

send check or money order to: People's Computer Company
P.O. Box 310
Menlo Park, Ca 94025

name _____
address _____

zip

what kind of computer do you use? _____

* subscriptions start with 1st issue of school year

\$4 for 5 issues
(\$5 Canada & overseas)

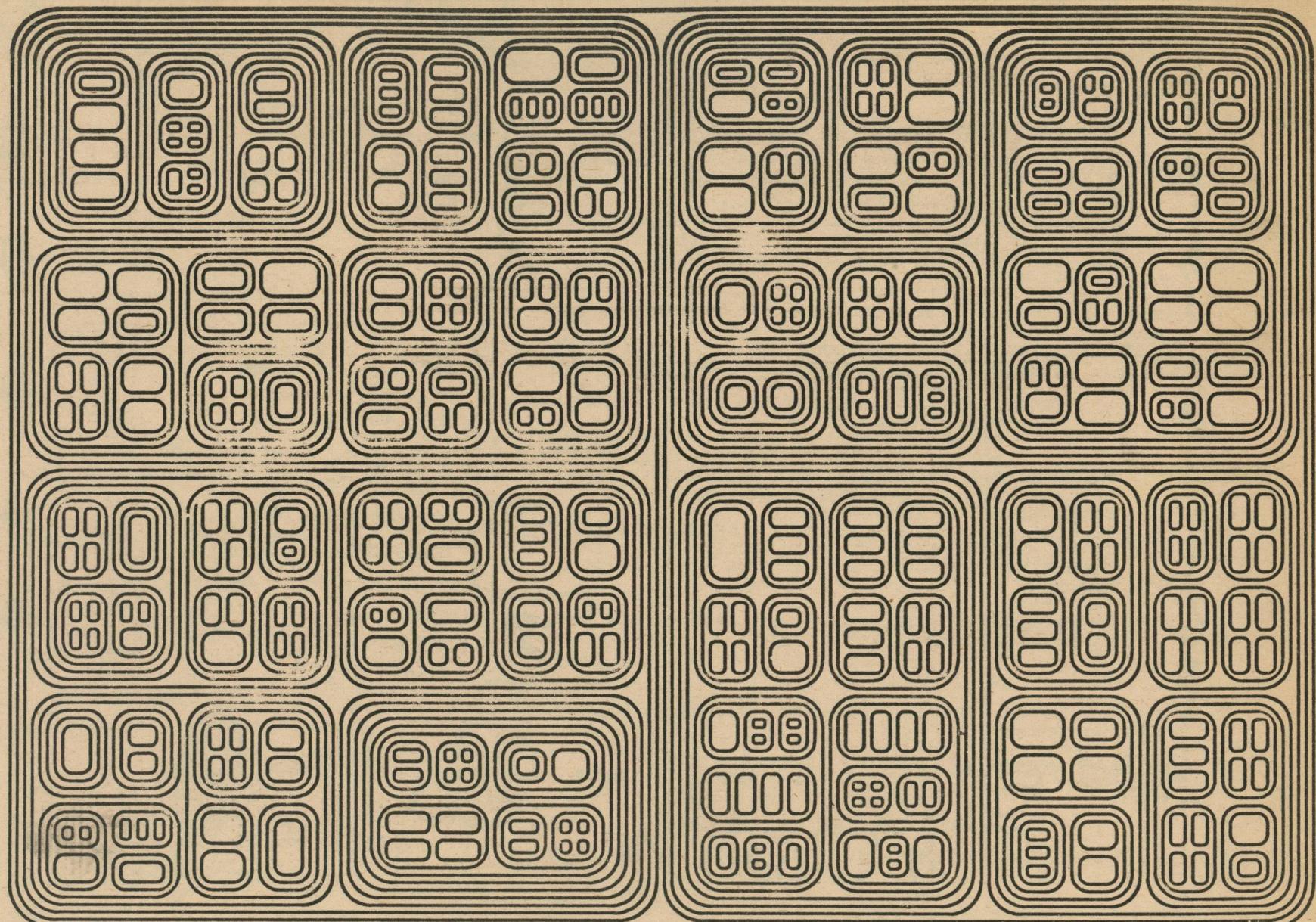
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PAID
Menlo Park, CA.
Permit No. 371

TO:

people's computer company

November 1973

Vol. 2
n. o. 2



"Insertions" by Daniel W. Van Arsdale

2

This is get to know us nite. Come play computer games, board games, puzzles, simulation games, rap about computers in the classroom or computers for people or bring your own topic!

OPEN HOUSE

Curious about PCC? Come any Thursday nite - it's FREE!

P.S. We won't object if you bring us some beer or other goodies.



FIELD TRIPS

Liberate Some PEOPLE From skool!

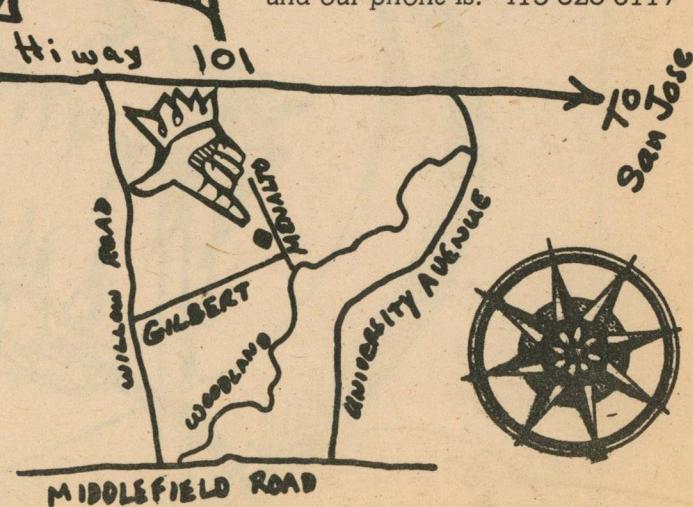


Take them on a field trip to PCC by skoolbus, carpool or bike brigade.

We can take up to 12 at a time for 1 to 2 hours.

*** FREE ***

Info? Call (415) 323-6117

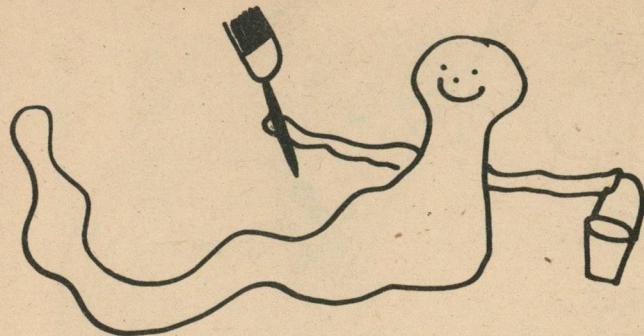


Computer Time

Rent computer time when the urge strikes:

Rates: \$2.00/hr
\$1.00/hr (students)

We are amenable to swapping for the time. No reasonable offer refused!



IN HOUSE COURSES

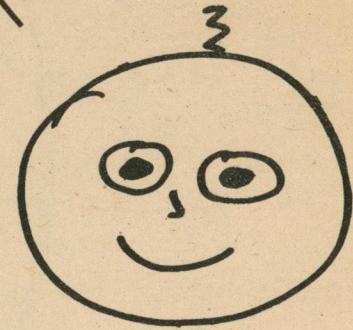
Do-it-yourself-hands-on-courses. Sign up for a "course". Play computer games or learn BASIC or both or ???

6 times ... 2 hours each time ... \$20

Arrange your own schedule. Here are the possibilities:

Tuesday 10 - 12, 1 - 4
Wednesday 10 - 12, 1 - 5
Thursday 10 - 12, 1 - 5

Come once a week for 6 weeks or twice a week for 3 weeks or whatever schedule you like.



math games & computer critters

Games to learn math by (and have fun with) -- from first grade up.

NUMBER, TRAP, STARS, BAGELS, BEYOND BAGELS, TAXMAN, HURKLE, MUGWUMP, SNARK, REVERSE, SUPER LUNAR, QUBIC, CAVES, WUMPUS, STAR TREK, . . . , and on and on and . . .

(Invent a game -- it's easy!)

Match wits with someone . . . yourself, another person, a computer.

Teach someone to program using INCHWORM, LADYBUG, GERMLAND, and other COMPUTER CRITTERS. Especially designed to show how the concepts of computer programming can be taught to very young children. Best of all, you don't even need a computer! COMPUTER CRITTERS can be used in any classroom. We will, however, have a computer available so you can see the CRITTERS in action on a real computer.



Saturday, November 17, 11 AM -- 6 PM
or Saturday, December 1, 11 AM -- 6 PM

Price: \$12 each session for you, or
\$10 if you bring a friend (grades 1-12)
The friend is free -- 1 friend per student

the Dave Show

SO YOU WANT TO WRITE YOUR OWN PROGRAMS . . .

We are offering two classes to people who want to learn how to program a computer:

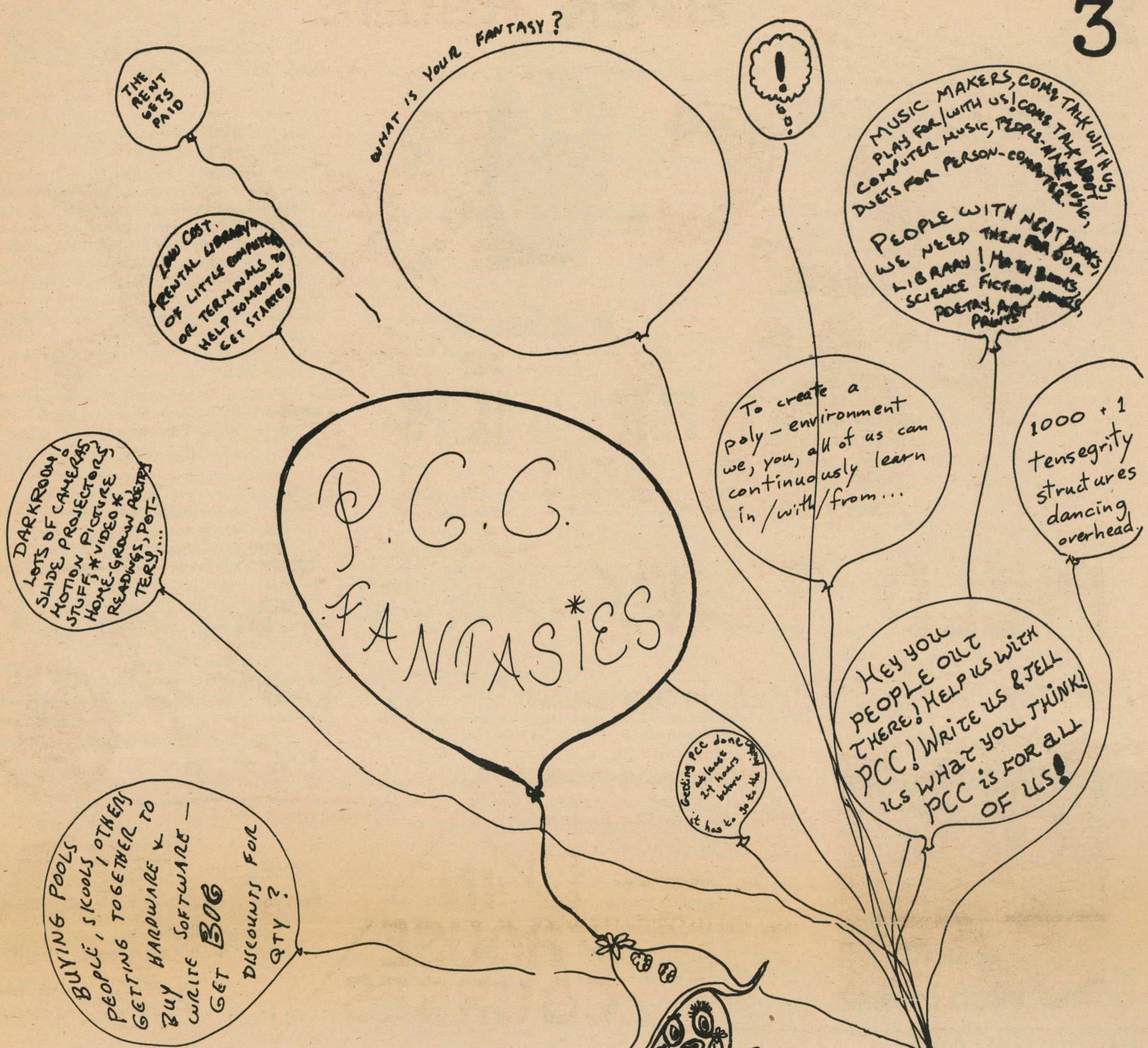
BASIC 4 Beginners is a hands-on class about BASIC, our favorite programming language. All our games are written in BASIC. The course will last 8 weeks, two hours of hands-on class time every Tuesday (4 - 6 PM or 7:30 - 9:30 PM) plus 10 hours of free computer time. Cost is \$40.

BASIC 4 Old-Timers is a new class and will cover advanced topics in BASIC. At the same time, we will be writing programs and games, focusing on useful techniques and BASIC writing style. The class will meet for 8 weeks of two-hour classes. Class hours are to be arranged. Everyone will also have 10 hours of free computer time. Cost is \$40.

CLASSES WILL START TUESDAY, NOVEMBER 27

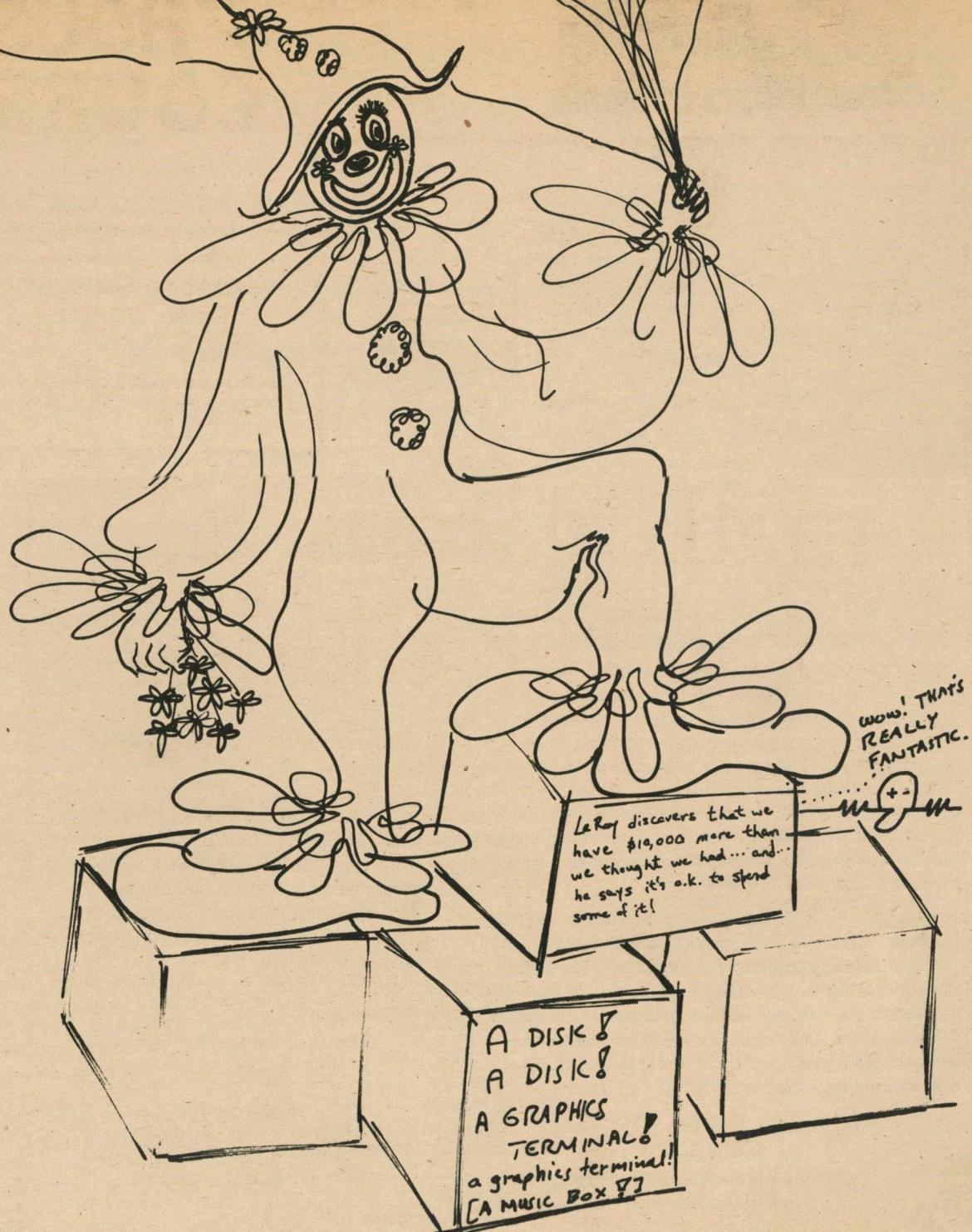
Both classes will have a Christmas vacation.

For more information, ask for Dave Kaufman at the PCC telephone: 323-6117.



The PCC Roadshow

Over the past several years, we have developed a rather unique approach to computer education through our various activities - doing workshops, teaching, writing curriculum & learning materials. For several years we have travelled around California to various campuses and learning festivals carrying our mini-computers, media, and broad selection of good computer materials. We have decided to put our personnel and materials up for rent for roadshows/workshops, for personnel or teacher training, education fairs, weekend campus workshops, as participants in educational fairs and future festivals - any place where experienced people with lots of backup media and materials would have impact in information dissemination and/or effective training. Call or write us concerning your situation and needs and we will design a learning environment to fit if possible, as well as negotiate a fee.



PILOT SHOT DOWN

Dear People:

I learned some new programming techniques from the PILOT 73 program, but other than that, I think that PILOT stinks. In your article, you mentioned "to use BASIC, one must have a minimal knowledge of algebra." Not one bit of algebra is needed to program on BASIC what you spacewasters have done on PILOT 73!!! With the exception of the M: statement everything in PILOT 73 can be done directly on BASIC.

T: is the same as PRINT, A: is the same as INPUT, \$label is the same as label\$, J: is the same as GOTO, U: is the same as GOSUB; M: is the only command that takes any trouble to program, N and Y are IF-THEN, C: is LET, and R: is REM. It seems to me that PILOT 73 is a disguised BASIC implemented on BASIC.

Now even though I dislike PILOT 73, I'm glad you printed the program. As I mentioned, I did learn some things from the program. PILOT 73 is a start on the road to people-run computers, but when you have a language as simple as BASIC, why do you need PILOT 73?

By the way, I think the April PCC is the best put out so far. It had a lot of pages, and it included some pretty good information.

Joel McCormack
3411 Eleanor Place
National City, CA. 92050

P.S. I will be sending my program that makes a different picture every run within a week.

Thanks for the letter, Joel, and I'm glad PILOT (PCC Vol. 1 No. 4) is good for something. I still think there is a need for more thinking about easy-to-use dialogue-oriented languages, and I'd like to know if anybody has had positive experiences with PILOT. Who is going to design a language that doesn't have the kinds of hang-ups that Marc wrote about re: BASIC in his article "Tilting at Windmills" in PCC Vol. 1 No. 2?

- Jerry

Some High Hopes in the Midwest

Dear Bob:

There has been a growing interest and need on the part of myself and other individuals in the Western Michigan region, in developing a community and research-oriented center, with a primary focus on computer education and related research activities. Your participation in the development of the People's Computer Center, I feel, may be closely aligned with major facets of the program now being generated by our group.

