategy, then run these programs in the game in fast time in order to determine their usefulness.

More "point-of-view" gaming should be encouraged. That is, the player should receive status information in a more natural way, not from "bird's-eye" or omniscient global viewpoints. Put the player inside the fantasy world that the game simulates. A simple example of this contrast are labyrinth games where the player "sees" only the corridors and intersections as he encounters them, not a printout of the entire maze.

All games are simulations, imitations of life. Simulations are models, abstractions that embed limited viewpoints on how the world works. Often they serve as sublimations for the aggressive sides of our nature, sides whose more direct expression cannot serve the survival of our cultures. Always, games impose arbitrary laws and constrain the interactions of individuals in their artificial worlds. They always have a metaphysical bias. But then so do all of our models, mathematics, languages, any descriptions of our world. It is through these that we perceive and construct our world. Let us recognize this and enrich our world with the fantasy and dreaming within us all.

It is unfortunate that almost all interaction amongst players in the space games that have appeared so far stress competition, aggression and imperialism. What about all of the other qualities that make us human? What about the interdependence and cooperation necessary for civilization? What about the part of our humanness that knows the world as a living partner that needs to be nourished, not ripped off? How can we expand our games in these directions? I hope that the Don Quixote Starship will be a forum and a medium to explore this.



the great san andreas fault caper

Do you people know what happened on April 18, in the year 1906? Well, for those who don't (you people who do know, don't tell them yet!) that was the worst day in California's history. It was the day of the San Francisco Earthquake. I bet that most of you readers don't know what time it happened. Well, it happened at 5:13 a.m. There were 600 dead; 300,000 homeless, and property damage was above \$400 million.

Now, people, would we want this to happen again? No, of course not! So what do you say we get together and *staple* the San Andreas Fault together?

What I want you to do for now is pick up your pen and a piece of paper and write to me, telling me things like what the staples should look like, how they should be put in the ground, and where they should be placed. Oh, yeah, don't forget to tell me what you think of the idea!

mr. san & mr. andreas of the faults



Don Quixote Stapship

More will appear in the next issue of *PCC* about this impossible game. Roughly, it is a game that may take thousands to design, many more thousands to play, decades to run, may require vast networks to be formed for information exchange, networks of hobbyist micros, communication links by Hams, CBers, and pony express, and an alternative education system. A vast fantasy to seed the stars!

CETI Studies

Carl Sagan has written several pieces on Communications with Extraterrestrial Intelligence (CETI). A recent paperback by MIT Press and edited by him is the proceedings of a joint U.S.-Russia Conference on the subject and contains many technical studies.

Co-Evolution Quarterly

Two recent issues of *CQ* have given a lot of attention to the space colonization concept (both for and against); see the Fall '75 and Spring '76 quarterlies. This always engaging and serendipitous journal can be found at "organic" bookstores or P.O. Box 428, Sausalito, CA 94965.

Earth/Space News(letter)

Earth/Space Inc. run by Paul Siegler puts out the News and a Newsletter that promote economical free enterprise in space. Recent articles discuss space law, Migma fusion, and space colonies among other subjects. This organization is located at 4151 Middlefield, Palo Alto, CA 94303.

L5 News

This is an ongoing and technically up-date medium on the serious efforts towards space colonization. Membership is \$20/yr. from L-5 Society, 1620 N. Park, Tucson, AZ 85719.

Starweb

Starweb is a multi-player, hidden movement, play by mail, strategic space game. For folks interested in this type of game which may be akin to DQ STARSHIP, contact Flying Buffalo Inc. who run many of these games in various science fiction and fantasy scenarios, at P.O. Box 1467, Scottsdale, AZ 85252. To start the game right away send \$10.





1. The youngest participant



2. The two Davids stayed 18 hours



3. Doug and Mark and the Space War machine at the end of the Marathon



4. Bob Moody brought an IMSAI computer



5. Sometimes Mark napped

SPACE GAMES MARATHON

by Dean Daily, Community Computer Center

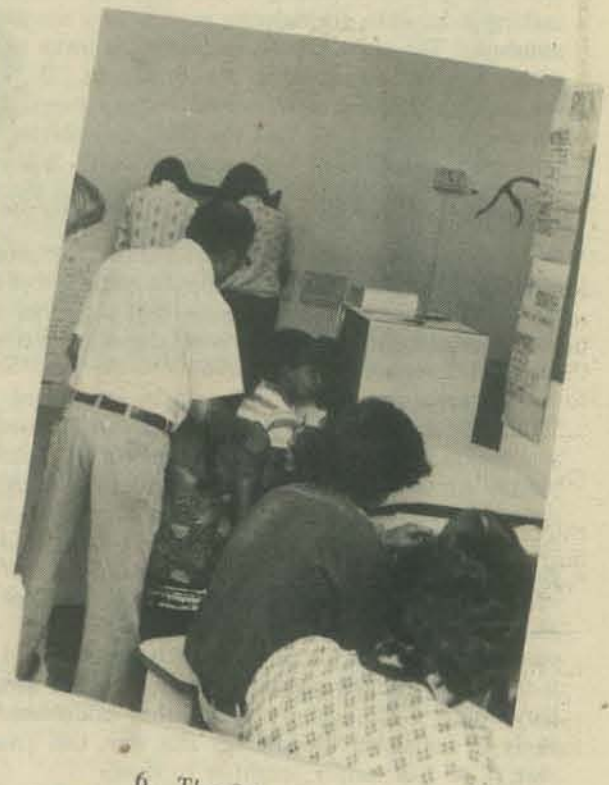
Amid the clattering of teletypes, a War of the Worlds ensued at the Community Computer Center at 1919 Menalto Drive in Menlo Park late last August as Star Trek space ship commanders fought to the death with enemy forces for 24 hours at the Center's first Space Games Marathon.

When the smoke cleared on the evening of August the 21st, the Center emerged as the winner, gaining 45 new friends and about 100 dollars from the event. Most of the Center's staff saw some action, especially Mark Freedman and Doug Faunt, who accompanied the troops for the entire 24 hours.

Two games, "Str1" (described in the January 1976 edition of PCC), and "Trek73," a more elaborate Star Trek game, were the favorites of the players, who included the battle-hardened David Rosensweig and David Kirsh, who spent 18 hours at or near their terminal posts. Many of the Marathon participants won a free hour of time at one of the Center's terminals.

The only cloud over the Center's "victory" is Pacific Telephone's new business rate which charges about 60 cents an hour on local calls—including the ones the Center makes to its remote timesharing computer.

Providing the ammunition and support that assured the success of the Marathon were the RAIR timesharing company of Mountain View, which has continuously provided computing facilities for the Center. Bob Moody, General Manager of the Byte Shop in Palo Alto, donated several books to be awarded as door prizes to Marathon combatants, and also lent an IMSAI computer which played a Star Trek game. Exidy Games of Mountain View lent a video bumper car game and Lynn Smith also brought a video space war on his PDP-8.



6. The Saturday afternoon crowd

But it's fun - but it's educational

Computer Games in the Classroom

We all know that games are fun, and most of us have played enough computer games to find them fascinating too. The computer is the perfect patient partner, the impeccable scorekeeper, the lightning calculator, and perhaps the sufficient challenge. Kids, also, have discovered computers, and have played games on them whenever they have had the chance. These computer games can be more than pure entertainment, however; they can also be used for educational purposes. Over the past several years, we at the Community Computer Center have been playing computer games with kids and introducing their teachers to the benefits of using these games in school.

Although computers are an aspect of modern technology not usually found in schools, they are inherently enticing to kids, and computer games can fill some of the needs in the classroom. Children are motivated to read because they are anxious to find out what the computer is "saying" to them. Once they can read "too big" and "too small" the world of the computer game is open to them. As children progress through the games, they come upon more words they need to read. When new games are offered judiciously, not frustrating the player with too many unfamiliar words, they continue to motivate reading.

Skills can be taught using computer games. Some of the most simple games we play offer a wide range of skills for the player to learn and practice. In "Number," for example, the computer picks a number, asks for guesses, and responds with clues.

GAME NO. 1
**NUMBER
YOUR GUESS? 67
TOO SMALL
YOUR GUESS? 78
TOO SMALL
YOUR GUESS? 95
TOO SMALL
YOUR GUESS? 97
TOO SMALL
YOUR GUESS? 99
TOO BIG
YOUR GUESS? 98
YOU GOT IT IN 6 TURNS!!!

The child practices reading words and numbers, following directions, making judgments, formulating guesses, and constructing and typing numbers. The child knows, or learns, to make successive guesses within the boundaries set in previous turns. If 31 was "too big," for instance, a guess of 49 would be inappropriate. Inappropriate guesses usually indicate that the child was playing with a range of numbers beyond his or her comprehension. When the teacher has successfully matched the range of numbers to the child's ability, the child will play with understanding. The time before winning will not be too long, and all the behaviors just completed will be reinforced. As much as possible, the game's level of difficulty should be matched to the player's ability. There is little point in playing a game that is so far beyond one's understanding that the computer's responses are ignored.

Concepts as well as skills can be introduced via the games. "Number" and its alphabetical counterpart "Letter" can be used at a higher level to approach the concept of guessing strategies. When players are able to guess within boundaries, though to do so without apparent design, they should be encouraged to consider creating guessing strategies. We describe strategies as "any kind of plan for your guessing." We tell players, "There are lots of different strategies you might use for this game. Look for one you think will work best." Many strategies emerge, and we discuss them all. At some point, players come upon the binary search method, and realize that that is the most efficient guessing strategy for this sort of game. Because they figure it out, and try it out, they understand it. They are more likely to remember the strategy this way, and know when to use it, than if we had simply taught it to them.

Binary search is a particular strategy that adults often see before kids do. One of the ideas that we try to impress on teachers is that people are ready for various levels of understanding at different times. A strategy that a child has put together is more likely to be remembered than one that has been fed to him.

— By Joanne Koltnow Verplank

"Animal" is another favorite game that is educational on many different levels. This time, the *player* thinks of an animal and the *computer* tries to guess it.

WOULD YOU LIKE TO PLAY 'GUESS THE ANIMAL' WITH THE PDP-8? *Y
PLEASE THINK OF AN ANIMAL.
HAVE YOU THOUGHT OF ONE YET? *Y
HAS IT GOT A TAIL *Y
HAS IT GOT JUST TWO LEGS *N
IS IT A HORSE *N
OH DEAR! I DIDN'T GET THAT ONE.
WOULD YOU PLEASE TYPE IN THE ANSWER!
*LION
PLEASE GIVE ME A QUESTION THAT WOULD DISTINGUISH IT FROM A HORSE
* DOES IT ROAR
AND WHAT WOULD BE THE ANSWER IN THE CASE OF A HORSE *N
THANK YOU VERY MUCH - I WILL REMEMBER THAT.
PLEASE THINK OF AN ANIMAL.
HAVE YOU THOUGHT OF ONE YET?

The game motivates reading, learning about animals, and learning to use reference books. The players have to follow directions:

PLEASE THINK OF AN ANIMAL'
HAVE YOU THOUGHT OF ONE YET?
*SKUNK
PLEASE SAY YES OR NO.
*Y

think about their animals in ways they perhaps had not expected to:

HAS IT GOT A TAIL *N
DOES IT MAKE WAR *Y
IS IT A HUMAN BEING

and have to create questions according to a prescribed pattern:

WOULD YOU PLEASE TYPE IN THE ANSWER.
*SPARROW
PLEASE GIVE ME A QUESTION THAT WOULD DISTINGUISH IT FROM A BIG-BIRD
*DOES IT TALK

Because of their backgrounds, some children are considered "language deprived." They benefit from any occasion to verbalize. "Animal" offers them this opportunity and gives it a direction. Whenever a group of children play "Animal," they use books and discussion to determine what they will tell the computer. The players think and talk about animals. They also learn to consider similarities and differences in formulating their questions.

Computer games can be used with individuals, small groups, or in whole class instruction. A game may be presented to the class, then modified to meet the needs of individuals, or it may be taught directly to a small group. This depends both on the ability range within the class and the availability and convenience of the terminal. The amount of teacher preparation will vary, too. The ideal situation involves matching the game and the players so well that they can play completely on their own.

Some of the special qualities of the computer show to best advantage where there is a single player. The computer's infinite patience allows adequate thinking time. A player does not have to defer to a quicker classmate, an unfortunately frequent occurrence for some children. Learning to recognize and complete patterns is hard for some children, and the same patient computer allows a child to thoroughly learn the necessary response pattern. Someone who does not finish the "read the question-type the answer-press RETURN" pattern will find that the computer fails to respond. After some time, the player will review the action and figure out what was missing. All this without the slightest comment from the computer. Eventually the review process will become part of the response and the player will have learned the pattern without outside help.

Patience is also important when the player gives the same wrong answer several times. If the game and player are well matched, this will not happen often. However, if it does, a good program will not distinguish between the first and successive instances of a particular response. Eventually it will be the player who will catch the mistake.

Infinite patience is especially useful for the times when a child plays the same game repeatedly. Perhaps it's the pleasure of success in an otherwise unsuccessful school situation; maybe a child is reluctant to try new things. Whatever the reason, the computer will play a game as long as the player wants to. At some point, the child will have had enough, but not because the computer was tired.

People's feelings are important, and their confidence is sometimes fragile in strange situations. Realizing this, we make our game programs considerate. If a particular guess is inappropriate to the game, the computer politely tells the player:

YOUR GUESS?82
TOO BIG
YOUR GUESS?R
I'M CONFUSED - TELL ME AGAIN
YOUR GUESS?75

The games are also easy to discontinue:

YOUR GUESS?STOP
THIS GAME AGAIN (YES OR NO)?

Except in a few special cases, our games do not limit the players' number of tries. People play until they get the answer, at which time the computer congratulates them:

YOU GOT IT IN 5 TURNS!!!

or they stop the game themselves:

YOUR GUESS?44
TOO BIG
YOUR GUESS?STOP
THIS GAME AGAIN (YES OR NO)? NO

Guess limits and/or sarcastic comments do not belong in games, especially when the games are otherwise providing a positive experience for the player. Someone may wish to work out personal guess limits as challenges, or to set up a record-keeping progress report, but neither of these should be done automatically. Games differ in how much room there is for player improvement. Once a player knows the most efficient strategy, scores in most of the guessing games will "show improvement" only with luck.

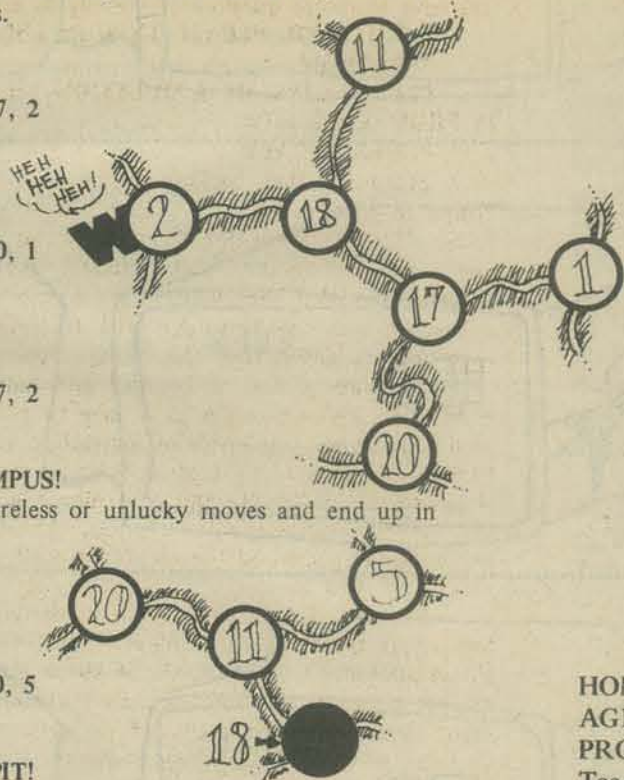
This is not meant to imply that all games for school use should be without limits of any kind. "Wumpus" is a good game and the limits are part of the challenge. The player is lost in a series of connecting caverns. The object is to shoot the Wumpus before it eats you. There are also dangers to avoid and a limited number of arrows provided. The configuration of the caverns and the placement of the dangers is different in each game, so one doesn't win by remembering where the Wumpus is. Players read the output and make a map as they thread their way through the caves.

I SMELL A WUMPUS!
YOU ARE IN ROOM 18
TUNNELS LEAD TO 11, 17, 2
SHOOT OR MOVE?M
MOVE TO?17
I FEEL A DRAFT!
YOU ARE IN ROOM 17
TUNNELS LEAD TO 18, 20, 1
SHOOT OR MOVE?M
MOVE TO?18
I SMELL A WUMPUS!
YOU ARE IN ROOM 18
TUNNELS LEAD TO 11, 17, 2
SHOOT OR MOVE?M
MOVE TO?2
OPPS . . . BUMPED A WUMPUS!

Some players lose. They make careless or unlucky moves and end up in the pit or the Wumpus.

** WUMPUS **
I FEEL A DRAFT!
BATS NEARBY!
YOU ARE IN ROOM 11
TUNNELS LEAD TO 18, 20, 5
SHOOT OR MOVE?M
MOVE TO?18
YYYYIEEE . . . FELL IN PIT!

"Wumpus" is not a beginner's game. Players should be able to understand the complicated situation of the caves and to follow directions. While playing, they make maps from verbally presented information, make decisions, and take risks. They experience some of the laws of probability and have to decide on bold or conservative approaches to the choices they are faced with. "Wumpus" encourages risk-taking while providing a relatively safe environment, the make-believe world of the game. This game-time decision-making allows players to practice for other times in life when the outcome of their decisions may be more important.



Many of the computer games, including some as complex as "Wumpus," can and should be played without a computer. When a game is played off the computer, someone, or a group, acts as the computer. Besides the obvious logistical advantages of extending computer usage, there are also educational benefits in playing the games this way. The kid-computer has to perform all of the computer's tasks. In the case of "Number," this means generating the secret number, comparing it to the guessed number, giving the appropriate response, and keeping count of the guesses made. Though it sounds complicated, even very young children, when the number range is within their abilities, can learn and enjoy playing "Number" this way.

"Being the computer" gives practice in different skills than are exercised when one is the player. Since the real computer never gives incorrect responses, the kid-computers have to do as well. This is a challenge they can meet and enjoy doing.

When children discover that they can be the computer in one game, some of the mystery of the game process, and of the computer, is removed. This allows them to be open to understanding other games as well. Playing against the computer has a new dimension when the player also has "been the computer."

The option of playing many of these games without a computer also allows the teacher to introduce new games in the classroom in simplified forms, in depth, and at any time.

There is a wide selection of games suitable for use in elementary and high schools. Players can find themselves challenged to guess the computer's secret word or secret number, where the hints are given in code; they can try to unscramble a list of numbers, beat the Taxman, or hunt the Cricket, Hurkle, or Snark. There are simulation-games where players try to land a spaceship without crashing, manage the resources of a kingdom, or direct the operations of a small business. Some simulations require large group participation, others can be played alone. Some of the complex games can be made available to less sophisticated players either by simplifying the rules or teaching them in stages. Many of the simpler games are suitable introductory material for older students who can be offered the challenge of finding good guessing strategies.

Computer games and simulations can help meet some of the obvious needs in the classroom. They also offer many more subtle educational advantages.

DOCTOR DOBB'S PROFILES

(Pronounced "Dawk'-ter Daubz")



JOANNE K VERPLANK

HOME: Community Computer Center (sigh)

AGE: Over 21

PROFESSION: Director, Vice-President and most of the Teachers at CCC

HOBBIES: Digging in garden (except when stabbing self with spading fork).

MOST MEMORABLE BOOK: (Can't remember any).

LAST ACCOMPLISHMENT: Getting three neighborhood boys to clean up the Center in return for computer time.

QUOTE: "You got any spare disk drives?"

PROFILE: Can't decide whether she likes left or right profile better.

SCOTCH: Prefers "Coke®"

YOU ARE INVITED TO ENJOY . . .
SIMULATIONS OF

COMFORT HOUSE

A JOINING OF PEOPLE' EXPERIENCES' RESOURCES AND
A BEGINNING '

TIMES: 5:30pm-8:00pm on Fridays
October: 1, 8, 15, 29
November: 5, 12, 19
PLACE: Prometheus

Contact: Gregory Yob (415)-326 4039
401 Florence, Palo Alto

A MINI TALE

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copyright 1976 by Technical Publishing Company,
Greenwich, CT 06830.

A mini tale

Mr. Dorn's comments on minis (The Trouble with Minis May, p. 82) may be apt, and are undoubtedly correct and timely, but in no case must be used as advice by a dp manager. He would probably lose his job. Let me tell you a true tale:

I was director of a small computer installation at the Univ. of California at San Diego. The installation was designed with the single minded aim of improving computer science education, in particular, applications programming skills; it was an immediate success. I ruthlessly forbade use of the system for any other task pursuant to the grant proposal that has garnered the money necessary for the project. Using two identical Novas, I was able to achieve 100% availability of the system, which drove 16 terminals. Eight were local, and another eight were placed in dorms and they communicated via phone lines. When one machine needed maintenance the other could be switched in to take up the load.

As an aside, I turned off the noisy fluorescent lighting in the facility and installed incandescent lighting covered with paper Japanese lanterns at a lower level of illumination. All the terminals were crt's, making this beneficial. I rented pillow chairs and low tables. It was a comfortable installation, and the students showed tremendous abilities in learning how to program.

Unlike the other computer "programs" at the university, there were no dropouts. Apparently everybody could learn to program on a system that was always up, gave its top priority to students, never frustrated them with delays or faced them with preemption by some "important" task such as scheduling or payroll.

Now comes the confirmation of Mr. Dorn's article. My classes were a hit. So put more students into them. My computer is always up and ready; so put more hardware into it and give this accessibility to some faculty and staff users (who are frustrated by the usual computer operation just like everybody else). Add cpu's, discs, more of this, and more of that. I said no. If you must, said I, set up another small installation dedicated to what you need. They said, "That's not necessary as you already have the nucleus right here."

I fought it for one year. I fought it for another, and students kept right on learning. The computers kept right on working, and the budget was very low.

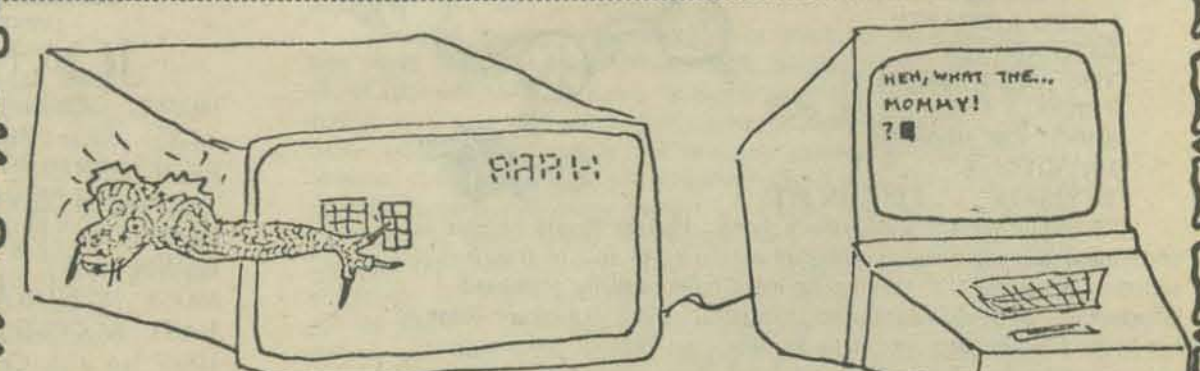
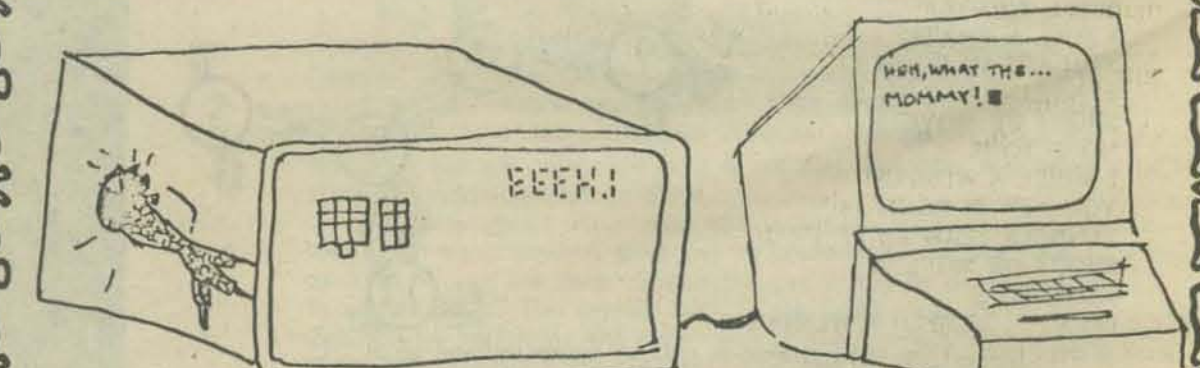
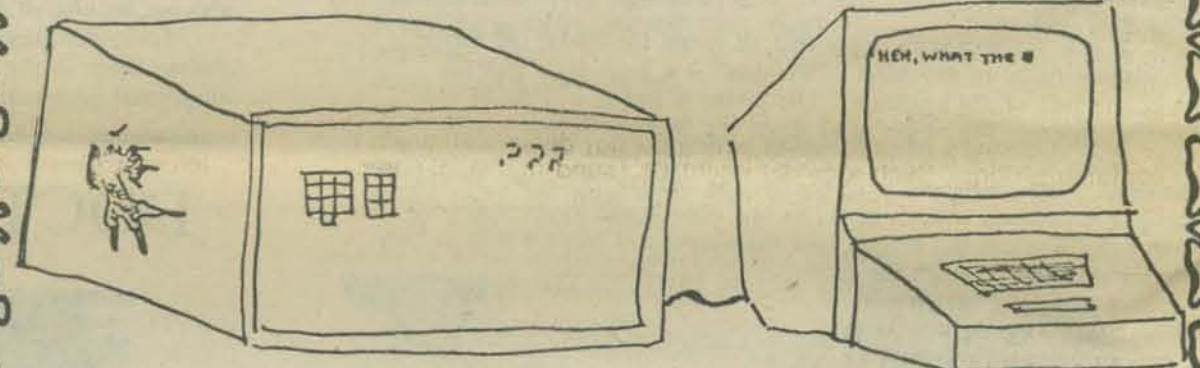
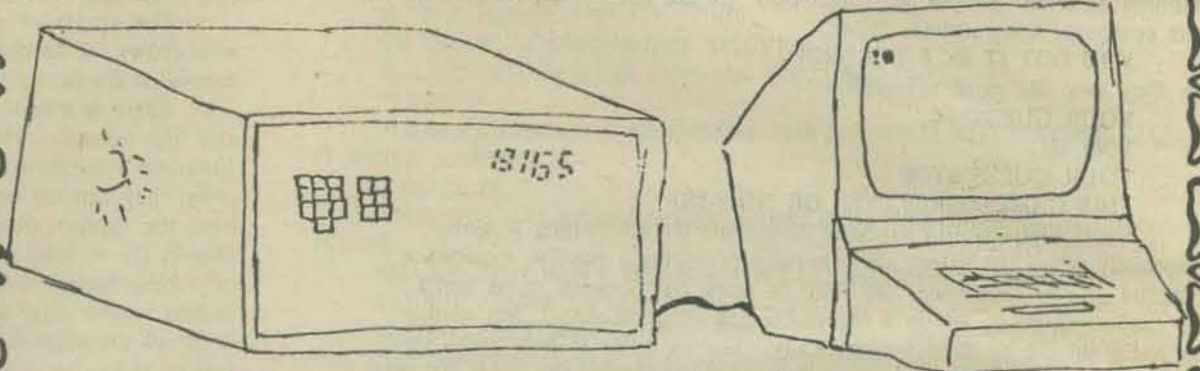
When I started, my classes held 20 students and I had time to work with them individually on our one computer. When the classes grew to 40 or so, and two computers and 16 terminals, it still worked. When I finally left, my classes had as many as 150 students (over my objections), and learning had deteriorated to typical university standards I resigned.

Last I heard, the center I set up still runs. All kinds of applications are run on their disc operating system, and more memory is now used for the system than I had to use for everything. The comfortable furniture and lighting are gone, and students have to wait for the opportunity to test out their programs part of the time. It looks, smells, and sounds like a computer center. I presume the administration is quite happy.

Anybody need a hard-headed mini computer manager?

JEF RASKIN
Brisbane, California

A MINI TALE



Thomas Greer
224 N. Alabama St.
San Gabriel, CA. 91775

TGG



—but which one?

The University of California is soliciting advice from vendors of computer equipment and programs. This is an opportunity to consult with us in advance rather than tell us what we should have done after the fact. We are earnestly seeking your best thinking prior to considering the publication of a Request for Proposal which will establish our direction for the near future. This document is *not* a Request For Proposal (RFP) but rather an invitation to share with us your ideas and recommendations whether they be basic or "blue sky." Your response to this Request For Information is voluntary and does not commit either you or the University.

The University wishes to dramatically improve the system of delivering computing capability to the 120,000 students on the nine campuses and associated sites. Instructional capability has been provided through both batch and timesharing services located on each campus. In the last two years, several of these centers have installed timesharing minicomputers which allow for the connection of several (typically, 16 to 32) remote terminals, through which the student may write programs in BASIC or access prewritten programs provided by an instructor ("Courseware"). These minicomputer-based timesharing systems have proven to be very effective and they have the capability of expanding the services to meet academic needs. Such systems are flexible enough to meet a very large percentage of the needs of a very large percentage of the students.

We feel that, now, with the changes being brought about by improvements in chip technology and the corresponding explosion in microcomputer capability, even lower cost solutions may be possible without giving up anything in capability. With any timesharing system, unless all terminals can be hard-wired, there will be additional costs (beyond the computer and the terminals) for modems and communications lines. Technology has been producing orders of magnitude improvements in price/performance of computers, but communications costs are rising. Therefore, it seems prudent to search for solutions regarding delivery of computing which do not depend vitally on communications. Such a model might be found in a single-user machine with the following design goals:

DESIRABLE FEATURES

Interactive programming capability in some language such as BASIC or APL. The implementation should include the advanced features of the language.

User space approximately equivalent to that provided in multi-user time-sharing systems.

User-removable read/write storage capability with "reasonable" retrieval times. (diskette, cassette, videodisk, etc.)

Both character and graphics capability on some screen medium. Appropriate software (firmware) extensions to deal with graphics.

Full typewriter or teletypewriter keyboard facility. Additional controls for cursor positioning for alphanumeric as well as graphics use.

Some form of course-writing software/firmware such as PILOT or DIALOG.

Editor program for preparation of programs to be executed on another computer.

Provisions for attachment of communications interface. This should provide two functions:

1. Easy interface to a host computer.
2. Ability to service input data streams from other devices such as laboratory experiments.

EXTENSION CAPABILITY

Additional or alternative language capability.

Software/firmware for word processing applications.

Color screens for graphics.

Provisions for attachment of high-quality impact printer of reproduction quality as output from word-processing applications.

PHYSICAL AND PACKAGING

Two physical versions. The first might be built into a desk or tabletop and would be considered non-portable. The second would be able to be carried by one person for short distances at least. Thus, this version would be "portable." The first version

could be located in groups of five or more in a monitored room, while the second could be used in individual offices and classrooms.

Since the majority of the machines would not have attached printers, an additional system type with the capability of produced hardcopy from the screen image would be needed. It would have the ability of printing a page at a time, on request of the user, from his removable storage medium. Both graphic and character printing would be required. This machine could be another version of the One-on-One with special software/firmware or an entirely different piece of equipment.

All equipment would operate from standard 110v 3-wire circuits. No special electrical circuits are to be needed.

MAINTAINABILITY

The system would be modular in design, allowing for board replacement to correct any failure. Adequate stocks of spare boards for each campus should be available. Board repair would be done by the vendor.

ALTERNATIVES

Although this is primarily a request for information for a single user system, the University does not wish to prejudice the thoughts and development that many vendors may have already devoted to the delivery system problem. Since our desire is to have the most cost-effective solution possible within the state of the art, a discussion of the pro and con of the above suggested approach compared with other possibilities would be most helpful. For example, a little more software or firmware might produce a cost-effective solution that might use a small number of keyboard devices clustered around a single processor. But the questions of file handling, of portability, and communications costs would need to be addressed as a minimum.

Another possible alternative might allow sharing of disk storage and common, read-only firmware while providing a microprocessor with each local unit.

If you should possess original ideas which might not satisfy the requirements anticipated in our possible RFP, the response to the RFI would be your opportunity to influence our determination of constraints to be incorporated into the RFP, so that your particular configuration would be eligible for consideration. This is important, since it is expected that only those responses to the RFP which satisfy State qualifications therein will be accepted, i.e., no alternative proposals. Any concept which might run the risk of having to be in the alternative proposal category should be presented as a response to the RFI, *not* the RFP.

While there is no monetary remuneration for responding to this document, efforts expended should provide plans and text-material needed for your response to the anticipated RFP. Hopefully, the uniqueness and enormity of our problem will be sufficiently tantalizing to serve as an inducement to stimulate your thinking.

Responses to this RFI should be returned by October 15, 1976.

QUESTIONS

Technical questions should be addressed to:

Charles W. Stevenson
Manager, Computer Planning
Systemwide Administration
University of California
Room 192, University Hall
Berkeley, CA 94720
(415) 642-0393

Procurement matters will be handled by:

Robert Brilliant
Purchasing Agent
University of California
2405 Bowditch Street
Berkeley, CA 94720
(415) 642-0881

Computer-building in the classroom: a proposal, & an implementation



PROPOSAL

This document proposes that Venice High School students, as part of their regular curriculum, shall build a computer and related accessories.

That during the process of building this computer they shall learn techniques of digital design through the use of actual components in bread-board assemblies.

That after the computer is built they shall develop an operating system for the computer.

That the computer shall then be used for other educational applications in the school.

That this program be instituted in a four-semester sequence in two phases.

Phase 1: Development of syllabi and experience by students and teacher

Phase 2: Implementation of the four semester sequence.

That technical advice, criticism, and evaluation be provided by computer professionals in the Venice High area.



memory, a teletype interface, and a tape cassette interface. This construction shall be done in a simulated manufacturing situation in which students serve in groups responsible for such functions as schedules, materials and production planning, and quality control.

All students shall participate in each group at some time and all students shall assemble and inspect components in the system.

- 3) Students shall check-out and operate the resulting system using BASIC (computer language) as provided by the kit manufacturer and using the existing school time-share teletype as a terminal.
- 4) Students and teacher, as a concurrent activity to all of the above, shall develop syllabi, schedules, and activities for the implementation of Phase 2 of this proposal.
- 5) Students, teacher, school and Area D staff, and the community technical consultants shall evaluate the performance of the computer system, the learning experiences of the students, and the over-all success of Phase 1 to determine if Phase 2 shall be implemented,

PHASE 1 January 1975 to June 1975

1) Students shall develop skills in digital component construction. These include:

(a) the ability to recognize and know the function of the elements used in digital circuits such as resistors, capacitors, diodes, integrated circuits, printed circuit boards, etc.

(b) the ability to assemble components using component specifications, schematic diagrams, and written instructions. Students shall develop this ability by working on plug-type "bread-board" assemblies in which the components are plugged into a board without the need of soldering. This allows the re-use of the component and provides flexibility in assembly and check-out of the digital assembly under study.

(c) mechanical skills such as wire-stripping, trimming components to fit, and soldering to a level of proficiency necessary to assemble computer components from kits.

2) Students shall construct from commercially available kits a computer and associated



A CALL TO SCHOOLS USING COMPUTERS

Do you have access to a computer in your school? Are you using a microcomputer in the classroom? Do you have students building computer kits for school use? These are a few of the questions that I need answers for during the coming year.

I have received a sabbatical from San Lorenzo Valley to study computers and computer curricula in the school classroom. Of special interest to me are schools and programs where students are building and using their own microcomputer systems (IMSAI, ALTAIR, APPLE, SWTPC, JOLT, etc.). A typical sample is given in the following letter received from Amberse A. Banks of Modesto:

August 13, 1976

Dear Don,

We read the articles in the PCC newsletter written by you and Kurt with great interest. The students here have been working on an IMSAI 8080 this summer. At the moment they have the 'toy' up and running with 8K of RAM. They are now trying to get a TV display and a keyboard input working. Suspect that it will take until after school starts. We have additional memory boards and a cassette interface scheduled to be assembled during the fall semester.

In the past we have offered a wide variety of programming courses to our students via the use of an IBM-1130 in the ROP lab at an adjacent high school. The logistics have not worked so the enrollment has dropped off recently. We hope that the current project will appeal to a wide variety of student interests; hardware hackers, programmers, users, software types, etc.

A couple of the boys entered Kurt's number guessing program but the results were disappointing because they did not have the music. Your article mentioned Dompier's "Program to Make an Altair Play Music." We don't have it. Can you help some hackers?

Thank you.

Amberse Banks
Math Dept.
Fred C. Beyer High School

In response to this letter, I would like to request permission to visit Fred C. Beyer High School as soon as possible. I would like to obtain pictures of the students at work, get their reactions and publish the results in *People's Computer Company* and other publications.

I would like to visit all schools with similar equipment and plans. My immediate goal is to develop a practical, inexpensive program for my own school system. However, if I receive enough response, the results could be made available in published form for use of other schools or interested parties.

If your school is involved in, or planning, an approach similar to this, please send a response to:

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

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modified, or abandoned.
PHASE 2 June 1976 and Subsequent
 Based on the experience and evaluation of Phase 1, a four-semester sequence in Computer Science shall be established as follows:

Semester 1 Grade 10 Introduction to Computer Programming
 Students shall learn elementary computer programming using the existing school desk-top programmable calculator, the BASIC language computer built in Phase 1, and the FORTRAN language system available under the District's MISS program. (This semester is the same as existing courses and has been offered at the school before.)

Semester 2 Grade 10 Introduction to Digital Design
 Students shall learn the fundamentals of digital design.

- (a) They shall learn to recognize and know the function of elements such as resistors, capacitors, diodes, integrated circuits, printed circuit boards, etc.
- (b) Using components they shall assemble and learn the operation of such computer related modules: and/or gates, flip-flops, clock pulse generators, counters, shift registers, parallel-serial and serial-parallel converters, de-coders, power supplies and power regulators. These modules will be assembled on a plug-in type of "bread-board" which allows the components to be used without soldering, providing greater flexibility in ap-

- (c) Students shall learn to assemble components using schematic diagrams, component specifications, and written instructions.
- (d) Students shall learn the mechanical skills of cutting, wirestripping, and soldering to a level of proficiency sufficient to build from kits.

Semester 3 Grade 11 Introduction to Computer Technology
 Students shall build from commercially available kits a computer and memory, a TV terminal interface, a TV terminal, and a tape cassette interface. Construction shall be under simulated manufacturing conditions. Students shall participate in groups to provide the functions of schedules, materials and production planning, and quality control. All students will participate in each group at some time. All students shall work both as assemblers and inspectors. Emphasis will be on working to precise specifications with a high degree of accuracy and careful workmanship.

Concurrent with the assembly of the computer, students will begin to learn the machine language of the computer and to design an operating system for their computer.

Semester 4 Grade 11 Introduction to Computer Systems
 Students shall continue to design and implement an operating system on their computer. Alternative activities would be the implementation of higher level languages or the design and construction of special purpose interfaces. These choices will depend on the wishes, interests, and special talents of the students.

PHASE 1 --Needed supplies and equipment
 Computer kit with associated kits to provide 8K memory, teletype interface, tape cassette interface.

Six sets of tools: 30 watt soldering irons with miniature tips, low-cost wire strippers, small needle-nose pliers with insulated handles, small pointed diagonal cutters with insulated handles. These tools will also be used throughout Phase 2 construction.

Miscellaneous parts for training in soldering: resistors, capacitors, diodes, etc.

One-time items:

Teletype
 Digital trainer, a kit to provide power and plug boards for teaching digital circuits through "bread-board" techniques

Related parts, manuals, texts for the digital trainer

Yearly items:

Computer kit with associated kits to provide 8K memory, TV terminal interface, TV terminal kit, TV monitor, tape cassette interface kit.

Miscellaneous consumable components for digital design trainer, miscellaneous consumable paper items.

SECTION E BUDGET

PHASE 1 January 1976 to June 1976

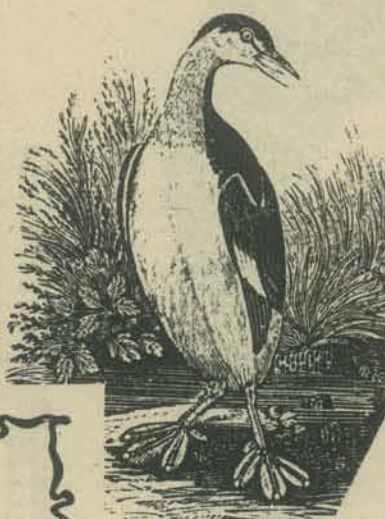
Computer and related kits	1200.00
Tools (6 sets)	180.00
Miscellaneous parts	100.00
Installation of electrical outlets	200.00
Additional security for room	100.00
Total for PHASE 1	\$1780.00

PHASE 2

One-time items:	
Teletypes	950.00
Digital Trainer Kit, Parts and Manual	200.00
Total Start-up Costs	\$1150.00

Yearly items:	
Computer and related kits	2000.00
Miscellaneous upgrading of tools and equipment	500.00
Consumables, components	100.00
Consumables, paper	50.00

Total Yearly Cost; PHASE 2 \$2650.00



STUDENT-BUILT COMPUTERS MAY FILL NEED

by Barbara Riker, Los Angeles Times

VENICE—The Venice High School bungalow where Arthur Armstrong has his classroom looks more like a mad scientist's laboratory.

Rather than sitting at their desks, the students cluster around intricate electrical equipment in a project Armstrong believes is the only one of its kind in city schools.

The 10 students are building a computer from a kit, and if the project is successful a proposal will be made to Los Angeles School District Area D to initiate a four-semester computer program in which future students, too, will build computers for the school.

There has been considerable previous interest in using computers in the schools, Armstrong observed, but the cost of purchasing and maintaining them has been an obstacle.

There is now a possibility that these costs can be drastically reduced by having the students in the schools build and maintain the computer themselves, Armstrong said. The computer kit his students are using costs \$1,300, but one already built would cost twice as much, he said.

At the heart of this general purpose digital computer is a silicon chip on a half-inch square which Armstrong explained provides most of the logic of a computer, but costs less than \$50.

Venice High participates in a time-sharing program with the school system's sophisticated computer downtown which will enable it to be used by many students at a relatively low cost of about \$1,500 a year.

Armstrong's students are testing the components they build by plugging them into an identical computer which Armstrong built himself, and which is also being used by students to gain programming experience.

The entire project is expected to take 10 weeks (to be complete by mid-April) with students working about an hour each school day.

The goal of the project, Armstrong said, is "to evaluate the use of such computers for general instructional use in classrooms and to determine the feasibility of having students build the computers."

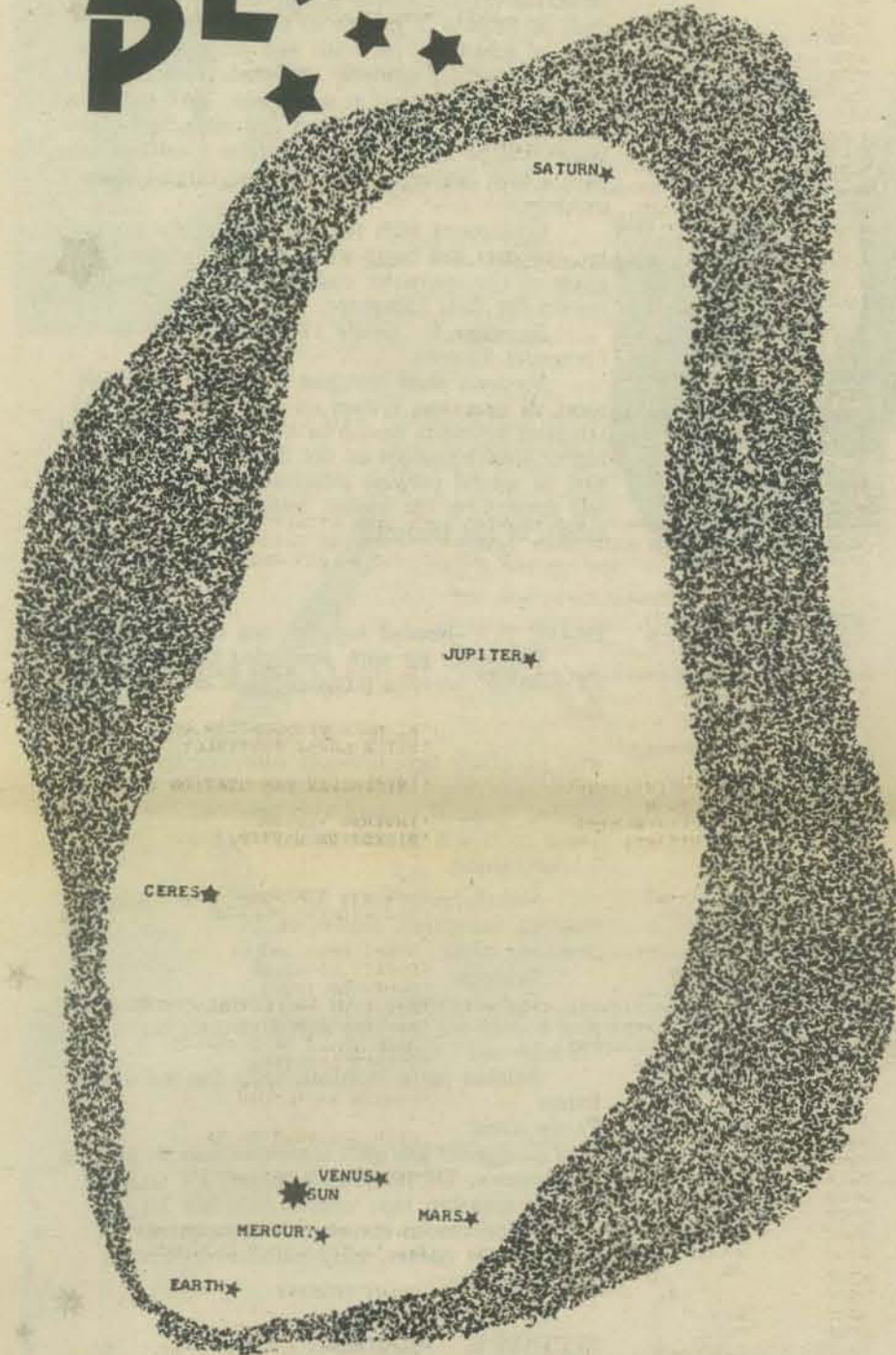
The program, if approved, will provide the school with a growing supply of computers to be built in the third of four semesters, and which could be used by all students in classroom activities, he explained.

A welcome by-product, he added, is "provocational motivation" for students who may be tomorrow's computer scientists.

"This will not prepare them at an occupational level, but it will lead to better motivation, interests and insights about the field," he said.



PLANETS



by mac oglesby

*** EACH MOVE MUST BE AT LEAST 93 LIGHT-SECONDS.

YOU ARE NOW ON EARTH. MOVE TO...? CERES
 YOU ARE NOW ON CERES. MOVE TO...? SAT
 YOU ARE NOW ON SATURN. MOVE TO...? JUP
 YOU ARE NOW ON JUPITER. MOVE TO...? MARS
 YOU ARE NOW ON MARS. MOVE TO...? VEN
 YOU ARE NOW ON VENUS. MOVE TO...? MER
 YOU ARE NOW ON MERCURY. MOVE TO...? EARTH

*** WELCOME BACK TO EARTH. YOU TRAVELLED 11032 LIGHT-SECONDS.

IF THE MINIMUM MOVE IS 93 LIGHT-SECONDS, THE SHORTEST
 ROUTE IS 11032 LIGHT-SECONDS.

*** CONGRATULATIONS ***



```

100 * NAME: ELEMLIB***:PLANETS
110 *
120 * BY: MAC OGLESBY ON 04/29/76.
130 *
140 * DESCRIPTION: THE PROGRAM PRINTS A MAP OF THE SOLAR SYSTEM
150 * (OUT AS FAR AS SATURN) AND A TABLE OF DISTANCES. THE USER
160 * IS ASKED TO FIND THE SHORTEST ALLOWABLE ROUTE WHICH TOUCHES
170 * EACH PLANET. THREE LEVELS OF DIFFICULTY ARE OFFERED.
180 *
190 * INSTRUCTIONS: TYPE "RUN" FOR COMPLETE INSTRUCTIONS.
200 * NOTE: THIS PROGRAM IS WRITTEN FOR TERMINALS WHICH PRINT
210 * SIX LINES OR TEN CHARACTERS PER INCH.
220 *
230 *
1000 RANDOMIZE
1010
1020 *FUNCTION FOR DISTANCE (IN LIGHT-SECONDS) BETWEEN PLANETS
1030 DEF FNA(A,B)=INT(485*(SQR(ABS(L(A)-L(B))/6)+2+(ABS(T(A)-T(B))/10)+2))
1040 *ABOVE LINE ENDS: (2)))
1050
1060 *READ POSSIBLE PLANET LOCATIONS: R(,) STORES ROW, C(,) COLUMN
1070 FOR J=2 TO 8
1080 FOR K=1 TO 5
1090 READ R(J,K),C(J,K)
1100 NEXT K
1110 NEXT J
1120 DATA 56,13,56,17,58,11,60,13,60,17 *MERCURY
1130 DATA 54,13,57,8,57,22,61,10,61,20 *VENUS
1140 DATA 52,15,55,6,55,24,63,9,63,21 *EARTH
1150 DATA 50,8,50,22,59,30,64,4,64,26 *MARS
1160 DATA 42,6,42,24,47,36,53,40,62,42 *CERES
1170 DATA 27,9,29,30,35,50,48,64,65,66 *JUPITER
1180 DATA 1,8,1,22,3,40,5,50,10,66 *SATURN
1190
1200 *READ LENGTH OF EACH PLANET'S NAME
1210 FOR J=2 TO 8
1220 READ B(J)
1230 NEXT J
1240 DATA 7,5,5,4,5,7,6
1250
1260 *READ PLANET NAMES
1270 FOR J=2 TO 8
1280 READ P$(J)
1290 NEXT J
1300 DATA MERCURY,VENUS,EARTH,MARS,CERES,JUPITER,SATURN
1310
1320 *READ ABBREVIATIONS
1330 FOR J=1 TO 8
1340 READ Q$(J)
1350 NEXT J
1360 DATA SUN,MER,VEN,EAR,MAH,CER,JUP,SAT
1370
1380 *READ LOCATIONS OF INNER PLANET SEPARATIONS
1390 FOR J=1 TO 6
1400 READ Y(J),X(J)
1410 NEXT J
1420 DATA 3,2,4,2,4,3,5,2,5,3,5,4
1430
1440 PRINT "IMAGINE YOU CAN MOVE FROM PLANET TO PLANET AT THE SPEED ";
1450 PRINT "OF LIGHT!"
1460 PRINT "LET'S TAKE AN INTERPLANETARY TOUR..."
1470 PRINT "1=SIMPLE 2=HARDER 3=HARDER STILL "; 'REPLAY RETURNS HERE
1480 INPUT F1
1490 IF (1-F1)*(2-F1)*(3-F1)=0 THEN 1520
1500 PRINT "PLEASE TYPE 1, 2, OR 3";
1510 GOTO 1480
1520 IF Q=0 THEN 1540 'SKIP INSTRUCTIONS IF REPLAY
1530 GOTO 1610
1540 PRINT
1550 PRINT "STARTING AND ENDING AT EARTH, TRAVEL THE SHORTEST ALLOWABLE"
1560 PRINT "ROUTE WHICH TOUCHES EACH OF THE SEVEN PLANETS SHOWN (INCLUDING"
1570 PRINT "THE MINOR PLANET CERES BUT NOT THE SUN).";
1580
1600 *PICK PLANET LOCATIONS
1610 FOR J=2 TO 8
1620 LET U(J)=J
1630 LET N=1+INT(RND*5)
1640 LET L(J)=M(J)=R(J,N)
1650 LET T(J)=C(J,N)
1660 LET N(J)=T(J)-B(J)
1670 NEXT J
1680
1690 *LOCATE SUN
1700 LET L(1)=58
1710 LET T(1)=15
1720
1730 *MOVE DISPLAY TO LEFT MARGIN
1740 FOR J=3 TO 8
1750 IF N(2)<N(J) THEN 1770
1760 LET N(2)=N(J)
1770 NEXT J
1780 IF N(2)=0 THEN 1840
1790 FOR J=1 TO 8
1800 LET T(J)=T(J)-N(2)
1810 NEXT J
1820
1830 *MOVE DISPLAY TO TOP MARGIN
1840 LET M1=0
1850 IF L(8)=1 THEN 1920
    
```

IMAGINE YOU CAN MOVE FROM PLANET TO PLANET AT THE SPEED OF LIGHT!
 LET'S TAKE AN INTERPLANETARY TOUR...
 1=SIMPLE 2=HARDER 3=HARDER STILL ? 3

STARTING AND ENDING AT EARTH, TRAVEL THE SHORTEST ALLOWABLE
 ROUTE WHICH TOUCHES EACH OF THE SEVEN PLANETS SHOWN (INCLUDING
 THE MINOR PLANET CERES BUT NOT THE SUN).

MAP SCALE IS ABOUT 1:6,000,000,000,000

TABLE OF DISTANCES (IN LIGHT-SECONDS)

	SUN	MER	VEN	EAR	MAR	CER	JUP	SAT
SUN	0							
MER	188	0						
VEN	348	342	0					
EAR	498	457	795	0				
MAR	731	635	420	1068	0			
CER	1365	1549	1439	1703	1800	0		
JUP	2518	2637	2336	3003	2432	1717	0	
SAT	4608	4740	4451	5077	4552	3557	2121	0

122143 531246


```

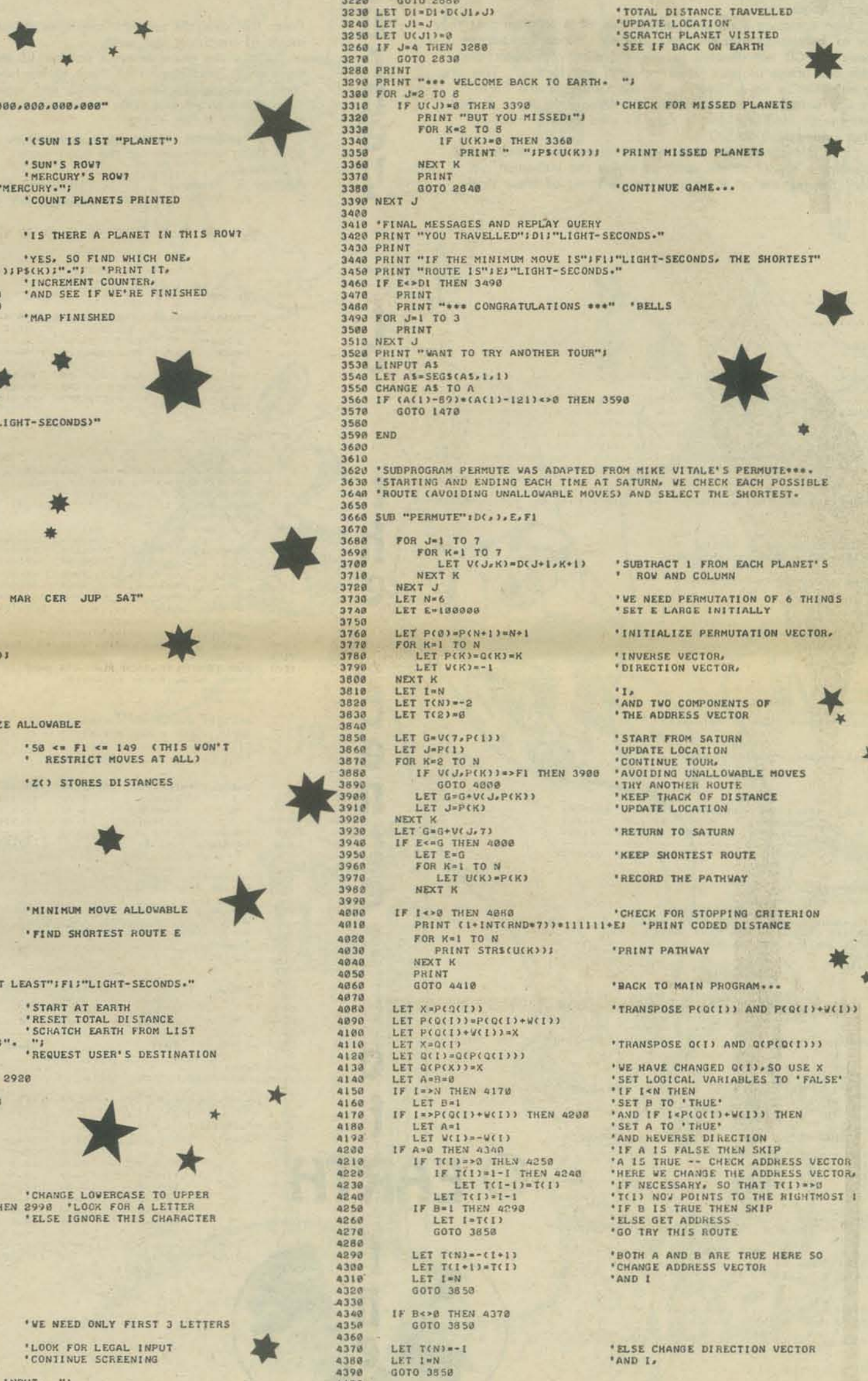
1860 LET M1=L(8)-1
1870 FOR J=1 TO 8
1880 LET L(J)=M(J)+L(J)-M1
1890 NEXT J
1910 *DETERMINE ORDER IN WHICH TO PRINT PLANETS
1920 FOR J=2 TO 7
1930 FOR K=J+1 TO 8
1940 IF M(J)<M(K) THEN 1980
1950 LET T9=M(J)
1960 LET M(J)=M(K)
1970 LET M(K)=T9
1980 NEXT K
1990 NEXT J
2000
2010 *PRINT MAP
2020 PRINT
2030 PRINT "MAP SCALE IS ABOUT 1:6,000,000,000,000"
2040 PRINT
2050 PRINT
2060 LET Q=8
2070 FOR J=1 TO 65-M1
2080 IF J<>L(1) THEN 2140
2090 IF L(2)<>L(1) THEN 2120
2100 PRINT TAB(T(2)-B(2));"MERCURY:";
2110 LET Q=Q+1
2120 PRINT TAB(T(1));"*SUN:";
2130 GOTO 2190
2140 IF M(Q)<>J THEN 2240
2150 FOR K=2 TO 8
2160 IF L(K)<>J THEN 2230
2170 PRINT TAB(T(K)-B(K));"PS(K):"; *PRINT IT,
2180 LET Q=Q+1
2190 IF J<L(1) THEN 2220
2200 IF Q<9 THEN 2220
2210 GOTO 2260
2220 GOTO 2240
2230 NEXT K
2240 PRINT
2250 NEXT J
2260 FOR J=1 TO 5
2270 PRINT
2280 NEXT J
2290
2300 PRINT "TABLE OF DISTANCES (IN LIGHT-SECONDS)"
2310 *COMPUTE AND STORE DISTANCES
2320 FOR J=1 TO 8
2330 FOR K=1 TO J
2340 LET D(J,K)=FNA(J,K)
2350 NEXT K
2360 NEXT J
2370 *FILL OUT MATRIX
2380 FOR J=1 TO 8
2390 FOR K=J+1 TO 8
2400 LET D(J,K)=D(K,J)
2410 NEXT K
2420 NEXT J
2430 *PRINT DISTANCE TABLE
2440 PRINT
2450 PRINT " SUN MER VEN EAR MAR CER JUP SAT"
2460 FOR J=1 TO 8
2470 PRINT QS(J);
2480 FOR K=1 TO J
2490 PRINT " ";
2500 PRINT USING "-###",D(J,K);
2510 NEXT K
2520 PRINT
2530 NEXT J
2540 PRINT
2550
2560 *CONVERT F1 TO MINIMUM MOVE SIZE ALLOWABLE
2570 IF F1>1 THEN 2600
2580 LET F1=50+INT(RND*100)
2590 GOTO 2740
2600 FOR J=1 TO 6
2610 LET Z(J)=D(Y(J),X(J))
2620 NEXT J
2630 *SORT THE DISTANCES
2640 FOR J=1 TO 5
2650 FOR K=J+1 TO 6
2660 IF Z(J)<=Z(K) THEN 2700
2670 LET T8=Z(J)
2680 LET Z(J)=Z(K)
2690 LET Z(K)=T8
2700 NEXT K
2710 NEXT J
2720 LET F1=Z(2+F1-2)+1
2730
2740 CALL "PERMUTE";D(,),E,F1
2750
2760 PRINT
2770 PRINT
2780 PRINT "*** EACH MOVE MUST BE AT LEAST"IF1;"LIGHT-SECONDS."
2790 PRINT
2800 LET J1=4
2810 LET D1=0
2820 LET UC(A)=0
2830 PRINT "YOU ARE NOW ON "IPS(J1);" ";
2840 PRINT "MOVE TO...";
2850 LINPUT A$
2860 IF (11-LEN(A$))+LEN(A$)>0 THEN 2920
2870 PRINT "INCORRECT INPUT. ";
2880 PRINT "PLEASE TRY AGAIN...";
2890 GOTO 2850
2900
2910 *PROCESS INPUT
2920 CHANGE A$ TO A
2930 LET A9=0
2940 FOR J=1 TO A(0)
2950 IF A(J)<96 THEN 2970
2960 LET A(J)=A(J)-32
2970 IF (90-A(J))+A(J)-65=>0 THEN 2990
2980 GOTO 3010
2990 LET A9=A9+1
3000 LET A(A9)=A(J)
3010 NEXT J
3020 LET A(0)=A9
3030 CHANGE A TO A$
3040
3050 IF A$<>"STOP" THEN 3070
3060 STOP
3070 LET A$=SEG$(A$,1,3)
3080 FOR J=1 TO 8
3090 IF A$<>QS(J) THEN 3110
3100 GOTO 3150
3110 NEXT J
3120 PRINT "I DON'T UNDERSTAND YOUR INPUT. ";
3130 GOTO 2880