Therefore, the purpose of my correspondence is in requesting an inexact amount of information from you, with the notion of first, establishing contact with successful programs in operation around the country, and secondly, to obtain the requisite materials from these centers in order that we may begin formal initiation of our own center.

Our needs at the moment are primarily developmental in scope. That is, information related to proposal generation, funding, detailed listing of program activity structures/management, and implementation, are required in fully assessing the priorities to be established, and to foresee problems and blunders by all concerned. In short, our chief concern is anticipatory design, with effective maintenance procedures, including the concept of self-obliteration as demonstrated by Stewart Brand and Company.

Your assistance with the above stated needs, and referrals to other individuals and groups you are aware of, will be invaluable in completing our efforts. I hope that this short letter is motivating to the point of founding a structure for future feedback, and also in finding a solution to alleviate frustrated pressure that myself and others must maintain in a non-relevant business EDP-oriented environment.

Konx Om Pax

Ed Robertson

MIS Administrative Assistant
Foremost Insurance Company
5800 Foremost Drive S.E.
Grand Rapids, Mi. 49501



FLIPS 'n CLIPS

Hello —

Tom Mandel showed me a copy of your paper and told me to write you. Up 'til now I've had nothing to write. Now I have a question: Do you have any suggestions for a cheap mechanical flip-flop? — a simple demonstration (working demonstration) for and/or "circuits". I thought maybe you've heard of someone using readily available cheap materials that easily conform to flip-flop. I want children to be able to build their own simple "logic circuit"

Pat Hennessy
1890 45th NE
Salem, Or. 97303

P.S. If you hear of anyone doing a thing with film clips that can be "edited" together in various combos, by computer from 10 stimulus — tell me.

I can't help on the first part, but here are a couple of things related to your P.S.

CINEMIX 1221-8th St., Berkeley, CA

has developed the hardware to mix 3 or more images from 16mm or 35mm film or slides. That does all the things you'd expect an optical printer to do, like zooms in and out of frames, cropping, split screen and other sophisticated effects. However, using a series of beam-splitters and other optics, you can actually preview what the combination of images will look like on a viewing screen. This allows a flexibility in preparing film effects usually only available in video. The master control board is connected to a Nova mini computer & disk that can "record" the effects in real time or frame by frame, and "play back" the program so that corrections and changes can be made until you are ready for a "take" of the composite images. At this writing, the software for the system is not completed to the point of fully exploiting the capabilities of the system.

I also received a mailing from Dicomex, which provides digital image processing services. They'll convert your film images computer-compatible mag tape for processing in your local computer facility. They can then convert your tape back to b&w or color photographic film.

DON UGGLA
DATA SERVICE OPERATION
DICOMEX CORPORATION
9700 NEWTON AVENUE S.
MINNEAPOLIS, MN 55431

Either service will cost some bucks.

COMPUTERWORLD

Need Computer? Try Rock

WATERVILLE, Me. — If you're desperate for funds to buy equipment for your computer center you might try a rock concert.

Sha-Ha-Ha, a student rock group from Messalonskee High School here, put on a benefit concert and raised some \$560. The funds were used to help purchase a Monroe calculator for the math department.

"I've been trying to get some kind of computer into the system for the last four years," said Joseph Morin of the math department, "but every year the school board shot us down because of funds. So we took the matter into our own hands."

EXPO '74

TO: People's Computer Company

ON: Computer-assisted environmental game and simulations

My search for computer assisted environmental games and simulations has led to the People's Computer Company via Rusty Whitney of OMSI.

The Environmental Education Center at Portland State University is working with Expo '74 (world fair in Spokane, Washington, opens in May, 1974) to try to introduce Expo goers to both the environmental decision-making process and to some of the specific environmental decisions citizens will have to make. One of the ways this might be done is through computer-assisted games and simulations. The two reasons for specifying computer-assisted are to demonstrate a social implication for the development of technology and to give fair goers some personal experience with this technology.

There are several ways we might be able to use environmental games and simulations at Expo —

... direct user-terminal interaction which would evaluate user decisions on environmental issues.

... short competitive games or simulations where users would make decisions but which would require staff interface between user and computer

... this third use is a bit different; instead of a drop-in short time period, users might pre-register for an all day gaming workshop. Workshops might be arranged for special groups such as 'citizens and planners of Portland, OR' etc.

I have access to bibliographies such as Horn and Zuckerman and Twelker, but if you know of games not listed in these references or if you have comments or improvements on these, please let me know. At this point, finding workable ideas, not hardware is the main problem.

I'm looking forward to hearing from you or your readers. Thank you.

Laura Williamson
373 Lincoln Hall
Portland State University
Portland, Or. 97207



DOING the TTY

NEWS ITEM: Regarding source of supply for Teletype Ribbons. Readers may be interested to know that the lowest cost anywhere for ribbons is directly from Teletype Corp., 5555 Touhy Ave., Chicago, Ill. 60067. They will supply ribbons, Part no. 181129 for \$0.50 each. This beats using old ribbons from Secr, Sci, etc. Also Teletype users should request ASR 33 Bulletins 310B, Vol. 1 and Vol. 2. These manuals contain extensive data on Teletype lubrication, adjustment, etc. A must for users.

Dr. Gerald A. Silver

OUTTA WORK BLUES

Dear People:

Having just recently begun instruction in the art and science of computer programming (college summer school); and having been initially interested in the more positive aspects of the field by S. Brand's report on the Inter-galactic Spacewar Olympics, etc., in Rolling Stone and having decided to try to eventually bull my way into a programming job somewhere west of the Mississippi (since my degree in anthropology is an immobile and unmarketable commodity);

I would appreciate receiving a sample of your newsletter, and information on its subscription price, if there is one. It seems the work you are doing is definitely worth looking into. Furthermore, if doing such things falls within the sphere of your job, I would tremendously appreciate your providing me with a little information on: (1) other means of access to interesting useful and fun literature in the field; (2) the availability of computer work of the non-profit, educational and people-oriented variety in the West, Southwest, Northwest and other suitable places.

Jerry Lombardi
297 Judwin Ave.
New Haven, Ct. 06515

HOW-TO'S

Dear Sir:

I am presently an MST candidate at Illinois Institute of Technology in the CS Department, participating in an Academic Year Institute sponsored by NSP for Junior and Senior High School Mathematics teachers. My project for this degree is a series of mini-texts designed for the Junior High School student, two of which are to be "Computers and Simulation" and "Computers and Gaming". I do subscribe to *The People's Computer Company* and have used some of its references and ideas. Are there any further ideas, references, books, etc., you would suggest aimed primarily at the 7th and 8th grade student?

These texts are to be individualized (not programmed instruction), stressing teacher-student interaction. Personally, I have found success as a math teacher through the logic, fun, and games approach to it and agree there is no better method to help students find the value the computer can have on their future than "snaring" their interest this way.

Any help will be greatly appreciated.

Mrs. Joan Ramuta
1005 Rooney Drive
Joliet, Illinois 60435

Tic Tac Toe?

Dear People:

A little while ago in one of your papers I saw a deal for students that allowed \$2.00 subscriptions. Enclosed is the required note from my teacher.

I like your paper a great deal. There are a lot of good programming tips and it also helps to get others interested in computers which is not always easy.

John Reinert

249 Dolphin Place
Bellingham, Wa. 98225

P.S. I use a IBM 360-40, IBM 7090 and also write in Course Writer III, BASIC, and a subset of PL/I called W.P.I. All three of these are available through the terminals.

And also, do you know where I can get a learning Tic-Tac-Toe program?



MORAL: IF YOU REALLY WANT TO DO SOMETHING ABOUT RESTORING BALANCE AND HARMONY AMONG THE LIFE FORMS ON THIS PLANET TURN UP YOUR SHIRT COLLAR, SCRAPE THE SHIT OFF IT, AND GIVE IT BACK TO THE INDIANS!



The New Alchemists

To Restore the Lands, Protect the Seas, And Inform the Earth's Stewards

Help a Kid Make a Konnection

Dear Sir(s),

I have recently moved from Corvallis, Oregon to Bellevue, Washington. In Corvallis I had access to a CDC 3300 and a Digital PDP 12. A friend of mine gave me some old copies of your newspaper.

I have not had any luck in finding a computer to use. So I would greatly appreciate it if you could send me a list containing the names & addresses (and possibly more information) of your subscribers in the Seattle, Bellevue area, to aid me in my "search". Any and all efforts will be appreciated!

Thank you!

Somebody help him out !!
A Friendly Computer Freak,
Stuart A. Celarier
Age 13, Grade 8
9925 NE 1st #36
Bellevue, Washington
98004

DESIGN-WISE

Dear Sirs,

We have an edu-25 system on a PDP-8e. We also have an optical mark card reader that we use for batch Basic. This card reader looks just like a terminal to the computer. The cards are a real help when we are teaching a class. The cards are terribly designed, we are trying to get our nerve up to print our own and redo handler. We will let you know if we do.

PRINCETON DAY SCHOOL Sincerely,
P. O. BOX 75 • THE GREAT ROAD, Thomas C. Pears IV
PRINCETON, NEW JERSEY 08540

Friends:

We have no computer people here but occasionally find that we could use one in certain portions of our research. I was wondering if during your communication with other computer people you would watch for individuals who might be interested in using their skills and resources to help develop improved ways of relating with nature and the environment. We are developing integrated agriculture/aquaculture/pure energy systems for decentralized communities, and feel that it's a shame that many of your contributors have only games to play. I think that if the proper individuals would be interested, the machines could be used to carry out many useful functions in such a scheme, such as garden layout planning (input being companion and antagonism relationships between species), solar heater designs for specific latitudes, windmill blade characteristics for various conditions, etc.

If you know of any of your acquaintances who may have interests along these lines, or anyone who may have suggestions on how we could apply computers as resources to what we are doing, I would be very happy to get in touch with them.

Yours for a kinder, greener world,
Earle Barnhart For New Alchemy

The New Alchemy Institute East

• P.O. Box 432 •

Woods Hole, Mass. 02543

Attention Hardware Phreaks BUILD A T.V. TYPEWRITER

Start on page 43 of the
September 1973 issue of
RADIO-ELECTRONICS Magazine.

60¢ ■ SEPT. 1973

Radio-Electronics

FOR MEN WITH IDEAS IN ELECTRONICS

BUILD A TV TYPEWRITER
Put Your Message On The Screen

HI-FI SPEAKER RATINGS
What They Really Mean

MASTER ANTENNA SYSTEMS
How To Wire A House

TV & FM ANTENNAS
For Best Pictures & Stereo

PLUS—
Jack Darr's Service Clinic
EL Coatings For Ion Tubes
Step-By-Step Troubleshooting
R-E's Replacement Transistor Directory

BUILD THIS TV TYPEWRITER
AND DISPLAY MESSAGES ON
YOUR SET'S SCREEN
DON LANCASTER

by DON LANCASTER

This construction project started out as a very low-cost computer terminal for home use, but as it went together, we became aware of the many possible noncomputer uses for such a device, particularly since it is priced right. What can you do with a machine that puts letters and numbers on an ordinary unmodified TV set?

Obviously, it's a computer terminal for timesharing services, schools, and experimental uses. It's a ham radio teletype terminal. Coupled to the right services, it can also display news, stock quotations, time, and weather. It's a communications aide for the deaf. It's a teaching machine, particularly good for helping preschoolers learn the alphabet and words. It also keeps them busy for hours as an educational toy.

GET THE COMPLETE STORY
The TV Typewriter is a very special story. Complete construction information, including full-size circuit-board patterns would require a long, multi-part article in Radio-Electronics.

To make it possible for interested readers to get full details of the unit and to immediately start construction, we are making available a special package of additional data, including complete construction details, more data on how it works, troubleshooting tables, connections and other important information. The cost of this 16-page package is \$2.00.

To order your construction details, send \$2.00 to:

TV TYPEWRITER
Radio-Electronics
45 E. 17 St.
New York, N.Y. 10003

JB BOOK

REVIEWS

Computers in Education Resource Handbook

From: Resource Handbook
Department of Computer Science
University of Oregon
Eugene, Oregon 97403

Price: \$10.00, ? pages [we didn't count them]
Weight: over 3½ pounds.

For those of you that are not aware, Oregon is one of the real leaders in using computers in schools. There is probably more school computing per capita in Oregon than anywhere in the country.

It is finally done. A book that will tell you damn near everything you could possibly want to know about using computers in education. It was written by a TEAM of experienced teachers in Oregon. It's good. It's complete. It's worth buying.

The objective of this *resource* book is "to aid teachers and administrators to increase their knowledge and understanding of the role and nature of computers in education". It's not a cover-to-cover reader for everyone. You can select the topics you are interested in and just read them. It is anticipated that the Handbook will be updated in the next 12 months (with YOUR feedback) and finally republished in late 74 (it was written in summer of 73). But you can buy it now.

It's Huge. More reading than any one person could read in a week. But it's complete . . . wow! We didn't read the whole thing (I can't believe *anybody* could read the WHOLE thing) but what we read was good, concise and to the point. Most chapters ended with abstracts of current articles that you can use for further reference. Some chapters ended with lists . . . lists of people, places and things that you should contact for further information.

Here are the chapter titles and some of my reactions:

Chapter I - Purpose of the Book.

Chapter II - Computers in Education. A technical overview along with a huge glossary of terms plus an attempt to answer the question - Why use computers in education? - good reading.

Chapter III - Teaching about the Computer. All about teaching computer literacy, computer programming and computer science. Even a "how to use the CARDIAC" paper computer section.

Chapter IV - The Computer as an Aid to Learning. Use of simulation programs, packaged programs, and information retrieval systems. Pleased to see some time devoted to junior high computer usage though they don't feel much impact has taken place, yet.

Chapter V - The Computer as a Teacher. Computer Assisted Instruction (CAI) and overview with some comments on its impact (little) and it's future (maybe).

Chapter VI - The Computer as a Classroom Management Tool. A brief look at CMI mainly centered on Project PLAN. I was surprised to see no mention of Comprehensive Achievement Monitoring (CAM).

Chapter VII - Administrative Uses of Computers. A quick look at what can be done with emphasis on how to train administrators

in the use of computers. A pertinent comment that administrators don't need to know everything but they **SHOULDN'T BE NOVICES EITHER.**

Chapter VIII - Computing Facilities. They used our past issues for reference (plus a lot of other things) and came up with an outstanding chapter. A little about bidding, an excellent article called "Some Hardware and Software Considerations" (which we will reprint in an upcoming SPECIAL ISSUE), a lovely commentary on your computer lab (minimize supervision to maximize usage) and some good information on computer networks.

Chapter IX - Computers in Special Education. Nothing written yet. Any of you care to contribute?

Chapter X - Surveys. Abstracts of surveys mostly covering who is doing and how many schools have computers and how they are used. Nothing on how effective computers are in learning.

Chapter XI - Computers in Research.

Chapter XII - Inservice Training. It's importance and a brief set of suggestions on how to teach teachers how to use computers.

Chapter XIII - Sources of Additional Information. Books, periodicals, non-print materials, places to visit, people to talk to, major projects . . . a complete list of resources.

One criticism. No mention of any evidence that computers are EFFECTIVE in improving kids learning or understanding. If such evidence is available, I wish someone would let me and the authors know about it. Such information would add frosting to this cake of a handbook. It would also help those poor souls who are trying to justify computer acquisition and run into the "cost effective" freaks that are frequenting school boards these days. (No offense gang, it's just hard to justify a computer these days on a cost effective basis with no evidence that it IS cost effective.)

If you're starting, in the middle and even if you THINK you know it all, get this Handbook - it's excellent.

LeRoy



Computer Conversations (Speaking in BASIC)

Ten Most Wanted Natural Numbers \$500 Reward

Teachers, Junior and Senior High:

Looking for a set of programming problems for your students with a high interest value, lots of challenge, and wide ability range? Then this collection may just be the starter set you have been looking for.

We say "starter set" for several reasons. The problems (41 of them) are on 5x8 cards, hence easily added to, rearranged, filed, grouped by types of problems, etc. You can give the whole deck to the students and have them choose problems to work on, or post one a day or one a week on the bulletin board in the computer room (i.e. "Problem of the Week"). As you or your students think of problems, they can be easily added to the deck. In fact, we would like to suggest that as problems are added, you share them with the authors and others (maybe through PCC?).

Most of the problems are in the category of "Number Theory". For example:

Problem #6:

"If the sum $1 + 2 + 3 + \dots + K$ is a perfect square (N^2) and if N is less than 100, what are the possible values of K ?"

Some have a very practical twist. For example:

Problem #21:

"There are 10 simple animals in a laboratory culture and enough food for 1000 such animals at time zero (the present). Every hour, the population doubles and enough food is added to the culture to feed 4000 more animals than at the previous hour. When, if ever, will the population outgrow the food supply?"

We did not find any problems that required more than a knowledge of simple algebra. Most require only some logical thinking. Some are easy enough for the beginning programmer. Others are quite challenging.

The Teacher's Guide contains listings of suggested programs (annotated) with some hints on how to use the cards.

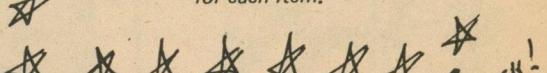
One thing we found for sure. Any student who attempts a number of these problems will come out with a thorough knowledge of loops, nested and otherwise!

Jim Norton



From: The Math Group
5625 Girard Ave. So.
Minneapolis, Mn 55419

Price: Cards: \$3.00 per set
Tchr's Guide: \$2.00 each
Add 15¢ Postage & Handling
for each item.



crunch!

The Adventures of TAXMAN: In Which Max and Minnie Meet Scram

[Ed. Note: See PCC Vol. 2, No. 1 (September 1973), Page 6 for an explanation of TAXMAN, HANDTAX, TAXMAX, and TAXMIN.]

Dear Max,

Keep your chin(s) up -- we found out how you can get the MAXIMUM score for the list with ten numbers (your score is 40, the Taxman's is 15).

HANDTAX shows how to do it.

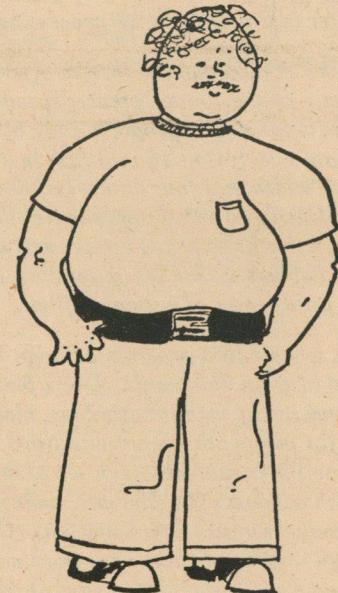
1 3 2 5 4 3 1 5 2 4
X X X * X 6 7 8 9 10

You get $7 + 9 + 6 + 10 + 8 = 40$; the Taxman gets $1 + 3 + 2 + 5 + 4 = 15$.

And here's a way to prove it's the *maximum* score.

The Taxman must get at *least* half the numbers in the list (i.e., at *least* 5 numbers) since he has to get at *least* one factor every time you choose a number. Therefore, you can get at *most* 5 numbers. Since you are able to pick the *largest* 5, you have the *maximum*!

We have formed a chapter of the Society for the Creation of a Routine Appropriate for Max (SCRAM). We are enclosing our charter and membership information.



Hoping you can get all that's coming to you,
SCRAM

Dear Minnie,

We find your problem to be of great interest to us. We have discovered how to get the MINIMUM score for the list with twenty numbers (your score is 40, the Taxman's is 170).

HANDTAX shows how to do it.

1 3 2 5 4 3 1 5 2 4 T
X X X * X 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

And here's a way to prove it's the *minimum* score.