```

```

3140
3150 IF J<>J1 THEN 3170
3160 GOTO 2830
3170 IF J<>1 THEN 3200
3180 PRINT "NO, YOU CAN'T GO TO THE SUN! ";
3190 GOTO 2840
3200 IF D(J1,J)>F1 THEN 3230
3210 PRINT PS(J1);" IS LESS THAN"IF1;"LIGHT-SECONDS FROM "IPS(J1);"."
3220 GOTO 2880
3230 LET D1=D1+D(J1,J)
3240 LET J1=J
3250 LET UC(J)=0
3260 IF J=4 THEN 3280
3270 GOTO 2830
3280 PRINT
3290 PRINT "*** WELCOME BACK TO EARTH. ";
3300 FOR J=2 TO 8
3310 IF UC(J)=0 THEN 3390
3320 PRINT "BUT YOU MISSED";
3330 FOR K=2 TO 8
3340 IF UC(K)=0 THEN 3360
3350 PRINT " "IPS(U(K));
3360 NEXT K
3370 PRINT
3380 GOTO 2840
3390 NEXT J
3400
3410 *FINAL MESSAGES AND REPLAY QUERY
3420 PRINT "YOU TRAVELLED"DI;"LIGHT-SECONDS."
3430 PRINT
3440 PRINT "IF THE MINIMUM MOVE IS"IF1;"LIGHT-SECONDS, THE SHORTEST"
3450 PRINT "ROUTE IS"IE;"LIGHT-SECONDS."
3460 IF E<>D1 THEN 3490
3470 PRINT
3480 PRINT "*** CONGRATULATIONS ***"
3490 FOR J=1 TO 3
3500 PRINT
3510 NEXT J
3520 PRINT "WANT TO TRY ANOTHER TOUR?";
3530 LINPUT A$
3540 LET A$=SEG$(A$,1,1)
3550 CHANGE A$ TO A
3560 IF (A(1)-87)*(A(1)-121)<>0 THEN 3590
3570 GOTO 1470
3580
3590 END
3600
3610
3620 *SUBPROGRAM PERMUTE WAS ADAPTED FROM MIKE VITALE'S PERMUTE***.
3630 *STARTING AND ENDING EACH TIME AT SATURN, WE CHECK EACH POSSIBLE
3640 *ROUTE (AVOIDING UNALLOWABLE MOVES) AND SELECT THE SHORTEST.
3650
3660 SUB "PERMUTE";D(,),E,F1
3670
3680 FOR J=1 TO 7
3690 FOR K=1 TO 7
3700 LET V(J,K)=D(J+1,K+1)
3710 NEXT K
3720 NEXT J
3730 LET N=6
3740 LET E=100000
3750
3760 LET P(0)=P(N+1)=N+1
3770 FOR K=1 TO N
3780 LET P(K)=Q(K)=K
3790 LET V(K)=-1
3800 NEXT K
3810 LET I=N
3820 LET T(N)=-2
3830 LET T(2)=0
3840
3850 LET G=V(7,P(1))
3860 LET J=P(1)
3870 FOR K=2 TO N
3880 IF V(J,P(K))>F1 THEN 3900
3890 GOTO 4000
3900 LET G=G+V(J,P(K))
3910 LET J=P(K)
3920 NEXT K
3930 LET G=G+V(J,7)
3940 IF E<G THEN 4000
3950 LET E=G
3960 FOR K=1 TO N
3970 LET U(K)=P(K)
3980 NEXT K
3990
4000 IF I<>0 THEN 4080
4010 PRINT (1+INT(RND*7))*111111+E;
4020 FOR K=1 TO N
4030 PRINT STR$(U(K));
4040 NEXT K
4050 PRINT
4060 GOTO 4410
4070
4080 LET X=P(Q(I))
4090 LET P(Q(I))=P(Q(I)+W(I))
4100 LET P(Q(I)+W(I))=X
4110 LET X=Q(I)
4120 LET Q(I)=Q(P(Q(I)))
4130 LET Q(P(Q(I)))=X
4140 LET A=B=0
4150 IF I=>N THEN 4170
4160 LET B=1
4170 IF I=>P(Q(I)+W(I)) THEN 4200
4180 LET A=1
4190 LET W(I)=-W(I)
4200 IF A=0 THEN 4340
4210 IF T(I)=0 THEN 4250
4220 IF T(I)=1-I THEN 4240
4230 LET T(I-1)=T(I)
4240 LET T(I)=1-I
4250 IF B=1 THEN 4290
4260 LET I=T(I)
4270 GOTO 3850
4280
4290 LET T(N)=-T(I+1)
4300 LET T(I+1)=T(I)
4310 LET I=N
4320 GOTO 3850
4330
4340 IF B<>0 THEN 4370
4350 GOTO 3850
4360
4370 LET T(N)=-1
4380 LET I=N
4390 GOTO 3850
4400
4410 SUBEND

```



Dear Dragon:

I am enclosing a list and sample run of a program that may be of interest to you and your readers. Since the January issue of PCC was devoted to games dealing with outer space, this one brings us back down to earth and further. This program takes us on a "Journey to the Center of the Earth." It was written on the University of Wyoming's Sigma 7, but with small modifications, it may be used on any machine that understands BASIC.

This is a simulation game type program which deals with building a model of the earth in which the individual can vary the number of shells and the thickness of these shells.

From this date the program calculates the mass and moments of inertia of the earth.

To play the game, select a number of shells, thickness of these shells, and density of them to see how close you can come to the actual values of mass and moment of inertia. Vary the program and rules to suit yourself. Maybe you can design a better world!

I have enjoyed reading your publication. You have a good thing going-keep up the good work.

Sincerely,
Andrew A. Aronson

710 Grand Avenue
Laramie, WY 82070

Journey to the center of the Earth

```

*****PROGRAM OF SHELL MODEL*****
WOULD YOU LIKE TO SEE THE MODEL USED BY JULES VERNE?
YES
THIS PROGRAM ASKS YOU TO DEVELOP A DENSITY MODEL OF THE
INTERIOR OF THE EARTH THAT SATISFIES THE GRAVITY AND THE
MOMENT OF INERTIA. YOU MAY DIVIDE THE EARTH INTO A NUMBER OF
CONCENTRIC SHELLS (LIMIT 10) AND ASSIGN EACH A THICKNESS AND
DENSITY. THE PROGRAM WILL THEN CALCULATE THE MASS AND MOMENT
CONTRIBUTED BY EACH OF YOUR SHELLS AND PRESENT THE TOTALS AS A
PERCENT OF KNOWN VALUES. THE SHELL THICKNESSES ARE TO BE INPUT
IN KILOMETERS. ERROR IN ARRIVING AT THE TOTAL THICKNESS (RADIUS)
OF THE EARTH WILL BE HANDLED AUTOMATICALLY BY THE PROGRAM.

SOME STARTING DATA: RADIUS OF THE EARTH = 6371 KM. AVE. DENSITY = 5.5

INPUT THE NUMBER OF SHELLS ? 1
SHELL---CORRESPONDING THICKNESS
1 6371
SHELL---CORRESPONDING DENSITY
1 75.5

SHELL THICKNESS DENSITY MASS MOMENT
1 6371.0 75.5 99.574 120.434
-----
TOTAL 6371 99.574 120.434

SATISFIED ? NO
CHANGE # OF SHELLS ? 2
INPUT THE NUMBER OF SHELLS ? 2
SHELL---CORRESPONDING THICKNESS
1 23000
2 23000
SHELL---CORRESPONDING DENSITY
1 74.5
2 76

SHELL THICKNESS DENSITY MASS MOMENT
1 23000.0 74.5 69.472 74.442
2 23000.0 76 16.191 3.454
-----
TOTAL 6371 85.492 79.692

SATISFIED ? NO
CHANGE # OF SHELLS ? 2
THICKNESS CHANGE -- HOW MANY SHELLS ? 2
DENSITY CHANGE -- HOW MANY SHELLS ? 2
INPUT SHELL # AND DENSITY
214.2
72.13

SHELL THICKNESS DENSITY MASS MOMENT
1 3000.0 4.20 64.774 86.152
2 3371.0 6.00 16.191 3.454
-----
TOTAL 6371 99.632 99.952

SATISFIED ? NO
CHANGE # OF SHELLS ? 3
INPUT THE NUMBER OF SHELLS ? 3
SHELL---CORRESPONDING THICKNESS
1 71000
2 71000
3 71
SHELL---CORRESPONDING DENSITY
1 74
2 75
3 76

SHELL THICKNESS DENSITY MASS MOMENT
1 71000.0 74 29.032 50.892
2 71000.0 75 25.192 29.982
3 4371.0 76 35.062 19.974
-----
TOTAL 6371 89.114 100.242

SATISFIED ?
CHANGE # OF SHELLS ? 2
THICKNESS CHANGE -- HOW MANY SHELLS ? 2

```

```

INPUT SHELL # AND THICKNESS
71.2000
DENSITY CHANGE -- HOW MANY SHELLS ? 2

SHELL THICKNESS DENSITY MASS MOMENT
1 5000.0 4.00 15.754 29.362
2 1000.0 5.00 30.362 44.152
3 4671.0 6.00 48.554 34.322
-----
TOTAL 6371 94.672 107.832

SATISFIED ? NO
CHANGE # OF SHELLS ? 2
THICKNESS CHANGE -- HOW MANY SHELLS ? 2
DENSITY CHANGE -- HOW MANY SHELLS ? 2
INPUT SHELL # AND DENSITY
71.2.5
73.7.5

SHELL THICKNESS DENSITY MASS MOMENT
1 5000.0 2.50 7.862 14.362
2 1000.0 3.00 30.362 44.152
3 4671.0 7.50 60.664 62.902
-----
TOTAL 6371 100.904 105.424

SATISFIED ? NO
CHANGE # OF SHELLS ? 2
THICKNESS CHANGE -- HOW MANY SHELLS ? 2
INPUT SHELL # AND THICKNESS
71.2000
72.2000
DENSITY CHANGE -- HOW MANY SHELLS ? 2
INPUT SHELL # AND DENSITY
71.3
73.7

SHELL THICKNESS DENSITY MASS MOMENT
1 2000.0 3.00 36.772 51.172
2 2000.0 5.00 24.772 15.662
3 2371.0 7.00 6.532 1.092
-----
TOTAL 6371 67.874 72.662

SATISFIED ? NO
CHANGE # OF SHELLS ? 2
THICKNESS CHANGE -- HOW MANY SHELLS ? 2
DENSITY CHANGE -- HOW MANY SHELLS ? 2
INPUT SHELL # AND DENSITY
71.3.5
72.10.5

SHELL THICKNESS DENSITY MASS MOMENT
1 2000.0 3.50 42.902 60.992
2 2000.0 10.00 51.002 33.312
3 2371.0 7.00 6.532 1.092
-----
TOTAL 6371 101.002 99.392


SATISFIED ? YES
LIKE TO SEE A MODEL USED BY JULES VERNE IN HIS
BOOK "JOURNEY TO THE CENTER OF THE EARTH" ? YES

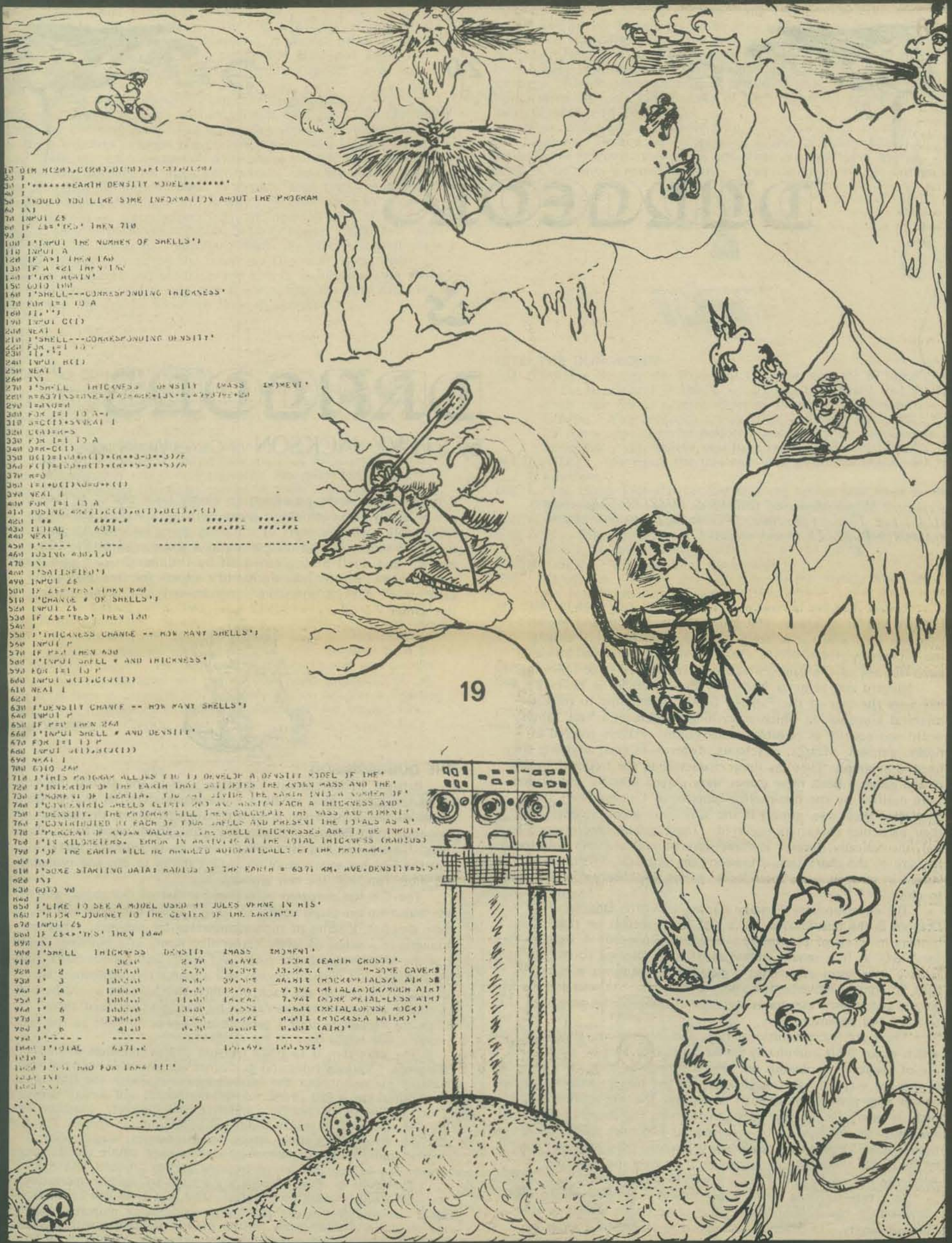
SHELL THICKNESS DENSITY MASS MOMENT
1 3000 4.75 3.692 1.354 (EARTH CRUST)
2 1000.0 8.75 19.374 33.262 ( " " "SOME CAVERNS)
3 1000.0 8.00 39.522 48.812 (OCCASIONAL AIR SPACES)
4 1000.0 4.00 12.462 9.392 (GIFTLIKE ROCKY AIR)
5 1000.0 11.00 16.842 7.942 (MORE METAL-LESS AIR)
6 1000.0 13.00 9.552 1.802 (METAL-DENSE ROCK)
7 1300.0 1.40 3.202 0.012 (CRICKETSEA WATER)
8 41.0 8.00 0.002 0.002 (AIR)
-----
TOTAL 6371.0 100.692 100.592
NOT BAD FOR 1864 !!!

```

MASS?
MOMENT OF
INERTIA?
HELP!
PLEASE EXPLAIN,
SOMEBODY...
SEND YOUR
IDEAS TO:

MASS &
MOMENT
OF
...INERTIA...
P.O. BOX 310
MENLO PARK
CA/ 94025



```

10 DIM H(20),C(20),D(20),M(20),I(20)
20 I
30 *****EARTH DENSITY MODEL*****
40 I
50 WOULD YOU LIKE SOME INFORMATION ABOUT THE PROGRAM
60 I
70 INPUT Z$
80 IF Z$="YES" THEN 710
90 I
100 INPUT THE NUMBER OF SHELLS
110 INPUT A
120 IF A=1 THEN 160
130 IF A=2 THEN 160
140 PRINT AGAIN
150 GOTO 160
160 SHELL=---CORRESPONDING THICKNESS
170 FOR I=1 TO A
180 I1=I
190 INPUT C(I)
200 NEXT I
210 SHELL=---CORRESPONDING DENSITY
220 FOR I=1 TO A
230 I1=I
240 INPUT D(I)
250 NEXT I
260 I
270 SHELL THICKNESS DENSITY MASS MOMENT
280 M=6371*3.14159*(C(I)*D(I)+C(I)*D(I)*C(I))
290 I=I+1
300 FOR I=1 TO A-1
310 M=C(I)*D(I)*C(I)
320 C(I)=C(I)+C(I)
330 FOR I=1 TO A
340 O=C(I)
350 D(I)=D(I)+D(I)*C(I)
360 F(I)=D(I)*C(I)*C(I)
370 M=M+O
380 I=I+1
390 NEXT I
400 FOR I=1 TO A
410 USING "###.###" PRINT C(I),D(I),F(I)
420 I
430 TOTAL 6371
440 NEXT I
450 I
460 USING "###.###"
470 I
480 SATISFIED
490 INPUT Z$
500 IF Z$="YES" THEN 840
510 CHANGE # OF SHELLS
520 INPUT Z$
530 IF Z$="YES" THEN 100
540 I
550 THICKNESS CHANGE -- HOW MANY SHELLS
560 INPUT P
570 IF P=0 THEN 840
580 INPUT SHELL # AND THICKNESS
590 FOR I=1 TO P
600 INPUT C(I),D(I)
610 NEXT I
620 I
630 DENSITY CHANGE -- HOW MANY SHELLS
640 INPUT P
650 IF P=0 THEN 840
660 INPUT SHELL # AND DENSITY
670 FOR I=1 TO P
680 INPUT D(I),C(I)
690 NEXT I
700 GOTO 240
710 THIS PROGRAM ALLOWS YOU TO DEVELOP A DENSITY MODEL OF THE
720 INTERIOR OF THE EARTH THAT SATISFIES THE KNOWN MASS AND THE
730 MOMENT OF INERTIA. YOU CAN DIVIDE THE EARTH INTO A NUMBER OF
740 CONCENTRIC SHELLS (LISTED) AND ASSIGN EACH A THICKNESS AND
750 DENSITY. THE PROGRAM WILL THEN CALCULATE THE MASS AND MOMENT
760 CONTRIBUTED BY EACH OF YOUR SHELLS AND PRESENT THE RESULTS AS A
770 PERCENT OF KNOWN VALUES. THE SHELL THICKNESSES ARE TO BE INPUT
780 IN KILOMETERS. ERROR IN RESULTS AT THE TOTAL THICKNESS (RADIUS)
790 OF THE EARTH WILL BE MINIMIZED AUTOMATICALLY BY THE PROGRAM.
800 I
810 SOME STARTING DATA: RADIUS OF THE EARTH = 6371 KM. AVE. DENSITY = 5.5
820 I
830 GOTO 90
840 I
850 WOULD YOU LIKE TO SEE A MODEL USED BY JULES VERNE IN HIS
860 BOOK "JOURNEY TO THE CENTER OF THE EARTH"?
870 INPUT Z$
880 IF Z$="YES" THEN 1040
890 I
900 SHELL THICKNESS DENSITY MASS MOMENT
910 1 3000 2.70 1.494 1.38E (EARTH CRUST)
920 2 1000 2.70 19.39E 33.24E ("SOME CAVERS
930 3 1000 8.50 39.59E 44.81E (MAGNETALSKA AIR SB
940 4 1000 8.50 12.86E 9.39E (METALLOID/IRON AIR)
950 5 1000 11.00 16.80E 7.94E (IRON METAL-LESS WIRE)
960 6 1000 13.00 2.57E 1.64E (METALLOID/ROCK)
970 7 1300 1.60 0.22E 0.01E (MAGNETALSKA WATER)
980 8 410 0.00 0.00E 0.00E (AIR)
990 I
1000 TOTAL 6371.0 100.00E 100.59E
1010 I
1020 I
1030 I
1040 I

```

DUNGEONS

&

DRAGONS

by STEVE JACKSON of Games Workshop

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Fantasy Gaming is now a rapidly-growing cult both in this country and in America. The spread of the hobby, and the enthusiasm with which it is being received, resembles very closely the Diplomacy 'fever' of the 1960s resulting in the world-wide establishment of the game, which now has a very large following.

Midgard and Hyboria (see Tony Bath's articles in issues 23 & 39) were the first of the Fantasy Games, attempting to recreate mythical kingdoms in which everything possible in a 'real' fantasy world was equally as possible in the games. Players entered as rulers, warriors, wizards, merchants, dwarves—in fact, anything they liked—and simply 'lived' as these characters in the fictional worlds of the games. Both these games were played postally and players were notified by the non-playing umpires or Gamesmasters (who controlled their own games) if and when any events relevant to their particular characters occurred. These games were planned to run, theoretically, *forever* as there were no real ultimate objectives for any of the characters. However, the practical difficulties involved in running such 'total-depth' games, eventually forced them to close.

The contemporary Fantasy Games, of which Dungeons & Dragons is the best-known, are a vast improvement on their fore-runners in terms of playability. Basically, Dungeons & Dragons (or 'D&D' as it is usually abbreviated) is an attempt to recreate fantasy adventures using greatly modified tabletop wargaming rules to control movement, combat and magic. As warriors, magicians and priests, players venture down dungeons in search of treasure and adventure.

There are many additional rules and innovations, though, which make D&D completely unlike any other sort of game. The use of magic is an obvious one which springs to mind, but there is also the way that the *imagination*s of the players and the Gamesmaster play a vital role in each adventure. No pre-set board, as such, is used; the dungeons are unknown to the players beforehand and must be explored to be discovered. The rules of the game need not be known by novices; they learn as they play and their original lack of knowledge counts as their own inexperience. Also, the objectives of the game are unlike any other.

In actual fact, the term 'game' applies only generally to D&D. Ultimately it has no end, and in this respect it is similar to the Midgard family. In practice, though, it is played as a series of 'adventures' or 'episodes' during which a party of players go down the dungeons and return (if luck is with them!). But there

is no winner or loser; an adventure simply takes place. In fact, it is a largely non-competitive game—perhaps 'co-operative' is more appropriate. The members of the party going into the dungeons are really simply pitting themselves, as a group, against the Gamesmaster. But don't be frightened off by the thought of a non-competitive game; players may decide to compete for treasure or pick each other's pockets down the dungeons—*anything* is possible in this game!



THE DUNGEON-GOD

Baffled? Then perhaps I'd better explain the general mechanics of the game. First of all, a Gamesmaster (GM) is vital to the whole show. This person is to a certain extent like the banker in Monopoly, but he may not play the game at the same time. By 'play' I mean join the other players and go in with the party—in fact the GM has much more important things to do, and probably has more fun than the rest anyway.

The GM has prepared beforehand a 'Set of Dungeons' which are drawn up on graph paper, to scale. These dungeons will be, at their simplest, a series of rooms connected by passages. They are arranged in a series of levels, rather like floors in a building. Level 1 is the level at which the party will enter, and various stairs, sloping passages and magical devices will connect this downstairs to levels 2, 3, 4 and so on, each of which will have its own labyrinth of rooms and chambers connected by passages. At least three levels are needed to start a game, but there is no limit to the maximum a GM might have in his dungeons.

The next step is to place treasure and/or monsters in these dungeons. Various rules and guidelines are given for monster and treasure placement, but the final decision rests with the GM. Generally speaking, a fair proportion of the rooms will contain treasure, which is always guarded by a monster of some sort. Monsters can also be stationed in empty rooms, corridors and so forth. The GM can also arrange any tricks, traps, secret passages, magic rooms, cryptic signs, little old men, etc., that he likes within the dungeons, which may help or hinder adventuring parties on their journeys.

The levels of the dungeons are always arranged in increasing levels of danger, going downwards. The first level will contain small amounts of treasure guarded by fairly weak monsters, but the second and third levels will be more treacherous, with more valuable prizes. And woe betide any newcomer wandering as far down as the sixth and seventh levels; hungry Wyverns, Minotaurs,

Vampires and Dragons lurk in the depths! An example of a simple dungeon (level 1 only) is shown below.

The GM will no doubt give the area a 'setting' as well, to enrich the character of his dungeon. A disused prison in a ruined city was one of the first dungeons I ever went down, while my own were set in long-abandoned smugglers' caves on a deserted beach.

Drawing up the dungeons can take a great deal of time and this must always be done well in advance of a game. In the meantime, the GM may spread vague rumours about his dungeons and as these circulate amongst the players, 'myths and legends' build up. While the actual game is taking place, the GM sits apart from the players, keeping his maps well hidden. As they venture into the dungeons, he informs them of exactly what they can see (including rough dimensions—this is why it is convenient to draw the dungeons out on graph paper) from the position they are in. Should they come across any man, beast or magic along their way, the GM must act as its controller. When the players suggest plans which are not covered by the rules, the GM must assess their chances of success and arbitrate, and this is usually done by giving odds and success and rolling dice to determine the outcome. In short, the GM acts as 'God' for his own dungeons.

ROLLING FOR CHARACTERS

But what of the players? In Dungeons & Dragons, players take on the lives of fantastic characters. Fighting Men, Magic-Users and Clerics are the three original classes of character, but others have since been developed.

Each player starts off as a relatively weak '1st Level' Character, but during the game, players are awarded Experience Points as they kill monsters and collect treasure. Accumulation of Experience Points enables characters to rise in levels and thus become more powerful. For example, a 1st Level Magic-User knows only one spell, but once he has reached 6th Level, he has 'learned' eight. However, before reaching 6th Level, he must have been awarded 35,000 Experience Points and this may take as many as 30 separate trips down the dungeons!

But before opting for his class, a player first must build up a personality profile of his character through a procedure which has come to be known as 'Rolling for a Character.' There are seven personality attributes: Strength, Intelligence, Wisdom, Constitution, Dexterity, Charisma and Gold Pieces. For each of these, a player must roll three standard dice, to obtain a score between 3-18 (or 30-180 Gold Pieces). He then considers these scores and decides which class his character will probably be most successful in. A character high in Strength will probably opt to become a Fighting Man, while Intelligence is the 'Prime Requisite' for Magic-Users, as is Wisdom for Clerics.

Having chosen a class and a name for his character, a player must then roll one dice to see how many Hits he may take—that is, the number of damage points he may suffer before being killed. First Level Magic-Users may also take one spell (to be used only once) with them. Finally each character must take a trip to the local Village Woolworth's to load himself up with arms, armour, weapons, provisions and other such odds and ends. The rules provide a price list for a large variety of such useful things and payment is made with Gold Pieces.

Thus, equipped for his adventure, he is now ready to enter the dungeons. He and his companions choose miniature figures (if available) to represent themselves and these are assembled on the table in the party's marching order. They then turn to the Gamesmaster . . .



INTO THE DUNGEONS!

GM: 'Walking through the Woods of Quendor, you are in search of the largest tree in the forest, as you have heard that its roots once led to caverns of riches tunnelled by Ground Goblins. You approach a very large, and very dead tree. Its trunk appears to be hollow. Judging by the stories you have heard, you believe you have reached your destination.'

MAGIC-USER: 'We climb the tree and look down the trunk with a lantern.'

GM: 'You climb 15ft and can see that the hollow tree leads down below ground level to about 20ft below the surface.'

MAGIC-USER: 'We all climb down to the bottom.'

GM: 'You find yourselves in a circular room 15ft in diameter with a 5ft wide passage leading off to the north.'

MAGIC-USER: 'We look down the passage.'

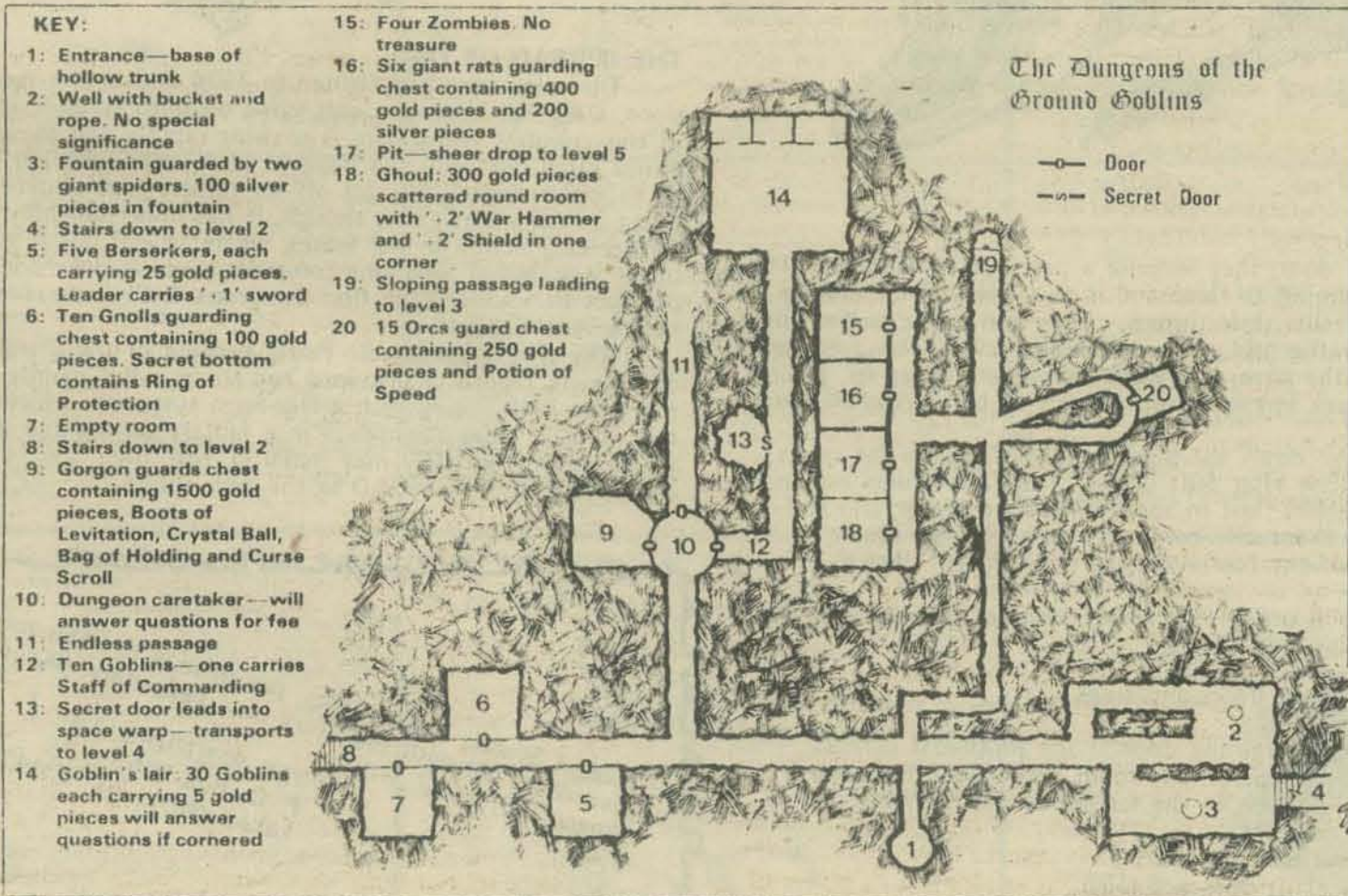
GM: 'It extends for 50ft and then turns to the right. You can see crossroads of some sort 30ft away.'