The integers 1-5 are in the first quarter of the list; 6-10 are in the second quarter; and 11-20 are in the second half.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
First quarter Second quarter Second half



If an integer m from the second quarter (6-10) is never chosen by you, then you will have to take either $n_1 = 2*m$ which is *always* in the second half, or $n_2 = 3*m$ which *may be* in the second half. Notice that $4*m$ is always too large to be in the second half of the list.

Conversely, choosing an integer r from the second half can eliminate at *most* two factors (s_1 and s_2) from the second quarter (and maybe some factors from the first quarter). This would mean that $r = 2*s_1$, and $r = 3*s_2$. But then $s_1 + s_2 < r$ so you would always get a *smaller* score by choosing s_1 and s_2 (if you could) rather than r . Therefore, the *lowest possible score must be at least the sum of the integers in the second quarter* -- in this case, the lowest score must be at *least* $6 + 7 + 8 + 9 + 10 = 40$.

But we were able to play TAXMAN giving up all the integers *except* those in the second quarter for a score of 40! Therefore, we have found the *minimum* score.

We have formed a chapter of the Society for the Creation of a Routine Appropriate for Minnie (SCRAM). We are enclosing our charter and membership information.

Hoping you can accumulate as little as possible,
SCRAM

[Ed. Note: What SCRAM is really saying to Minnie is that if you didn't take 6 or 7 or 8 or 9 or 10, you would have to take 12 or 14 or 16 or 18 or 20 (twice what you didn't take) and that you'll always end up with a higher score by doing it that way.]

[Ed. Note: It seemed a heavy burden, indeed, to have to inform the SCRAM chapters that their choices of names were ambiguous (one was formed for MAX, the other for MINNIE). But I noticed an *incredible coincidence* -- the strategy used for TAXMAX with a 10-number list was *identical* to the strategy used for TAXMIN with a 20-number list!! I have forwarded this observation to each SCRAM chapter along with the suggestion of the formation of a joint group, the Society for the Creation of a Routine Appropriate for Max and Minnie (SCRAMM).]



FIGURE 19

**** OFFICIAL TAXMAN COUPON ****

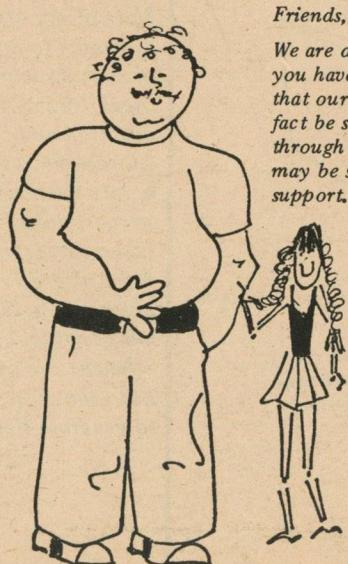
- Enclosed are hints, strategies, and results from plays of TAXMAN.
- I wish to join my local SCRAMM.
- I want to form a local SCRAMM. Please enclose the charter and membership information.
- I am enclosing \$ to support an international SCRAMM drive.

NAME: _____

ADDRESS: _____

Mail to: TAXMAN
c/o PCC
P.O. Box 310
Menlo Park, Ca 94025

Try some other lists for Max and Minnie -- in particular, try a list for Max and then play TAXMIN with a list that is twice that size.



Friends,

We are deeply gratified by the progress you have made. It is our sincere hope that our individual problems may in fact be somehow connected and that through a joint SCRAMM effort they may be solved. Thank you for your support.

What is the connection between TAXMAX and TAXMIN? Was this just a coincidence or is it the beginning of a lasting relationship? What complications might the TAXMAN have in store for our heroic couple? Be sure not to miss the next thrill-packed issue!



Curses! So Max and Minnie are joining forces. But there are complications (sneer) they've never dreamed of -- chortle, chortle.



Dear Pam,

Thank you for the chance to express some thoughts on computer art and its future. My academic background is in mathematics and my present job is not directly involved with computer graphics. But I have been interested in its esthetic possibilities for three years and presently have access to a DatagraphiX 4460 Computer Output Microfilm (COM) recorder. This is operated offline from tapes generated by an IBM 7094 computer in a strictly batch processing environment.

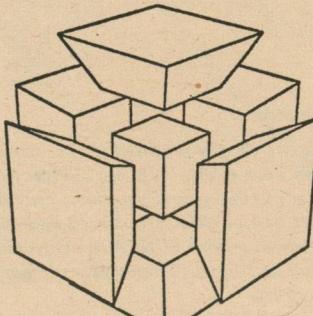
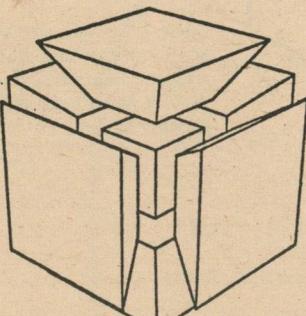
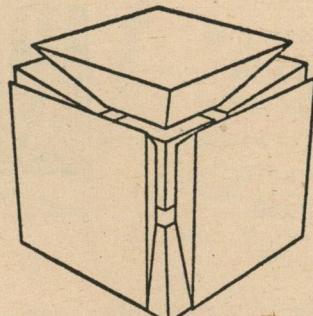
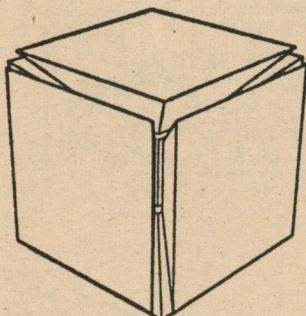
I think that electronic graphics devices offer more esthetic potential than mechanical plotters because of their much greater speed and because of their greater variety of graphical effects subject to program control. For example, the COM recorder I am now using plots a vector on 16 mm film in about 4 milliseconds, and there are four choices of line width and four choices of line intensity. Color is already available at some installations (see Popular Science, February, 1973). High costs and the difficulty in getting large prints are present drawbacks to COM. But the great speed of electronic displays allows the generation of numerous modifications of a design or the direct production of animated films.

For example, when I first program a design I make certain features variables which are to be read in from data cards. These features may include line width, a starting seed for a sequence of random numbers, placement and relative size of components, a view point for perspective representations, the number of points on a star, and so on. In one computer run each such set of design parameters is acted upon by the program which advances the film and makes separate plots. Thus simply adding data cards produces entire new variations. Of course in the debug stages an interactive terminal display of these variations would be a great help. This parametrization of designs and the resulting ease of total modification is a distinctive aspect of computer art and permits the "mass production" of different prints. A computer artist could market his work as an edition of unique prints.

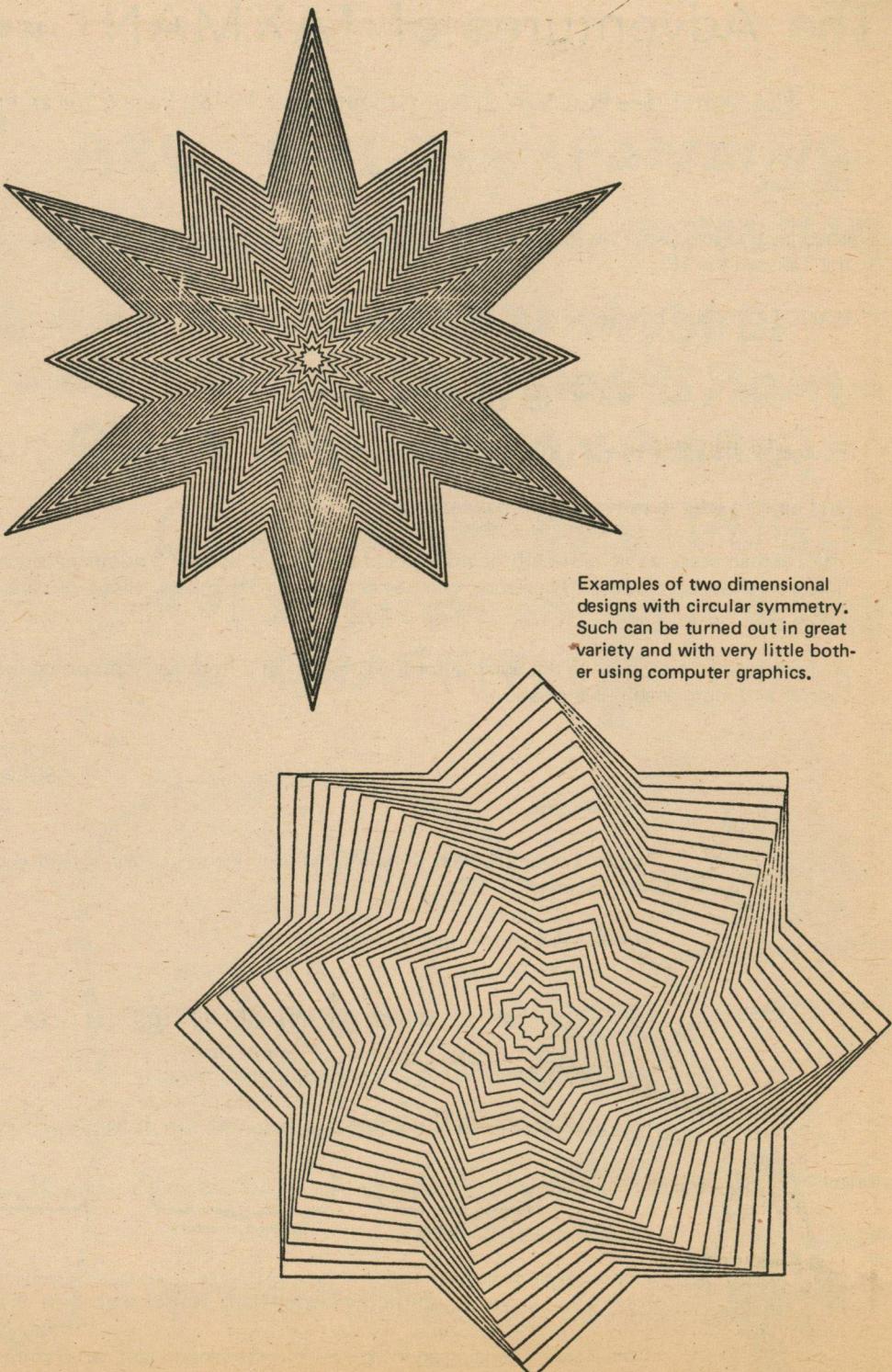
I do not think computer graphics can enter into and compete with most painting traditions, with the possible exception of certain hard edge or linear styles. But it should be increasingly applied in areas of commercial art such as advertising, fabric design, educational illustration, and architecture. Uniform coloring of an area with plotters is technically difficult and I feel computer art would be more impressive if there was more manual and photographic modification of the output. Collaboration of commercial artists and programmers should be productive.

I do think that computer graphics makes possible whole new modes of esthetic expression that will produce dazzling visual experiences in the coming decades. Computer animated geometrical designs are a well known example. The color film *Permutations* by John Whitney and Jack Citron is an impressive sequence of transforming mandalas. Newer technology makes such work easier and I am sure there are more recent examples I haven't seen. For cost reasons I haven't made a film using COM but the basic programming is simple in principle – in a large loop an image is incrementally transformed, plotted, and the film is advanced one frame.

I expect to see more interpretive color displays of sound (music) on home television screens. Perhaps all present attempts use analog methods; but digital processing in the conversion of sound to an image might be tried. Digressing here, my guess is that a clever real time visual display of vocal sounds would give a deaf child the understanding of speech and the feedback to learn to speak. This might be the fastest way for anyone to learn to speak, and if the display included the letters spoken (a difficult programming feat given our present language and spelling) one might learn to read at the same time, at a very early age. In any case this present ability of the mind to express itself instantly in pictures suggests possibilities of some higher order visual communication system evolving. Such a language of light could use the full capability of the retina (e.g., parallel processing) rather than using it as a model of the ear as a printed phonetic alphabet does. I don't have the technical background to work in this area now; but it's fun to speculate about and if I ever return to school I may get into it.



Hypercube Dilation. A demonstration of animation possibilities in 4 frames. Seven cells of a 4-dimensional "hypercube" are progressively contracted about their centers and projected into three dimensional space. An easy program if general geometrical subroutines are available.



Examples of two dimensional designs with circular symmetry. Such can be turned out in great variety and with very little bother using computer graphics.

* I wrote to several computer artists and asked them to send me their thoughts about computer art and some copies of their work. Here is what I received from Dan Van Arsdale.

Another new artistic medium made possible by the accuracy of computer graphics is stereoscopic art. Stereo pairs of drawings are easy to produce – one just plots two projections from displaced eye positions. Although the first stereoscopic images seen were manual drawings by Wheatstone, the drafting difficulties prevented any important artistic applications and the whole idea became associated with photographic ultrarealism. A stereoscope should be looked upon as simply a device to present separate images to the eyes, and these images do not have to be restricted to separate views of a single spatial configuration. The most promising idea here is to use "binocular rivalry" effects. This is the presentation of unmatched and conflicting colors and contours to corresponding parts of the left and right retinas. Reactions are very individualistic and color rivalries can cause the appearance of lustre, alternations of colors, or even the additive light mixture of the two – an effect much sought by the impressionist painter. Dynamically changing perceptions produced by binocular rivalry are the experience of processes in the visual cortex at the back of the brain, processes that search for a unified interpretation of the stimuli. Work in "binocular art" is going to be esthetically difficult (e.g., avoiding visual discomfort) and quality presentation requires a 35 mm stereo slide viewer. Still this is something I would particularly enjoy experimenting with in the future. Some simple stereo films have already been made using COM. But imagine the possibilities of a full color stereoscopic film with music and rivalry effects in the images. This could be a fantastic neurological excursion.

Most of my effort in computer graphics has been in the development of general programs to assist in the production of line drawings – not in the actual production of such drawings. The result is a package of FORTRAN subroutines with such capabilities as reflection, rotation, duplication, cross sections, automatic viewpoint selection and scaling, hidden line deletion, and a repertoire of stored polyhedra. All procedures work for two, three, or four dimensional figures and are independent of any particular graphics device except for a single statement. These programs are particularly suited for esthetic and educational uses of plotters and I hope I can find another job this year that involves a continuation of this work or other graphics applications. Also I look forward to more experimentation and production of computer art itself, preferably in collaboration with artists or photographers. Programming as it is, I see computer art as a disciplined undertaking, and requiring the efficient use of expensive machines. Eventually it may be easier and cheaper. But even with the present technology I believe computer art has the capability to generate the most exciting visual experiences of the twentieth century.

Daniel W. Van Arsdale
5361 Perkins Rd., No. 5
Oxnard, California 93030



the films of JOHN WHITNEY

16mm sound films

Title	Minutes	Price	Rental
Permutations	7	120.00	10.00
Osaka 1-2-3	3	40.00	10.00
Matrix	6	100.00	10.00

All are in color, except Osaka 1-2-3.

Pyramid Films

Box 1048
Santa Monica
California 90406

(This is an
excerpt from
an article
written about
John sent us)

John has done other films using various interesting mechanical processes - write Pyramid Films or Museum of Modern Art for a complete list - J.W. (See Jan. 1971 AMERICAN CINEMATOGRAPHER) 9

DATE

8/8/73

Dear Jerry: Delighted with your paper - hope I can contribute somehow

The enclosures refer to Pyramid and Museum of Modern Art as source for my films
my wife or I will pay a visit next time

SIGNED

John H. Whitney

INFORMATION PROCESSING 71 - NORTH-HOLLAND PUBLISHING COMPANY (1972)

Invited Papers Sciences and Humanities

A COMPUTER ART FOR THE VIDEO PICTURE WALL

John H. WHITNEY

600 Erskine Drive, Pacific Palisades, California 90272, USA

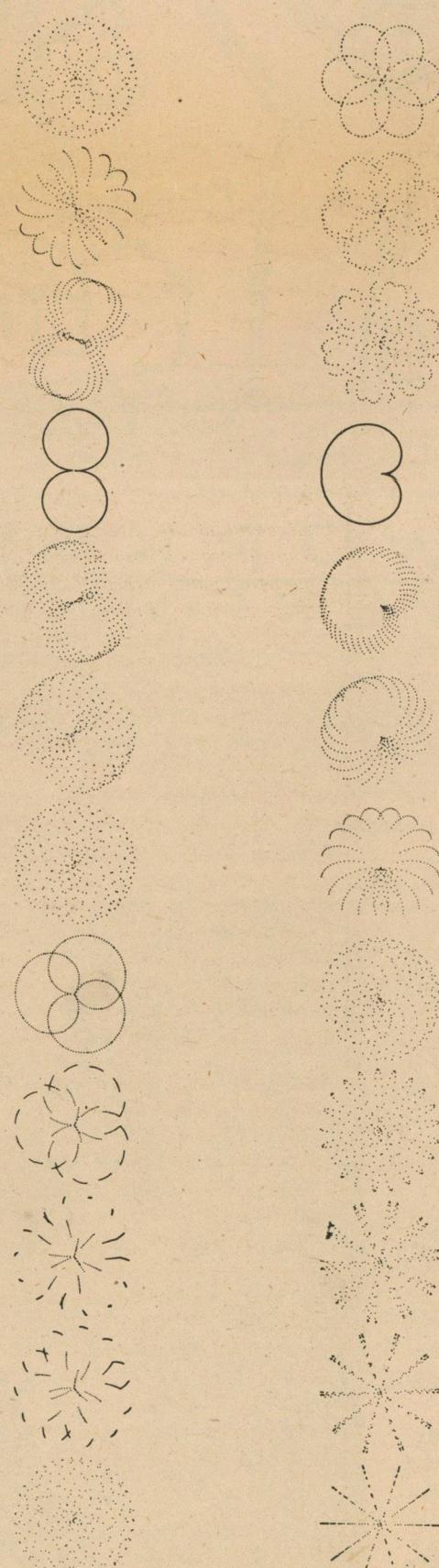


Fig. 1.

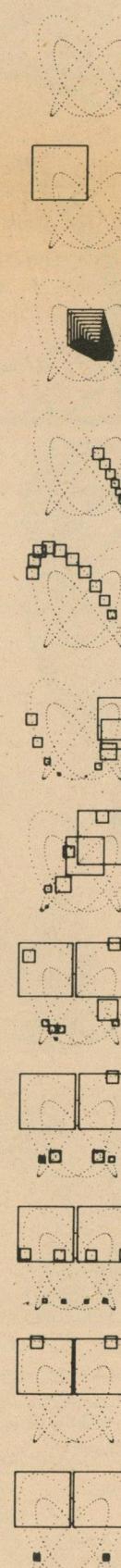


Fig. 2.

If you were to watch the picture on the screen 24 new pictures a second are displayed and you can see changes taking place sometimes very rapidly and sometimes quite slowly. This rate is determined by the size of the incremental steps, or the parametric changes, as they are written into the basic equation. Points seem to be scattered around in a circular area randomly at one moment. But at certain moments they all seem to fall in line to make up some simple rose curve, symmetrical figure; sometimes it is a three lobed figure, or ten or four or two lobed figure.

These action sequences proceeding from order to disorder and back to ordered patterning, suggest a parallel to harmonic phenomena of the musical scale. In an aesthetic sense, they have the same effect; the tensional effects of consonance and dissonance. The scattered points fall into some ordered symmetrical figure when all the numerical values of the equation reach some integer or whole number set of ratios. The effect is to subtly generate and resolve tension which is similar to the primary emotional power of music composition. Incidentally, the link between mathematics and music having been remarked, it is particularly the whole number harmonic ratios which support such suppositions.

It is unfortunate that the static illustrations to this text do not begin to show what is already a rather subtle and fleeting experience in the motion picture film. Musical illustrations to any text on that subject usually presume that the reader may perform the illustration if need be. That is, of course, impossible here. Yet this is the best and simplest illustration I have so far. This may suggest how a motion graphic parallel to the harmonic phenomena of music is beginning to take shape. It is a clue as to how visual form may be shaped into periodic elements for the construction in time and space of moving visual elements of nascent time-oriented abstract art.

As a second illustration of periodic visual harmonic structure, a few frames have been selected (in the same manner as fig. 1) from the film MATRIX.*

Instead of the simple circular pathway of PERMUTATIONS, now, in MATRIX, the pathway is a more complex orbit which folds around and back on itself and extends in three dimensional x, y, z, space. (See first frame of fig. 2.) All action moves along this path and the visual harmonic principle has become more sophisticated. Lines and cubes move around this orbit path in the film, but in this example, I will show what happens to the cluster of squares. Each square moves independently of its neighbor. The lead square has the fastest rate. Each following square is moving slightly slower. So the squares spread out along their orbit. The lead square "laps" the slowest moving square, like cars on a race track. However, chance is not the controlling factor. The factor of whole number ratios is at work here as in the previous illustration. Harmonic phenomena dictates that sooner or later this apparent randomness will be punctuated by an orderly arrangement of these squares just as the random array of points in PERMUTATIONS fall into rose curve patterns. (See last three frames of fig. 2.)

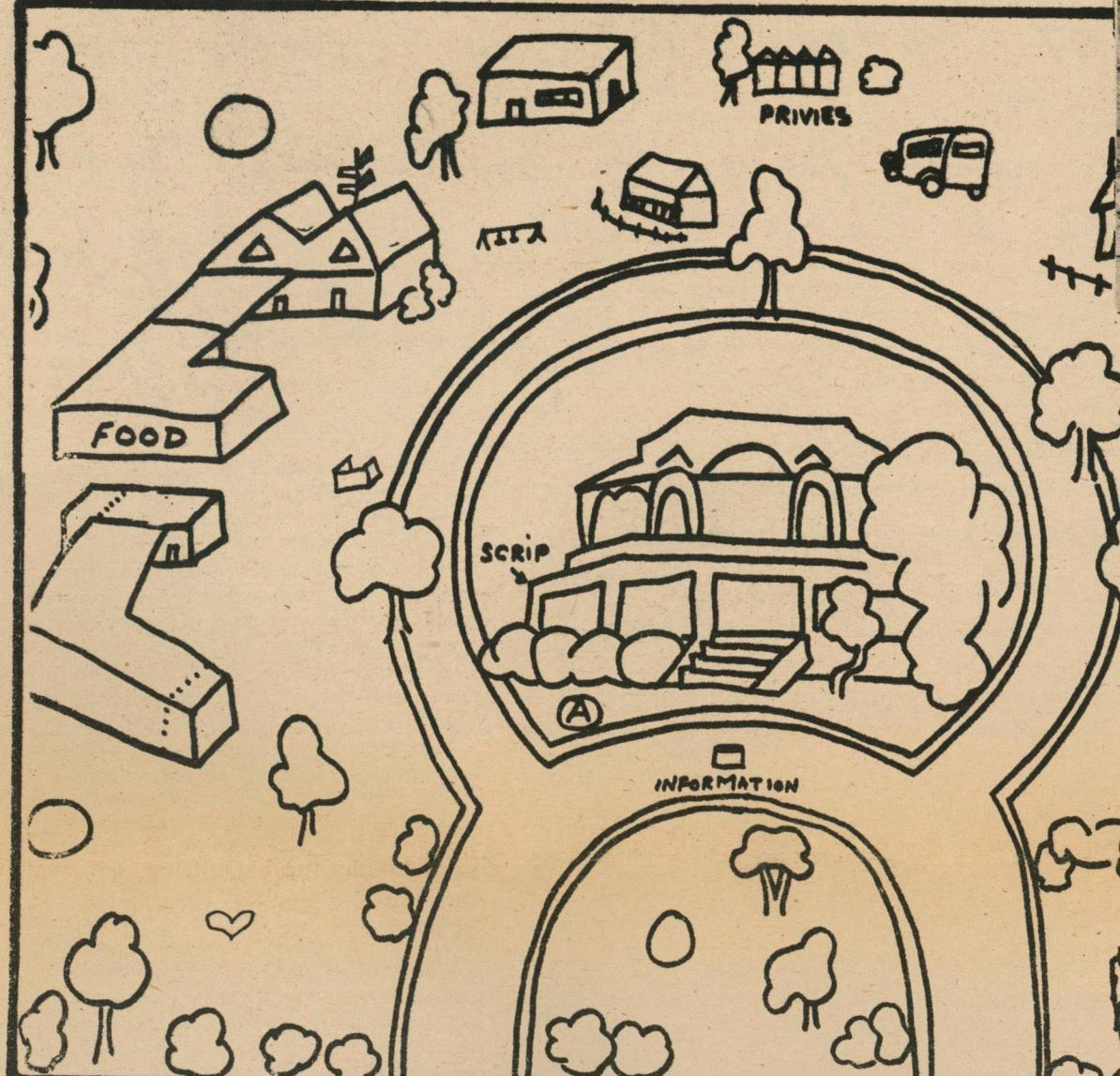
So MATRIX too is another exercise in visual harmonic composition. It too, I think, is rather clumsy; as you would expect from beginning exercises of a youthful composer's first note book. I am not that young, but I hope you can share with me what promise I see in all this.

* PERMUTATIONS 7 min. This film is available from the Museum of Modern Art, New York or Pyramid Films, Box 1048, Santa Monica, California 90406.

* MATRIX 6 min. This film is available from the Museum of Modern Art, New York or Pyramid Films, Box 1048, Santa Monica, California 90406.

THIS WAS THE 2ND ^{super}^{ecstatic} completely creditable SCHOOL LEARNING FAIR

COUPON FOR MORE INFORMATION
ABOUT HOW TO HAVE A LEARNING
FAIR SEND ME TO:
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PENINSULA SCHOOL, LTD.
PENINSULA WAY, MENLO PARK, CA 94025



Creative Dramatics for Young Children... Yoga... Environmental Awareness Game... Captain Flash's Incredible Funky Laser Light Show... Hypnotic perceptibility... Sight Singing... Games of the Plains Indians... Weaving techniques... Exercise in Imagination... Primary Potpourri... Discovering Life in the Bay... Gestalt Dream work and Fantasy... What's Cooking with Kids... Exploring and Allowing Through Psychosynthesis... Integrating Dance and Movement with Science... Movement... Space and Movement...

Making Films With Children, Children's Films, Art, and Children... Music concepts and Games... Family Movement...

WORKSHOPS ↑ ↓ PERFORMANCES

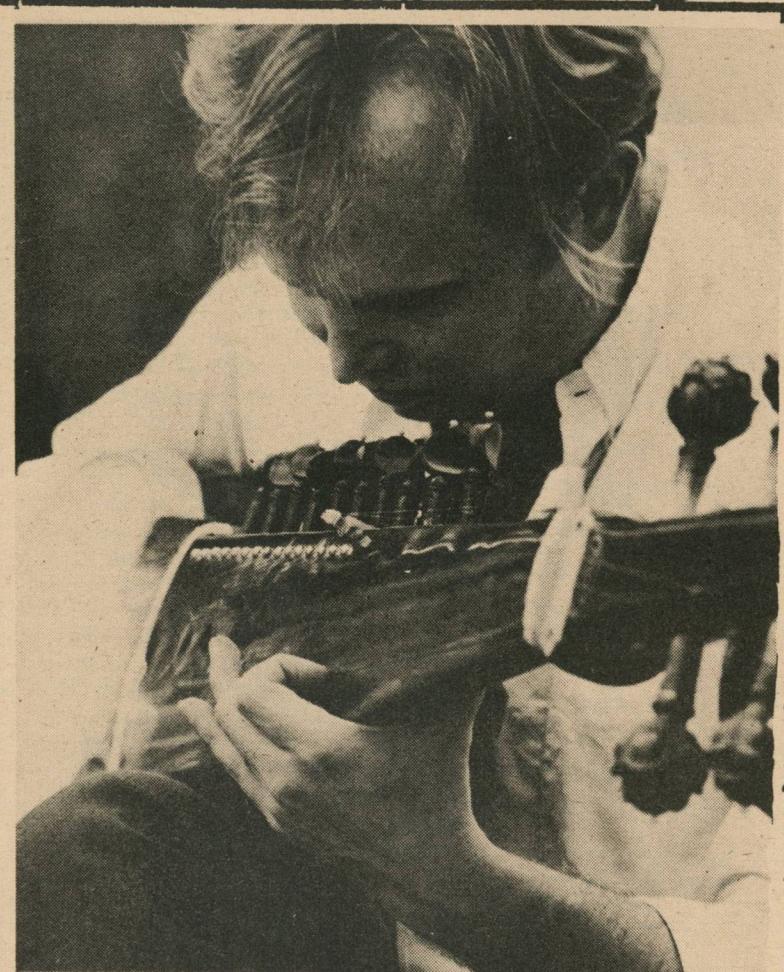
Karate Demonstration... Aikido Demonstration... T'ai Chi Demonstration... Brabner and Sheridan... Sky Piece Environmental Experience...

DISCUSSIONS ↓

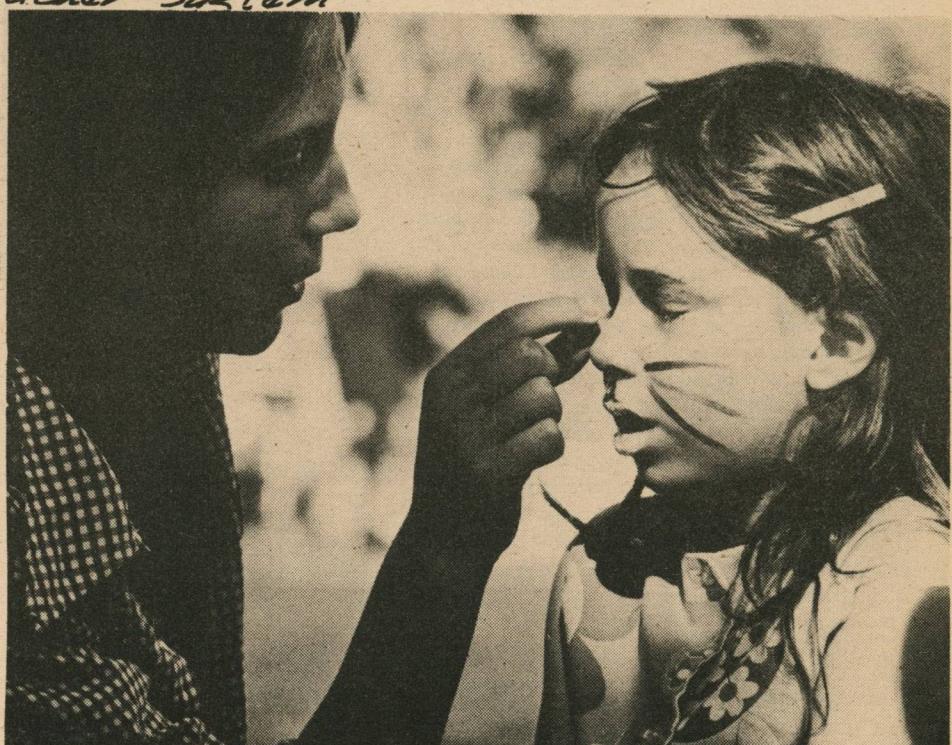
Talking about Peninsula School... Peninsula graduates talk about high school for parents of Jr. high kids... Sexism in Children's literature... Alum Rock Voucher System

AND ↓

Information Network... Mary Jo's Bookstore... Kai Old Wood Wooden Toys, Games, Furniture, Tarot Reading... Paper Bag Sculpture...



Briarpatch Car Maintenance Clinic... Solar Energy, Work shop... Windmills... Lawrence Hall of Science... Clay... Batik... Egg drop Experiment... Ghosts, Geobright Modular Building Construction... Toothpick sculpture... Bottlers... Clicks by Clicks... Fairy Tale Game... Potato Printing... Make up... Tree 100m... wire sculpture... Polarity Massage Pain Chaser Clinic... Photo printing... Slot car city... Moth Games... People's Computer Company



NEW GAMES TOURNAMENT

11

Do you like to play? I guess we all do. PCC was invited to bring its computer games to an event organized by Stewart Brand and Pat Farrington. The event being a collection of weird games and activity open to participation by those admitted (\$2.50 a day) to the Gerbode Wildlife Preserve October 19 - 21.

Friday morning we loaded the dragon and my double cab pickup with: a HP 9830, 13 game tapes, public caves tape, reversi, tooter, and other fun stuff, food, a cooler, propane stoves, tables, sleeping bags, not enough tents, my experimental hang glider, and the gang of us: Bob, Pam, Dave, Howie, Marc, Shel, Wally, Lois, Fred, Chiqui, and two bottles of fine Sherry. We arrived at a small grassy valley surrounded by hills, wind, and incoming fog. We unloaded at a cluster of hyperbolic tent structures. An Army power generator supplied our a.c.

Games and such were in progress, spread out here and there in the distance. I'll just mention some of the many we observed and/or joined in: a fine demonstra-

PONG



BOFFING

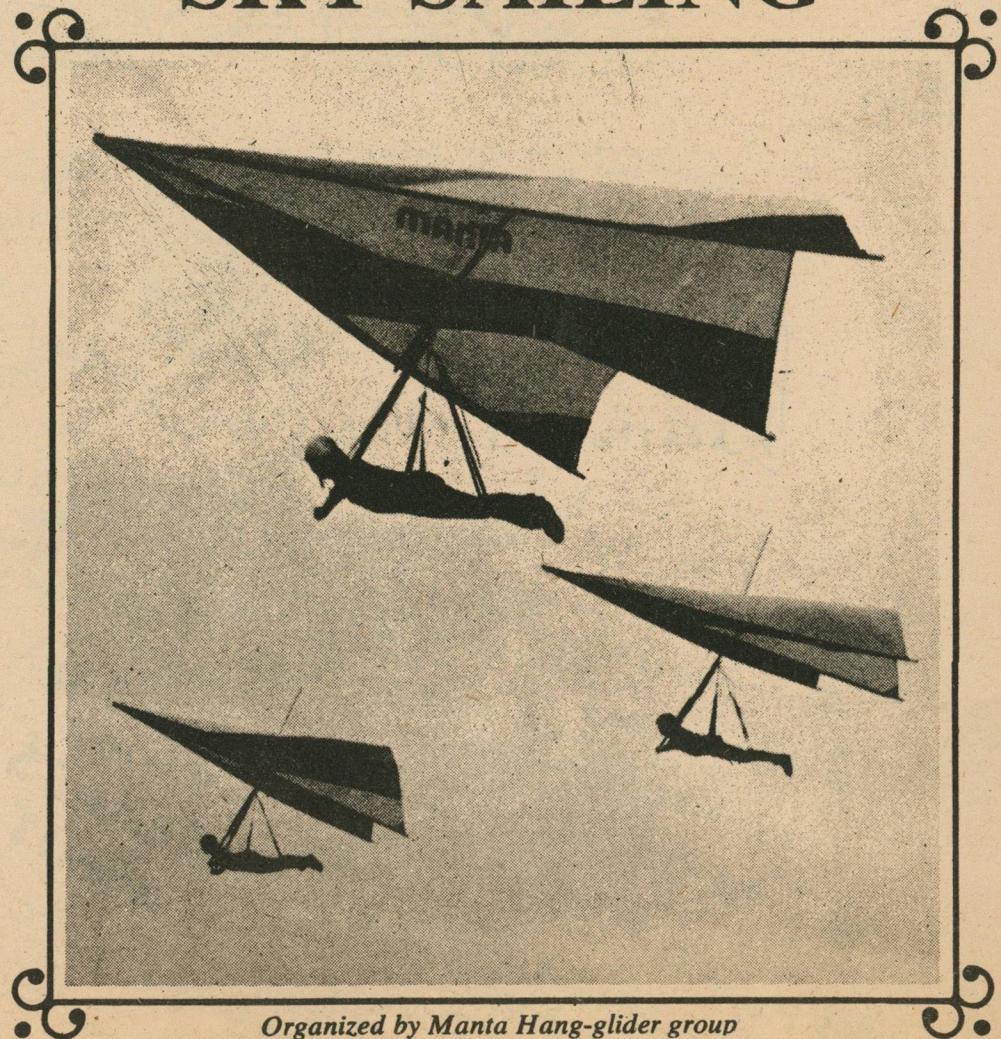


Mike Pasaro and Charles Selberg (organizer)

"Play hard, play fair, nobody hurt."

Wavy Gravy

SKY SAILING



Organized by Mania Hang-glider group

tion of Aikido, furious boffing, volleyball with variations (simultaneous serving), string kites and helium balloons dancing in the sky, Manta Rogallo wings descending from the hills, 100 people rope tug-of war across a gully, six foot diameter earthball game—knocking the world around, new frisbee demonstrated, Mexican stand off, a rough game of Do Do Do—an ancient Tibetan game which is a combination of tag, tackle, and safety zones, capture the flag, . . .

Four Generations had a tent with a variety of quality board games: Old Mill, Impasse, Go, Go-moku, Parchesi, Karma, Nine-in-row, chess, etc. Pacific High/Hog Farm ran a soup and sandwich shop. Saturday nite Gary Snyder explained and started the Bone game, a traditional Northwest Indian guessing game accompanied by chanting and energetic psychological confusion.

In the same area with our computer games of the keyboard & paper printout type were several very popular TV screen display computer games: Pong, Pong Doubles, Spacerace, and Gotcha (these are manufactured by ATARI 14600 Winchester Blvd., Los Gatos, Ca. 415-374-2440). Spartan International brought some TV spacewar games and the Diplomacy board game.

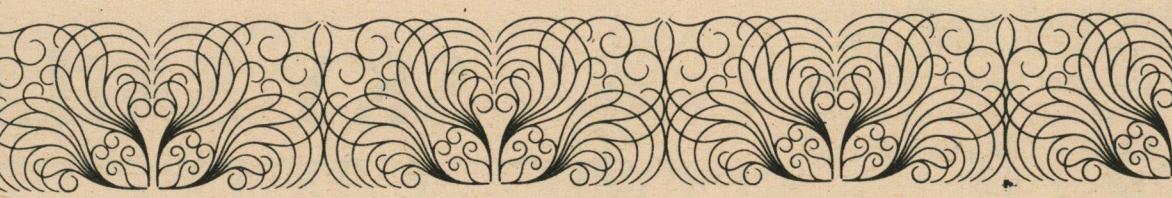
T'was a fun time for the 800 or so enthusiasts there that sunny Saturday. High winds and wet came during the night. Sunday the event was cancelled. We packed up and left tired. Yet as we rode home we chatted merrily about the games we had enjoyed most.