MAGIC-USER: 'We proceed to the crossroads and look left and right.'

And so it goes on . . .

As the GM calls out locations and dimensions, various members of the party chart these on graph paper maps of their own. But they must be intelligent enough to do so!

Anyway, after turning left at the crossroads and then right, they come to a large junction and find a withered old man sitting on a rock . . .



MAGIC-USER: 'Hail, old man—how came you to these parts?'

GM: 'Greetings, friends. I am the taker of care in these labyrinths. How may I serve you?'

ELF: 'Well, you could tell us where we can find treasure!' (Whereupon the Magic-User glares at the Elf for his tactless outburst.)

GM: 'Aha! Treasure-hunters, eh? Well you'll find nothing here.'

FIGHTING MAN: 'No, aged friend, my colleague is no doubt over-optimistic. We are a geological surveying party and would merely like to chart these passages. Perhaps you could help us?'

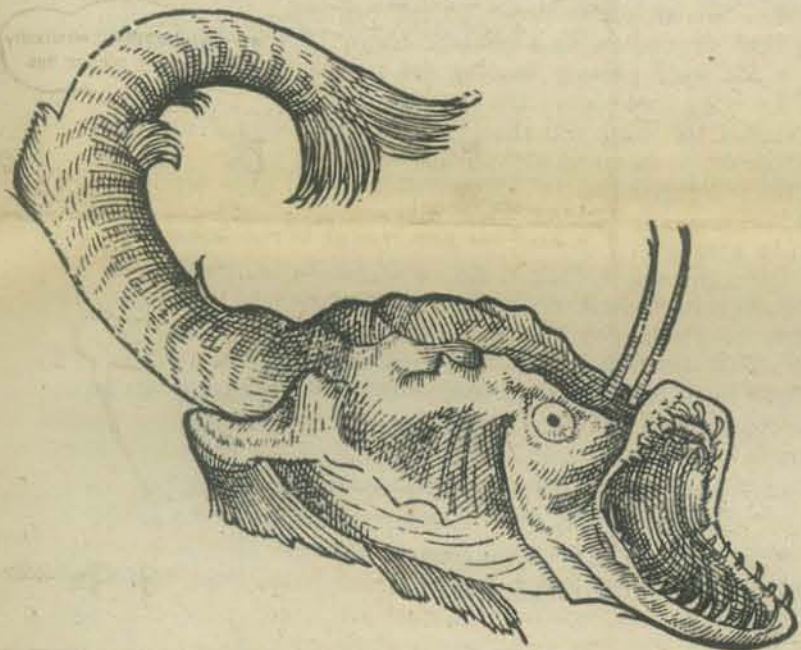
GM: (Throws dice to see whether the old man believes him—he does.) 'Certainly, fellows, I shall be happy to assist. What can I do for you, and how much is it worth?'

The party talk amongst themselves. Some would like to ask him if he'd give them a conducted tour of the dungeons; some would like to ask him what's behind the doors they can see; some don't trust him and inevitably, someone wants to leap over and lop his head off.

MAGIC-USER: '10 Gold Pieces for you if you tell us what's behind these doors.'

GM: (Rolls for acceptance.) 'Very well. Yon east door leads to a Goblin's lair. Yon north door leads to a magic passage from which no man has ever returned. Yon west door seals the Room of the Bull.'

The party chatter and opt for the west door as the prospect of battling a bull seems the least dangerous. They pay the man and thank him. After bursting the door open, they are horrified to find a Gorgon inside! They beat a hasty retreat! The GM throws the dice and an encounter takes place—unluckily for them—in which the dwarf who charged the door is turned to stone and must be abandoned. However, the rest escape unhurt.



Trying the east door, they surprise a party of 10 Goblins. The Magic-User sends them all to sleep and is awarded 250 Experience Points. The Fighter slits their throats. They search the bodies and find nothing but a rather old, elegant-looking stick. After applying all sorts of tests to the stick, the Magic-User finally gives up, but puts it in his backpack anyway, suspecting it to be a wand of some sort.

Venturing further down the passage, the Elf checks for secret doors and discovers one after 50ft or so. The party enters but immediately feel themselves 'lost in space' unable to see or feel anything clearly. They eventually come to rest in a large, square chamber. On each of the four walls are three doors. Which do they choose?

MAGIC-USER: 'I pull out the stick and wish we were back at the crossroads with the old man!'

GM: 'Nothing happens.'

ELF: 'I check for secret doors and traps.'

GM: 'You find none.'

FIGHTING MAN: 'I charge the door in the south-east corner.'

GM: 'The door bursts open. The room inside is 30ft square. There is a large chest in the far corner and standing over it is a green dragon.'

FIGHTING MAN: 'I slam the door!'

GM: (Rolls the dice) 'It does not close.'

MAGIC-USER: 'I command the dragon to stay put.'

GM: (Noting that the Magic-User is still holding the stick) 'The dragon becomes still and silent.' (Jubilation in the party!)

FIGHTING MAN: 'I approach the dragon—very slowly! Does it move?'

GM: 'No.'

FIGHTING MAN: 'I plunge my sword into its neck.'

GM: 'It bleeds dragon blood but does not move.'

FIGHTING MAN: 'It eventually drops down dead. You have 450 Experience Points.'

The party rush into the room and open the chest to find 1500 Gold Pieces, 1000 Silver Pieces, a Potion and a Scroll. They are rich beyond their wildest dreams!

But they are also lost in the dungeons of the Ground Goblins.



EXPERIENCE POINTS

When a party eventually emerges from the dungeons, the members are usually carrying quite a bit of treasure and have been awarded a number of Experience Points. These Experience Points are the real object of the game and these are awarded for killing monsters and emerging with treasure. When players first set off down the dungeons they begin as First Level characters. Every time they play again, including in different dungeon systems, each play must keep the same character, till death they do part. Characters, as they accumulate Experience Points, gradually rise in power, status and ability, to 10th Level Fighting Lords, 16th Level Wizards and 20th Level Patriarchs. These are the highest levels described in the rules, but guidelines are given for determining Experience quotas of even higher levels. Thus there is no limit to the ambitions one may aspire to and the game, as such, never really 'ends.'

The actual rules to D&D are in a constant state of flux. Additional rules are continually being issued in the form of supplementary books, of which 'Greyhawk' and 'Chainmail' are the first two. Other rules can also be incorporated. 'War of the Wizards,' a 2-player battle of sorcerers, is a completely separate game which can quite easily be brought into D&D, and many groups of players have their own 'house rules' which they play within the group.

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THE SPREAD OF D&D

The rules were copyrighted in 1974 and in the short time since, D&D has become a cult game on both sides of the Atlantic. In this country, enthusiasm is growing rapidly and already one postal game (and you can imagine what a full-time job that must be to gamesmaster!) has got off—or rather, gone under—the ground. Being an American game, though, it has understandably developed further as a hobby in the States, where several postal games are under way and at least one computer-moderated version is being played. In addition, the first Dungeons & Dragons convention was held in late February.

Why is it so popular? Partly because of the theme—Fantasy of Tolkien, Moorcock, Howard and so on. But mainly because of the game itself, being such a free-form system in which players can virtually place themselves in a fantasy setting and make all the decisions that they may make in 'real' life. Yes, we'll be hearing a lot more about D&D in the near future.

FLASH!

Tactical Studies Rules (TSR), the creators of "Dungeons & Dragons" have come out with their very own bimonthly mag—called The Dragon (\$9/year). Write:

TSR PERIODICALS
P. O. Box 756
Lake Geneva, WI 53147

FORTTRAN MAN

by **Lee Schneider & Todd Voros**

As you may recall from the last episode, our hero Fortran Man has received an urgent call for help from his old friend Doktor Debug in the 'Old Country' of Transistoria, where a strange and frightening plague has struck the land.....

It strikes without warning.....stalking the land, lurking in the shadows and pouncing on passing files - leaving them terminated most abnormally, drained completely of bits, leaving only two small file marks on the victim's body!

Even the learned Herr Doktor has been powerless against the evil affliction.....

And now, responding to the desperate call for his help, Fortran Man is found aboard a long-distance transport, many milliseconds down the channel from his native 360 City.....

He has traveled for many cycles since leaving the busy ports of 360 City - and here, far from the complex structures and nanosecond rates of the Big City, the gentle currents and slow ripples flowing down the same channel are almost enough to inhibit any thoughts of deadly menaces and hazardous adventures.

Ahhh nothing like the aroma of that err-free I/O air!

F 10 11

But Fortran Man, knowing his urgent duty, does not for an instant halt his computation of the facts at hand even as they cruise by the Great Planes and he offhandedly pauses to admire the graceful flux of wild gauss as they swim among the eddy currents along the bank and nest within the cores of ancient, low-level logic trees

hmmmm . . . missing bits . . . file marks . . . maybe . . .

Below the Great Planes come the vast Data Fields which border Transistoria and here they would often pass small villages where the age-old process of data collection goes on as always, with rows of hard-working Stack Pushers moving their data stacks under the ever-watchful supervision of the local Stack Pointer.....

Come on! Move it along! This way! Come on! Move it along!

The journey stretches on, until, finally, the ever-flowing channel arrives at the fathest reaches of its domain—in the ancient land of Transistoria!

With the great peaks of the Monolithic Mountains towering in the distance, the drive current of the transport is at last cut and they float gently into the port

Just as I remember it - the last of the truly remote terminals!

F 10 0

Arriving at last at his port-of-call, F-man is shifted ashore among the other passengers Quickly he scans the crowd for his old friend, and immediately hails him in the customary manner

CALL DEBUG (I,J,K) I

RETURN I

PORT OF TRANSISTORIA
110 baud 300 baud

O F 11

F-Man and the good Herr Doktor hurry across the dock towards each other, and at last the old friends meet once again

No need to address me in such formal terms, F-Man considering how long we've known each other!

Sorry—force of habit! How is the situation here?

Not good! Three more files terminated in the last cycle—we need help! And quickly!

You know I'll do everything I can

Follow me, F-Man! In the interest of time, I've arranged it with UART Central for you to bypass Customs

Good! I've always prided myself in keeping my code in good order!

Speaking of which, Herr Doktor, how have you been lately?

Ach, busy as always, especially since this terrible plague has broken out

CRC / CUSTOMS
BYPASS ->

F B

..... and since poor Mrs. Debug's termination not so long ago, I am, alas, a stand-alone job once again

But then, I'm not completely alone ... I have my beautiful daughter Parity to keep me company! Have you met?

Greetings, mein Herr! Welcome to Transistoria! Mein father has told me so much about you!

Uh, hello

D F

P

The formal introductions completed, the three of them exit the port and head for the village

Tell me, F-Man, do you have any ideas as to the cause of this mysterious affliction we are up against?

Perhaps, Herr Doktor it has occurred to me that maybe this is not a disease at all, but rather the work of some demented program!

Hmmm this could be! Come with me to the local job controller office and perhaps we can check this out

F D P

A short time later, they are in the controller office, further compiling their theory

Well, F-Man, I've checked with the regional APL, and they report all inmates fully accounted for!

Asylum for Programmatic Lunacy but I wouldn't put too much faith in their reports their records are so confused it's often difficult to tell the keepers from the inmates!

APL?

1-7?

D P

Then, of course, there is always the possibility that one of our local subroutines has gone mad, although I have not noticed anyone behaving in an abnormal manner perhaps it is an outsider from another village

Well, whoever it is, I have a plan to capture the culprit! Here is what we must do

I want to help too!

1 F D

P

Fortran Man describes his plan to the others, and they branch out of Job Control Headquarters, each heading for their respective tasks

I will gather my deputy routines, F-Man

Good! When they are assembled, I have specific instructions to give to them

Run home and fetch my bag, Parity dear—I have many calls to make

Yes, father!

1 F

D P

Later that cycle, as darkness falls, the two old friends relax in the Doktor's living room, taking refreshment at the Doktor's rustic, hand-carved symbol table

Parity and I have checkpointed every address in the village, using file-protect passwords to which *only I* have the key!

Good, the Controller's deputies have the village surrounded, and the curfew will assure that all subroutines are RETURNED home by this time

F D

But before the kindly old Doktor can move, Fortran Man leaps over the symbol table and rushes for the door into the next room

Don't worry, old friend—Parity is safely staying with the job controller at his headquarters!

Don't you see? I have deliberately made *this* address the *only* unprotected location in the village, which means if your insane program wants a file

Of course! He must come here!

Stand aside! I'll handle this!

F

Ready to apprehend the villainous culprit, F-Man bursts through the door but then, suddenly, the normally fearless fighter of evil stops short—as a sinister shadow falls over the room and he stares in disbelief at the figure before him

GASPI!!! It's ... it's ...



Suddenly, the conversation is interrupted by a strange noise from the next room.....

Eh? What's that—it seems to be coming from my daughter's room!

I'd better check my Parity

F D



FORGET ME NO

We stand in amazement at the infinitely vast and the infinitely small. Astronomers deal with quasars that are eight billion light-years away and physicists deal with resonance particles that live for a trillionth of a trillionth of a second. Yet such discoveries sink into insignificance compared with the real wonder of the universe that is part of ourselves.

Each of us carries three pounds of material far more complicated than anything else that scientists study. The distant quasar and the tiny resonance particle are more apt to be analysed in satisfactory fashion soon, than is the soft, grayish mass of material within your skull.

For complexity, there is nothing like the human brain. The brains of elephants and whales are larger, but on the basis of the evidence of things accomplished, the human brain stands without a peer. It contains about ten billion nerve cells and a hundred billion smaller auxiliary cells. Each cell is extraordinarily complicated and is equipped with tiny branching filaments extending outwards in all directions. These living filaments approach each other so that those from two neighboring cells are separated by only tiny gaps called "synapses." Across those synapses, communication can take place by way of chemical molecules and electrical impulses. Each cell can make such connections with up to dozens of its neighbors.

It is the complexity that results from billions of cells in a set of intricate connections that makes it possible to learn, reason, imagine, and create, on the human level. And every aspect of mental activity rests on memory. To learn means to gain new memories. And it is on the basis of those memories, old and new that we do everything else—even create, for no creation is utterly new, but invariably stands on the basis of the old and remembered.



But what is memory? Somehow every sense impression to which we are exposed leaves its mark on the brain; a mark that remains for a longer or shorter time. And somehow, by an effort of will, we can bring up from all these imprints something that is relevant to our immediate purpose.

Few of us are satisfied with the efficiency of our own memory mechanism. Few of us feel that we remember all we should or as quickly as we should; and so we forget the really remarkable feats we accomplish even with a "poor" memory. The mere fact that we can speak reasonably well means that we can remember thousands of words, recall each one as we need it, and recall, too, something of the system of putting them together in such a way that others can understand what we are saying. This, alone, is something nothing else on earth, but the human brain, can do.

How does a particular word insert itself into the memory; the word "brain" for instance? If I were to ask you the name of the object inside a person's skull, you would say "brain" at once, but how did you select that sound from all the different sounds you know the meaning of? Did you somehow check over all the sounds you know and pick out the right one? Did you associate "brain" with "skull"? As soon as you heard the latter, did you think of the former? But I might have asked what the skull was composed of and you would have said "bone."



Or suppose I had asked you if "blain" was an English word. You would probably say, no, at once. "Brain" and "plain" are English words, but not "blain." How could you tell? Did you check over all the English words you know and notice that not one of them was "blain"?

These are very simple cases of memory, but they are already enough to stump scientists in the field. The fact is that no one knows how human beings remember. No one knows how human beings recall what they remember.

What does seem obvious, though, is that the capacity to remember is enormous. Suppose we consider the smallest unit of fact, a yes-or-no item, to be a "bit." What seems a single memory may involve a considerable number of bits. For instance, if you can remember your father's face, you can remember whether his eyes are blue or not-blue; whether he is bald or not-bald; whether his face is broad or not-broad; whether his lips are thick or not-thick? Each memory and many more about that remembered face is a bit. Some estimates have placed the total number of bits a brain can acquire in the course of a long lifetime to be a quadrillion: 1,000,000,000,000,000.

On the average, then, you accumulate ten trillion bits a year and from these bits you have to recall the particular bits you want. If you are ever impatient with yourself for forgetting, then, remember to spend a little time marvelling at the fact that you remember anything at all.

But how can so many bits possibly be stored? To imagine that each brain cell is, for instance, devoted to one bit is ridiculous on the face of it. There may be more brain cells in your head than there are people on the planet but that number still isn't enough. The memory-system must be something much more subtle.

Suppose that a specific memory is not stored in a single cell but that it consists of a pathway from cell to cell. Imagine ten brain cells, each one of which is connected by delicate little fibers to all the others. A tiny electrical impulse can leap the

synapses and pass from the first to the second to the third, and so on, until the tenth is reached.

But it can do this by a variety of paths. It can go 1-2-3-4 . . . or 1-3-2-4 . . . or 3-4-1-2 . . . and so on.

The total number of different ways in which an electric current can pass through each one of ten cells after starting from any one of the ten, is, actually, 3,628,800. If 18 cells were involved and if each was connected to each of the other 17, then the total number of different pathways an electric current could take to pass through all of them would be about 6,400,000,000,000,000. If each pathway could represent a single bit of information, then the total number of pathways would be more than six times as great as the total number of bits a human brain could accumulate in a lifetime.

One could imagine a small complex of 18 cells holding a lifetime of memories. Naturally, we would not expect the brain to work in this fashion. Too much would be concentrated in too little. A tiny injury might wipe out all memory. It is much more likely that the brain works with a great deal of leeway for error. Memories might be duplicated 1,000 times over in different parts of the brain. There would be room for it. A thousand different groups of 18 cells, placed strategically here and there in the brain, each one with an independent store of memories, is conceivable at any rate.

Or suppose that instead of different circuits, there are molecules involved. In each of the billions of cells in the brain there are many billions of molecules. Some of these are the rather large and complex molecules of proteins, which are the most versatile materials of living tissue. There are at least a million times as many protein molecules in the brain as there are total numbers of bits in man's longest, largest memory store.



Could there be a different protein molecule for every bit?

Each protein molecule is made up of a string of amino acids of about twenty different varieties. An average protein molecule might be made up of 300 amino acids, each one being any one of the 20. The number of possible different combinations of amino acids is far beyond the merely astronomical. If every protein molecule in every living creature that ever lived during Earth's whole existence were different, it would be a mere pinprick to all the different protein molecules that could exist.

A chain of merely 14 amino acids could exist in enough different varieties to account for four

ing it. A circuit is not a material thing so much as a relationship among cells. It cannot be transferred unless a group of cells is taken out alive and re-planted alive in another brain. A molecule, on the other hand, is a material thing and a non-living one at that. It might well be taken out of one organism and injected into another.

And yet, just to make things more difficult, isn't it possible that each organism invents a protein or a circuit for itself every time it needs to store a bit of memory? In that case transfer is impossible because each brain would have its own language that would be gibberish to any other.

Still scientists were bound to experiment. In a famous experiment in 1961, James V. McConnell at the University of Michigan reported startling experiments with small organisms, called planaria, which are very low in the scale of life-complexity. He subjected them to a flash of light and then to an electric shock. Their bodies contracted at the shock and eventually began to contract as soon as the light shone. They had learned that the light meant a coming shock, and that might mean the production of special memory molecules. McConnell then chopped up the trained planaria and fed them to untrained planaria. He found that the untrained planaria, after their cannibalistic diet, learned to react to the light faster than did ordinary planaria. Had they incorporated some of the special memory molecules and obtained a headstart?



It was difficult to work with planaria, however, and to interpret their behavior. Not everyone accepted McConnell's results.

In 1965, the Danish physiologist, Ejnar Fjerdingstad, moved much farther up the scale and began to work with rats. He trained rats to go to the light in order to get food. He then collected the brains of a number of such trained rats, mashed them up, and injected the material into untrained rats. He found that such injected rats learned to go to the light very quickly. Somehow a memory of light-associated food had been transferred with the brain material.

The Hungarian-American physiologist, Georges Ungar, went even farther. In 1970, he subjected rats to an electric shock in the dark so that they finally developed a strong fear of the dark. Brain extracts,



when injected into unshocked animals, caused them to show fear of the dark, too. From several pounds of brains of animals trained to show fear, Ungar isolated a chemical compound which would induce the fear in an untrained rat. What's more, it induced the fear in mice, too, and even in goldfish.



Not only were the memory molecules in one organism not gibberish to another organism of the same species, they were not gibberish even to organisms of another species. Ungar called his compound "scotophobin" from Greek words meaning "fear of dark."

It turns out that scotophobin is a very small protein molecule, made up of a string of just 14 amino acids. What it does in the cell and how it works is as yet completely unknown, but it is the closest approach, so far, to anything that might be considered an actual memory molecule.

Ungar intends to go farther. He plans to train rats to become habituated to a loud noise and learn to pay attention to that. He will then see if he can find a molecule that will transfer the opposite of fear. Working with tens of thousands of goldfish, he hopes to train them to distinguish blue from green (to go to a blue light for food, for instance, but not to a green light) and see if he can isolate a chemical for color-distinction.

If several different molecules can be isolated, each with its own memory symbolization, some interesting generalizations might be drawn.

And what will all this mean for the future? As scientists learn more about the mechanism of learning and memory, will it mean that they will be able to improve the action of the human brain? Will they find conditions that favor rapid learning and efficient memory? Will they learn how to tap memories at will? Will they learn to unblock them permanently so that it will be possible for human beings to remember *everything*? Will all this raise the intelligence of human beings sky-high and make supermen out of us?



Perhaps we shouldn't hold our breaths over the possibility.

For one thing, the human brain is exceedingly subtle and it may be a long time yet before these first gropings into the workings of that organ will yield firm results. And even after it does, there is no certainty that it would be wise to tamper with the brain.

Almost everyone is sure, for instance, that he would be better off with a better memory, and that a better memory would somehow mean a better intelligence.

But would he and does it?

Some great scientists and mathematicians had prodigious memories, but others had very poor memories. What's more, some people with virtually photographic memories, who seem to forget nothing, are of only ordinary intelligence or less.

Are we even sure we want to remember better than we do? Perhaps there would be disadvantages involved?

Earlier in the article, for instance, I asked if "blain" were an English word and said it wasn't. Undoubtedly most readers agreed with me at once. A few, however, might have dimly recalled coming across the word "blain" in the Bible (see *Exodus*, chapter 9, verses 9 and 10) and might have hesitated. Whether they finally decided, yes, or, no, the point is they would have hesitated.

Can it be that too good a memory might result in hesitation now and then in the course of life, where those with more efficient forgetteries would not hesitate? Would remembering too much get in the way of action? Would it get in the way of decision? Would it get in the way of further learning?

It might even be that the force of natural selection over millions of years of human evolution has worked against a too-efficient memory. Perhaps we fuzzy-minded individuals are the end product of a careful winnowing process. Perhaps we're the ones that survived best in the long run.



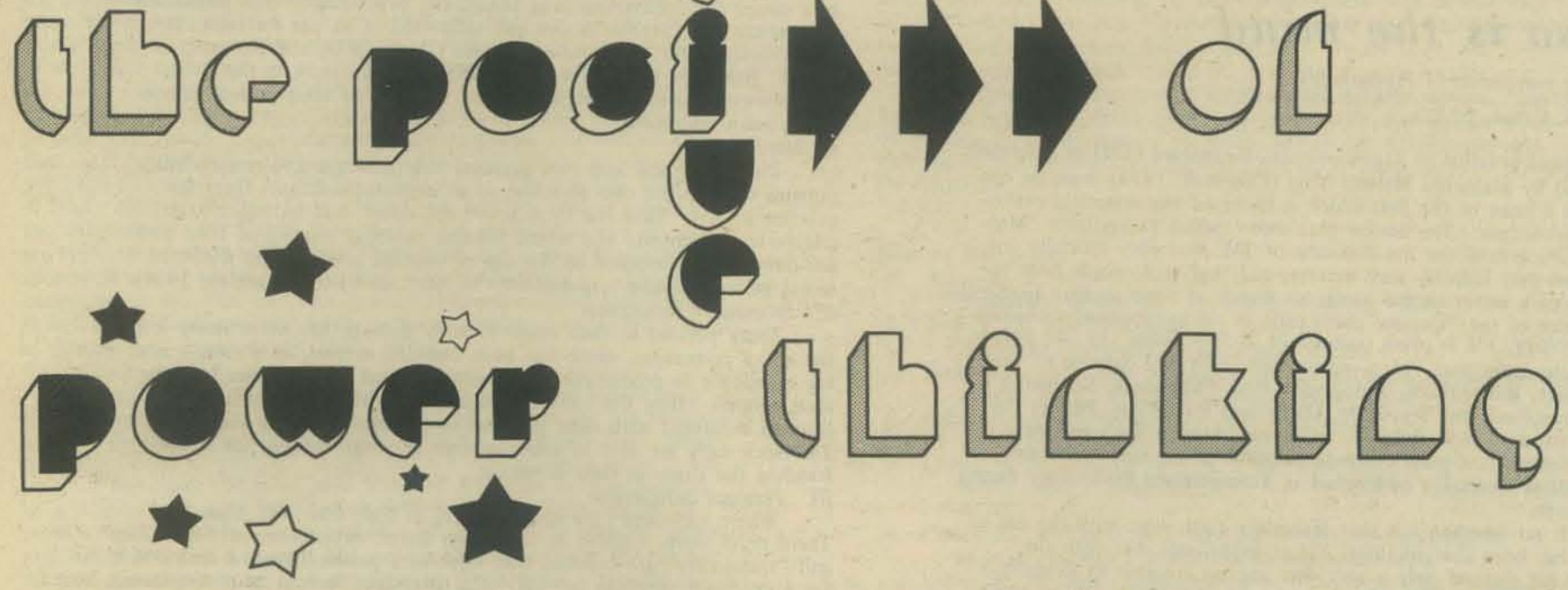
Let us not, then, be too anxious to improve a brain in a way that might not be an improvement. Mankind is learning these last few years that not all technological advances are necessarily beneficial or useful in the long run. Wherever we go and in whatever direction we move, we want to be careful that what we do does not backfire or lead to unexpected side-results.

And where must this caution be most clearly expressed but in the case of a mechanism so delicate and complex that it has no fellow in the known universe?

If we are going to fiddle with the human brain, it can only be hoped that we do so with the greatest possible care. If there is anything we must *not* forget, it is that. □

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→ FLIGHT DANCES WITH THE ELECTRIC MIRROR
→ PERHAPS INCLUDING:



by Peter Wonacott

Feedback Encephalography is the process of displaying to an individual the ongoing electrical activity generated by his brain. This activity, picked up from specific locations on the surface of the scalp, fluctuates in response to our will. It is a thing we do with ourselves and can apply to the arts of life, too.

The electroencephalographic (EEG) potentials emitted by the human brain provide one of the few objective measurements of the activity of man's central nervous system. These measurements in turn become the structure within which the reflection, via EEG, of the electrochemical dance of consciousness becomes the instrument of growing perspective. The potential's sources and mechanics are not fully understood, but EEG potentials are known to originate in the firing mechanisms of the neurons, whose individual potentials are reflected as they travel the surface of the cortex.

Classically speaking, there are four basic types of EEG patterns, classified according to their frequency (number of Hertz or cycles per second). In adults, each of these frequency bands represents a specific mental arousal level, and each is associated with a set of generalized behavioral correlates:

Beta (13+Hz), a high level of mental arousal and involvement in external factors, focused attention, active concentration; directed attention to visual and auditory stimuli, from anxiety to high energy and joyous creativity.

Alpha (8-13Hz), relief from focused attention; a relaxed, poised mental state which facilitates inwardly directed attention; receptivity to subliminal learning.

Theta (4-8Hz), drowsiness, dreaming, hypnagogic imagery and association; access to unconscious material, subconscious, integrative problem-solving, and the assimilation of new information.

Delta (0.5-8Hz), deep, dreamless sleep. Lowest arousal level.
Feedback encephalography is the process of monitoring an individual's EEG patterns and feeding them back to him in the form of ongoing visual or auditory displays. By receiving immediate and continuous information concerning his EEG fluctuations, the individual undergoes a learning process which enables him to recognize and correlate specific EEG patterns with discernable mental and physiological states. With time, this learning process results in the individual's ability to enhance, suppress, and control various types of EEG activity and their mental and physiological correlates.

I have found instruments provide optimum flexibility in feedback range selection by incorporating continuously adjustable frequency and amplitude threshold, enabling one to continuously select the upper and lower limits of feedback range. Thus, any of the four frequency bands—alpha, beta, theta, and delta—as well as selective portions and combinations of these bands, can be designated for feedback. This method of feedback range selection is significantly more useable and straightforward. Continuously variable frequency and amplitude range selection is a very important human engineering factor in light of the variance of EEG baseline characteristics which occur from trainee to trainee. With continuously variable threshold controls, one can set the feedback frequency range to correspond with initial baseline characteristics, and later gradually shape the threshold settings as the individual progresses in feedback training. This shaping process considerably enhances the effectiveness of feedback encephalography.