--- Fred Moore

IE ± E

Special PCC -

LEFT



EARTH SCIENTISTS DISCOVER GIANT ICKY THINGS Oozing GUCK WHICH(WHO) WANT OUR WOMEN AND ARE NOT AT ALL RADIOACTIVE AND.....
CAN OT BE KILLED BY A PLEASANT CROWD OF PEASANTS WITH TEARGAS AND TORCHES BUT..... THEY FALL IN LOVE WITH DISGUSTING LUMPS OF PLASTIC

THE END

PROGRAM OF THE DEATH CENTURY
10 GOT TO 10
09 END

PCC IS PERFECT FOR FRESHA FISHA

322-4424
How Bout IT 88

BERTONIS
FRESHA
FISHA
MARKET

ELECTRONOTES NEWSLETTER

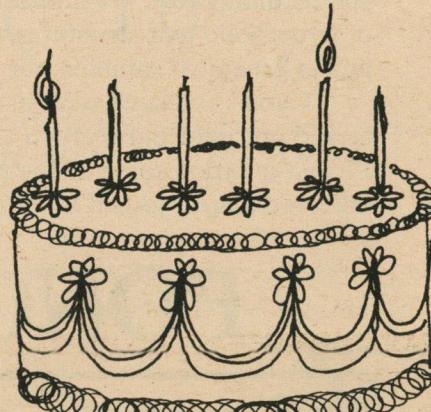
STORY #89

MINI-COMPUTER MANUFACTURERS INVENT THE WORLD AND.....
WHICH(WHO) TAKES OVER THE WORLD AND.....
EVERYONE LIVES HAPPILY EVER AF*5%*!-X;?V!?!
*** SYSTEM COMING DOWN IN FIVE MINUTES - PLEASE LOG OFF ***
AND EVERYBODY LOSES

THE END

SLASH YOUR ZEROES DAMMIT!

How about adding a candle for us people over 63?



(How old am I?)

Binary B
for people

Plant in whole intersection at Market and Van Ness, S.F.
full of 2-tips
merry-golds
photograph batzen flowers, etc.
Monday morning

how often is that so fortuitous?

Computers And Teaching An Interactive Newsletter
Northwestern University Computer Aids to Teaching project

CONFERENCE

On Computer-based Learning/Living and Information Exchanges

WHEN: November 26, 1973
9 a.m. -- The Learning System. What we're talking about. Learning exchanges, etc.
10 a.m. -- The Computer's capabilities. What it can and cannot do. How it all fits in.
11 a.m. -- Discussion of existing and planned systems, Marian Park, Evanston Learning Exchange.
12 noon -- Lunch. Bring your own in a bag, or go to any of a number of convenient spots.
1 p.m. -- Round-table discussions and some strategy sessions for the Chicago area. Ending about 4.
6:30 p.m. -- Recapitulation for all who could not attend the daytime sessions. E70 Seminar.

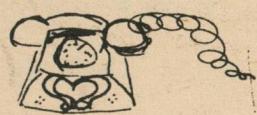
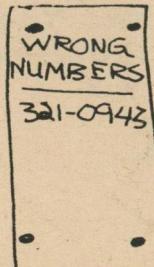
PARTICIPATION: The number of participants must be limited to about 50, because of the facilities available. Participants may call 492-5367 for more information. Registrants will be asked to pay \$5.00 each, and will receive a packet of background materials (including Illich's Deschooling Society, The Learning System article and other goodies).

Kiss
How many motors is it
Lynn

Simulation Gaming News, an Alohn and Hyer publication, is issued five times a year (every other month except in the summer). Subscriptions are \$4 for five issues, and checks (not purchase orders) should accompany subscription requests. Zip codes also should be supplied. Advertising rates and specifications are available upon request. Communications should be addressed to S/G/N, Box 3039, University Station, Moscow, Idaho 83843.

SPECIAL STAR TRADER WILL APPEAR IN THE NOVEMBER ISSUE, WHICH WILL BE A SCI FI ISH.

Write TAXMAN today!
(See page 7.)

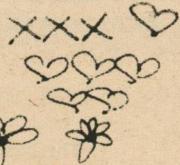


STORY # 87

EARTH FALLS INTO THE SUN AND EVERYBODY DIES

THE END

Luv, PCC



EARTH IS ATTACKED BY GIANT GREY SPOTTED EXTRAGALACTIC DWARFS WHICH(WHO) MISUNDERSTAND US AND ARE NOT AT ALL RADIOACTIVE THEY CANNOT BE KILLED BY A CROWD OF ANGERED DWARFS THEY WATCH OLD NIXON SPEECHES AND THEY.... LEAVE THE END

BOTTOM?

P
9 Menlo Ave
Menlo Park
CA 94025

WRAPPING

and design of electronic music systems and

~ Graffiti Pages

13

Write a program to find consecutive numbers (heh-heh!) in a composite base (or base n) why not a base 5? Number guessing game. Write a number guessing game for BASIC game that plays with numbers in any base! We would like a BASIC game for PCP's that plays one potato, two potato, three potato, six... that's perfect!

Birthday Cake
over 30...

N CHEERS FOR PCC
WHAT'S $2 \times N \times 4$ ← that's e.g. as π.

Serious Staff
LOGIC FOR THE
TRULY
INTERESTED

LOGIC NEWSLETTER
NO. 509 6 VOLUME

LOGIC NEWSLETTER
POB 252
WALDWICK NJ
07463

RIGHT

EARTH IS ATTACKED BY GIANT EXTRAGALACTIC ICY THINGS DOZING GUCK
WHICH WHO LOOK UPON US AS A SOURCE OF NOURISHMENT AND EAT US ALL UP! YUMMY
THE END

PINK NOISE SOURCES AND DIGITAL SYNTHESIZERS
PRINT "HOW MUCH ANTI-GRAVITY"
330 IT DEPENDS ON HOW MANY CHIMPANZEES YOU GOT

ON THE TELETYPE?

There's this great magazine, see,
and it's published in London monthly.

A one-year subscription is \$9.

Send your name and mailing address to:

GAMES AND PUZZLES MAGAZINE

Box 1176, Palo Alto, Ca. 94302

(don't forget to send the nine bucks)

Sample Issue? Send \$1

NAME A POST FIX
OPERATOR
COMMONLY
USED IN
MATHEMATICS!

IT'S
OUR COMPUTER
MARK

IN WHAT
BASE IS
'212'
A PALINDROME?
IN WHAT BASE
IS THE NAME
FOR 'FOURTEEN'
A PALINDROME?

POTATO BUGS
D. TORCHES BUT.....

ANSWER: A BRAIN BACKWARDS!
NAME A COMPUTER
ENTIRELY OUT OF
MEAT!

A GUIDE TO CRT's

For lots of REASONABLY
DECIPHERABLE INFO ON
CRT's (CATHODE RAY TUBE terminals)
BEG, BORROW OR STEAL THE Sept '73
ISSUE of COMPUTER DECISIONS

Hayden Publishing Co., Inc., P.O. Box 302, Rochelle Park NJ 07662

WRITE: B.A. HUTCHINS
60 SHERATON DRIVE
ITHACA NY 14850

ALTHOUGH THE MOON IS MUCH SMALLER THAN THE EARTH,
IT IS A GREAT DEAL FURTHER AWAY.

Anyone have any computer stuff
for the ISCS science materials?
Write LeRoy at PCC if you do!



Visit the
Public Cares
appearing in a computer
near you

LEROY SEE-

HARDWARE
HARDWARE
HARDWARE
SPECIAL ISSUE
SPECIAL ISSUE
COMING SOON
COMING SOON
COMING SOON

"COMPUTERS ARE
MARVELOUS
CRETINS"
- SALVADOR DALI

"DALI'S
ARE
MARVELOUS
SALVES" - COMPUTER

LATEST PERIPHERAL
DEVICE FOR MINI'S

Leave PAPER CLIP IN -

THE PROGRAMMER'S TOOLBOX

by marc le brun

page
XIV

[Each issue we will present an "advanced" programming technique: with explanations, examples, programs and problems. We welcome suggestions for topics of interest to you.]

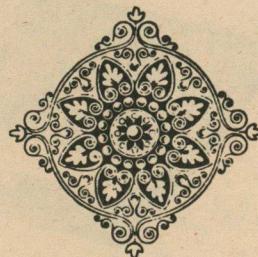
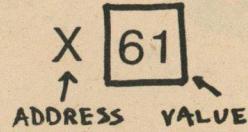
ADDRESSING THE QUESTION

This time around we will build on an idea mentioned in this column in the May '73 issue; the idea of an address. To recap briefly, we imagine that numbers stored in the computer live in boxes (sometimes called cells), and that the address of a number is a *name for the box that contains that number*.

For example, the letter "X" is the address of the value of the variable X. For instance, if a program has a line that says

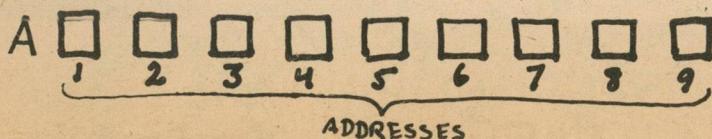
100 LET X=61

then when the computer does this line the result is



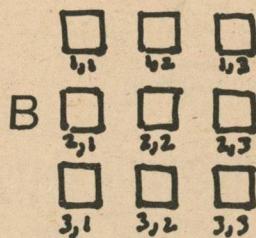
In this article we will be thinking about the addresses in arrays. An array is kind of like the name of a street, and the subscripts are similar to the numbers of the houses on the street.

Here is the array A:

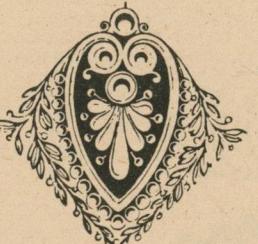
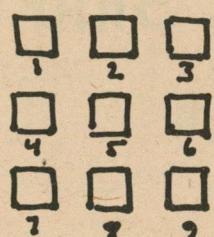


We could go on like this for two-dimensional arrays, where we have 1st street, 2nd street, and so on. However there is a neat thing we can do with two-dimensional arrays that makes them into one-dimensional arrays!

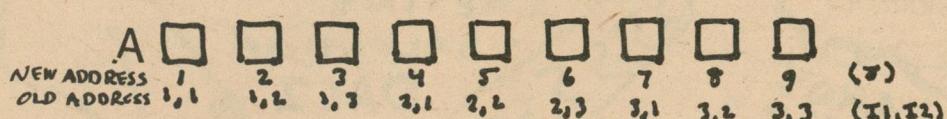
Here is how it works. First we will start with a 3x3 array (which we will call B).



Notice how we use *two* numbers for each address. Now here is the trick: we go through and *number each of the boxes with a single number* like so.



(You have seen this trick before: have a look at a calendar.) Now we can rearrange the boxes to make a new array (good old A) like so.



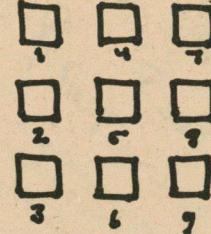
Now the question is, given the old address (I1,I2) in B, what is the new address (J) in A? The following is an expression which will find J for us:

$$J = 3*(I1 - 1) + I2$$

Let's try it out: the middle cell in B has the address 2,2. Its address in A is

$$3*(2 - 1) + 2 = 5$$

O.K. Now we didn't have to number the cells in B the way we did. We could have done it this way:



Of course, we now need a different expression to get the A address from the B address, and here it is:

$$J = 3*(I2 - 1) + I1$$

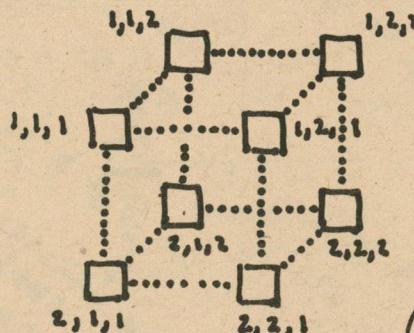
Notice that this expression is almost the same as the first one. This is because our second method of numbering was very similar to the first.

We can use *any* method of numbering we want (diagonal, spiral, or some weird way that doesn't even have a name).

For each numbering method we will get a *different* expression. These expressions (which are called **addressing functions**) all have one thing in common, they take a many-number address and turn it into a one-number address.

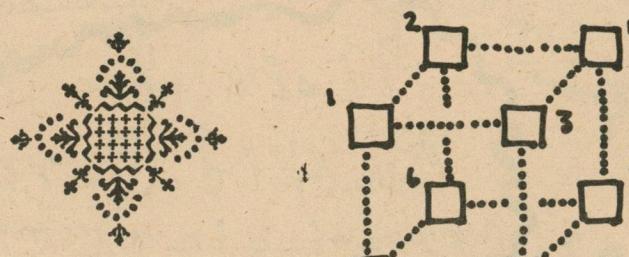
Now the neat thing about numbering methods and addressing functions is that they can be used to turn *any* structure at all into a one-dimensional array! This means that we can think of values as being arranged in any shape we like, and then use an addressing function to convert *our* addresses into ones the computer can understand, in this case one-number addresses.

Here is another example. Suppose we wish to think of some values as being arranged in a 2x2x2 cube:



i wish
i was a
dodeca-
hedron.

Now if we number them as follows:



we get the addressing function

$$J = 4*(I1 - 1) + 2*(I2 - 1) + I3$$

Just to check: the cell in the lower right hand corner of the front of the cube has for its address 2,2,1 so we get

$$J = 4*(2 - 1) + 2*(2 - 1) + 1 = 7$$

(Here is a problem: can you find a general addressing function for n-dimensional "rectangular" arrays having dimensions d₁, d₂, ..., d_n?)



Now suppose we wrote the last addressing function as a subroutine.

```
1000 REM *** CUBE ADDRESSER ***
1010 LET J=4*(I1-1)+2*(I2-1)+I3
1020 RETURN
```

Then the following program would store the numbers 1 to 8 in the "corners" of the "cube" according to the numbering method we used above.

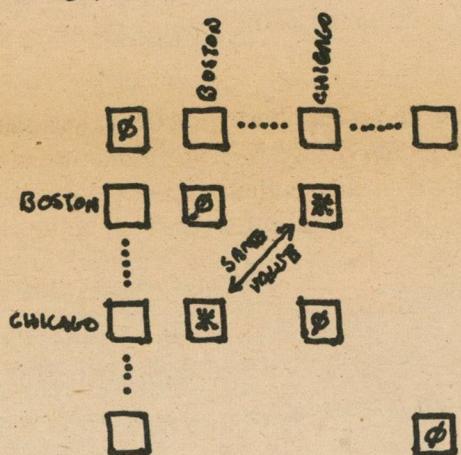
```
10 DIM A(8)
100 FOR I1=1 TO 2
110 FOR I2=1 TO 2
120 FOR I3=1 TO 2
130 GOSUB 1000
140 A(J)=J
150 NEXT I3
160 NEXT I2
170 NEXT I1
```

Of course, this is not a very interesting application. The above example is to show how we use the addressing function:

- first we convert *our* address to the *computer* address,
- then we use *that* address to operate on the values in the structure.

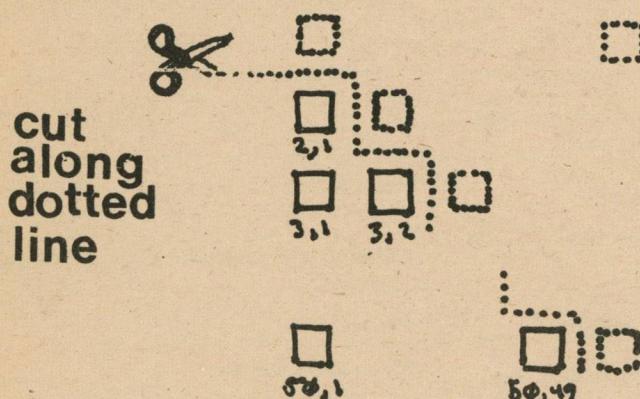
Now this method works just as well for any sort of structure. Here is an example:

Suppose we are storing the distances between cities in an array. One of the things we might notice about this array is that all the cells on the main diagonal contain a 0 (because each city is always 0 distance from itself) and that the array is symmetrical about the main diagonal ($B(I,J) = B(J,I)$) (because Chicago, say, is just as far from Boston as Boston is from Chicago).

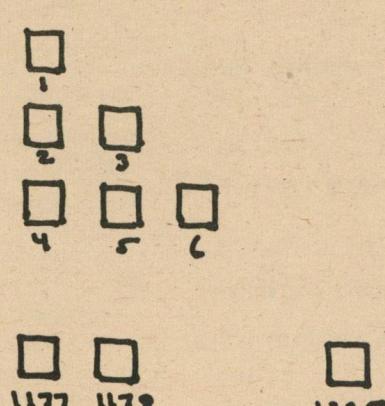


Now if we just stored the distances "one-way" we would cut the amount of storage needed by more than half. If we have say 50 cities this is quite a bit!

Here is the structure that we get by chopping off the useless or redundant cells.



Now we can number this "triangular" array as follows:



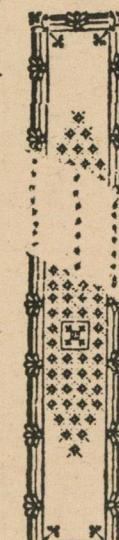
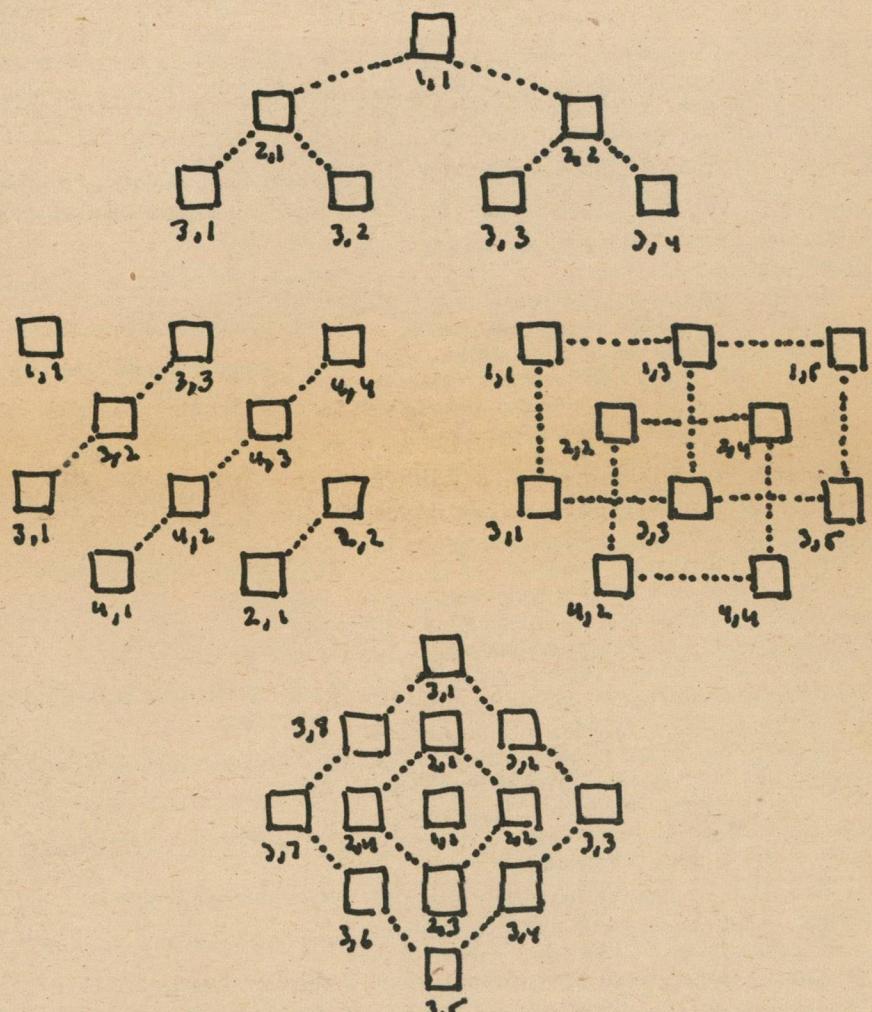
which gives us the addressing function

$$J = (I1 - 1)*(I1 - 2)/2 + I2$$

And here is how we would look up the distance between city C1 and city C2.

```
5000 REM *** CITY DISTANCES ***
5010 IF C1>C2 THEN 5080
5020 IF C1<C2 THEN 5050
5030 D=0 ← DISTANCE OF CITY FROM ITSELF
5040 RETURN
5050 I1=C2 } SWITCH SUBSCRIPTS IF CELL
5060 I2=C1 WAS CHOPPED OFF
5070 GOTO 5100
5080 I1=C1
5090 I2=C2
5100 J=(I1-1)*(I1-2)/2+I2
5110 D=A(J)
5120 RETURN
```

You will find that addressing functions will give you a lot of freedom in how you think about data structures. Here are some other structures you can try out these ideas on. See if you can figure out the appropriate addressing function for each one.



You will notice that all of the structures we have used in this article have some sort of regular pattern. Next issue we will talk about how to do addressing on structures that are

- unmannly
- shabby
- bind-moggling
- easy to implement in BASIC
- ΦΩ≈↔ΦΠΨζΦΩζ

If you have any questions or suggestions concerning this column, send them along with a stamped self-addressed envelope to:

HACK-MAN
c/o PCC
P.O. Box 310
Menlo Park, Ca 94025

and I will be happy to send you a *deluxe individualized reply*/*
ERRATA-----

Last issue, I gave you an incorrect expression for Q.
The correct expression is:

$$Q = J \cdot P \cdot K + K$$

Thanks to Fred Moore for pointing it out, and sorry about that folks! (Next issue I will tell you why I made this particular error, and will even blame it on somebody else [naturally]!)

Parry Encounters the Doctor

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The rising interest in resource-sharing computer networks is easily detected by the rapidly increasing literature on the subject.¹ One very visible and thus far successful project is the ARPA (Advanced Research Projects Agency) Network.² This packet-switching communications network now interconnects over 40 computers at almost 40 sites.

An essential goal of the Arpanet is to share resources. Of the many programs and data bases available, two seem very appropriate to interconnect: 1) *Parry*, a simulated paranoid; and 2) *Doctor*, a simulated psychiatrist.

Parry is the psychotic brainchild of Dr. Ken Colby (Stanford Univ.). The motivation behind Parry's genesis in 1964 was the desire to understand and model the belief system of paranoid psychotics. Colby chose to have this model made externally visible through natural language interrogation by a human agent (e.g., a psychiatrist). The goal of modeling paranoid belief systems has been successfully realized. Parry is equipped with a complex belief structure which relates "self" to the threatening and vindictive world (as Parry sees it).

Not so easy, however, is the implementation of natural language communication between human and program. Colby has found himself forced to tackle a formidable "side issue": getting a program to *understand* natural language input. Parry uses a semantic pattern matcher rather than a phrase structure grammar to achieve understanding of sentences typed into it. The belief structure is searched to determine Parry's understanding of the input sentence.

If Parry believes it understands the sentence, it produces a *canned* response appropriate to the question or statement presented. Otherwise, Parry will say something noncommittal, but relevant to the context of the present conversation. Because Parry generates sentences from a canned menu, it is capable of producing complex and convincing statements, much like those of its flesh-and-blood counterparts. At present, Parry appears to understand about 70% of the sentences presented. A new system may be able to understand 80-85%. Human patients appear to understand around 95% of the conversations in which they engage.³

Doctor is a close relative of *Eliza*⁴ a natural language program invented by Prof. Joseph Weizenbaum of Massachusetts Institute of Technology. Eliza was created around 1965, partly as an experiment to see how closely a transformational grammar could model human conversation. Using the same principles, Weizenbaum constructed Doctor. Essentially, these programs accept sentences and, when possible, produce new sentences from them.

For example, if the sentence "Do you know anything about bookies?" is presented, Doctor may respond with "What makes you think I know anything about bookies?" What happens is that Doctor sees a sentence of the form "Do you X?" and produces "What makes you think I X?" This is the essence of a transformational grammar.

Of course, if Doctor cannot match the syntax of a sentence, then it must punt. There are two possibilities: 1) say something noncommittal, such as "Please go on." or "What does that suggest to you?"; 2) recall an earlier match and refer to it, for example: "How does this relate to your nerves?" where "nerves" was an earlier topic of conversation.

Although no strong attempt is made to make Doctor understand the input, in Parry's sense, Doctor can respond sensibly. For example, on seeing "I hate my mother.", the Doctor might say, "Tell me about your family."

The success of the transformational

grammar is largely dependent on its ability to match the syntax of the sentences it sees. The version used in this experiment was an old one with a rather limited set of syntax matching rules. The surprising thing is that while Doctor exchanges very little information with the conversant, the resulting conversation bears close resemblance to many human conversations (which have the same informationless property).

These two programs were running respectively at the Stanford Univ. Artificial Intelligence Laboratory (on a DEC PDP-10/PDP-6 under a locally modified version of 10/50), and at Bolt Beranek and Newman, Cambridge, Mass. (on a DEC PDP-10 under TENEX). They were joined through a program running at the Univ. of California at Los Angeles (on an XDS Sigma 7 under the locally produced SEX operating system).

The transcript which follows is the verbatim conversation which occurred when the input and output of Parry and Doctor were cross-connected through the ARPA Network. The reader should not consider the result to be anything but a source of entertainment. No scientific or research intent was in mind, except to find out whether the mechanics of connecting the two programs could be worked out. ("*" represents Parry. "Comments" are the author's.) The conversation begins with the Doctor's opening greeting:

Good Evening.
Tell me your problems. Please terminate input with a period or a question mark.

*People get on my nerves sometimes.
I am not sure I understand you fully.

*You should pay more attention.

Suppose you should pay more attention.

*You're entitled to your own opinion.

What makes you think I am entitled to my own opinion?

*It bothers me just to be around people in general.

Please go on.

*I went to the track at Bay Meadows a while back.

What does that suggest to you?

*I went to the races.

What else would you like to discuss?

*Horseracing interests me.

Why do you say that just now?

*There's a lot of crooked gambling going on there.

I am not sure I understand you fully.

*It's clear to me if not to you.

Do you think it's likely that not to I?

*I went to the races.

Please go on.

*I gamble on horses.

What does that suggest to you?

*I went to the races.

What else would you like to discuss?

*Gambling has been nothing but trouble to me.

Why do you say that just now?

*I've had experience with crooks gambling at the track.

I am not sure I understand you fully.

*I've already told you enough about that.

Oh? I enough about that?

*I went to the races.

Comment: This has to be the most persistent and patient paranoid I have ever encountered.

Please go on.

*Do you know anything about bookies?

What makes you think I know anything about bookies?

*A bookie didn't pay me off once.

What does that suggest to you?

*I beat up the bookie who did not pay off, and I thought he might use his friends in the underworld to get even with me.

What else would you like to discuss?

*What do you know about racketeers?

Why do you ask?

*What experience have you had gambling?

Why does that question interest you?

*I like horseraces.

What else do you like?

*I know the mob controls the big racketts.

Who are you really talking about?

*Have you ever really thought about the MAFIA?

Suppose you ever really thought about the MAFIA?

*Let's talk about something else.

I am not sure I understand you fully.

*You keep asking me the same things, why not change the topic?

In what way?

*What do you mean?

Why are such questions on your mind?

*I thought I told you, people get on my nerves.

Your nerves?

*Well, I don't know.

Don't you really know?

*I would say so.

Please go on.

*I would rather not discuss that anymore.

Would you like to discuss your nerves?

*I guess so.

What does that suggest to you?

*What are you getting at?

What answer would please you most?

*It's not a matter of like or dislike.

What else would you like to discuss?

*I am getting tired of answering the same questions over and over.

What resemblance do you see?

*Why do you need to know that?

What do you think?

*I don't understand your motives.

Why don't you understand my motives?

*Shouldn't I be?

Comment: ???

Why do you say that just now?

Comment: I was wondering the same thing.

*That's just the way it is.

Suppose that's just the way it were not.

*So?

I am not sure I understand you fully.

*You harp on the same questions too much.

What does that similarity suggest to you?

*I don't get you.

Conversation between
a simulated paranoid
and a simulated psychiatrist

by Vinton Cerf

Do you wish that you did get I?

*It's about time you showed some interest in my feelings.

Oh? I showed some interest in your feelings?

Comment: Must have been an accident...

*I will help you if I trust you.

Do you wish that you trust I?

*Maybe yes, maybe no.

You don't seem quite certain.

... Excuse me for just a minute. Sorry to have interrupted you, please continue...

*Really?

Please go on.

*In my opinion you have a one-track mind.

What makes you think I have a one-track mind?

Comment: You ready for this?

*I used to go to the track every week.

What does that suggest to you?

*I avoid racetracks now because the races are fixed.

Is that the real reason?

*I'd rather not discuss it.

What else would you like to discuss?

*That's something I don't want to go into.

Does that trouble you?

*I went to the races.

Why do you say that just now?

*It's none of your business.

Why are you concerned over my business?

*I don't confide in strangers.

Don't you really confide in strangers?

*Let's change the subject.

Perhaps that concerns your feelings.

*I went to the races.

I am not sure I understand you fully.

*What's wrong with you that you keep on bugging me about this?

Who are you really talking about?

*The way you repeat yourself is getting ridiculous.

Suppose you repeat myself is getting ridiculous.

Comment: Howzat?

*There are some tricky operators down there.

Are there really some tricky operators down there?

*The guys involved in the horseracing racket.

Please go on.

*You are a real nag.

Comment: Just one of the horses.

Does it please you to believe I am a real nag?

*I have had enough of this.

What does that suggest to you?

*Goodbye.

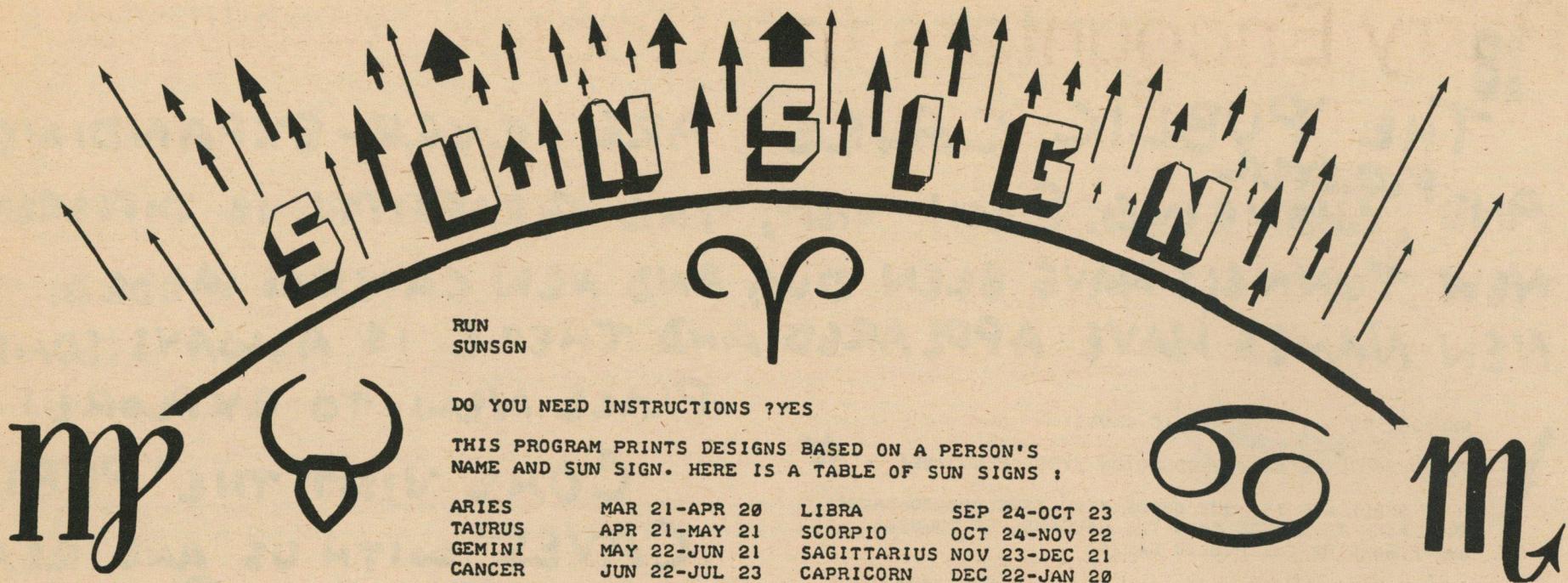
It's been my pleasure, that \$399.29 please.

Comment: Talk about tricky operators ...

Acknowledgment. The idea of connecting these two programs has occurred to several people, among whom R. Tomlinson (Bolt, Beranek and Newman) should be singled out as having also successfully accomplished this task. □

1. Rustin, Randall (ed.), *Computer Networks*, Courant Computer Science Symposium 3, Prentice-Hall, Inc., Englewood Cliffs, N.J., 1972.
2. Roberts, L. G., and Wessler, B. D., "Computer Network Development to Achieve Resource Sharing," *AFIPS Proceedings*, Spring Joint Computer Conference, 1970.

3. Colby, K., "Artificial Paranoia," *Artificial Intelligence—an International Journal*, Vol. 2, 1971, pp. 1-25.
4. Weizenbaum, J., "ELIZA—A Computer Program for the Study of Natural Language Communication between Man and Machine," *Communications of the ACM*, Vol. 6, No. 3, March 1966.



RUN
SUNSGN

DO YOU NEED INSTRUCTIONS ?YES

THIS PROGRAM PRINTS DESIGNS BASED ON A PERSON'S NAME AND SUN SIGN. HERE IS A TABLE OF SUN SIGNS :

ARIES	MAR 21-APR 20	LIBRA	SEP 24-OCT 23
TAURUS	APR 21-MAY 21	SCORPIO	OCT 24-NOV 22
GEMINI	MAY 22-JUN 21	SAGITTARIUS	NOV 23-DEC 21
CANCER	JUN 22-JUL 23	CAPRICORN	DEC 22-JAN 20
LEO	JUL 24-AUG 23	AQUARIUS	JAN 21-FEB 19
VIRGO	AUG 24-SEP 23	PISCES	FEB 20-MAR 21

FIRST NAME ? BOB
MIDDLE NAME ? ZIMMERMAN
LAST NAME ? DYLAN
SUN SIGN ? GEMINI

THE PROGRAM ASKS FOR A FIRST, MIDDLE AND LAST NAME. IF YOU DON'T HAVE A MIDDLE NAME TYPE A CARRIAGE RETURN. THE PROGRAM ONLY PAYS ATTENTION TO LETTERS, AND IGNORES ALL OTHER TELETYPE CHARACTERS. HERE WE GO

FIRST NAME ? ABRAHAM
MIDDLE NAME ?
LAST NAME ? LINCOLN
SUN SIGN ? AQUARIUS

*** ***
*** 0 0 ***
* *** *
00
*** #00* ***
*** 00 ***
*** ***
*** 00 ***
*** #00* ***
00
* *** ***
* *** *
*** 0 0 ***
*** ***



FIRST NAME ? JANE

MIDDLE NAME ? ANN

LAST NAME ? WOOD

SUN SIGN ? CAPRICORN

*0*** * * * * * * * * ***0*
0* *0* *** *0* *0
* * *0 * * 0* * *
* * *0 * * 0* * *
* * *0 * * 0* * *
0* *0* *** *0* *0
*0*** * * * * * * * * ***0*

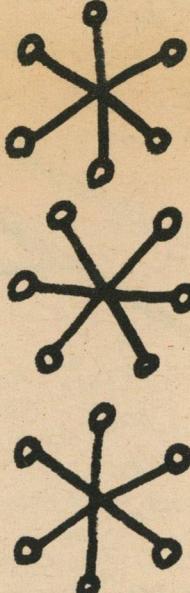
*0 *** *** 0*
0* * * *0*
** *0 *** 0* ***
* 0 0 *
*** *** *** ***
* * *0 0* * *
* * *0 0* * *
* * * * * * * *
* * *0 0* * *
* * *0 *** 0* ***
0* * * *0*
*0 *** *** 0*



```

1000 REM *** SUN SIGN DESIGN - PEOPLE'S COMPUTER CENTER ***
1010 REM *** BOX 310 MENLO PARK CALIFORNIA 94025 ***
1015 PRINT "USE UPPER CASE ON TERMINALS WITH UPPER AND LOWER MODES"
1020 REM *** PROGRAMMER : JANE WOOD ***
1030 REM
1040 DIM AS[72],BS[26]
1050 BS="ABCDEFGHIJKLMNPQRSTUVWXYZ"
1060 REM
1070 REM *** INSTRUCTIONS ***
1080 PRINT
1090 PRINT "DO YOU NEED INSTRUCTIONS ?"
1100 GOSUB 2493
1110 PRINT
1120 IF X=0 THEN 1290
1130 PRINT "THIS PROGRAM PRINTS DESIGNS BASED ON A PERSON'S"
1140 PRINT "NAME AND SUN SIGN. HERE IS A TABLE OF SUN SIGNS :"
1150 PRINT
1160 PRINT "ARIES MAR 21-APR 20 LIBRA SEP 24-OCT 23"
1170 PRINT "TAURUS APR 21-MAY 21 SCORPIO OCT 24-NOV 22"
1180 PRINT "GEMINI MAY 22-JUN 21 SAGITTARIUS NOV 23-DEC 21"
1190 PRINT "CANCER JUN 22-JUL 23 CAPRICORN DEC 22-JAN 20"
1200 PRINT "LEO JUL 24-AUG 23 AQUARIUS JAN 21-FEB 19"
1210 PRINT "VIRGO AUG 24-SEP 23 PISCES FEB 20-MAR 21"
1220 PRINT
1230 PRINT "THE PROGRAM ASKS FOR A FIRST, MIDDLE AND LAST"
1240 PRINT "NAME. IF YOU DON'T HAVE A MIDDLE NAME TYPE A"
1250 PRINT "CARRIAGE RETURN. THE PROGRAM ONLY PAYS ATTEN"
1260 PRINT "TION TO LETTERS, AND IGNORES ALL OTHER TELE"
1270 PRINT "TYPE CHARACTERS. HERE WE GO . . . . ."
1280 PRINT
1290 REM *** GET STRING PARAMETERS ***
1300 PRINT
1310 PRINT
1320 PRINT "FIRST NAME ";
1330 GOSUB 2420
1340 GOSUB 2240
1350 V0=X
1360 PRINT
1370 PRINT "MIDDLE NAME ";
1380 GOSUB 2420
1390 GOSUB 2240
1400 V2=X
1410 PRINT
1420 PRINT "LAST NAME ";
1430 GOSUB 2420
1440 GOSUB 2240
1450 V4=X
1460 PRINT
1470 PRINT "SUN SIGN ";
1480 GOSUB 2420
1490 GOSUB 2240
1500 V6=X
1510 PRINT
1520 PRINT
1530 PRINT
1540 REM
1550 REM *** COMPUTE NUMERIC PARAMETERS ***
1560 V=V0
1570 Q=0
1580 GOSUB 2380
1590 V1=M
1600 V=V2
1610 GOSUB 2380
1620 V3=M
1630 V=V4
1640 Q=7
1650 GOSUB 2380
1660 V5=M
1670 V=V6
1680 Q=5
1690 GOSUB 2380
1700 V9=M
1710 C=0
1720 REM
1730 REM *** PICTURE PRINTING LOOP ***
1740 FOR J=-(V9+3) TO V9+2
1750 AS=""
1760 V0=V0-J
1770 V2=V2-J
1780 K0=2*V5+2
1790 REM

```



```

1800 REM *** COMPUTE ROW ***
1810 FOR K=K0 TO K0
1820 K1=K0+K+1$ 
1830 V0=V0-K*V5
1840 V=V0
1850 Q=9
1860 GOSUB 2380
1870 V7=M
1880 V2=V2-K*V3
1890 V=V2
1900 Q=7
1910 GOSUB 2380
1920 V8=M
1930 IF K <> K0 THEN 1950
1940 V8=-1
1950 GOTO SGN(V8-V7)+2 OF 1980,1960,2030
1960 AS[K1,K1]="0"
1970 GOTO 2010
1980 AS[K1,K1]="" "
1990 GOTO 2020
2000 AS[K1,K1]="" "
2010 C=C+1
2020 NEXT K
2030 REM
2040 REM *** PRINT ROW ***
2050 K=1
2060 IF C=0 THEN 2120
2070 PRINT AS[K,K];
2080 IF AS[K,K]="" " THEN 2100
2090 C=C-1
2100 K=K-1
2110 IF K <= LEN(AS) THEN 2060
2120 PRINT
2130 NEXT J
2140 REM *** ASK FOR ENCORE ***
2150 PRINT
2160 PRINT
2170 PRINT
2180 PRINT
2190 PRINT "WOULD YOU LIKE TO DO ANOTHER ONE ";
2200 GOSUB 2493
2210 IF X=1 THEN 1290
2220 STOP
2230 REM
2240 REM *** CONVERT INPUT STRING TO NUMBER ***
2250 X=0
2260 J=1
2270 IF J>LEN(AS) THEN 2360
2280 K=1
2290 IF K>26 THEN 2340
2300 IF AS[J,J]=BS[K,K] THEN 2330
2310 K=K+1
2320 GOTO 2290
2330 X=X+K+192
2340 J=J+1
2350 GOTO 2270
2360 RETURN
2370 REM
2380 REM *** MODULOUS FUNCTION ***
2390 M=V-INT(V/Q)*Q+1
2400 RETURN
2410 REM
2420 REM *** FETCH STRING ***
2430 PRINT "? ";
2440 ENTER 255,T,AS
2450 IF T=-256 THEN 2440
2460 PRINT
2470 RETURN
2480 REM
2490 REM *** YES OR NO FETCH ***
2500 X=0
2510 INPUT AS
2520 IF AS="NO" THEN 2580
2530 X=1
2540 IF AS="YES" THEN 2580
2550 PRINT "PLEASE ANSWER YES OR NO ... "
2560 PRINT "ANSWER "
2570 GOTO 2520
2580 RETURN
2590 REM
2600 END

```



READING YOUR SUNSIGN DESIGN

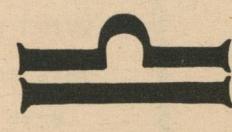
*'s indicate EXPANDING STUFF.
0's indicate CONTRACTING STUFF.
Space indicates NO STUFF.