Current clinical applications of feedback encephalography therapy include: insomnia, stress and anxiety, alcoholism rehabilitation, learning difficulties, hyperkinetic children, epilepsy, migraine and tension headaches, hypertension, and heart disease. To the mystically oriented, the above are so much spittle and dust. Not so much because encephalography gives one a concrete, inherent feeling for alpha faster than, say, transcendental meditation, but because it saves years, as many as fifteen to twenty, required to master theta and its mental and physiological correlates. Previously, schools of meditation could only offer time, practice, and environment as tools to achieve this deep state.

Mastery of Theta places the power of change and control in loving relationship with your subconscious and superconscious minds, rather than with an external authority. Classically speaking, it returns to an individual communication to and from his subconscious, a subconscious civilization educates us

into intolerance of, rather than appreciation by mind or love by heart. This potential in turn becomes limited only when one hesitates in taking the next step in the spirit's search for experience. Here it should be pointed out that the study of the potentials of various states originated with the study of various mystic states and that clinical application is in its infancy, whereas mystic applications of these states date back beyond recorded history. The term "mysticism" has of late been updated, and is now referred to, by some, as self-realization.

The communication I speak of is a dynamic interchange of conscious energy that takes the form of visual imagery and internal audio interchange (inner voice). Both forms of interchange have their external tools, many visual, as in the Tarot. The audio tools include chants and prayers. The degree to which this energy organizes the subconscious depends on the state within which it is applied. In Beta, one's concentration is externalized and the mind tends to shortcircuit. It fills its passages with endless oscillation—fear of fear, revulsions to revulsions, guilt about guilt, an endless trap—the gift of the status quo system of values. This is because we are not designed to be in Beta to the extent civilization apparently requires and so educates us to be. In Alpha we dampen these oscillations. At the same time, the subconscious begins feeding back information. This information is often not comprehended because we are unaccustomed to dealing with internal visual or audio transmission and its personal meaning. In Theta, visualized goals prompt visual or audio feedback which relates to these goals, thereby facilitating understanding. So we begin the study of this feedback as a means of communication, not only internally but between ourselves and other beings; subconsciousness being the agency of telepathic communication. Again, once we begin moving energy to the subconscious we begin to organize it and balance out the energy which is overcharging self-consciousness.

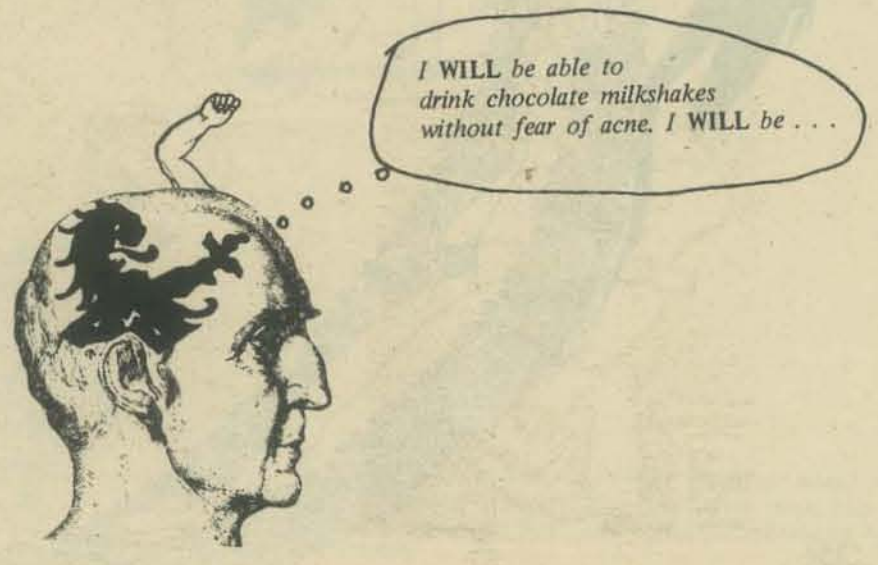
[Peter Wonacott is a brainwave biofeedback technician in private practice. He may be contacted at 1820 Waverly St., Palo Alto, CA 94301, (415) 321-8573.]

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← All available from the PCC Bookstore
—M. J. W.

All of these books are available from the PCC Bookstore.



It's all in the body-- and so is the mind

(reprinted by permission of *Psychology*)

by Russell N. Cassel, Ed.D.

The present practice of Transcendental Meditation (TM) as described in some detail by Maharishi Mahesh Yogi (Campbell, 1974) must be considered to be a hoax of the first order in terms of any scientific evaluation of the procedure. The notion that some special two-syllable "Mantra" is uniquely critical for the fostering of TM, that only specially endowed persons may identify such mantra, and that such words must remain a deep dark secret to the owner all smack of some ancient voodooism.

For many of the "Quacks" with little or no professional sophistication in psychology, TM is often claimed to be "all things" to "all people".

At one and the same time TM is represented to be The Science of Creative Intelligence, Biofeedback, Autogenics, Peak Experience, Science of the Mind, Transcendental Sensuality, Hatha and Raja Yoga, Perfect Relaxation, Hypnosis, Hindu Religion, and other things I can't presently recall. This, indeed, is a gross overgeneralization of the eight different levels of realities creditably established in Transpersonal Psychology during the past decade.

There is no question but that Maharishi Yogi, even with the use of a "Mantra" has been able to foster TM in individuals, but with the crudeness of his method only a very few persons are able to experience the precious phenomena. Whether or not such individuals achieve the experience of TM is more a "Chance" circumstance that occurs in spite of the mantra and procedure, and not because of it. Quite similarly there is hard evidence that in some instances where TM is the goal differences in temperature between the two hands of the same person of 20 degrees or more have been realized, but this is biofeedback or autogenics and not TM. When such conditions of wide temperature differential are fostered, often there is little recognition of the crisis state involved in such organism which can be lethal in consequence, and which represents criminal behavior for unlicensed and unqualified persons.

As a retired Air Force Colonel who served for several decades as a Research Psychologist, the author recalls real problems in connection with pilot target training. The marked inability of our pilots to hit the target with the early jet aircraft was significantly improved when pilots were given immediate knowledge of their target success. Almost overnight "chance" target success was changed to realistic success with small error when objective evidence of target accuracy was provided. In a similar manner TM success can be changed from chance or luck happenstance to creditable meditation by the use of biofeedback techniques.

TM Expected Outcomes

Researchers at the Menninger Foundation are investigating the speculation that there may be a "field of mind" similar to the earth's magnetic field. That thoughts and ideas may exist in this field of mind, and that properly trained persons may be able to tune-in to such thoughts and ideas. This, to be sure, has not been established as fact, but the merits of TM do not rest alone on the presence of such a field. Meditation offers anyone who engages in it seriously the challenge of learning to do what one wants to do with their own mind, and that alone is a merit most worthy of the challenge (Green, Elmer E. and Alice M., 1973). The Illinois House of Representatives resolved, "... that all educational institutions, especially those under State of Illinois jurisdiction, be strongly encouraged to study of feasibility of courses in

TM . . ." (Roberts and Clark, 1975). In New York thousands of junior and senior high school students have been given courses in TM for several years. The National Institute of Mental Health has made a sizeable grant of money available for the training of 150 high school teachers in the practice of TM, the United States Army has used TM as a means for combatting drug abuse, and psychologists and physicians everywhere have become active and interested in its use for relaxation and sometimes for therapeutic purposes (Doer, 1975; and Roberts, 1974). Based on a review of the professional literature in the field, the following expected outcomes listed in order of their present importance, seem reasonable:

I. Mind Control

The act of will and own personal independence and responsibility remains the number one objective as an expected outcome from the practice of TM. Here the hyperactive individual, and individuals just unable to concentrate and attend become personal masters of their own self-direction; as opposed to the use of operant conditioning where external persons assume responsibility for such direction (Assogioli, 1974).

II. Progressive Relaxation

Many persons in their single journey through life never really learn the art of relaxation, which has been fostered in part by a society seeking excellence in productivity and endeavor, and TM promises help for such persons. Here the individual laden with the frustration created through onslaught with their personal environment, and by the use of TM twice daily are able to rekindle their personal energies for withstanding the stress in their life-space.

III. Personal Satisfaction

Where individuals are able to order at their own will Alpha and Theta brain waves tailored to their own tastes, experiences of "well-being" and "tranquility" are fostered that serve as a personal reward, and which are a necessary requisite for TM. The attendant feelings of pleasantness, reverie, and self-satisfaction are personal reward enough to continuously engage in the practice of TM, even if there were no other expected outcomes (Harris, 1974).

V. Improved Personal Health

People who are tense and often laden with anxiety have conditions that foster poor mental and physical health. Sometimes such conditions promote poor circulation, maybe an imbalance in endocrine hormones, including a break-down in other physical functioning. Through the practice of TM the tension is relieved, good mental health may be regained, and proper physical function is often the attendant outcome.

VI. Increased Freedom

The paramount value among all others remains the freedom and independence for self-direction, and by increasing space for movement one's personal freedom is enhanced significantly. The use of TM increases the range for choices by an individual, and thereby fosters increased freedom and independence to those who practice it.

VII. Personal Power

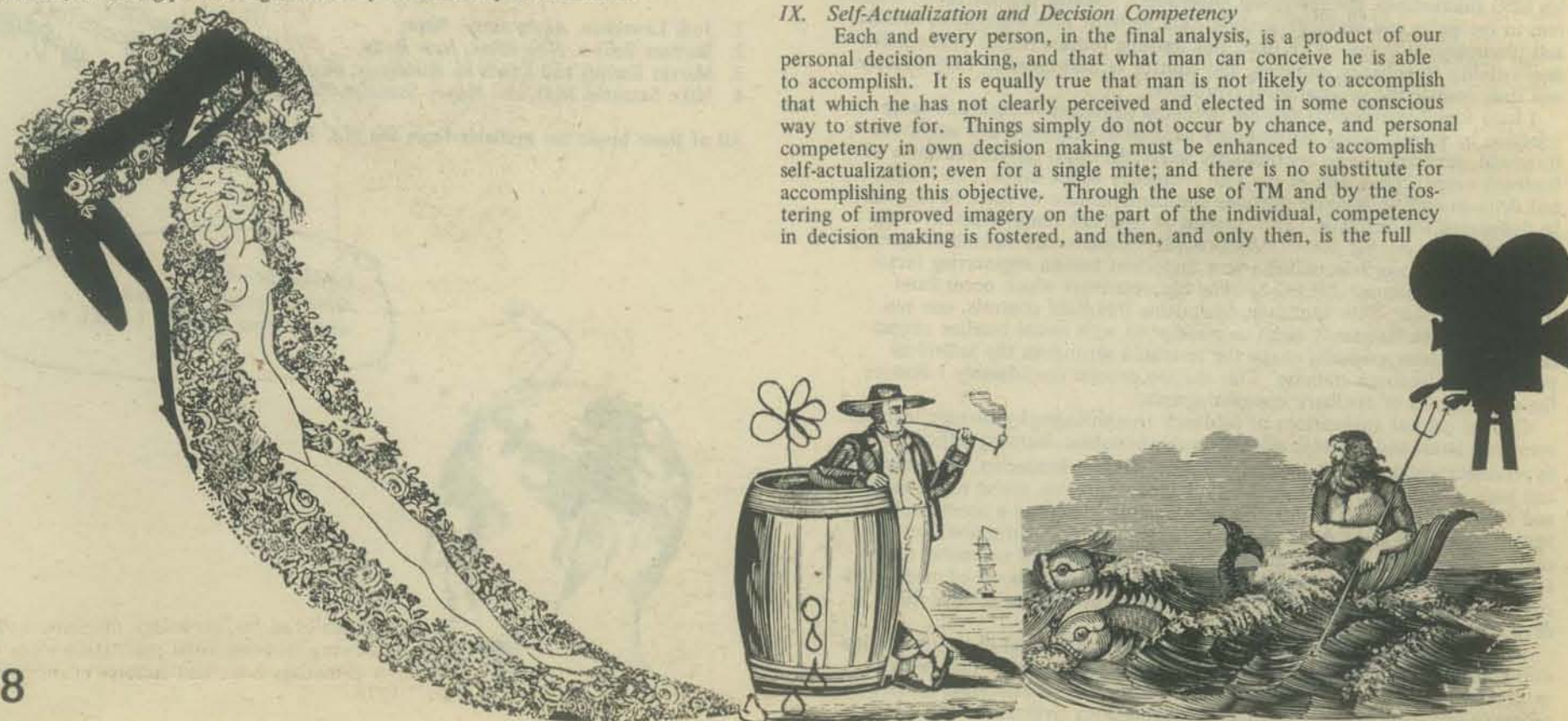
There is increasing evidence that real personal power derives more from internal meditation and self-discovery, than external observations and objective perceptions of reality. TM represents an unprecedented approach to the study of one's inner resources, the use of intuitive and even spiritual phenomena often never enjoyed by the individual often become common practice by them.

VIII. Peak Experiences

The ultimate of life derives largely from one's "peak" experiences, and the ability of individuals to turn-on and to forget their cares and worries for some period of time. The paradoxical nature of ecstasy reported for dangerous drugs, including alcohol, are dwarfed by comparison to the personal satisfaction derived from TM. Thus, TM serves as an alternative to the use and abuse of dangerous drugs for achieving similar objectives, and, indeed, represents a new and much more effective and satisfying way for turning-on.

IX. Self-Actualization and Decision Competency

Each and every person, in the final analysis, is a product of our personal decision making, and that what man can conceive he is able to accomplish. It is equally true that man is not likely to accomplish that which he has not clearly perceived and elected in some conscious way to strive for. Things simply do not occur by chance, and personal competency in own decision making must be enhanced to accomplish self-actualization; even for a single mite; and there is no substitute for accomplishing this objective. Through the use of TM and by the fostering of improved imagery on the part of the individual, competency in decision making is fostered, and then, and only then, is the full



potential of the individual realized.

X. Development and Use of Higher Levels of Reality

There is conclusive evidence that man is capable of eight or more levels of reality, each being independently organized, and each representing progressive higher levels for personal adaptation. However, man has been created by the Maker so perfect and efficient that he has been able to survive, even in our increasingly complex society, by use largely of the single outer level of reality (sight, sound, taste, smell, and touch). For some individuals, in addition, there has been an approach to the development of "inner reality" including six other senses (labyrinthine or inner ear, viscera, hypothalamus of affect, kinetic, internal sense of time, and synesthesia). For still others there has been a rather organized approach to the science of creative intelligence. Thus, largely only three of man's eight levels have been utilized. In addition man is capable of five other levels well defined in transpersonal psychology, two of which are typically involved in TM: (1) Transcendental Sensuality—improving of sensual acuity and increasing literacy for deliberating in relation to design, color, esthetics, and music; and (2) Transcendental Meditation—ability to communicate with some universal wholeness and mind control to achieve peak experiences (Cassel, 1976).

Biofeedback and TM

Presently, four different aspects of biofeedback are important in the development and effective use of TM, and without the use of some accurate feedback the practice of TM remains a "happenstance" phenomena, or simply a "chance" occurrence; not a scientific practice in any sense of the word. Without such feedback TM must be considered to be a religion with very little success attainment, practiced largely by persons totally ignorant of crisis states generated in the organism which may easily be lethal in nature and criminal in consequence for the unlicensed person practicing as a physician or psychologist. For TM in the scientific sense belongs alone in the realm of all other "helping relationships", and from a scientific standpoint can only be practiced legally under the careful supervision of the sophisticated professional in the helping relationship arena.

Feedback Myograph

The electromyograph (EMG) provides the two basic features that are essential, and critical to any scientific introduction to TM: (1) First, there is a carefully calibrated index of electrical discharge of one's striped muscles depicting degree of relaxation present, and (2) Second, there is a "sensitivity" selector providing the individual with progressively increased ability for the relaxation approach. Here the individual is provided immediate knowledge of success in accomplishing personal relaxation, and the individual is able to work in some meaningful and effective manner in own pursuit of relaxation; so necessary for TM to emerge.

Feedback Encephalograph

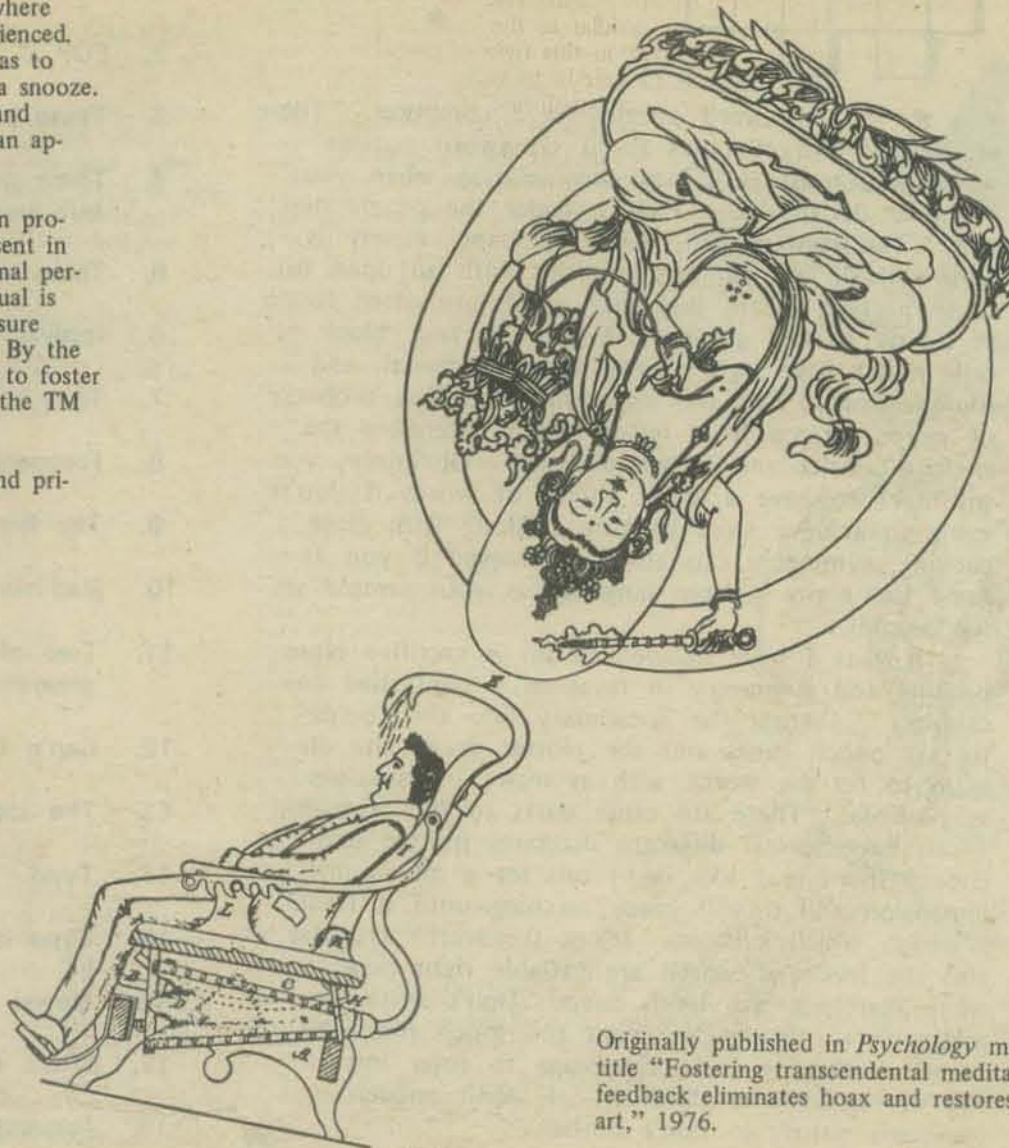
The electroencephalograph (EEG) provides the individual with accurate information as to the presence of "Alpha" and "Theta" brain wave frequencies which are equally important for effective TM. Meditation is predicated alone on a functioning brain, not a sleeping individual, and too often the novice practicing TM has only had a short snooze, where "Delta" brain waves were the rule, and where the true ecstasy of meditation is seldom or never really experienced. By use of the EEG individuals are given scientific knowledge as to their actual preparation for meditation; as opposed to taking a snooze. This, to be sure, represents the difference between quackery and science, and there can be no substitute for such feedback as an approach to TM.

Feedback Dermograph

The galvanic skin response (GSR) dermograph or autogen provides the individual with accurate assessment of emotions present in the individual for a particular moment of time. Here subliminal perceptions so critical in meditation are assessed, and the individual is provided immediate knowledge of notions and events of exposure that produce the desired effects in relation to one's feelings. By the use of the GSR a social climate can be structured that serves to foster improved meditation, and which serves to enhance success in the TM process.

Feedback Thermometer

Here we are concerned with the organism as a whole, and pri-



Originally published in *Psychology* magazine under the title "Fostering transcendental meditation using biofeedback eliminates hoax and restores creditability to art," 1976.

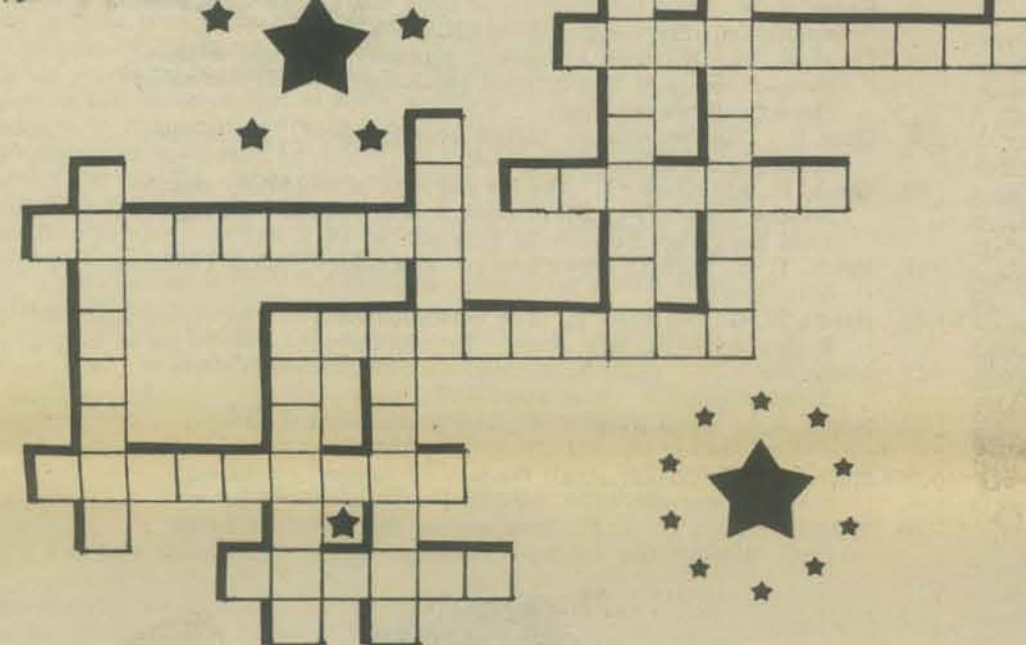
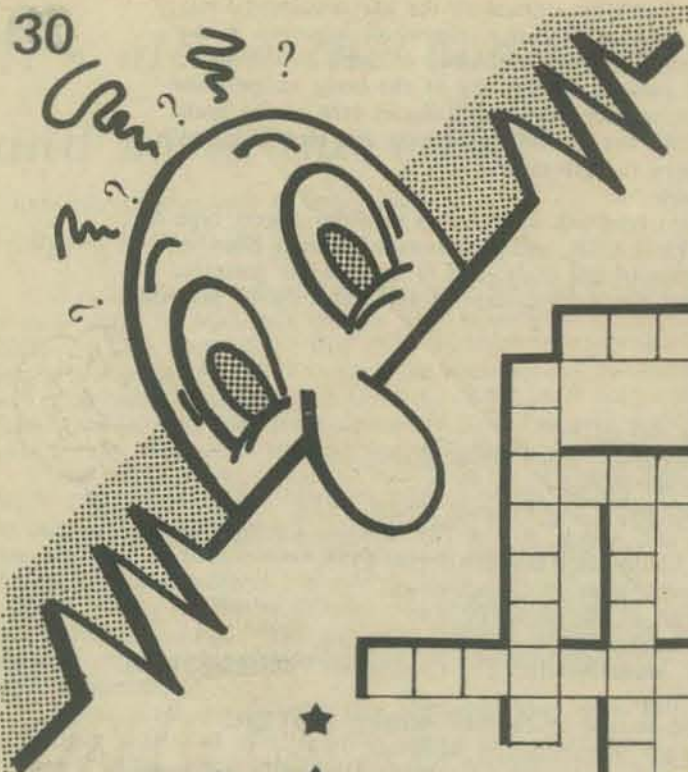
marily with feedback information critical to the life sustaining functions of the individual involved. Always, the whole organism is involved in TM, and always the delicate balance of one's autonomic system is involved, and periodic monitoring of the body temperature insures that activity planned for the Hypothalamus area of the brain is not "spilling" over into the Medulla Oblongata and interfering with the vital centers necessary for life itself.

More Advanced Feedback

The more advanced feedback instruments provide concert type information with EMG, EEG, GSR, and temperature readings given variously from different areas of the body, and in concert-like patterns. This, to be sure, exceeds the present state of art, and must be planned for tomorrow.

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★ I do crossword puzzles on a computer. There are several characteristics about crossword puzzles which you must take into consideration when you begin to design one. First consider the puzzle matrix. The conventional, daily newspaper variety is close-packed, and symmetrical, but with an open list. Close packing means just that—words are often found in tightly packed groups. A four by four block of cells might have eight words; four horizontal, and four vertical. This was apparently the first property of words formed from letters which interested the ancient puzzler and puzzle designer. Obviously, you will have to have a larger choice of words if you're going to achieve close packing. Along with close packing, symmetry can also be achieved if you assume the entire written language as your sample set for puzzles.

★ What I have decided to do is sacrifice close packing and symmetry in favor of a controlled vocabulary. I enter the vocabulary into the computer via punch cards and the plotter draws the diagram to fit the words with as many intersections as possible. There are other parts to the algorithm, I can have several different diagrams printed and choose the one I like, or I can set a maximum dimension and it will keep searching until it finds a design which suffices. It's a tree-search problem, and the levels of search are variable right now; we're searching five levels deep. Don't write me asking for a listing—I've spent too much time and money perfecting it to this stage to enter into any correspondence about it. I won't answer any questions either, so don't bother.

CROSSWORD
PUZZLE
by
F
ARMBRUSTER
A
N
K

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

★ Here's what you do to solve the puzzle. Read the publication thoroughly and carefully. Find what you think are the words which answer the clues. Notice that the diagram has no numbers on it. The numbers of the clues have no relationship to the position of the word in the diagram. Using whatever brand of logic you possess, fill in the diagram, one letter to a cell, until the diagram is completed and every clue is accounted for. The spelling is as found in the publication, so if there are misspelled words in the original, they will be misspelled in the puzzle. All the words in the puzzle were taken from the last issue of PCC (Vol. 5, No. 1, July 1976).

1. Newest addition to the van's equipment
2. PDP 8 in a desk with a floppy disc and a CRT
3. These people are turned on to computers
4. These people are not turned on to computers, but would be, given time.
5. These are people we're not getting through to.
6. festival
7. They set up demonstrators of their systems
8. Frequency
9. The first eight, which are pretty audible
10. Red-haired siren and confirmed computer addict
11. Two of the mechanisms by which nervous systems generate reality
12. Cap'n Quirk
13. The spectrum of sound is _____
14. Typo
15. Typo corrected, 7 tone scale now valid
16. Vowel is to dissonant as _____ is to _____
17. Wierd things
18. Important type of data not available in any BASIC system

LETTERS TO THE



Dear Bob:

I am now receiving your two journals with varying degrees of awe and delight. We ordered the IMSAI with the large mother board, and a CRT terminal kit and have received both. Just completed the first 2200 solder connections on the mother board (whew!!) beginning to get pixilated. It is my understanding that IMSAI is now shipping their 8K BASIC and there is always MITS BASIC. My concern is now application software due, mainly, to my general ignorance in the realm of machine, assembly, and higher level programming. Also my ignorance as to sources for programs. We are in the process of finding somebody to hire to do some of our business programming and are waiting patiently for some business type application packages to come along. I have a suspicion that the business end of this deal will take care of itself, more or less, and so my main concern is in the realm of programs for the education of my children.

In your Vol. 4, No. 5 issue there was an article on the Huntington Computer Project Packages. This article noted that it was available from DEC and I am confused. After having written several letters to DEC and DECUS it became apparent that what I could get from DEC was salesmen. They were kind, and nice, and confusing (adding to my already confused state). DECUS sent me catalogues which state that they will ship to members who either own or are working with DEC machines. I don't own a DEC machine, I don't work with DEC machines, I would prefer not to chisel from anybody—do you have any suggestions as to how to acquire these packages without being somewhat sly? Any help on this would be greatly appreciated. [Write to: Dr. Ludwig Braun, Director, HUNTINGTON TWO, State University of New York, Stony Brook, NY 11794 . . . Tell him a Dragon sent you.]

Last night we went to Seattle to listen to Dr. Suding express his thoughts on his new wonder machine. He also had his Phi-Deck system which was edifying. After we get the IMSAI up and running in the office I am seriously considering one of his machines and would appreciate your thoughts on his efforts. I sometimes wonder about the necessity of having the newest and fastest and most modern chip insofar as there is usually a software lag in there somewhere. Somebody may, with expertise and understanding, express their thoughts about the advantages (real, cosmetic, and ego) of having the newest and most modern thing and in passing mention one or two drawbacks. Is something new and modern really always better? (Time-honored question—especially when there is something new and wonderful every other week.) I know, in a logical sense, that if one micro-computer will do the things I want done, as fast as I want it done, etc., it should be fast enough and yet Dr. Suding's machine has incredible appeal! Just think!! With a machine such as this I can upgrade and do things considerably faster than before. It has twice as many commands as the 8080 (even though I am not too sure that I understand what that means and the increase in the number of commands does not assure me of any more software but rather, because of the newness, assures me of less). There are lots of other points to touch in consideration of new vs. old and tried but I am boring even myself. Just one more thought (sigh): it may be that the concept of the micro-computer itself, because of its comparative newness, engenders a craving for more that is new and wonderful in the hope that this is all that is left because, in general, the old and tried has not proven to be all that functional in a cultural context. (What in the hell did that mean!!!)

There is also the possibility that as one becomes more familiar with micro-computers the added capacity will be necessary to accomplish the weird and wonderful things only now dreamt of. One more thought (sigh, sigh): I note that there is a group seriously trying to put together a nuclear space ship. They may have use of micro-computers in their esoteric and terrifying computations, a possible use to all those machines out there being used only on a sometimes basis. All this HAS to mean something! [Greg, I suspect your IMSAI, with ALTAIR BASIC, will keep you happy for awhile!]