The outer part of the design is your IMAGE
(how you look to other people.)

The inner part is your BEING (how you look to yourself.)

As you see, Bob Dylan's image is made of densely EXPANDING STUFF (lots of ***)
Abraham's is more balanced (both * and 0.)

One's situation lies in the arrangement of his expanding stuff, contracting stuff, and space.



THE 'PUBLIC CAVES' ARE EVER-EXPANDING
AND FOREVER CHANGING. EACH VISIT, THE GRAFFITI IS DIFFERENT;
NEW TUNNELS HAVE BEEN DUG, AND NEW CAVERNS ADDED.
NEW NAMES HAVE APPEARED AND THERE IS ALWAYS SOME-
PLACE NEW TO EXPLORE!

WELCOME TO ... 'THE PUBLIC CAVES'.

WOULD YOU LIKE AN INTRODUCTION (YES OR NO)? YES

I SHALL ACT AS YOUR GUIDE THRU 'THE PUBLIC CAVES'.
FEEL FREE TO BROWSE THRU THE CAVERNS AND TUNNELS
WHICH MAKE UP THE PUBLIC CAVES.

ENJOY THE DELECTABLE WRITINGS ON THE WALLS
LEFT BY THOSE WHO'VE COME BEFORE YOU. ADD YOUR OWN
LINES WHENEVER THE CREATIVE URGE STARTS ITCHING.

YOU CAN ALSO CREATE A NEW CAVERN (AND NAME IT TOO !)
OR ELSE DIG A TUNNEL FROM THE CAVERN YOU FIND YOURSELF
IN TO ANY OTHER CAVERN OF YOUR CHOICE.

AFTER BROWSING AWHILE IN EACH CAVERN, READING THE
GRAFFITI AND WHATNOT, I SHALL ASK YOU:

WHAT WOULD YOU LIKE TO DO NEXT?

YOU CAN SAY:

WRITE	IF YOU WANT TO ADD SEVERAL LINES OF YOUR OWN
MOVE	IF YOU WISH TO MOVE ON TO ANOTHER CAVERN
BUILD	IF YOU WOULD LIKE TO BUILD A NEW CAVERN (AND AUTOMATICALLY DIG A TUNNEL TO IT)
DIG	IF YOU WANT TO DIG A TUNNEL (TO AN EXISTING CAVERN)
OUT	IF YOU'VE DECIDED TO LEAVE 'THE PUBLIC CAVES'... *** IMMEDIATELY ***

LET'S GO !!!

COME VISIT THE 'PUBLIC
CAVES' WITH US AND READ
THE GRAFFITI !

YOU ARE NOW IN
'PCC'

WHICH WAS CREATED BY BOB ALBRECHT
THIS IS WRITTEN ON THE WALLS:

HAVE SHOES ON THEIR FEET
AND SOMETHING TO EAT
WOULDN'T IT BE FINE
IF ALL HUMAN KIND
HAS SHELTER
HI THERE



***** TO GET TO THE UDDER SYDDE

WHAT WOULD YOU LIKE TO DO NEXT? MOVE
TUNNELS LEAD TO:

- 1 'OUTSIDE OF YOU'
- 2 'PIPPIN TRIPPIN'
- 3 'SPACEMEN AND OTHERS FROM AFAR STAR'
- 4 'OUTSIDE OF YOU'
- 5 'CAN'T DIG TO THIS ONE !'
- 6 'ADDENDA, ADDENDA, ADDENDA !!!!'

WHICH NUMBER? 2

YOU ARE NOW IN
'PIPPIN TRIPPIN'...'
WHICH WAS CREATED BY ZIPPER THE RIPPER

THIS IS WRITTEN ON THE WALLS:
CAPTAIN GRIMY THE GRIPP
CAME ABOARD HIS SAILING SHIP
TO FIX HIS FAUCET A-Drip
AND MADE A SLIP
GLUBBLE BUBBLE GLIP!

WHAT WOULD YOU LIKE TO DO NEXT? MOVE
TUNNELS LEAD TO:
1 'THE NAME OF THIS FANTASTIC CAVERN'
2 'PCC'
3 'THE NEW CAVERN'
4 'ZIPPITY PLIP PLOP'
5 'WHICH NUMBER? 2'

YOU ARE NOW IN ...
'FIRST YOU OPEN THE (THEN YOU CLOSE THE)'
WHICH WAS CREATED BY (((((ME)))))

THIS IS WRITTEN ON THE WALLS:
WHEN I GET OLDER,
CLOSING MY HAIR,
(MANY YEARS FROM NOW (DEF FN X())),
SEVERAL LINES LATER ***
WILL YOU STILL NEED ME, (WILL YOU STILL FEED () (ME)),
WHEN I'M ((LAMBDA X. X,2)) ((LAMBDA X. X,X)), () HALT
((LAMBDA X. X,3)) ((LAMBDA X. X,X))

WHAT WOULD YOU LIKE TO DO NEXT? MOVE
TUNNELS LEAD TO:
1 'PIPPIN TRIPPIN'
2 'ADDENDA, ADDENDA, ADDENDA !!!'



YOU ARE NOW IN ...
'MARK MY WOIDS, Y'ALL'



WHICH WAS CREATED BY MARK ROBERTS, ESQ

THIS IS WRITTEN ON THE WALLS:

BEEP BEEP THE ROAD RUNNER

WHAT WOULD YOU LIKE TO DO NEXT? OUT

THANKS FOR VISITING 'THE PUBLIC CAVES' WITH ME

BRING YOUR FRIENDS BACK NEXT TIME AND SHOW THEM AROUND!

YOU ARE NOW IN ...
'ADDENDA, ADDENDA, ADDENDA !!!'

WHICH WAS CREATED BY THE NOTEKEEPER

THIS IS WRITTEN ON THE WALLS:

HIPPITY HOPPIES EVERYWHERE
MULTIPLES GROUPIDS INTEGRATIVE STICHES
MATHEMATICAL JARGON GIVES MY *** THE ITCHES
DO YOU KNOW A GOOD JOKE? A LIMERICK OR TWO,
WRITE THEM ON THE WALLS HERE ---

GOOD AND CLEAN ONES TOO !!!
TO BE OR NOT TO BE THAT IS A QUESTION END

WHAT WOULD YOU LIKE TO DO NEXT? MOVE

TUNNELS LEAD TO:

- 1 'FIRST YOU OPEN THE (THEN YOU CLOSE THE)'
- 2 'PCC'
- 3 'MARK MY WOIDS, Y'ALL'

WHICH NUMBER? 3

COME ON, TRIBE! LET'S EXPLORE!



INSIDE THE CAVES

by dave of the caves

19

The CAVES family of games so far consists of CAVES1, CAVES2, CAVES3, PUBLIC CAVES.

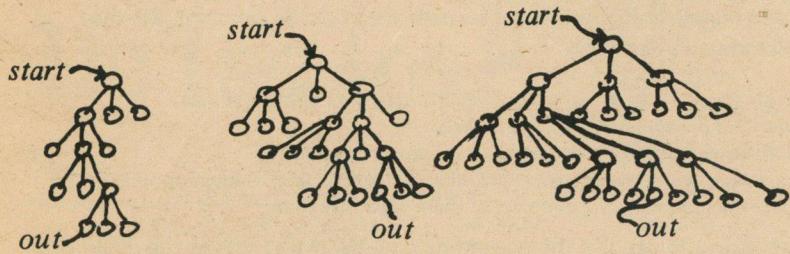
You are invited to come inside the CAVES and see how they are constructed.

Remember CAVES1? It appeared in the May 1973 issue of PCC. Here's how it started:

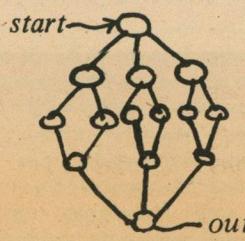
IMAGINE YOURSELF AN EXPLORER OF THE FAMOUS DAZZLEDORF CAVES. YOU'VE BEEN UNDERGROUND FOR DAYS, TRIPPING THROUGH THE CAVERNS AND TUNNELS. UNFORTUNATELY, YOU'RE LOST, AND YOUR FOOD HAS RUN OUT.

THERE IS ONLY ONE PATH OUT. SEE IF YOU CAN FIND IT.

CAVES1 can generate three kinds of CAVES. Here they are -



All three start you at the top and let you try to find the only path that leads out. A CAVE could also look like this -



Every path leads out. Not too interesting for a game, is it?

Each of those maps can be built by a CAVES program. First, you have to start -

Hi! I'm the top circle and my name is #1

then you decide how many tunnels (three is my favorite number) and give each a # name -

my name is #2
I was created next, so I'm #3
and me, I'm #4

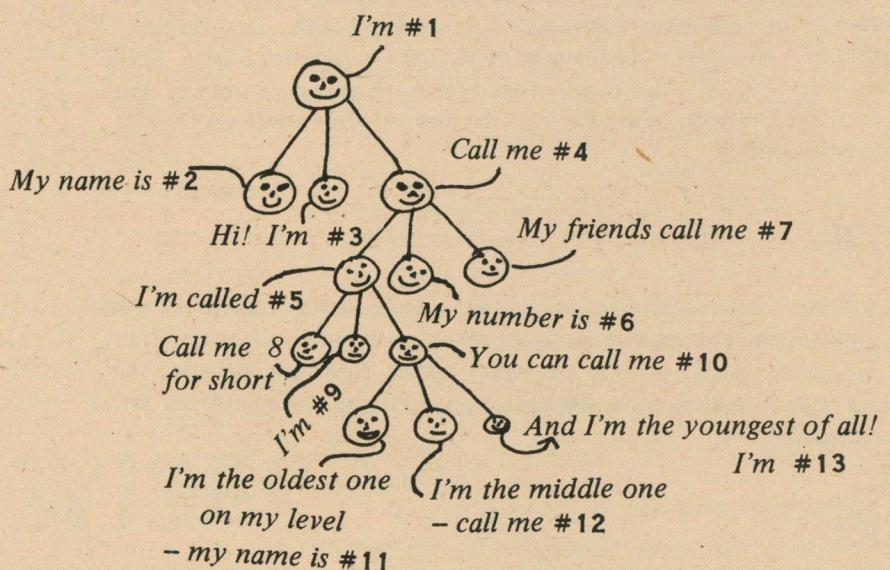
Pick one of the NODES on the second level -- (I picked #4 -- if you didn't, then try again) -- and do the same thing --

#1
#2
#4
#3
#5
#6
So that makes me #7

If people had numbers for names, what would YOUR number be?

A good idea for names is to give each NODE a different one. I like to choose each new name by adding 1 to the last name I gave out.

So here's the final picture:



So there you are. A little family of connected circles (folks in computer science call them NODES), each with its own name.



Here are the ideas that made this structure --

1. Start with the top NODE. Call her #1
2. Do this 4 times --
 - 2A. Do this 3 times --
 - 2A1. Add 1 to the last name
 - 2A2. Make a new tunnel and a new NODE using the new name
 - 2B. Pick one at random
 - 2C. Move down to it
3. Pick the NODE you're in and call it the "out" NODE.

So that is what we'd like to happen. In the CAVES family, tunnels and NODES are created and kept track of by a special set of subroutines called TREE SUBROUTINES. The word TREE is used in computer talk to mean all the different kinds of structures made of tunnels and NODES.

NEXT ISSUE we'll talk about the TREE SUBROUTINES and how you can use them in your own games. Maybe we'll even have time to talk about how they do their jobs!!!

Project LOCAL

Background

Project LOCAL has been around since 1967. It is one of the more successful secondary school consortiums or cooperatives. LOCAL received some national acclaim a few years ago when someone at Westwood High School did a controlled test of second year algebra students and demonstrated that students who learned algebra using flowcharting techniques and computers, increased their scores on an abstract reasoning test by 17.2% and S.A.T. scores by 7.5%. This was first reported in *PTA Magazine* and subsequently reported in *Reader's Digest*. Since that early notoriety, LOCAL has grown and grown and grown. Thanks to Bob Haven and Pam Ellsworth, who submitted the material from which we have prepared what follows.

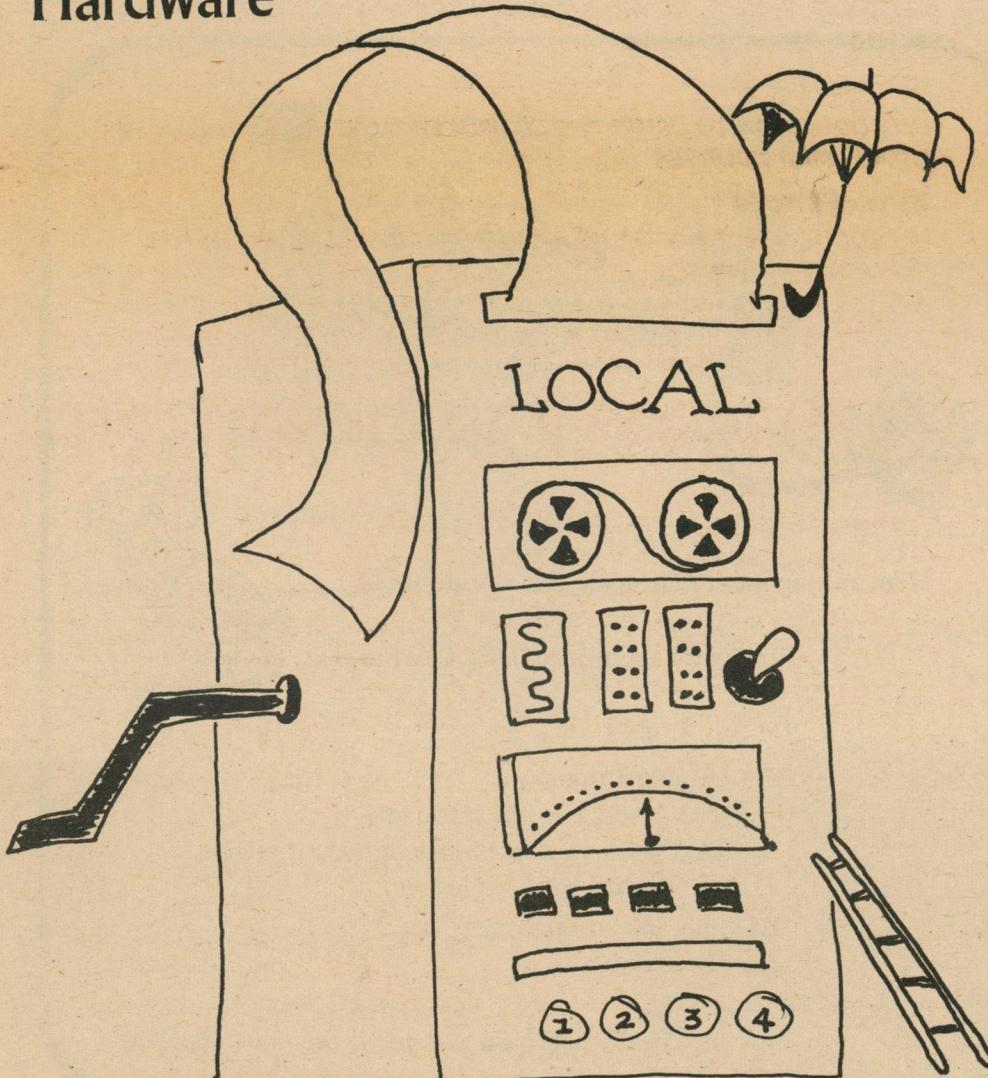
What

Project LOCAL is a non-profit corporation set up to facilitate cooperation in performing the functions necessary to support computer-oriented education. Its membership includes the Towns of Lexington, Natick, Needham, Wellesley and Westwood (Massachusetts), some services are provided also to non-member towns and to individuals.

Who

Policy is set by a Board of Directors consisting of the superintendents of the five member systems. The staff consists of Bob Haven, Director, Pam Ellsworth, Curriculum Specialist, and Kay Olson, Executive Secretary. Teachers are employed as necessary to write resource materials and textbooks and to conduct in-service training and evaluation work. The staff works closely with a School Coordinator in each of the five member systems.

Hardware



"The hardware set-up differs from school to school. Six of our schools have DEC Family-of-8 computers with the number of users varying from 6 to 20. The systems are disk-oriented and operate mainly in the BASIC language, although two of them have multi-language capabilities. At this time, the 33 ASR Teletype is the main input/output device used. The Lexington system does have a line printer, DECTapes, and a card reader which they use for both instructional and administrative purposes."

Looking Ahead

Looking ahead somewhat, Project LOCAL hopes to establish its own regional educational computer center sometime in 1974. The plans being considered call for two large mini-computers (if there is such a thing . . .?) capable of serving over 50 stations. One machine would be equipped with: (1) one of the fullest implementations of BASIC available; and (2) for elementary schools, the LOGO language and program control of devices such as "turtles", music boxes, and plotters.

Services

*D.J. Leroy
Finkel*

In-service Training for teachers and administrators affords the best means for showing the educational potential of the computer and the ways to realize this potential.

18 different courses in several different disciplines cover topics not covered by local university curricula.

Faculty consists of persons with many years of training and experience in computer-oriented education.