To drop back to reality. I have mentioned the problem of the Huntington packages. What I am also interested in getting, from somewhere, are some other educational programs of any sort, on any subject. I am not really interested in the philosophy behind them (Is CAI really the best way, etc.). I am rather interested in exposing my kids to everything that I can in the hope that out of any grab-bag of programs that I might put together, something will prove beneficial (the cry of a desperate father). It is also important that they be in some sort of BASIC or machine code compatible with the 8080 because that is where I am currently at. Dr. Dobb's mentions the CCC as a possible source of programs but so far it looks as if, for the most part, games are offered and while they do have instructional capabilities, and I'll put as many in as I can find, I am also hoping to get something just a little more hard core in case some intense interest evolves. My whole thinking may be screwed up and I really would appreciate any comments and/or thoughts. [Try *Teach Yourself BASIC* from the PCC bookstore.]

I really would appreciate and admire any information, assistance, thoughts, sources, comments, etc. that you might provide. I have a nagging feeling that I am not the only 'owner' of children somewhat desperate for any kind of help they can get. The ownership of children opens a whole other can of worms and, like rights, implies incredible responsibilities. I just can't help but feel that these responsibilities cannot simply be voided or superseded by the public schools. I have made an attempt to teach my own kids and it does not work—I am too impatient, too close to a problem, too frustrated (by expecting too much perhaps?) and while I do not believe that a computer system is the whole answer it is a start. [Help is on the way! Keep reading PCC.]

My friend and yours,
Greg White 216 East 5th Street
Port Angeles, WA 98362

Dear Bob:

Comments on *D.D.J.C.C.&O.*!!!! First, Tiny BASIC itself: Basically OK (I'm sorry about that . . . really I am) but it lacks some flexibility because you don't have floating point math and a few simple functions like sin and cos. Look at it this way—with Tiny Basic extended you are halfway there to writing 4K BASIC . . . 25% of the way to 8K BASIC. In my opinion it is a waste of a \$1000 machine to be running just TB on it, when if you just added another \$100 or \$200 you could be running some superior software. Of course there is the problem of getting the software cheap too, so I may be wrong to say that.

Second point: since I am sure everyone is patting everyone else on the back what with *D.D.J.C.C.&O.*, I guess you can hear some criticism. You may have made a mistake by introducing a new newsletter and taking stuff out of *P.C.C.* The way I got interested in home computing was by reading all about assembler and machine code and hardware in *P.C.C.* If you take it out, you may be isolating high school people playing games on big systems from home computing people, since the high level language programmers won't bother with a newsletter for home system people. Furthermore there are now two newsletters, not one, and you know how bad it is to pay for all that stuff. [Steve—We will put heavy stuff in *DDJ* and news, beginner stuff, etc., in *PCC*.]

This may, on the other hand, work out OK since you will now have room in *P.C.C.* to explain stuff like assembler, machine code, and hardware in *P.C.C.* and not just list it or mention it. [Yes!]

Who is this Dr. Dobb character anyway? [A visitor from the planet Pern.]



One last item: I've seen BASIC take a lot of knocks lately, what with people saying, "BASIC is a very inefficient language and it doesn't suit the needs of the home computer user and besides it is hard to learn and who said we need it anyway and there must be a better language for games, etc. etc. etc." but I have yet to see any concrete stuff in the way of ideas for a better language. Besides, you don't see people clamoring for FORTRAN or COBOL for their home systems! Or how about JCL! Think, if you were designing the ideal language, what would you put in it? Well, first we need something to print stuff on the terminal so we'll use a PRINT statement and then we need to be able to jump from one spot to another so we'll use a GOTO. I guess maybe PL/M or something might be better but if all the software brains in all the computer software factories can't come up with anything better, knowing that their users will pay millions for it, why should some people who mess around with this stuff in their spare time think they can? Sorry to get crabby like this (again), but you know how it is.

Steve North 7 Deerhaven Lane
Newfoundland, NJ 07435

NICE WORDS ABOUT US

Dear Dragon Bob,

Just got Volume 4, Number 6, and as usual I see that you are going to continue with your inflation policies, that is, more pages, more articles, more interests, more people, more letters, games, pictures, reviews, and so on. That's why I'm renewing with my inflated dollars.

In the following paragraphs, please don't think I'm trying to slight the things I do not mention. I just don't have time to pursue everything that is interesting. But I would like to say that the book "BASIC" by Albrecht, Finkel, and Brown is the best of the several that I have.

DYNABOOK: First heard of this thru Ted Nelson, but what I need to know about it now is — should I hold off on my next major hardware purchase or should I start saving up to buy some for my kids? I keep telling my friends that something like Dynabook will cause the next cultural revolution, that my own children will hopefully participate in it while they're still in school, and that it will make the communications revolution of the 60's look like a stepping stone. It will happen when a high school government class is able to analyze a government budget as a semester project, the way that Dartmouth students can analyze a US census. Or something else that is just as impossible now.

CABRILLO COLLEGE ELECTRONICS CLASS: Boy, I wish I had had something like that. About all the direction I could find as a kid was from books, so now I read about rather than do it, to an unfortunate extent. There is a Science Institute for young people in St. Petersburg, Florida, that is not limited to electronics, but seems to have much the same goals. Could someone write up an article of that for publication?

CALCULATORS: After reading Isaac Asimov's wonderful books about Science and Mathematics, one of the things I wanted to do was program my computer to sort and process numbers the way that he does. However, I can see that calculator programs would allow more people to do this, especially if tables of data and formulas and explanations for specific results are given in the same place.

SPROCKET MAN: YES!

SMRT: I've never been able to figure out why it cost more to have two cable pairs connected by twenty feet of copper wire (permanently) than it costs to have them connected by a multi-million dollar automatic switch. For those of you who write your Congressmen occasionally, AT&T has already approached our national law-makers about putting the US on one phone system. They were turned down, but they were not laughed out the door. You can be sure that they'll be back, the question is, what will their next visit be disguised as? Maybe Fortran Man should look into this.

CCC: With any luck, I'll be there within a year. Do you folks have anything that will convince a Korean-born wife with limited English that a computer is something that she needs and wants?

BILL GATES: I can see that I'm not going to get a personal reply to the letter that I wrote. I do hope however that Bill will be able to publish something about the comments that he received, both good and bad. I too would like to see programs in the public domain, not to mention computers, worldwide telephony (one of these days I've got to get a Ham License), transportation, money, food and most other things. Granted, Tiny BASIC seems to be spreading, but things like Altair BASIC, APL, FORTRAN, ALGOL 68, and whatever else you want, are not going to be implemented for twenty different CPU's during lunchbreaks. Yet I've seen several letters and editorials that call for program writers to do all their work out of the goodness of their hearts so that others can load and go without doing any work at all for their precious "public domain." That last sentence looks kind of strong, but let's face it: the people who write for the public domain will get the lost time they put into their program while the rest of us will get all of the benefits.

COMPUTERWORLD: This may sound fickle after the last paragraph, but here goes. God is the only one who gives help from above. Most other help comes not from above, or even from the side, but comes instead by exploiting someone who is lower and more helpless. The only way the little people on the bottom are going to get help is by uniting and giving it to themselves. Some minority groups have already discovered this, but most either ignore or forget about it (I'm in this class too often), or they have been so filled with what someone else wants them to know that they have never found out the truth. If you don't believe this, you haven't read "The Screwing of the Average Man" which is available in paperback and at your local library.

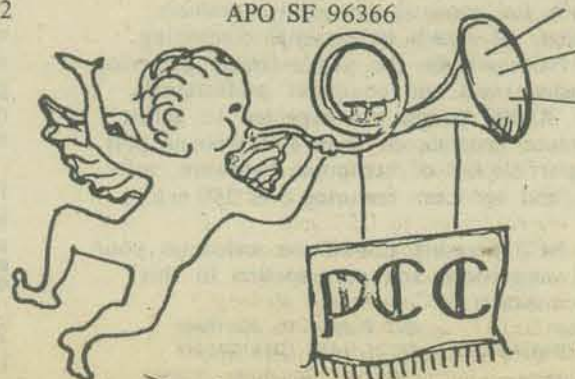
JOHN R. LEES, JR.: My Altair 8800 No. 2214553K may not feed any starving children in India, but the stereo you buy at Radio Shack will help to feed other children in Korea. The technology, not just the stereo, is what airlifts food, blankets, and medicine to earthquake-ravaged Guatemala in military aircraft. Some of the best war machines ever made have a proud record of saving lives. As for John, I say, "John, keep asking your questions. Most of the ones you asked in PCC have answers already. When you start getting answers you don't like, or when you ask questions that have no answers, then you will know where your work lies, to make answers that are good."

PCC: Keep up the good work, the world needs it.

Yours,

Ron Seibel
406-62-3552

2146 CG Box 3313
APO SF 96366



Dear PCC:

Now that you have me hooked on your style of education, I hunger for more. I like the directions you are taking with PCC and DDJ branching out. I suspect that my science fictional inclinations will cause more interest in the original PCC's emphasis on "realizable fantasies" and computers in education. On the other hand, DDJ sounds like it could become a handy problem-solving reference book/magazine. Have you considered developing a reference or cross-reference system based on key words that would allow you to publish annual indexes to each volume? Would your format be amenable to punching with a standard 3-hole punch for binding?

When I started writing this letter, there was, deep in the recesses of my crania, an urge to comment on the many things I liked about Vol. 4, No. 6. However, there were so many exciting and useful articles that I fear any comments will have to be extremely brief and superficial. So, herewith:

"Dynabook Project"—Xerox is onto a great approach for developing a useful system. It is a rare and unique opportunity which I must thank PCC for, and most profusely. How often does a consumer get a chance for input *before* the system is built?

"ST*R TR*K" by Bill Crow was an extremely competent article which demonstrated an immense knowledge of the TV series, computers, and Star Trek fandom. Never have I seen such a quantity of information on those subjects condensed into a mere two pages.

"Do-it-yourself space navigation" among planets by Salisbury will come in handy someday when I need convincing figures for a SF story I'm writing.

"Biofeedback Center of California" by Alec Dubro. Wow! Talk about mind expansion. At this pace, I'm going to be spending 1/2 my spare time contacting these fascinating groups I read about in PCC.

"Sprocket Man??" A lot of very practical advice for bikers of any age.

"SMRT will hurt" by Leroy Finkel. MORE MORE MORE. As the age of distributed data and word processing descends upon us, computer buffs will need all the help they can get evaluating telecommunications systems and equipment. Home and school-based computer networks may prove to be the only way to make computing power available to everybody at minimum costs. So we need lots more articles of this kind.

Well tempus figited. I must be blasting off for now. Meanwhile, keep up the good work . . .

Yours truly,

Frank Stodolka

2633 Dupont Ave. South
Minneapolis, MN 55408



1977 NATIONAL COMPUTER CONFERENCE JUNE 13-16, DALLAS *Special Call for Papers in Personal Computing*

The 1977 National Computer Conference will feature several events for personal computing enthusiasts including the Personal Computing Fair, exhibits of personal computing equipment by manufacturers, seminars and social events in addition to paper presentation.

Two days of Personal Computing paper and panel presentations are being planned. Papers and panels in any subject of interest to personal computing enthusiasts are sought including

- personal computer software,
- hardware designs and trends for personal computing,
- innovative applications of personal computing systems,
- the influence of the personal computing movement on the computer industry and computer science education,
- standards for personal computing products,
- predictions of trends in personal computing.

The '77 NCC will be the year's largest gathering of data processing users and computer professionals. Approximately 30,000 people are expected to gather for the conference program of over 100 sessions plus the year's largest display of computer hardware, software, systems, and services featuring over 250 exhibitors.

The '77 NCC Steering Committee welcomes your comments and suggestions and participation in this event. Please contact:

Dr. Portia Isaacson CONFERENCE CHAIRMAN Mathematical Sciences The University of Texas at Dallas Richardson, TX 75080 214/690-2172	Dr. Robert R. Korfhage PROGRAM CHAIRMAN Dept. of Computer Science Southern Methodist University Dallas, TX 75275 214/692-3082
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1977 NCC Paper Guidelines

Previously unpublished papers are solicited. Papers submitted for consideration must be in final form with all figures and tables, ready for typesetting. All papers will be refereed. Refereed and approved papers will be sent immediately to the printer, with no opportunity for author changes. The Conference Proceedings Editors reserve the right to edit all papers prior to publication or to request that the authors change them to meet AFIPS publication requirements.

The material submitted should include:

- 1) Six copies of the paper. The paper should be a maximum of 5,000 words. The submitted paper should be the final version—cleanly typed, double spaced on one side of the paper, ready for typesetting. Each page should be numbered and have the principal author's name on it. Submission of a paper implies guarantee by the author that all necessary approvals and clearances have been obtained.
- 2) Six copies of a page containing a 150 word abstract, the Computing Reviews Classification and four to six keywords descriptive of the content of the paper.
- 3) Three copies of a short biography of the presenter to be used in conference publicity and for introductions by the session chairman.

Deadline for all submissions is December 1, 1976. Authors will be notified before March 1, 1977 regarding the acceptance of their papers.

Please send all submissions to the '77 NCC Program Chairman:

Dr. Robert R. Korfhage
Dept. of Computer Science
Southern Methodist University
Dallas, TX 75275
214/692-3082



INSTALLATION BEGINS FOR LARGEST SCHOOL COMPUTER ORDER

Computer Curriculum Corporation (CCC), Palo Alto, California has started installation of computer systems and terminals for Compton Unified School District in Los Angeles County, California. The contract calls for 544 display terminals to be installed in twelve schools, the largest number of instructional terminals ever ordered at one time by a school district. Installation will be completed in early September.

The district is using Emergency School Aid Act (ESAA) funding to support the project. The value of the CCC contract is over \$1,100,000 to cover equipment rental, curriculum lease, and system support for the first year. CCC is supplying all the equipment and computer programs for the project and has opened a maintenance office in Compton.

According to CCC's president, Patrick Suppes, "The instructional computer system in Compton will give over 19,500 individual lessons in Mathematics and Reading every school day. The program selects, presents and grades questions automatically and provides diagnostic reports to the students' teachers."

CCC specializes in curriculum and equipment for computer-assisted instruction (CAI) and has installed systems in elementary and secondary schools in sixteen states.

NEW ORLEANS HAMFEST AND COMPUTER FEST

The New Orleans Hamfest and Computer Fest, sponsored by the Jefferson Amateur Radio Club, will be held October 30-31 at Archbishop Kummel High School, 1901 Severn Ave., Metairie, LA (New Orleans suburb).

Forums at the fourth annual event will include several on computers by the Crescent City Computer Club and others by or about AMSAT, MARS, emergency communications, RTTY, QRP, novices and beginners and antennas.

Among the scheduled meetings will be the Louisiana Council of Amateur Radio Clubs, the Louisiana ARRL Convention, MARS and other amateur radio groups. Banquets, non-commercial and other exhibits are being arranged. Call-in frequencies will be 146.34-.94 and 3.95 MHz.

Reservations and latest details may be obtained by writing to Dominick "Nick" Tusa, WA5RMC, Chairman, New Orleans Hamfest, P.O. Box 10111, Jefferson, LA 70181.

ONTARIO, CANADA RETAIL COMPUTER STORE

Preparations are now in the final planning stage for a retail computer store to serve hobbyists, software houses, small businesses and OEM's. The potential market has a population of 3,000,000.

I'm interested in becoming a dealer for products which will be of interest to customers in the above categories.

Please forward all pertinent data for your product line, including catalogues, technical bulletins, price lists, dealer discount schedules, etc. to:

John S. Crawford
66 Castlefield Ave.
Toronto, Ontario
M4R 1G4 Canada
(416) 487-7415

KENTUCKY FRIED COMPUTERS OPENS RETAIL STORE

The Kentucky Fried Computer store is now open for business. Hours are 11 a.m. to 6 p.m. daily. We are fully stocked, and we service what we sell—both kits and assembled units. We sell many products at a substantial discount from manufacturers' list prices. We also give special prices on complete system purchases. We can help you "put it all together."

Our product line includes:

- * IMSAI—full line.
- Processor Technology—full line.
- Cromemco—full line.
- * Polymorphic—full line.
- Lear Seigler—ADM terminal kit.
- * Morrow's Micro-Stuff—Smart Cassette interface.
- * Oliver Engineering—Optical paper tape reader.
- Keyboards, monitors, accessories and publications.
- * Starred items are available by mail to PCC readers at 10% off manufacturers' list price. For mail orders, send money order or cashiers check (personal checks require 3 weeks processing) plus 2% shipping and handling. Californians add sales tax. This offer is for a limited time only.

2465 Fourth Street
Berkeley, CA 94710
(415) 549-0868

"A computer in every pot."

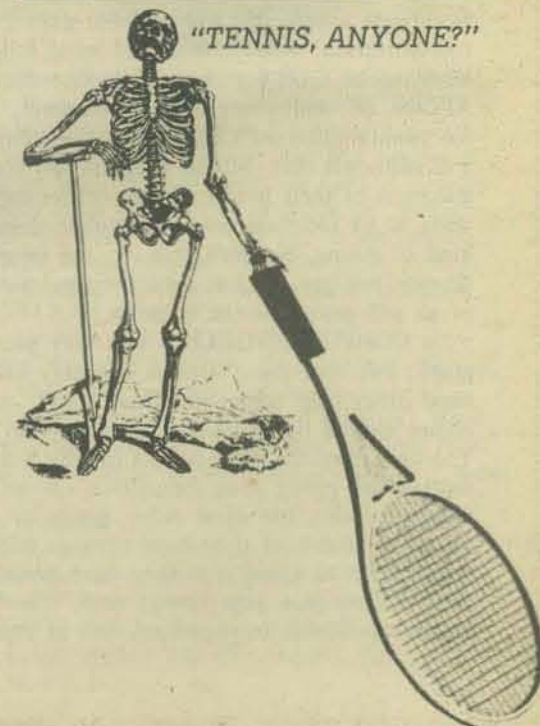
BREAK-THRU: A PARTICIPATORY JOURNAL

We at *Break Thru* are looking for people who have had unusual experiences and would like to share them. We are starting publication of a "participatory journal" of unusual experience dealing with everything including psychic phenomena, life and death, U.F.O.'s, occult, revelatory experience and any other unusual experiences. The purpose of this journal is to have people share experiences with others. We believe that somewhere, someone may have had a similar experience and would like to be able to relate to others who have had the same type of experience. If you would like to have your experience published, please write it down and mail it to:

Break Thru
1743 Silvertree Drive
San Jose, CA 95131

The story will be printed in your exact words. You need not be concerned about writing ability. The experience being written about is the only consideration. As many stories as space permits will be used. You will receive a copy of the issue your story appears in.

Look for your story in *Break Thru* soon.



Dear PCC,

My God, to think how incomplete my life has been until—FLAME!—I discovered the dragons of PCC.

I've read all of Judy Edwards copies of PCC. (If I flunk my test in the morning, I'll blame you dragons.)

Bkgd: MA in English, BA in Psych., PhD cand. in Instructional Design. Very into CAI (giving a paper on a CAI module about sonnets at ADCIS.) Rabid BASIC programmer. Rabid magician. Rabid synthesist, building super-synthesizer. Rabid photographer. Generally rabid. Wife (of 5 yrs) and daughter (3 months) unbiten by above. BUT I'M TRYING'

Yes, James is great. QUICK, GOOD PARTS.
Yes, MicroMM—slow, overpriced, instructions not worth a —

nam-OBSEEN

10 x = Rnd(s)

20 go to x of 30,40,50

30 print "crap" etc.

Big Q's:

1. I have a 6502 chip & books. Is there a version of BASIC for me? Where? HELPI
2. Are there clubs or interested people anywhere in eastern Iowa? HELPI HELPI
3. Would you want to print:
 - a. Program for practicing bidding bridge hands?
 - b. FANCY POKER GAME?
 - c. A number game—kinda like NIM only E.Z.
 - d. Program to determine day of week for any date?



A TAUNT:

At the U of I, using an HP 2000 Access & Super Bee Terminal, our STARTREK has:

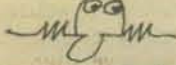
1. Mnemonic commands
2. Visibly moving torps
3. Trades
4. Klingons who *move*, attack and explode.
5. Romulans who fire torpedoes
6. More capabilities than *any* game anywhere!

Details: Mr. Jonathan Williams

CAI LAB

U of Iowa

Iowa City, Iowa 52242

IOWA?


Earl Keyser
Dragon in Residence
Box 56, Keota, IA

AMRAD COMPUTERFEST

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

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

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

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

For reservations, contact any of these nearby motels directly: Vienna Wolf Trap Motel, 430 Maple Ave E, Vienna, VA 22180, (703) 281-2330; Tysons Corner Holiday Inn, 1960 Chain Bridge Rd, McLean, VA 22101, (703) 893-2100; or Tysons Corner Ramada Inn, 7801 Leesburg Pike, Falls Church, VA 22043, (703) 893-1340.



SECOND GENERATION COMPUTER STORES

by Gene Murrow, President, Computer Power and Light, Inc.

"If by some miracle of technology and economics it were possible for every household to own a high-quality piano, would we soon find taxi drivers discussing the intricacies of Brahms' Intermezzi or Rodgers and Hart musical scores with empathetic passengers?"

The fantasy of a computer in every home is becoming more and more a reality, largely due to the price/performance/size/impact of the microprocessors and the growing acceptance of easily-learned languages such as BASIC.

As breath-taking as the progress and future possibilities are, a fundamental obstacle to realization of the fantasy still remains. It is a problem not clearly articulated amidst the flurry of product announcements and the daydreams of the futurists, yet it has shaped the computer and sophisticated calculator business for years, and will continue to do so. Simply stated, it is the technical mismatch between the product and the population. Most people who could well use a computer and would be pleased to own one, do not understand how to make such machines work, and a person will not buy a machine if it cannot be made to serve. Solutions to this dilemma have taken two forms. The first, exemplified by IBM, is to provide a complete support system for the user. Hardware maintenance is provided by IBM, operation is supervised by a "priesthood" of computer experts specially trained in the complex litany of the data processing service, and the user's title is substantial. The alternative, common among vendors of programmable calculators, is an attempt to educate the user himself in the operation of the machine. Unfortunately, this scheme suffers from the reality that the person doing the "teaching" is more a salesman than an experienced educator or competent programmer, and widespread adoption of such machines outside of highly technical areas has not occurred.

The substantial sales of microcomputer kits is not indicative of any profound alteration of the technical mismatch between electronic genie and individual user. The typical computer hobbyist, who accounts for over 70% of the sales according to some estimates, is someone with experience in electronics, ham radio, or computers. The computer clubs are populated with people from Hughes, TRW, IBM, Stanford University, etc. Even these sophisticated purchasers often find themselves with a completed kit which they cannot do much with, or that simply does not work, and the frustration builds. . . . The Southern California Computer Society has been consistently pressured to offer classes in programming for the engineers, and in electronics for the programmers. Manufacturers are perpetually badgered for more support—software, repairs, information, and even refunds.

We think that the time and circumstances are right for a change. A computer that is small, versatile, reliable and priced within reach of an individual can be built by established and competent manufacturers. Computer programming in BASIC or a similar language can be taught by competent and experienced educators to the average person. Computer power can be placed in the hands of all the people, not just the hobbyists'.

With this goal in mind, we at Computer Power & Light are offering a complete, fully-assembled and tested "consumer" microcomputer system, the COMPAL-80, a series of 8 classes in programming and applications, and some introductory software for \$1,700. The system is 8080 mP-based, and includes a 16-line X 64 character video display, 16K bytes of RAM memory, 1K byte of PROM, an RS 232 serial I/O port, BYTE-standard cassette interface, the new Keytronix ASR-33 type keyboard, and a Sanyo 9" monitor. With the general consumer in mind, we have eliminated the computer "front panel": all utility functions (I/O drivers, tape loaders, etc.) are resident on PROM. For users who are interested in traditional computer functions, the PROM includes "front panel" routines which allow the operator to load and display memory, single-step the processor, and execute starting at any location. The idea is that one just turns it on and begins programming.

Teaching the non-technical person how to use a computer is a trickier problem than configuring good hardware. The teacher in this situation must be a person experienced in helping people learn, not just a computer expert pressed into service. The typical "lecture method" fails miserably when applied to computer programming. Our teachers will draw on years of experience to teach programming in BASIC (available on the COMPAL-80 system), to teach the use of other available software packages such as word-processors, and to guide students in applying their skills to tasks they wish to tackle.

In summary, we see "reaching the people" as the next problem to be solved by all of us in the home computer movement. Our approach at Computer Power & Light is to provide a machine as solid as a brick, and a learning experience as thorough, competent, creative and joyous as the best teachers around can make it. We invite all PCCers to drop in and see us at 12321 Ventura Blvd., Studio City (Los Angeles), California, any time after our opening September 28th—hunt a wumpus or two and share your ideas and criticisms with us.





PHILADELPHIA HOME COMPUTER SOCIETY

At last Philadelphia has its own computer society. It started as the result of a letter in *BYTE*, the initial meeting drew of 80 interested individuals. So far we have had demonstrations of Sphere and the Digital Group computers. Plans are for field trips to the Moore School of Electrical Engineering (birthplace of the ENIAC) and to nearby MOS Technology. Our newsletter, *The Data Bus*, provides meeting information as well as articles on hardware and software, book reviews, letters, cartoons, etc. Interest is mushrooming and all of us here have visions of computer grandeur.

Dick Moberg
404 S. Quince St.
Philadelphia, PA 19147



CONTRA COSTA COUNTY CLUB STARTING UP

The following person is organizing a computer club in the area of Contra Costa County, California. Contact him if you are interested in this club—the fourth computer hobby group in the San Francisco Bay area.

Eric Bergman, 3188 Kingsley Pl, Lafayette CA 94549; (415) 283-6256.



MARIN COUNTY COMPUTER GROUP

Hobbyists in the Marin County area of California gathered for the first meeting of a new hobby group on July 21st. For information about this new group, contact the Byte Shop Computer Store, 509B Francisco Blvd., San Rafael, CA, (415) 457-9311.



GAMES FOR TEKTRONIX 4010?

Dear PCC,
Could you please send me a list of Tektronix graphic games you have available, if any. I have access to a Tektronix 4010. If you have any games for this unique terminal, I would like to obtain them.

Sincerely,
Kenneth Young
3311 W. 3rd St., Apt. 1-319
Los Angeles, CA 90020

(Kenneth—We don't have any Tektronix 4010 games. Maybe some of our readers will have games to share. Have you written to Tektronix?)



SAN FRANCISCO'S SETH IS BECOMING THE BOOTSTRAP COMPUTER STORE

A computer mob known as SETH, 4001-24th St., San Francisco, CA 94114, is working on opening a storefront computer operation that will include walk-in, play-a-computer game facilities. They have miscellaneous peripheral gear and would like to trade some of it for other goodies. They will also sell gear on a consignment basis. They can be contacted at the above address or at 3979-24th St. By phone, call (415) 282-8000 or 282-3550 (11 a.m.-7 p.m.), or 824-4997 and ask for Bob, George or Don.



BERKELEY GETS ITS SECOND COMPUTER STORE

Mark Greenburg and Chuck Grant have just opened (Aug. 16th) Kentucky Fried Computers, a new computer store at 2465-4th St., Berkeley, CA 94710, (415) 549-0858. This makes the second computer store for the relatively small city of Berkeley (Computer Kits being the first) and we understand a third one (yet another Byte Shop) will be opening shortly.



NEW HOME COMPUTING RAGS

In the event that you have blindly bypassed the full-page ads in a number of ad-carrying magazines, two new hobby periodicals are in the offing:

Personal Computing, bi-monthly, \$8/yr (\$6/yr before Sept. 1976), first issue October-November, Benwill Publ. Corp., 167 Corey Rd., Brookline, MA 02146.

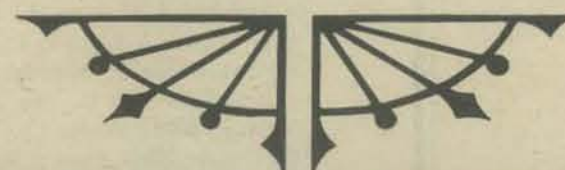
Microtek, monthly, \$10/yr, first issue: September, 1976, Schneider Publ., Inc., Dows Bldg., Cedar Rapids, Iowa 52401 [Iowa??].

Both will be your usual, run-of-the-mill, exciting hobby rags, filled with display ads, articles, letters, etc. *Personal Computing* is touting an interesting twist: each issue will carry a full-color, poster-sized computer graphic . . . a center-fold for computer phraeques. Betcha neither one of 'em will ever devote 15 or 20 pages to complete documentation and annotated source code listings of system software, though [Dr. Dobb tooting his own horn.]



CROMEMCO NEW ADDRESS

CroMemco has moved from Los Altos. Their new address is 2432 Charleston, Mountain View, CA 94043, (415) 964-7400.



AN EXCELLENT BUY & SELL NEWSLETTER

There is a very useful little typewritten newsletter available, that is explicitly concerned with want ads for computer hobbyists, both for buyers and sellers. It is called *ON-LINE*, and is published by D.H. Beetle, 24695 Santa Cruz highway, Los Gatos CA 95030. It is published every third Wednesday, is sent by *First Class* mail, contains 6 to 12 pages in each issue, and has a very fast turn-around—all ads received as late as the preceding Saturday are included in the issue for that month. The publisher states that they put out 17,3925 issues per year, but we assume that is merely an approximate figure. Subscriptions are \$1/four issues, or \$3.75/18 issues (= one year), or \$7/36 issues.

For those wishing to advertise, there are both line rates and word rates, and there are reduced rates for ads running in multiple issues. There are also much lower rates for non-commercial ads than for commercial ads. As far as we can tell, there are no display ads; it's all text, which means much more meat in much less space.

We highly recommend this publication to those interested in buying or selling goods for the computer hobbyist.



"P.E. ARTICLES TELL HOW TO BUILD A SYSTEM FOR UNDER \$100"

Dear Bob,
July 16, 1976
For some time now I've felt that the hardware oriented types (like me) who only want to spend \$100 or so to get started have been completely neglected. I've also been approached by many hobby groups who want to know more about the COSMAC microprocessor. To satisfy both types of potential users, I've prepared a series of articles showing how to build a complete COSMAC microcomputer (called ELF) for under \$100. This series of articles started in the August, 1976 issue of *Popular Electronics*, and should be of interest to many of your readers who are still looking for a lower cost way of getting started. The basic microcomputer doesn't need a terminal since input switches and an output display are provided. A novice user can actually do more with this system initially than he could with a \$466 Altair 680 by itself (I have both systems). Of course, the COSMAC ELF has no cabinet or PC board and you must handwire 12 chips together. Other articles in the series will provide programs, applications, inexpensive interfaces, memory expansion, and a simple operating system. A very low cost graphic video display is also planned for the ELF microcomputer. I just want to make your less affluent readers aware that plans for a low-cost, do-it-yourself, micro-computer are now available via this series of articles.

Best wishes,
Joe Weisbecker
1220 Wayne Ave.
Erlton, Cherry Hill, NJ 08002

EDITOR'S NOTE: Joe is the architect/designer of RCA's COSMAC.



WAR & LOVEMAKING

Dear Dragon:

The John R. Lees, Jr. letter in your Vol. 5, No. 1 issue has all the makings of a perfect equation. Within the body of his letter he cancels out each point he tries to make. $0=0$.

At the risk of adding Philosopher to my Soldier/Engineer designation, I would like to suggest that Lees Jr. is worrying up the wrong tree. As he himself notes in his citation from "Computer Power & Human Reason," technology is pretty well self-limiting. Most technology, from hula hoops to SST's, has to stand in the marketplace and compete for the available dollar. (Gawd: reflected technology, except for the sewing machine, but he never objected to news of any of his frequent fasts being broadcast by telegram to the faithful.)

If Lees Jr. wants to worry about the real threat to our continued existence, he should concern himself with the social engineering schemes being broadcast out to us with little concern as to whether we want to buy or not, and with little proof as to their efficacy.

I do consider the effects on my clean air of all the cars starting every morning. But I go beyond that, unlike Lees Jr., and consider what would happen if the cars did not start, and reject the consequences of that occurrence.

My ownership of a home computer may be "intertwined" with the starving child in India. Just about as much as my flashlight pointed at the moon is "intertwined" with the overall level of moonlight reflected back to earth.



But enough of this lovmaking. Those of us in home computing, with the possible exception of Mr. Lees, know as much about the innards of our "black box" as we care to. What we are involved in now is developing ways to enhance the utility of the home computer to the individual. That's what P.C.C., and the whole home computer field, are all about.

Lees can dress in sackcloth (grown by and woven by starving Indians) and sit in ashes (from coal mined by blacklung smitten miners, burned to the detriment of our pristine air) if he wants to. This Old Soldier, recognizing that we don't have 100,000 years from now if we don't have tomorrow, is going to use computers, and the rest of technology, to (a) have fun; (b) make a profit; and (c) survive, not necessarily in that order.

—The Old Soldier



HUMANE COMPUTING

Dear Bob,

I am working on a survey of the humanistic use of computers and would like to get in touch with other people who are interested in this field. I want to learn about what can, and is, being done to make the use of computers as humanized as possible. More specifically, I want to know:

- What are the potentially humane applications of computers?
- What are the important ingredients in humanized computer systems?
- What is currently being done in the field of humane computing, both in terms of theory and practice?
- What individuals and groups are actively doing this work?
- What are their particular goals and objectives?
- What are the results so far?
- What are the major factors determining their successes and failures?

I would like to hear from anyone who can contribute to answering such questions. They should write to me describing their thoughts, fantasies, plans and experiences related to the humane use of computers. Besides corresponding with people, I hope to actually visit and talk to as many contacts as possible. All the material I collect in this way will go towards the publication of a survey of humane computing.

I am enclosing a survey outline which goes into more detail about my project.

Yours sincerely,

Andrew Clement
HUMANE COMPUTING
789 W. 18th Avenue
Vancouver, B.C., Canada
V5Z 1W1

A SURVEY OF THE THEORY AND PRACTICE OF HUMANE COMPUTING

Outline

Do computers have a role in the humanizing of our society? Can we use them to facilitate the creative expression of our individuality and the healthy fulfillment of our potential? Can the use of computers help us to communicate meaningfully with each other, so as to promote mutual caring, understanding and respect? If computer systems can indeed contribute to furthering humanistic ideals, what would such systems look like in principle and how well do existing and planned systems measure up to these aims in practice?

Or perhaps computers, by their nature, are inappropriate for such a role in people's lives? If so, why, and what can be done to ensure that computer systems are as humanized as possible? Just what are the limits and limiting factors in the humanistic use of computers?

There are some of the major questions that I am posing in this survey of "humane computing"—the use of computers for humanistic objectives. Since this field is still relatively unexplored, the first part of my study will be to construct a theoretical foundation, bringing together general principles related to humanized technology and applying them specifically to computers. What will result is a practical definition of "humane computing" and a set of criteria for judging the humaneness of computer systems.

The second part of my study will be to use these criteria as the basis for evaluating existing and planned computer systems. To the greatest extent feasible this evaluation will rely on direct experience of the individual system and interviews with the people actually involved with their creation, operation and use. While I wish to view as many systems in as wide a range of contexts as possible, my emphasis will be on small-scale and/or inexpensive systems. In particular, I am interested in systems used by individuals or community-based groups to serve their own needs in communications, education, recreation and creative expression.

Emerging from these evaluations will be a set of guidelines for the implementation of humane computer systems. These guidelines, together with an exploration of promising areas for future developments, will make the published results of this study of particular interest to computer people who wish to incorporate humanistic principles in their work.

This survey is sponsored by INFAC, a Vancouver-based community computer group, and funded through the Canada Council.

August 1976

Andrew Clement



GAMES FOR PROGRAMMABLE CALCULATORS

Dear Bob,

I received the July PCC yesterday and am happy to see that it is as interesting as ever.

I noticed that you mentioned my program on Page 19, so I am writing to let you know that I have moved and am no longer at the address listed. For your records, my address is:

7003 Longridge Ave.
N. Hollywood, CA 91605

Thanks for mentioning me, and keep up the good work.

Sincerely,
Richard Moffie

Authors Wanted

Dear Bob,

We appreciate your running the announcement about APL Press, and have had a number of responses from people who specifically mentioned having read about us in PCC or Dr. Dobb's.

APL Press is proving to be an interesting experience, and is consuming a lot of time. Although our mailing list is growing daily, we are always interested in receiving names of people who would be interested in our publications. We are also open to suggestions for articles for the newsletter, and prospective authors.

Sincerely,
Jean Iverson
APL Press

Box 27
Swarthmore, PA 19081

NETWORKING

Dear People,

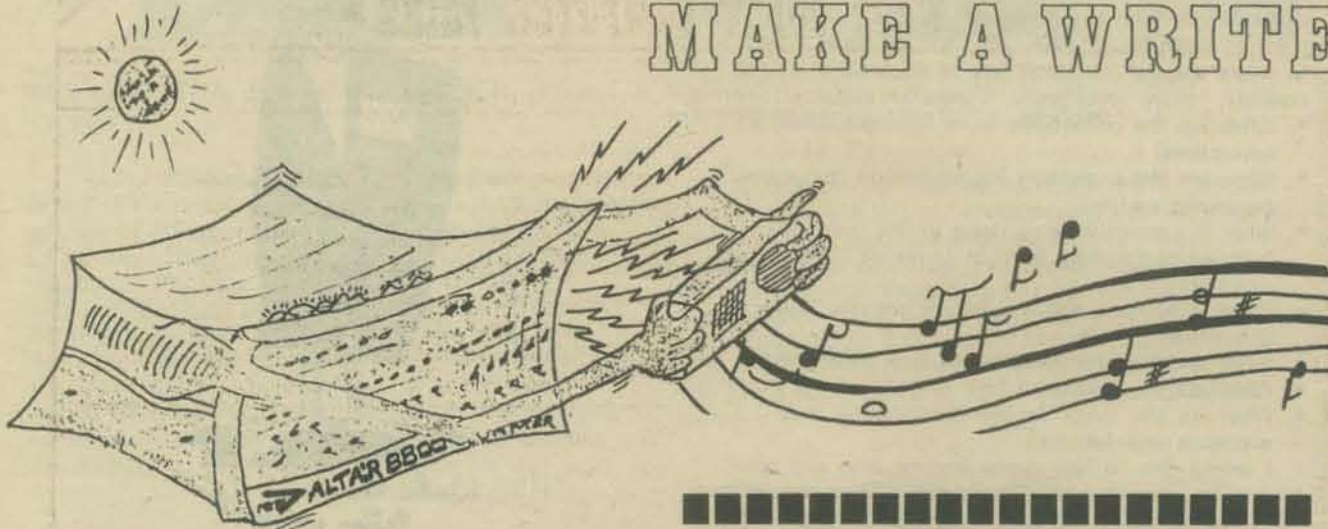
We are an information sharing network, working for Social Healing. We share an abundant resource of programmers, engineers and information and communications people. The idea has come to all of us at one time or another of using communications and computers as a catalyst in linking social change networks everywhere and in doing so establish a real time and relevant cultural feedback loop which is conspicuously absent today. We'd be very interested to hear of the work the People's Computer Co. is doing and whether or not you would be interested in sharing more information on the possibility of setting up such a computer network, possibly by way of Direct Broadcast Satellite Technology.

We are in the process of considering such a grant proposal as a means of funding and would appreciate whatever input you may consider important.

Light & love,
Frank Cataryao
META Systems

67 Talbot Road
Northboro, MA 01532

TWO RUNS DON'T MAKE A WRITE.



REVIEW OF THREE PERIODICALS CONCERNING ENERGY, TECHNOLOGY, AND PEOPLE by "The Old Soldier"

Intermediate Technology
556 Santa Cruz Ave.
Menlo Park, CA 94025

Self-Reliance
1717-18th St., N.W.
Washington, D.C. 20009

People & Energy
1757 S Street, N.W.
Washington, D.C. 20009



The three titles above are from newsletters that recently came into PCC. All are concerned with energy and technology, and each has something to recommend it, but since the combined subscription prices come to \$23.50 a year, some discrimination becomes necessary.

People & Energy is the most political of the three and a strong advocate for the corporate conspiracy theory of explaining our energy problems. For those who feel that way, this will help reinforce that attitude. No article on the suppression of the 100 MPG carburetor, but perhaps next issue . . .

Intermediate Technology is trying to put together working groups to examine production of energy, goods and foodstuffs to seek more rational production units in this time of rising transportation and energy costs. Looks like a good way to pick up multiple ideas without a lot of rhetoric.

Self-Reliance, issue no. 1, got to me. The article, "Do We Need Large Companies?" advances the thesis that, beyond a certain size, corporate growth does not enhance efficiency. Those advantages that do accrue are, greater leverage for equal percentage advertising expenditure, better and less expensive access to credit, and the possibly mistaken impression that large company employment is more stable. Another article, "Towards Sewerless Cities," brought an "amen" from me. The majority of the water we use in the home is used just to carry away sewage. Los Angeles, from just one plant, The Hyperion Sewerage Works, discharges between 350 and 750 million gallons per day of sewage containing water into the ocean. Modern technology, and some technology not so novel, offers viable alternatives to this waste, and some of the alternatives are explained here. *Self-Reliance* has a fan in

-the Old Soldier-

Dear Bob,

While browsing through my PCC Vol. 5, No. 1, I discovered an error I made in my program entitled "A Musical Number Guessing Game" published in the issue. I forgot to include part of my program (the music data) because I thought all you dragons out there who read PCC would know it.

Also, ADD. 004 in my program should be 000 and ADD. 005 should be 001. And you deposit your guess in ADD. 1000 instead of 200.

Well, here it is!

Data for "Daisy"

Address Data	Address Data
110 034	170 040
111 034	171 042
112 034	172 046
113 042	173 034
114 042	174 034
115 042	175 042
116 053	176 046
117 053	177 053
120 053	200 053
121 071	201 053
122 071	202 053
123 071	203 046
124 063	204 042
125 055	205 042
126 053	206 053
127 063	207 063
130 063	210 063
131 053	211 053
132 071	212 063
133 071	213 071
134 071	214 071
135 071	215 071
136 071	216 071
137 071	217 071
140 046	220 053
141 046	221 053
142 046	222 042
143 034	223 046
144 034	224 046
145 034	225 071
146 042	226 053
147 042	227 053
150 042	230 042
151 053	231 046
152 053	232 042
153 053	233 040
154 063	234 034
155 055	235 042
156 053	236 053
157 046	237 046
160 046	240 046
161 042	241 071
162 046	242 053
163 046	243 053
164 046	244 053
165 046	245 053
166 046	246 002
167 042	247 377

COMPUTER CHESS TOURNAMENT

Entries are being solicited to the Seventh U.S. Computer Chess Championship to be held October 19-21, 1976 in conjunction with the ACM Annual Conference in the Hyatt Regency Hotel, Houston, Texas. A four-round Swiss style tournament is planned with the first round on Tuesday, October 19 beginning at 8 p.m., and the final round on Thursday, October 21 at 8 p.m. The field will be limited to 12 teams. David Levy, International Master from England, will serve as tournament director.

For further information and for an application form, write to Dr. Monroe Newborn, School of Computer Science, McGill University, Montreal, Quebec, H3C 3G1, Canada.

NAUCAL

For the latest in computer fare for intrepid educators, go to NAUCAL this fall. Members and fellow travelers of the National Association of Users of Computer Applications to Learning (NAUCAL, of course) will trek to Portland, OR on October 28-30, 1976 to sample gourmet delights in:

- Computing for Elementary Schools—Author Languages—Micro/Mini Processors—CMI Applications—Competency Achievement—Delivery Systems—Career Guidance Systems—Educational Computing and the Public—New Thoughts on Administrative Computing—Computers and Small Districts—Simulations—The Future of Big Systems—Teaching Programming Languages—Test Item Resources—

For more information, write to:

Dr. John J. Mandelare
NAUCAL Registrations
Clackamas County IED
Marylhurst, OR 97036



DE ANZA COLLEGE OFFERS TWO SHORT COURSES

1. Introduction to Microcomputers for the Scientist and Hobbyist—I

Friday, October 1, 1976 (6-9 pm)
Saturday, October 2, 1976 (9-4:30 pm)
Saturday, October 9, 1976 (9-4:30 pm) \$40, including text

2. Programming and Logic Design Using Microcomputers—II

Friday, October 22, 1976 (6-9 pm)
Saturday, October 23, 1976 (9-4:30 pm)
Saturday, October 30, 1976 (9-4:30 pm) \$40, including text

- Machine Controllers
- Intelligent Terminal
- Memory Management
- Automotive
- Pre-processors
- Industrial Controls
- Communications Systems
- Desk Top Computers
- Traffic Controllers
- Banking Terminals
- Typesetting
- Broadcasting

- Games
- Computer Enthusiast
- Burglar Alarms
- Model Railroads
- Photography
- Sprinkler Systems
- Financial Records
- Lighting and Heating
- Astronomer
- Amateur Radio Operator
- Electronic Music

THE SCIENTIST

THE HOBBYIST

For more info: DE ANZA COLLEGE — SHORT COURSE
21250 Stevens Creek Boulevard
Cupertino, California 95014
(415) 257-5550 Ext. 368 or 369



Now it should work right! Have fun!

May all your bytes=8bits,

Kurt Inman



Personal Computing '76

by James S. White

The world's first multi-vendor, nationwide, personal computing exhibition! This was Personal Computing '76, the hobby computer trade show held in Atlantic City, NJ, the last weekend in August. The show was big—80 exhibits, 40 seminar sessions, and a paid attendance over 5000. Following similar, but regional, shows in Trenton (May 2, attendance of 500), and Cleveland (June 12, attendance of 1500, 24 exhibitors), Atlantic City seemed a mirror of the growth of the hobby computer field.

The over 80 exhibitors ranged from IBM (who left the churning public exhibit floor and showed its 5100 in a tenth floor suite) to (what seemed like) a 2-man vending company formed the prior week. Present, or represented, were most vendors advertised in national hobby computer magazines, several too new to be advertised, local computer stores, and a wide variety of other organizations. Booths were often manned by personnel such as company presidents and software authors, so firsthand information was available. Much of the material shown was new—discussions of history produced the feeling that about 1/3 of the products and literature shown hadn't existed 2 weeks earlier. Despite the crowd, the floor wasn't too crowded, and only occasionally was a booth inaccessible for long because of others in front.

The visitor with an overloaded wallet (or charge card) could take home most anything, ranging from a (or 100) IMSAI computers to a used resistor, chosen from a wide variety of components, to an ink-still-wet copy of *Micro-trek*, issue No. 1. Those less affluent (or those who, like me, had spent their month's hobby budget just traveling to the show) could take free literature, much more than the casual reader will be able to study before it becomes obsolete. Hardware was not given away on the floor—much of that exhibited was a one-of-a-kind prototype, and armed guards carefully searched all packages leaving the floor, but among the hundreds of door prize items given away were 10 computers.

If this diverse show had a theme or message, it was that the hobby computer field is exploding—rapidly growing in many directions. One strong trend demonstrated by several vendors seemed to be towards **ALTAIR** bus compatible boards, and at least 2 other manufacturers have joined IMSAI in the alternate mainframe section of this market. However, several new mainframes shown and many new independently offered peripherals shown weren't **ALTAIR** compatible. Trends towards assembled and tested equipment, and sales via computer stores, were talked about by many, but old and new kits, and manufacturer-to-user selling plans continued to proliferate. The Z-80 was popular, but controlled less than half the new CPU's.

With this diversity, and the multitude of new products, there was no star of the show, no dramatically new product that seemed clear to lead the field. Among the products I noticed were a 6-foot (diagonal) color display of computer output (a large screen TV form of Cromenco Dazzler output); National Semiconductor's "calculator" keyboard I/O for its SC/MP kit, which will result in a complete (except for power supply) computer for under \$200, and the **BABY!** I microcomputer, complete with alpha keyboard, packaged in an attache case, and available with a \$54 per year maintenance contract. The discontinued \$350 disc drive model that was the headline loss-leader of the June 12 show went unnoticed as list prices of standard drives were as low as \$390 (\$525 in plug-in form); perhaps the leading discount item was the \$76 (list: \$200) Z-80.

Seminars, in session a total of 13½ hours, also covered a wide variety of topics. Many sessions explained (i.e., promoted) specific hardware, others were on software, applications and publications. The biggest defect of the whole show, I felt, was that I missed too many excellent talks because I couldn't be in 2 (or 3 or 4) places at the same time.

Consistent with the increasing diversity in hardware, computer hobbyists seemed totally unreceptive to anything resembling control of their activities. A twice presented appeal to work towards software standards, to allow exchange of programs, might as well have been made to the sea gulls outside the hotel. A meeting of representatives of many of the USA and Canada computer clubs (another first) produced friendly discussion but the agreement that the extreme of coordinated club activity should be informal correspondence by club librarians to ex-

The First • WEST COAST COMPUTER FAIRE •

A conference on personal computers and home computing

- **When:** Friday-Sunday, April 15-17, 1977
- **Where:** The Civic Auditorium, San Francisco
- **What:** A Conference
 - formal papers
 - informal talks
 - panel discussionsAn Exhibit
 - personal and group projects
 - commercial products from over 200 vendorsBanquets & A Luncheon
 - fascinating speakers
 - exciting topics
- **Who:** 7000 to 10,000 Computer Phreaks
 - Computer Hobbyists
 - Computer Professionals
 - Educators with Computer Interests
 - "Ham" Radio Fans

Cause it's time to do it!

There have been three exciting conventions on the east coast.

Now, it's time to have a *super show* located right where it all started: in the San Francisco Bay Area

- **Who's putting it on:**
 - Organizers are:
 - Jim Warren, Editor, *Dr. Dobb's Journal*
 - Bob Reiling, co-leader, Homebrew Computer Club
 - Co-sponsors include:
 - Homebrew Computer Club
 - People's Computer Company
 - Stanford University's Electrical Engineering Department
- and co-sponsorship resolutions are being offered before a number of west coast hobbyist and professional organizations, including:
- Community Computer Center
 - Southern California Computer Society (SCCS)
 - Association for Computing Machinery Chapters (ACM)
 - IEEE Computer Society Chapters
 - CPU's of Monterey
 - Lawrence Livermore Hobbyist Club
 - Marin County Hobbyist Club

WATCH FOR MORE DETAILS IN *PEOPLE'S COMPUTER COMPANY* AND IN *DR. DOBB'S JOURNAL*.

- **Who'll be there:** Almost everyone who is anyone in personal computing. As far as companies are concerned—in the first day of contacting commercial organizations with interests in microcomputers and computer hobbyists, almost *every one of them* committed, on the spot, to being exhibitors and/or giving talks. These included:

Byte, Inc.	Zilog
Call Computer	Cromemco
Computer Converser	OSI
STM Systems	Byte Magazine
Associated Electronics	Percom
Project Support	<i>Microcomputer Digest</i>
Engineering	MOS Technology
Processor Technology	National Multiplex
Osborne & Associated	Quay Computers
Technical Design Labs	Southwest Texas
Polymorphic Systems	Products
Microcomputer Associates	American Microsystems Inc.
National Semiconductor	Apple Computers
Solid State Music	Etc.

and, a note of special interest to PCC readers:

Though there have been a number of computer hobbyist conventions and exhibitions, this is the first one that will have a major Conference Section devoted explicitly to personal computers and microcomputers in education. This section will offer a number of talks and discussions concerning the use of small, inexpensive computers in elementary, secondary, and single-user college and university education. It will also be concerned with the use of personal computers in the home for educational purposes, including their use with pre-reader children.

If you would like to present a paper or lead a panel discussion in this Section, contact:

Don Inman, Chairman
Personal Computers for
Education Section
350 Nelson Road
Scotts Valley, CA 95066
(408) 335-3360



If you wish to otherwise participate in this Computer Faire, contact:

Jim Warren
People's Computer Co.
Box 310
Menlo Park, CA 94025
(415) 323-3111



change program material. At this session, a SCCS director said that SCCS was pulling back from its past policy of nationwide recruiting. Later, the President of MACC, the largest and most active of club affiliations, responding to an appeal for someone to fill the void and organize the nation, said that MACC didn't want to expand its power.

Large hobby computer shows seem certain to be an important part of the scene, at least for the next couple of years. The east and west coast areas will have 2 or 3 shows each year, and the Cleveland show will repeat, bigger and better, next spring. Nothing seems likely yet for the western Great Lakes area—but Atlantic City was put on by 3 young, totally inexperienced radio amateurs (who, incidentally, worked 16 hours per day, 7 days per week, for 9 months).

A personal computing show, I learned, is a very

good place to gain a large amount of knowledge, a good place to answer a few specific questions, and the only place to get lots of current information. However, I had gone to Atlantic City with the objective of learning about everything there that was new to me. I learned a lot, and had a good time. But, in 2 days of concentrated effort, I learned only about 30% of what was at the show to learn in my areas of interest. I left with the feeling that I possessed a much smaller part of the total knowledge in this field that I felt when I came, and certain that this field is growing too rapidly for any hobbyist to keep up with the complete field, much less catch up.

But I suspect there is a type of person in a worse situation than I am. Veteran **AI** owners, have pity on the newcomer trying to evaluate all available microcomputer systems to choose the best one for himself.

Pythagoras' gifts to music and musicians were many; the two we will use here are:

- (1) A vibrating object produces *overtones* with frequencies that are integer multiples of the fundamental frequency (see PCC No. 2 to avoid confusion).
- (2) Intervals between tones are specified (and apparently perceived!) as the *ratio* of the frequencies of the two tones.

This second idea suggests that *rational*[†] approximations to any interval are possible. As it turns out, until the time of Bach all constructed scales (in the West) were based on this idea. Pythagoras himself constructed one which became the basis for our music system.

To start with, remember that the overtones are integers, if the fundamental is set equal to 1. When Pythagoras plucked his one-stringed "monochord", he obtained as the strongest and most pleasing overtones the frequencies

1 2 3

He then reduced this 3-tone scale to the range of one octave (the interval between 1 and 2). To do this he used a lower octave of the 3 overtone, a note with frequency 3/2. The scale then became

1 3/2 2 This is the basic scale. What next?

Well, the 3 overtone has an overtone with frequency $3 \times 3 = 9$ which sounds pleasing when it accompanies overtone 3 (for the same reason that 3 sounds good when it sounds together with tone 1). Moreover, tone 9 has the same "good vibes" with tone 27. Pythagoras continued to add tones in this fashion until he had a scale of seven different tones, two of which were the original 1 and 2. They were

1 9/8 81/64 3/2 27/16 243/128 2

These frequencies have been reduced to one octave by successive division by 2, and arranged in numerical order.

Pythagoras also added an eighth tone to his scale. This interval does not appear in the overtone series of the fundamental, but it is closely related to the fundamental. It is a note with frequency 2/3. The fundamental is the 3 overtone of this note. In order to place it in the same octave (from 1 to 2) as the rest of the notes, it must be multiplied by 2. Here is the complete scale, together with the names for these scale degrees derived from the medieval theorist Guido of Arezzo:

1 9/8 81/64 4/3 3/2 27/16 243/128 2

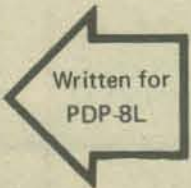
DO RE MI FA SOL LA TI DO

This eight-tone scale has dominated Western musical thinking for thousands of years. It also appears in Hindustani music. Here is a program which generates the frequencies in the true Pythagorean manner, and prints them out in decimal notation.

```

100 PRINT "PYTHAGOREAN SCALE"
110 DIM F(7)
120 REM STARTING WITH 2/3, MULTIPLY SUCCESSIVELY BY 3/2
130 LET F(1)=2/3
140 FOR I=2 TO 7
150 LET F(I)=F(I-1)*3/2
160 NEXT I
170 REM CONVERT TO NUMBERS BETWEEN 1 AND 2
180 FOR I=1 TO 7
190 IF F(I) >= 1 THEN 210
200 LET F(I)=2*F(I)
210 IF F(I) <= 2 THEN 240
220 LET F(I)=F(I)/2
230 GOTO 210
240 NEXT I
250 REM SORT LOWEST TO HIGHEST
260 FOR I=1 TO 6
270 FOR J=1 TO I
280 IF F(J) <= F(I+1) THEN 320
290 LET X=F(J)
300 LET F(J)=F(I+1)
310 LET F(I+1)=X
320 NEXT J
330 NEXT I
340 REM PRINT THE SCALE
350 FOR I=1 TO 7
360 PRINT F(I)
370 NEXT I
380 PRINT
390 END

```



RUN

PYTHAGOREAN SCALE
1
1.125
1.33333
1.26562
1.5
1.6875
1.89844

[†]A rational number is a number that can be written as the ratio of two integers. E.g., 1.5 is a rational number because it can be written as 3/2.

BASIC Music:

Pythagoras and Rational Music

By PETER LYNN SESSIONS
Reprinted from PCC Vol. 1

Where is tone 2? It must be added at the end, because the scale is not complete without it; like the NEXT statement, it tells you where to start repeating. But — it cannot be generated like the rest of the tones: no power of 3 ever exactly equals any power of 2. This problem plagued Pythagoras, and every other musical thinker after him. In a scale based on the 3 overtone as this one is, only intervals which can be reduced to powers of 3 divided by powers of 2 are "in tune." All the others are out of tune. In the 12-tone tempered scale we discussed last time, all the octaves are "true," and everything else is out of tune. Which is better? Some partial answers may appear in future issues, but check out the literature first (assuming you have virtually unlimited time).

Now for some problems. You can modify or adapt our program to solve these if you wish.

First, you might wish to be able to INPUT the frequency of the fundamental in cycles per second, and obtain the Pythagorean frequencies in the same units. Do it!

Second, there are other important intervals besides 2 and 3/2. One of the most important of these is the ratio 5/4, which is the 5 overtone reduced to the lowest octave. The system of "just" intonation uses the 5/4 overtone along with the 3/2, to create a scale that fits the "3 main chords" very well indeed. For a complete explanation of the terms which follow, you'll need a music text. First, the Tonic (home base) chord is defined as consisting of the following tones

Tonic	1	5/4	3/2
	root	3rd	5th

This pattern is characteristic of "major triads" in the just intonation system. The other two of the 3 main chords are called the Dominant and the Subdominant. The Dominant starts with tone 3/2, and the Subdominant starts with tone 2/3 (symmetrical, no?).

The tones of the Dominant are computed as follows

$$\begin{aligned} \text{root} &= 3/2 \\ \text{3rd} &= (3/2) * (5/4) = 15/8 \\ \text{5th} &= (3/2) * (3/2) = 9/4 \end{aligned}$$

Note that the relative frequencies of the 3 tones are the same as in the Tonic. Only the starting frequency has been changed.

Similarly, we can describe the Subdominant.

$$\begin{aligned} \text{root} &= 2/3 \quad (\text{moved up to } 4/3) \\ \text{3rd} &= (2/3) * (5/4) = 5/6 \quad (\text{moved up to } 5/3 \text{ that is, } 10/6) \\ \text{5th} &= (2/3) * (3/2) = 1 \end{aligned}$$

This gives us a complete scale of eight tones if we count the 2 overtone. Here is the scale (rearranged).

1	9/8	5/4	4/3	3/2	5/3	15/8	2
DO	RE	MI	FA	SOL	LA	TI	DO

Can you program this one?

Next, here are two "approximately Oriental" scales. One is pentatonic, the other diatonic (eight tones).

1	5/4	3/2	7/4	2			
1	9/8	5/4	11/8	3/2	7/4	15/8	2.

Naturally, "do" "re" etc., don't do justice to the sounds of either of these two scales.

Can you program them? Can you play them?

Final question: If the overtones go up to infinity, do all intervals appear when you play one tone? Can any interval be approximated (to a given level of error) with a rational fraction?

Quick and easy reference:

Paul S. Malcom, "Mathematics of Musical Scales,"
The Mathematics Teacher, November, 1972.





The Aesthetic Research Centre
of Canada



**BIOFEEDBACK AND THE ARTS:
RESULTS OF EARLY EXPERIMENTS**
David Rosenboom, Editor

A second, updated edition of this informative publication, covering work done by major artists and researchers in the field of biofeedback and the arts and neurological information processing related to aesthetic experience. This book contains articles on practical applications, how-to-do-it information about the electronics involved in work with biofeedback and the arts, research and theoretical modelling reports, philosophical articles, and a gallery of pieces, scores, and ideas. Some authors and artists represented include: David Rosenboom, Richard Teitelbaum, Alvin Lucier, Dr. Edgar E. Coons, Dr. Lloyd Gilden, Jacqueline Humbert, Barbara Mayfield, C. Mark Nunn, etc. This publication serves to fill an information gap that currently exists in this new and expanding field by providing useful information for those interested in engaging themselves in related projects and stimulating ideas for those interested in the concepts.

EXCERPTS FROM THE AUTHOR'S PREFACE:

"Initial infatuation with the breakthroughs of biofeedback research, on the part of many investigators, began with the significant potential of making direct physical connections between an externally generated product, (such as musical sound), and internal experience as represented by the electrical output of the brain. Through much technical research it has been found that the catalogue of information, of both general and highly specific types, that can be extracted from these electrical signals is quite astounding. And in the process we have learned much about the relationship between experience and these externally manifested waveforms and have had to completely reopen questions concerning aspects of subjective experience, states of mind, and their relationship to these signals.

"In our LABORATORY OF EXPERIMENTAL AESTHETICS we have been amassing a large body of knowledge in the techniques of neurological referencing for types of aesthetic experience, biofeedback, the development of the potential for daily conscious awareness and control of a large range of aspects of one's own neurophysiological functioning, (especially with respect to art), the relationship of these data to personal experiences, (especially those which involve practice), and the development of artistic expressions related to these experiences. It is strongly felt, that the knowledge has reached a level of sophistication allowing practical application...."

"Rosenboom and his collaborators are engaged in work that has profound implications for the creative arts. This wide ranging collection includes schematics and construction details for low-cost biofeedback instrumentation, elucidation of some of the problems and possibilities concerning live electronic music performance, and scores for "Brain Music for John and Yoko", etc." Don Buchla in the Whole Earth Epilog.



**J.E.A. THE JOURNAL OF EXPERIMENTAL
AESTHETICS**
Michael Byron, Editor

Each issue of this occasional journal presents a series of original publications devoted entirely to expanded directions in Experimental Aesthetics, approached through a broad, interdisciplinary base. The Journal encompasses a diversity of areas in currently developing art systems and art forms with special emphasis placed on recent applied research in human information processing.

The Editorial Staff of the Journal of Experimental Aesthetics endeavors to provide in each issue both theoretical and practical information through a wide cross section of contributed papers submitted by authors active both internationally and nationally. As well, the Journal will occasionally provide, through special inserts, a window into the people and activities of the Aesthetic Research Centre of Canada.

Volume 1, No. 1 contains:

META META HODOS
by James Tenney,
University of California at Santa Cruz

A significant capsulization of Mr. Tenney's work in composition, structural linguistics, and generative languages for music.

BIOFEEDBACK WITH CEREBRAL EVOKED POTENTIALS AND PERCEPTUAL FINE TUNING IN HUMANS
by Christopher Mark Nunn,
Laboratory of Experimental Aesthetics,
York University

"Mr. Nunn's paper is a must for anyone interested in establishing functional biofeedback systems in electronic media studios as well as for those interested in the relevant background in physics, psychophysics, and psychology. It contains an excellent review of work done to date on the cognitive significance of changes in specific peaks of the auditory evoked response, a practical guide, including circuitry, for implementing a real time, evoked response peak detection and biofeedback system, along with designs for experimental paradigms."

(David Rosenboom)

WHEN THE VIRUS KILLS THE BODY AND IS BURIED WITH IT, THE VIRUS CAN BE SAID TO HAVE CUT ITS OWN THROAT: ON THE PROBLEMATIC OF TODAY'S MUSIC NOTATION
by Robert Ashley
Mills College

"... Ashley's talk was a positive contribution."
(Cornelius Cardew in 'Stockhausen Serves Imperialism')

The price of a subscription for four sequential issues is:

Individuals in North America	\$15.00
Individuals in Other Countries	\$17.00
Libraries & Multiple Reader Institutions in North America	\$30.00
Libraries & Institutions in other Countries	\$35.00

Available from PCC Bookstore.



FORTHCOMING TITLE:

**THE ART OF DRUMMING:
SOUTH INDIAN—MRDANGAM**

by Trichy Sankaran

(Foreword by Palghat Mani Iyer)

Acknowledged as one of the foremost rhythmic virtuosi in India, Prof. Sankaran's book represents years of work at cross-cultural, musical understanding. This book is a major step forward in bringing an understanding of a non Western tradition to Western readers & practitioners.

Written specifically for the Western reader, it provides, in simple form, basic knowledge on the technique and theory of South Indian drumming. General subject areas include: 1) the role of Mrdangam in South Indian music, 2) the technique of playing, 3) a brief theory related to the performance practice today, and 4) Mrdangam lessons in notation.

Specific chapter headings include: Mrdangam; The Function of the Two Heads in the Art of Drumming; Tala Theory; Solkattu; etc.

The text is amply illustrated with numerous photographs.

Along with Prof. Sankaran's book, a full length stereo LP record will accompany the book. The record will contain demonstrations of the Mrdangam lessons given in the book, along with examples of solo composition and improvisation.

Here is a brief excerpt from the author's Preface:

"The purpose of this book is to make available in simple form for Western readers some basic knowledge on the technique and theory of South Indian drumming. As there has been an ever growing interest in listening to the South Indian percussion instrument, *mrdangam*, and also in learning the art of playing *mrdangam*, I have made a humble attempt in putting forth the role of *mrdangam* in a South Indian music concert, the technique of playing, a brief exposition of theory related to contemporary performance practice, and *mrdangam* lessons in notation. Having performed widely with eminent artists in India and also abroad, and having taught many North American students the art of drumming in the past years, I wish to present in book form the information and materials which I have been taught by my teachers, and also those which I have developed during the years of my performance and teaching. I hope that this book will be of some help to students of Indian music, drumming students in particular, as well as to general readers, in understanding the theory and technique of South Indian drumming."

ABOUT A.R.C.'S PUBLICATIONS:

A.R.C. PUBLICATIONS specializes in presenting you with the most interesting and stimulating advances in the fine arts and related disciplines, including the areas of Education, Scientific Research, Aesthetics, Biofeedback, Perception, World Music, and World Soundscape Studies.

This is accomplished through the on going publication of a diverse range of emphatically practical and useful books and records issued in exclusive editions using the highest state-of-the-art engineering and manufacturing standards available.

All of the books listed in this brochure have been adopted over the past year for course work at various universities and colleges in Canada and in the United States.

The Old Soldier Turns Onto ENERGY

Very few people are neutral on the subject of energy generation. California's recent nuclear initiative brought out the bumper stickers on a par with the Vietnam War. The rising cost of our travel, power and heat has intruded itself on our lives to the extent that no one is totally free of its effects.

The various books mentioned on these pages are primarily concerned with alternate energy sources, and necessarily so. One of the peripheral benefits from "growing our own" energy that is not emphasized is that, when we know the cost, we are not as likely to waste energy. It is easier to put on another sweater than to chop wood.

One of the more unfortunate aspects of our current energy problem is the fact that so many attempts are being made to insulate the private consumer from the reality of rising energy costs by jiggling rate structures of utilities and by attempting to control prices by fiat. While all this has not stanchied the rising cost of energy, it has convinced many consumers of energy that life can go on as it has if only the right laws can be enacted. Let us hope that some of these energy publications can help develop the awareness necessary to prepare us all for the future.

HANDBOOK OF HOMEMADE POWER

The Mother Earth News
\$1.95 from Bantam Books, 666 Fifth Ave.,
New York, NY 10019

A collection of articles from various sources about alternate energy sources. The usual Wood, Wind, Water, Solar and Methane. This book gives a good overview of all the above topics, but O.S. was most impressed with the helpful advice on wood cutting. It is difficult to save energy costs when you have to pay up to \$100 a cord, so anyone committed to wood burning has to be ready to cut his own. From how to handle an axe to sizing and storing wood are well-covered, and the advice on which wood stove to select is hard to improve on.

I am always enthralled with Water Power articles, but few of us have the location to make water do our work. The wind and solar sections have some ideas not found elsewhere, and might provide project material for schools since some of the ideas require a minimal investment.

The methane articles do make some references to the hazards associated with methane production and storage, but for my money they are not nearly emphatic enough. I would not advise anyone to attempt this enterprise unless they are prepared to make major investments in equipment. The home methane generator is in the hazard category of the home nuclear reactor. Leave methane generation to the pros.

Other Homes & Garbage
Leckie, Masters, Whitehouse & Young, 1975.
Sierra Club Books, 530 Bush St.,
San Francisco, CA 94108

This book covers most of the material already covered in *The Energy Primer*, that is, Alternative (and energy efficient) Architecture, Electricity from Wind and Water, Solar Heating, Waste Handling (including methane generation), Water Supply, Agriculture and Aquaculture.

It is a bit more explanatory than the *Primer*, and should add to your understanding of the energy picture even if you don't immediately build a dam in your backyard.

*see PCC Bookstore

SOLAR HEATING & COOLING

Engineering, Practical Design and Economics
Jan F. Kreider & Frank Kreith
McGraw-Hill, 1221 Avenue of the Americas,
New York, NY 10020

If you really mean it about putting your hard-earned cash into a Solar installation this year, the first \$22.50 should be for this book. *Solar Heating & Cooling* is not a rehash of magazine articles and teasers, but a good professional level treatise in many ways better even than the guidebooks available to the engineering world. All of the tables and formulae necessary to design your own installation, or to evaluate a contractor's proposal, are right here. If you do not have the math, some of the sections could be rough sledding, but the text is explanatory enough for you to get the idea, and can at least recognize whether the contractor is trying to snow you. The solar tables, weather tables and system diagrams bring together all you need but the money.

The bona fides of the authors: Dr. Kreider is President of Environmental Consulting Services and Dr. Kreith is a Professor in the Chem Engineering Department of the University of Colorado, Boulder.

SCHOOL ENERGY USAGE BY COMPUTER

Administrators of elementary school districts can now find out how their energy usage compares with other schools through use of a computer service provided by Educational Facilities Laboratory (EFL) under funding of the Federal Energy Administration.

The charge is \$15 to have a comparison run, and programs are in the fire to evaluate the effect of various changes to operating procedures and physical plant modifications on energy use.

Work is under way to modify the program to permit analysis of secondary schools. Information is now available from EFL and can be obtained by writing Educational Facilities Laboratory, 3000 Sand Hill Road, Menlo Park, CA 94025, (415) 854-2300.

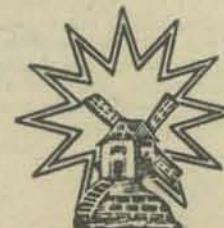
ENERGY AND DOMESTIC HOT WATER

In the modest climate we enjoy in California, it is not unusual for a household to expend more energy heating domestic water than heating the house. Irrespective of the means of heating that water, a big savings can be had by intelligent supervision of your water heater.

Heat loss from stored hot water is directly proportional to the difference between the storage temperature and the ambient temperature, therefore, the lower your tank thermostat setting, the lower your losses. Few people can tolerate a shower temperature hotter than 105° F. Shaving is normally done somewhat hotter at 110° F, hand dishwashing is uncomfortable above 120° F. Clothes washers and dishwashers normally require 140° - 150°.

Ideally, water would never be heated until needed, and then never hotter than the utilization temperature. Practically, we are used to the convenience of hot water on whim, so the tank is maintained to satisfy our hottest requirement and sized to accommodate the maximum expected draw (for instance, two showers, a load of dishes and a washer of clothes in one hour).

Most dishwashers have internal booster heaters, so performance should not suffer if initial fill is around 110° F, especially if you let your dog lick all plates clean first. Experimentation with cold water detergent and chlorine bleach for germicidal action can often permit cooler clothes washing temperature. This leaves the shower, the biggest hot water glutton in the average residence. The average shower head, uncontrolled, will use from 8 to 12 gallons per minute of water. Since only about 80% of the hot water tank capacity can be withdrawn at the storage temperature, if water were stored at the 105° F utilization temperature, the 40 gallon tank would run cold after 4 or 5 minutes of showering. Special low-flow shower heads can cut shower flow to two or three gallons per minute and make lower storage temperatures workable.



The Old Soldier was pleased, recently, to see that our friends at Lockheed had picked up a \$7 million contract to build a (that's right, one only) windmill, to generate 500 KW of electricity.

Wonder how many 500 KW windmills really private enterprise could up for the same price.



ON THE SENSATIONS OF TONE
by Herman Helmholtz (excellently translated in 1885 from the last German edition by Alexander Ellis)

\$6.00.

The classic scientific book which links music theory, acoustics, and physiology of the ear—written by one of the world's great universalistic scientists. The physics of sound are studied including superimposition of waves and phase, sympathetic resonances, quality of the tone of different musical instruments based on present harmonics, noises heard at the beginning or end of notes, etc. Helmholtz describes the biology of the ear and provides an early (1877) explanation of the function of the cochlea. Combination tones and beats, intervals and chords, scales and tonal systems (Chinese, Greek, Pythagorean, Arabian, Persian, Ecclesiastic, tempered, just, etc.), progression of parts, consonance and dissonance, and esthetics are discussed in detail. The following appendices are a valuable addition to the main text:

- On the Size and Construction of Resonators
- On the Motion of Plucked Strings
- On the Production of Simple Tones by Resonance
- On the Vibrational Forms of Pianoforte Strings
- Analysis of the Motion of Violin Strings
- On the Theory of Pipes
 - A. Influence of Resonance on Reed Pipes
 - B. Theory of the Blowing of Pipes
 - I. The Blowing of Reed Pipes
 - II. The Blowing of Flue Pipes
- [Additions by Translator]
- Practical Directions for Performing the Experiments on the Composition of Vowels
- On the Phases of Waves caused by Resonance
- Relation between the Strength of Sympathetic Resonance and the Length of Time required for the Tone to die away
- Vibrations of the Membrana Basilaris in the Cochlea
- Theory of Combinational Tones
- Description of the Mechanism employed for opening the several Series of Holes in the Polyphonic Siren
- Variation in the Pitch of Simple Tones that Beat
- Calculation of the Intensity of the Beats of Different Intervals
- On Beats of Combinational Tones, and on Combinational Tones in the Siren and Harmonium
- Plan for Justly-Toned Instruments with a Single Manual
- Just Intonation for Singing
- Plan for Mr. Bosanquet's Manual
- Additions by the Translator
 - A. On Temperament
 - B. On the Determination of Pitch Numbers

The volume (about 600 pages) is illustrated generously with diagrams, graphs, tables and musical examples. It provides a broad background for reading more modern research papers. I would highly recommend *On the Sensations of Tone* to those who design or program musical instruments as well as to all composers.

John Snell

BUILD YOUR OWN WORKING ROBOT
David L. Heiserman. 1976. \$5.95.

A step by step explanation of making your own working robot. The final version is capable of:

- 1) chasing the cat
- 2) wandering around for hours
- 3) finding its battery charger when it's low
- 4) responding to commands from you, the master.

This project is not for novices—you'll need experience with TTL technology, transistor amps, control circuits, and a working knowledge of Boolean algebra.

NUMBERS: SHORTCUTS & PASTIMES
Jack Gilbert. 1976. 336 pp. \$6.95.

If this doesn't prove to be the most entertaining of textbooks, it's sure to be the most educational funbook of numbers and math games—and it's loaded with easy-to-learn tips for making even complex numbers mentally manageable. Even with the advent of pocket calculators, being able to mentally calculate is a valuable asset. Even those people who've always had trouble with math will feel comfortable and self-assured with this remarkable text—it shows how to use a few basic mental exercises to perform highly involved (seemingly) mathematical calculations without a calculator . . . and without pencil and paper! It shows how to be first with the right answer in almost any situation!

Most of the real-life problems we encounter in our everyday life are problems involving estimation to at least some extent. In this book, several chapters are devoted to the art of estimating with a precision that exceeds even those multidigit calculators. Gilbert shows how to quickly arrive at very close answers for square roots, cubic roots, and logarithmic functions. The second half of this two-part volume is packed with parlor tricks, games and puzzles that will show off new-found skills at trimming numbers down to size, and that will amuse and amaze the reader and his friends.

INTRODUCTION TO MICROCOMPUTERS,
VOLUMES I & II

Adam Osborne. 1976. \$7.50 each.

The second edition of *An Introduction to Microcomputers* has been revised and expanded to two volumes, to keep up with the fast-moving microcomputer industry's pace of change. Have things changed that much in just 5 months? You probably know the answer to that already: a flood of new and second-source CPU chips and a whole host of new LSI support packages. Nowhere else can you get all this vital information. **VOLUME I—BASIC CONCEPTS** surveys the subject, from elementary concepts to system configuration and design. In **VOLUME II—SOME REAL PRODUCTS** we take a long, hard look at products available today and about to be announced tomorrow.



METRICALLY YOURS
Helen Hunter and Paul Wallach. 1976. 70 pp. \$2.95.

The metric system is here to stay and it's super simple to use once it becomes familiar. This big format book uses lots of cartoons and simple, clear language to facilitate mastering this most logical system of measurement. Included in each section are plenty of questions and answers for self-testing, as well as one page of flash cards to cut out. *Metrically Yours* is written clearly enough for the elementary student, and it offers everyone, young and old, a quick, concise rundown (or brush-up) on metrics.

Foreign airmail rates are tremendous (about \$3.80 a pound, and books are heavy)! Therefore, having had large complaints from various sectors about huge airmail charges, our policy will be to notify you of the amount of postage before shipping the order. This causes a slight delay, but will save wear and tear on me (and shock to you!).

Happy Lady

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THE PCC DRAGON T-SHIRT
Nancy Hertert, 1974, \$4.00

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

SWEAT SHIRTS

Nancy Hertert, 1974, \$7.00.
XL sweatshirts in blue and dark green only.



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

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

TTL COOKBOOK

Don Lancaster, 1974, 328 pp. \$7.95.

The author discusses what is required to understand and use transistor logic, assuming the reader is familiar with electronics up to and including transistors. Covers basics of construction and a discussion of the different types of TTL. An excellent instructional aid which doubles as a quick reference guide to the 7400 series.

Hardware

ACTIVE FILTER COOKBOOK

Don Lancaster, 1975, 240 pp. \$14.95.

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

THE BUGBOOK I & II and INSTRUCTORS WORKBOOK

Rony, Larsen & Braden, 1974. Two volumes plus workbook. \$19.95.

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

THE BUGBOOK III

Rony, Larsen & Titus, 1975, \$14.95.

The entire 8080 instruction set is discussed in detail. This big paperback is about interfacing the Mark 80 computer to the real world.

FUNDAMENTALS AND APPLICATIONS OF DIGITAL LOGIC CIRCUITS

Sol Libes, 1975, 192 pp. \$5.98.

Learn the basics of digital logic. Enough info to be used as a reference for deconfusing semiconductors, logic and logic classes, binary arithmetic, memory types, and analog-digital devices.

INTRODUCTION TO MICROCOMPUTERS

Adam Osborne & Associates, Inc. 1975, 384 pp. \$7.50.

People call PCC and ask for a book which is a good introduction to microcomputers. Previously we have had to say that there really isn't one—but now there is—and this is it.

THE TEXTBOOK OF VIDEO GAME LOGIC VOL. 1

Joel Miller, 1976, 112 pp. \$14.95.

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TV TYPEWRITER COOKBOOK

Don Lancaster, 1976, 256 pp. \$9.95.

Another fine "cookbook" from Don Lancaster! And it really is a cookbook, not just a recipe book. Although there are plenty of schematics, the emphasis is on what the problems are in designing a TV typewriter and various ways of solving those problems. I especially like the discussions of the advantages and drawbacks of different designs.

Software

ADVANCED BASIC

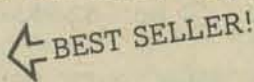
James S. Coan, 1976, 184 pp. \$6.95.

Advanced BASIC is all about what do do after *Basic BASIC*.

ALPHA-NUMERIC MUSIC WITH AMPLITUDE CONTROL

Malcolm T. Wright, 1975, 23 pp. \$2.00.

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

BASIC  **BEST SELLER!** by the Dragon & Friends.
Albrecht, Finkel and Brown, 1973, 325 pp. \$4.95.

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

BASIC BASIC

James S. Coan. 1970. 256 pp. \$3.95.

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

BASIC PROGRAMMING

Kemeny and Kurtz. 1971. 150 pp. \$6.95.

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

FUN AND GAMES WITH THE COMPUTER

Edwin R. Sage. 1975. 360 pp. \$5.95.

An introductory text which teaches BASIC computer programming through games of chance and strategy. Most of the games in the text can be run on a minimum 4K computer and remainder on an 8K system.

MY COMPUTER LIKES ME

WHEN I SPEAK IN BASIC

Bob Albrecht. 1972. 64 pp. \$2.00.

This "learn by doing" workbook introduces BASIC to young or old, with no previous computer experience or knowledge of programming.

101 BASIC COMPUTER GAMES

Editor, David Ahl. 1974. 250 pp. \$7.50.

This book contains instructions for 101 games, all in BASIC. Most games are simulations of sports, card games, board games and games of chance.

PCC GAMES PROGRAM LISTINGS

PCC. 1974. 31 pp. \$2.00.

This booklet contains the bare program listings of the computer games presented in Volumes I and II of *People's Computer Company*. They are written in HP 2000F time shared BASIC and may easily be modified for other systems.

PROBLEMS FOR COMPUTER SOLUTION

Gruenberger & Jaffray. 1965. \$3.98.

After you learn to talk to computers, what do you talk about? If you want inspiration, this book has 92 problems, something for everyone—easy stuff, hard stuff, math stuff, non-math stuff, all beautifully written.

PROGRAMMING PROVERBS

Henry F. Ledgard. 1975. 134 pp. \$5.95.

Principles of good programming with numerous examples to improve programming style and proficiency. Examples in ALGOL 60, BASIC, FORTRAN and PL/1. Long section on programming the game KRIEGSPIEL CHECKERS.

TEACH YOURSELF BASIC VOLUMES 1 and 2

Bob Albrecht. 1970. 64 pp. each. \$2.95 each.

Written by a Dragon with a seventh grade mind, this book covers teletype fundamentals and BASIC instructions in Book 1 and more sophisticated instructions for the novice in Book 2. Slow and easy learning.

WHAT TO DO AFTER YOU HIT RETURN or
P.C.C.'s First Book of Computer Games
PCC. 1975. 157 pp. \$6.95.



A fantastic book of computer games written in BASIC—number games, verbal games, science fiction games, all in the outrageous style of *People's Computer Company*. A big book, crammed to the margins with tasty tidbits—strategies, treks to the stars, simulations, wumpus hunts, and much more. Destined to be one of those books.

Computers in General

COMPUTER LIB/DREAM MACHINES

Theodore Nelson. 1974. 186 pp. \$7.00.

Man has created the myth of the computer as cold, oppressive and sterile. This book sees them as veritable panoply of things and dreams. Enuf info for 3 books.

COMPUTERS AND COMPUTATION

Scientific American. 1950 through 1971. 280 pp. \$6.00.

Twenty-six articles from *Scientific American* about computers, what they are, how they happened, how they work and how they are used.

Math & Calculators

45

THE BEST OF CREATIVE COMPUTING, VOL. 1

David Ahl, editor. 1976. 328 pp. \$8.95.

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

II CYBERNETIC FRONTIERS

Stewart Brand. 1974. 96 pp. \$2.00.

- I. Both sides of the necessary Paradox (Conversations with Gregory Bateson).
- II. Fanatic Life and Symbolic Death among the Computer Bums (Space war freaks should check this one out).

ADVANCED APPLICATIONS FOR POCKET CALCULATORS.

Jack Gilbert. 1975. 304 pp. \$5.95.

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

CALCULATOR CALCULUS

George McCarty. 1975. 254 pp. \$8.95.

This book is about the calculus. What distinguishes it, however, from other books is that it uses the pocket calculator to illustrate the theory. A computation that required hours of labor when done by hand with tables is quite inappropriate as an example or exercise in a beginning calculus course. But that same computation can become a delicate illustration of the theory when the student does it in seconds on his calculator. The machine is like a microscope, and its magnification is a hundred millionfold.

MATH & CALCULATORS (Continued...)

GAMES, TRICKS AND PUZZLES FOR A HAND CALCULATOR. Wallace P. Judd. 1974. 100 pp. \$2.95. ★

This book is for anyone who owns or intends to purchase a hand calculator, from the most sophisticated to the basic "four banger." Also good clean fun.

GAMES WITH THE POCKET CALCULATOR ★
Thigaragan & Stolovitch. 1976. 54 pp. \$2.00.

No tricks or puzzles, the 24 games in this book fall within the classical definition of interactive activities. They all involve an element of conflict and competition with rules for making moves and ending the game. Fast paced games that do not require being a mathematician or having more than one "four banger" per game.

GETTING THE MOST OUT OF YOUR ELECTRONIC CALCULATOR
William L. Hunter. 1974. 204 pp. \$4.95.

A "how to" book for people who want to use electronic calculators for basic math, homework, unit pricing, grocery shopping, simple interest, income tax preparation, and running the modern kitchen.

MATH, WRITING & GAMES IN THE OPEN CLASSROOM
Herbert R. Kohl. 1974. 252 pp. \$2.45.

A careful analysis of the ways in which games can be used for teaching. Descriptions of countless games and learning ideas that stimulate children's imagination so they can comprehend complex mathematical concepts, strategy and probability theory. Herbert Kohl loves kids—and it shows in his book.

PROBABILITY
D. J. Koosis. 1973. 163 pp. \$2.95.

This book is for people who want to learn probability. Work your way thru this book before you take STAT 1.

PROF E. MC SQUARED'S (ORIGINAL FANTASTIC & SATISFYING CALCULUS PRIMER)
Swann and Johnson. 1975. 111 pp. \$2.95.

Our original idea was this: if we would find characters for each mathematical concept in differential calculus, and set them all to work, the result would be far more lively and involving than the usual textbook trip. What happened along the way was that the characters acquired more life than we had expected and sometimes seem to charge off in their own directions. So, if they lead you astray, go back and re-read what you have already done. Try the exercises—we have left room to work them out in the book, and the answers are in the back.

PROF E. MC SQUARED'S CALCULUS PRIMER (PART 2)
Swann and Johnson. 1976. 103 pp. \$2.75.

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

PROFESSOR GOOGOL'S MATH PRIMER
Sam Valenza Jr. 1973. 144 pp. \$4.50.

This is a math textbook with a sense of humor—an experiment in the visualization of mathematical ideas through cartooning. Effective and interesting communication of a sometimes unexciting subject. Mad, mad visual stuff makes this great for all you kids, young and old.

STATISTICS
D. J. Koosis. 1972. 282 pp. \$3.95.

This book is for people who want to learn statistics. Do this book before you take STAT 1.

Human Hardware & Software

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

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

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

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

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

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

BODY TIME
Gay Gaer Luce. 1973. 411 pp. \$1.25.

"An absorbing and fully-detailed treatment of a subject we're all at least vaguely aware of—the physiological, social and emotional rhythms in our lives. While there are enough studies and experiments to boggle the brain, the author retains the proper perspective between detail and readability. Read the book and you cannot help but gain a greater awe, appreciation and respect for the beautiful complexity of the human body—leading to greater care of/for and understanding of your own."

EYE AND BRAIN: The Psychology of Seeing
R. L. Gregory. 1973. 253 pp. \$2.95.

Beautifully illustrated and easily understood, this book is it for learning how the eye and brain function together. This book sheds new light on looking—what you see isn't necessarily what you get.

NEW MIND, NEW BODY: BIO-FEEDBACK: NEW DIRECTIONS FOR THE MIND
Barbara B. Brown, Ph.D. 1974. 523 pp. \$2.50.

A basic source for the technician, home or otherwise. This is the definitive text on biofeedback, presented simply and clearly, while retaining all the worth of traditional scientific methods.

SEEING WITH THE MINDS EYE: The History Techniques and Uses of Visualization

Mike Samuels, M.D. and Nancy Samuels. 133 pp. 1975. \$9.95.

The human mind is a slide projector with an infinite number of slides stored in its library, an instant retrieval system and an endlessly cross-referenced subject catalog. What is this inner seeing? Avoided by the standard educational process, the importance of visualization in our lives has yet to be adequately explored. This book plugs in your slide projector and pulls down the screen. Time to look in. A big format book, one-inch thick with plenty of photos and illustrations, eight in full color.

THE CENTER OF THE CYCLONE

An Autobiography of Inner Space
John C. Lilly. 1972. 237 pp. \$1.95.

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

THE PSYCHOLOGY OF CONSCIOUSNESS

Robert E. Ornstein. 1972. 269 pp. \$1.95.

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

THE UNIVERSAL TRAVELER: A soft-systems guide to creativity, problem-solving and the process of reaching goals.

Don Koberg and Jim Bagnall. 1974. 128 pp. \$4.95.

A definitive manual presenting a logical systematic approach to the creative problem-solving of everyday life, employing graphic visualization as well as statistical representation. Written in the belief that the same mathematical discipline used in solving complex world problems can be utilized in our everyday lives for the attainment of systematic and creative resolution of everyday problems.

Music

ALPHA-NUMERIC MUSIC WITH AMPLITUDE CONTROL

Malcolm T. Wright. 1975. 23 pp. \$2.00.

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

ELECTRONIC PROJECTS FOR MUSICIANS

Craig Anderton. 1975. 134 pp. \$6.95.



The first 4 chapters are an introduction to basic electronics, the fifth contains 19 projects including a preamp, metronome, 8-in one-out Mixer, electronic foot switch and ultra-fuzz, concluding with a section on trouble-shooting and access to further information. The best book we have seen for the beginning kit builder.

PRINCIPLES AND PRACTICE OF ELECTRONIC MUSIC

Gilbert Trythall. 1973. 214 pp. \$6.95.

The first few chapters are concerned with the relationship between waveform and sound quality, and with the elementary electronic concepts one needs to know in order to produce

the desired waveforms. At this point the author begins to build, piece by piece, and electronic music studio—your own synthesis and recording facility. Uncle Gilbert tells how to translate conventional musical notation of all forms into synthesis instructions. Also included is a brief history of electronic music, how to get and protect a copyright and a 200 word glossary of electronic music terminology. Very elementary and nothing about computer music.

Games

FUN AND GAMES WITH THE COMPUTER

Edwin R. Sage. 1975. 360 pp. \$5.95.

An introductory text which teaches BASIC computer programming through games of chance and strategy. Most of the games in the text can be run on a minimum 4K computer and remainder on an 8K system.

GAMES, TRICKS AND PUZZLES FOR A HAND CALCULATOR



Wallace P. Judd. 1974. 100 pp. \$2.95.

This book is for anyone who owns or intends to purchase a hand calculator, from the most sophisticated to the basic "four banger." Also good clean fun.

GAMES WITH THE POCKET CALCULATOR



Thiagaragan & Stolovitch. 1976. 54 pp. \$2.00.

No tricks or puzzles, the 24 games in this book fall within the classical definition of interactive activities. They all involve an element of conflict and competition with rules for making moves and ending the game. Fast paced games that do not require being a mathematician or having more than one "four banger" per game.

MATH, WRITING & GAMES IN THE OPEN CLASSROOM

Herbert R. Kohl. 1974. 252 pp. \$2.45.

A careful analysis of the ways in which games can be used for teaching. Descriptions of countless games and learning ideas that stimulate children's imagination so they can comprehend complex mathematical concepts, strategy and probability theory. Herb Kohl loves kids—and it shows in his book.

101 BASIC COMPUTER GAMES

David Ahl, editor. 1974. 250 pp. \$7.50.

This book contains instructions for 101 games, all in BASIC. Most games are simulations of sports, card games, board games and games of chance.

PCC GAMES PROGRAM LISTINGS

PCC. 1974. 31 pp. \$2.00.

This booklet contains the bare program listings of the computer games presented in Volumes I and II of *People's Computer Company*. They're written in HP 2000F time shared BASIC and may easily be modified for other systems.

WHAT TO DO AFTER YOU HIT RETURN



or P.C.C.'s First Book of Computer Games
PCC. 1975 157 pp. \$6.95.

A fantastic book of computer games written in BASIC—number games, verbal games, science fiction games—all in the outrageous style of *People's Computer Company*. A big book, crammed to the margins with tasty tidbits—strategies, treks to the stars, simulations, wumpus hunts, and much more. Destined to be one of those books.

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