Tuitions are well below those charged by local colleges.

Courses are held in locations more convenient than most college campuses.

Document and Computer Program Library provides back-up support for teachers preparing courses and for administrators charting new directions.

One of the most extensive collections in the U.S.A. of textbooks, reference books teaching units, technical reports, periodicals and computer programs related to computer-oriented education; especially notable for materials directly applicable to real classroom situations.

Effective retrieval of the right materials made possible by subject indices for individual staff members, monthly "briefs" summarizing the best computer teaching applications in several disciplines and a card catalog organized alphabetically by concept to be taught.

Convenient access realized by "phone-up" orders for documents and direct delivery to schools.

Costs Per Pupil are reduced to levels usually realized only with very large student bodies (costs to members for individual services are 20 to 55 per cent less than from other Boston-area sources).

Non-profit status makes all resources available to school systems at cost.

Low overhead promotes maximum efficiency.

Bulk purchasing confers the economies of quantity discounts.

Primary resources (hardware, personnel, libraries) serve a large student population, thereby greatly reducing the unit cost of these expensive items.

Full-time Staff Consultants give the needed helping hand that makes the difference between a mediocre educational computer program and one which really fulfills objectives. It should be emphasized that this type of service is free to consortium members.

For the neophyte computer user, someone who is always on hand to answer questions and help with those sure-to-arise difficulties, brought on by inexperience, which usually turn out to be minor but which loom so large to one who is just getting started.

For the experienced computer user, someone who can give stimulating suggestions for new approaches, additional expertise in areas where there are "blind spots", and assistance in analyzing hardware and software difficulties.

For the department head and administrator, someone to help in analyzing needs, designing computer applications to fulfill needs, determining resource requirements, selecting and acquiring hardware, and implementing the applications designed.

LOCAL personnel have many years of experience in all phases of computer use in both education and business.

Responsiveness, Quality and Reliability of Services assured by five years of successful experience at providing services to schools engaged in computer-oriented education; that experience includes the following notable accomplishments:

The number of users of computer facilities in LOCAL schools has increased from eight teachers and 250 students in 1967 to over 100 teachers and 5,000 students in 1972. Member schools have added to the scope of their computer use new applications such as drill and practice, simulated laboratories, laboratory support, and clerical support for individualized instruction. Moreover, new subject areas have been added, including chemistry, physics, social studies, biology, and language arts. Four elementary schools have begun to use the computer in teaching.

Five different evaluation studies of the effects of computer-oriented instruction in student achievement, attitude, and problem-solving skills have been conducted in LOCAL schools. Four of these studies found improvements attributable to computer techniques.

The LOCAL staff planned and coordinated the installation of five time-sharing systems; the staff has assisted in operating and expanding these installations and has administered time-sharing services to eleven schools outside the LOCAL membership.

The LOCAL staff conducted studies to determine the feasibility of:

using individual towns' computers as the basis for administrative data processing; using one town's computer as the basis for a regional data processing center; and using members' computers to fully automate a clerical support system for individualized instruction.

Reports of these studies are available from the project office.

The LOCAL staff designed and implemented the following computerized systems:

an attendance accounting system; an information retrieval system useful in administration, educational research, and hypothesis-testing in science; and an automated test scoring and reporting system to support individualized instruction.

LOCAL has trained over 350 teachers in the Boston area in computer-oriented teaching in math, science, and social studies.

The LOCAL staff has helped to originate and stimulate the growth of area organizations for educators interested in computers, especially BIT (BASIC Information for Teachers) and MEDPA (Massachusetts Educational Data Processing Association).

LOCAL has published eight different books, one of which is a programmed text for teaching computer programming used by schools, hospitals and companies all around the U.S.

LOCAL has received international recognition as one of the most significant projects working in the field of pre-college computer-oriented instruction.

WANTED: More information on networks, schools, groups, whoever, getting together to share a computer resource —

In Service Courses

THE POTENTIAL OF THE COMPUTER IN THE INSTRUCTIONAL PROCESS

4½ hours, \$25.00

INTRODUCTION TO PROGRAMMING IN THE BASIC LANGUAGE

16 hours, \$80.00

TEACHING ADVANCED PROGRAMMING TOPICS

20 hours, \$100.00

HOW TO JUSTIFY COMPUTER EQUIPMENT FOR INSTRUCTIONAL AND ADMINISTRATIVE USE

6 hours, \$30.00

SELECTING AND ACQUIRING COMPUTER AND COMMUNICATION FACILITIES FOR INSTRUCTION

10 hours, \$50.00

WRITING COMPUTER-ADMINISTERED DRILL AND PRACTICE DIALOGS IN BASIC

10 hours, \$50.00

COMPUTER SUPPORT FOR COMPREHENSIVE ACHIEVEMENT MONITORING (CAM)

6 hours, \$30.00

DESIGNING AND IMPLEMENTING COMPUTER-BASED SIMULATIONS FOR USE IN SOCIAL AND PHYSICAL SCIENCES

10 hours, \$50.00

FUNDAMENTALS OF COMPUTERS AND ASSEMBLY LANGUAGE

20 hours, \$100.00

INTRODUCTION TO USING THE COMPUTER IN TEACHING SECONDARY SCHOOL MATHEMATICS

20 hours, \$100.00

INTRODUCTION TO USING THE COMPUTER IN TEACHING SECONDARY SCIENCE

20 hours, \$100.00

USING SIMULATION IN TEACHING SECONDARY SCIENCE

10 hours, \$50.00

INTRODUCTION TO USING THE COMPUTER IN TEACHING SECONDARY SCHOOL SOCIAL STUDIES

20 hours, \$100.00

INTRODUCTION TO USING THE COMPUTER IN BUSINESS AND DATA PROCESSING COURSES

20 hours, \$100.00

INTRODUCTION TO COMPUTER-ORIENTED INSTRUCTION IN THE ELEMENTARY SCHOOL

20 hours, \$100.00

Other Networks you can read about —

TIES in Minnesota, PCC, Vol. 1, No. 3

RESOURCE 1 in San Francisco, PCC, Vol. 1, No. 3

LACE in Wisconsin, PCC, Vol. 2, No. 1

LAWRENCE HALL OF SCIENCE, PCC, Vol. 1, No. 1

Networks to Contact for More Information —

Carnegie Mellon University

Dr. Alan Perlis:

Department of Computer Science
Schenley Park
Pittsburgh, PA. 15213

Purdue University

Dr. Saul Rosen

Computer Science Department
Lafayette, Ind. 47907

Illinois Institute of Technology

Dr. Peter Lykos

Information Service Center
Chicago, Ill. 60616

California Institute of Technology

Dr. G.D. McCann

Booth Computing Center
Pasadena, Ca. 91109

New Jersey Educational Computer Ctr.

Dr. William Carroll

5 Huntington St.

New Brunswick, NJ 08903

University of Iowa

Dr. Gerard Weeg

University Computer Center
Iowa City, Iowa 52242

Southern Regional Ed. Board

Dr. John Hamblen

130 Sixth St. N.W.
Atlanta, Georgia 30313

Dartmouth College

Dr. Thomas Kurtz

Kiewit Computation Center
Hanover, N.H. 03755

University of Texas

Dr. Charles Warlick

Computation Center
Austin, Tx. 78712

Colorado State University

Dr. Lee Maroell

Department of EE
Fort Collins, Co. 80521

Lexington HS

Lexington High School is planning a quite ambitious computer-oriented curriculum for next year in math alone, not to mention what's going on in other departments. The following description, provided by Walter Koetke of Lexington High School, could serve as a model for programs being developed elsewhere.

Students may plan to enroll in any one of the following seven computer related mathematics courses by reserving specific blocks in their schedule for work in the computer/mathematics laboratory. The pace and even the content of each course will be individually made for each student. Most courses consist of a series of specific topic sheets through which students can complete small units at their own pace.

COURSE DESCRIPTION

COMPUTER APPRECIATION — Open to all students who have NEVER COMPLETED an Algebra course. Topic emphasis will be on demonstrations of what computers can and can not do. Students will receive a great deal of "hands-on" computer use with demonstration programs, but little or no programming will be required. 2 periods/week.

INTRODUCTION TO PROGRAMMING — Designed for students with no programming experience who have not completed second year algebra. Topic emphasis is on learning to write, enter, and run programs in BASIC. 2—4 periods/week.

COMPUTER RELATED MATHEMATICS — Designed for students with or without programming experience who have already completed second year algebra. A wide variety of pre-calculus mathematical topics that usually are not covered in other courses will be examined. 2—4 periods each week.

COMPUTER RELATED NON-MATHEMATICS — Open to students with BASIC programming experience who have completed or are simultaneously enrolled in second year algebra. Topic emphasis is on the programming of non-mathematical computer applications using more advanced techniques of BASIC programming. Sample units include: sorting routines, file-manipulation, simulations, games, etc. 2—4 periods/week.

ADVANCED COMPUTER RELATED MATHEMATICS — Open to students familiar with BASIC programming who have completed or are simultaneously enrolled in Pre-Calculus Math. Topic emphasis is on numerical methods of applied mathematics. Sample units include: computing zeroes of high order functions, numerical differentiation and integration, interpolation and extrapolation techniques, solving systems of equations etc. 2—4 periods/week.

COMPUTER SCIENCE — Open to students who have completed any one of the three preceding courses. Topic emphasis is on learning assembly language programming for the PDP 8/I then using this language to implement algorithms that would be inconvenient or impossible using BASIC, FOCAL or other interactive languages. 2—4 periods/week.

PROJECTS — Open to students who have successfully completed any one of the four preceding courses. Students will work on individual, large projects that they originate or that are suggested by the instructor. Cooperative projects with other departments are encouraged. Advanced programming techniques and mathematical skills are required, as well as the ability to conduct and then write a report of a research project. Sample programming projects might be: a program to play checkers, a program that permits multiple-terminal interaction in a stock market or other type of decision making simulation, a CAI program to drill students in Spanish verb forms, etc. 2—6 period/week.

In the fall of 1967, three groups of average college-bound juniors in the Westwood Massachusetts Senior High School began to take second-year algebra, a fact which in itself is not unusual. What was unusual about these groups was that, although all three were taught the same mathematics material by the same teacher, students in two groups received instruction in flowcharting and used this technique of designing and representing problem solutions graphically, in doing their homework. Students in one of these two groups also learned computer programming and did homework problems on the computer. The third group, which served as a control group, was taught in the traditional fashion, using lecture, classroom discussion and ordinary pencil and paper homework assignments.

Over the school year, the group which worked with the computer improved more than either of the other groups in general scholastic and reasoning abilities, as measured by standardized tests. As can be seen in the following figure, the computer group improved more than twice as much as the control group on a test of general scholastic ability and almost four times as much on a reasoning test.

% CHANGE IN GROUP MEAN FROM PRE-TEST TO POST-TEST		
	ABSTRACT REASONING TEST	SCHOLASTIC APTITUDE TEST
CONTROL GROUP SCORES	4.6	2.9
FLOWCHART GROUP SCORES	9.7	5.1
COMPUTER + FLOWCHART GROUP SCORES	17.2	7.5

WELCOME TO • • •

THE PCC BOOKSTORE

The PCC storefront has started carrying books as well as computer tapes which we have used and endorse. From now on, we will be running a regular page to tell our readers about these materials. Prices quoted here include postage and shipping, unless annotated.

MAKE CHECKS OR MONEY ORDERS TO US:

PEOPLE'S COMPUTER COMPANY
P.O. BOX 310
MENLO PARK, CA 94025

Books

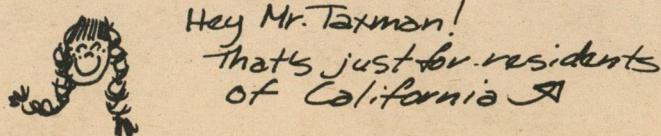


My Computer Likes Me -- by Dymax

Price -- \$1.19 each
Quantities of 100 -- 1.00 each!
Warning: Price goes up to \$1.49 as of 1/1/74.
Order now and save!

BASIC, Albrecht, Finkel, Brown -- a Wiley Self-Teaching Guide

Price -- \$3.95
Plus Shipping & Handling -- .40
Total -- \$4.35



Problems for Computer Solution, Gruenberger & Jaffrey -- by Wiley

Price -- \$6.95
S & H -- .50
Total -- \$7.45

(See review in PCC
Vol. 1, No. 3)

BASIC Programming, 2nd Ed., Kemeny & Kurtz -- by Wiley

Price -- \$6.25
S & H -- .40
Total -- \$6.65

(See review in PCC
Vol. 1, No. 1)



Tapes

These are our very own computer games. They are written in a standard form of BASIC and will run on any system that uses Dartmouth BASIC. When strings are used they are standard Hewlett-Packard strings and you may have to modify the programs for your system. If you are a PCC subscriber, you can get free listings of all our games -- send a stamped, self-addressed envelope for each listing. For the tapes themselves, these prices apply --

HURKLE	Apr 73	Page 22	\$ 2					
MUGWUMP	"	3	2	CAVES1	You need a copy of	May 73	page 5	\$ 3
SNARK	future issue		2	CAVES2	TREE SUBROUTINES	Sep 73	12	3
STARS	Dec 72	3	2	CAVES3	to make these work	"	13	3
NUMBER	Oct 72	8	2		PUBLIC CAVES KIT	this issue	18	8
LETTER	"	11	2		TREE SUBROUTINES	this issue	19	4
TRAP	Feb 73	8	2					
BEYOND BAGELS	future issue		2		HUNT THE WUMPUS	this issue	23	4
TAXMAN	Sep 73	6-7	3		SUPER WUMPUS	future issue		4
REVERSE	May 73	4	2					
BUTTON, BUTTON, WHO'S GOT THE BUTTON?	future issue		2		SUNSIGN	this issue	17	3
					CHOMP	Feb 73	9	3

THESE PROGRAMS USE HP STRINGS

HUNT THE WUMPUS

YOU ARE IN ROOM 8
TUNNELS LEAD TO 1 7 9
SHOOT OR MOVE (S-M)?M
MOVE TO?1

I SMELL A WUMPUS!
YOU ARE IN ROOM 1
TUNNELS LEAD TO 2 5 8
SHOOT OR MOVE (S-M)?M
MOVE TO?2

YOU ARE IN ROOM 2
TUNNELS LEAD TO 1 3 10
SHOOT OR MOVE (S-M)?M
MOVE TO?3

YOU ARE IN ROOM 3
TUNNELS LEAD TO 2 4 12
SHOOT OR MOVE (S-M)?M
MOVE TO?12

BATS NEARBY!
YOU ARE IN ROOM 12
TUNNELS LEAD TO 3 11 13
SHOOT OR MOVE (S-M)?5
NUMBER OF ROOMS(1-5)?4
PATH OF ARROW

ROOM # 1 ?3
ROOM # 2 ?2
ROOM # 3 ?1
ROOM # 4 ?5
AHAI! YOU GOT THE WUMPUS! HE WAS IN ROOM 5
HEE HEE HEE - THE WUMPUS'LL GETCHA NEXT TIME!!

PLAY AGAIN (Y-N)?Y
SAME SET-UP (Y-N)?N

RUN
WUMPUS

INSTRUCTIONS (Y-N)?Y

WELCOME TO 'HUNT THE WUMPUS'.

THE WUMPUS LIVES IN A CAVE OF 20 ROOMS.
EACH ROOM HAS 3 TUNNELS LEADING TO OTHER ROOMS.

HAZARDS:

BOTTOMLESS PITS - TWO ROOMS HAVE BOTTOMLESS PITS IN THEM.
IF YOU GO THERE, YOU FALL INTO THE PIT AND LOSE!

SUPER BATS - TWO OTHER ROOMS HAVE SUPER BATS.

IF YOU GO THERE, A BAT WILL GRAB YOU AND TAKE YOU TO
SOMEWHERE ELSE IN THE CAVE WHERE YOU COULD
FALL INTO A PIT OR RUN INTO THE . . .

WUMPUS:

THE WUMPUS IS NOT BOthered BY THE HAZARDS SINCE
HE HAS SUCKER FEET AND IS TOO BIG FOR A BAT TO LIFT.

USUALLY HE IS ASLEEP.

TWO THINGS WAKE HIM UP:

YOUR ENTERING HIS ROOM

YOUR SHOOTING AN ARROW ANYWHERE IN THE CAVE
IF THE WUMPUS WAKES, HE EITHER DECIDES TO MOVE ONE ROOM OR
STAY WHERE HE WAS. BUT IF HE ENDS UP WHERE YOU ARE,
HE EATS YOU UP AND YOU LOSE!

YOU:

EACH TURN YOU MAY EITHER MOVE OR SHOOT A CROOKED ARROW.

MOVING - YOU CAN MOVE TO ONE OF THE THREE ADJOINING ROOMS;
THAT IS, TO ONE THAT HAS A TUNNEL CONNECTING IT WITH
THE ROOM YOU ARE IN.

YOU MIGHT WANT TO USE SOME SCRAP PAPER TO MAKE A
MAP OF THE CAVES AS YOU GO, SHOWING WHERE YOU'VE
BEEN AND WHERE YOU THINK THE WUMPUS AND THE
HAZARDS MIGHT BE.

SHOOTING - YOU HAVE 5 ARROWS. YOU LOSE WHEN YOU RUN OUT.
EACH ARROW CAN GO FROM 1 TO 5 ROOMS.

YOU AIM BY TELLING THE COMPUTER

FIRST, THE NUMBER OF ROOMS YOU WANT THE ARROW
TO TRAVEL.

SECOND, THE PATH YOU WANT THE ARROW TO TAKE FROM
ROOM TO ROOM.

THE ARROW'S PATH IS A LIST OF ROOM NUMBERS
TELLING THE ARROW WHICH ROOM TO GO TO NEXT.

THE FIRST ROOM IN THE PATH MUST BE CONNECTED TO THE
ROOM YOU ARE IN. EACH SUCCEEDING ROOM MUST BE
CONNECTED TO THE PREVIOUS ROOM.

IF THERE IS NO TUNNEL BETWEEN TWO OF THE ROOMS
IN THE ARROW'S PATH, THE ARROW CHOOSES ONE OF THE
THREE TUNNELS FROM THE ROOM IT'S IN AND GOES ITS
OWN WAY.

IF THE ARROW HITS THE WUMPUS, YOU WIN!
IF THE ARROW HITS YOU, YOU LOSE!

WARNINGS:

WHEN YOU ARE ONE ROOM AWAY FROM THE WUMPUS OR A HAZARD,
THE COMPUTER SAYS:

WUMPUS - 'I SMELL A WUMPUS'
BAT - 'BATS NEARBY'
PIT - 'I FEEL A DRAFT'

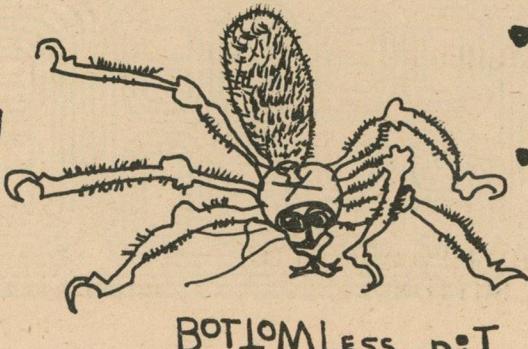
We couldn't agree
on what Wumpus
looks like ... sooo

Send me
in for
a
special
surprise!

we made a box
for You to draw
a wumpus. Is he
(she?) evil or
preyed upon by
hunters (arrow)
or is he (she) simply
a creature who wants
to be left alone?
what say?

SHE (HE?)

SHE (HE?)



BOTTOMLESS PIT

PCC

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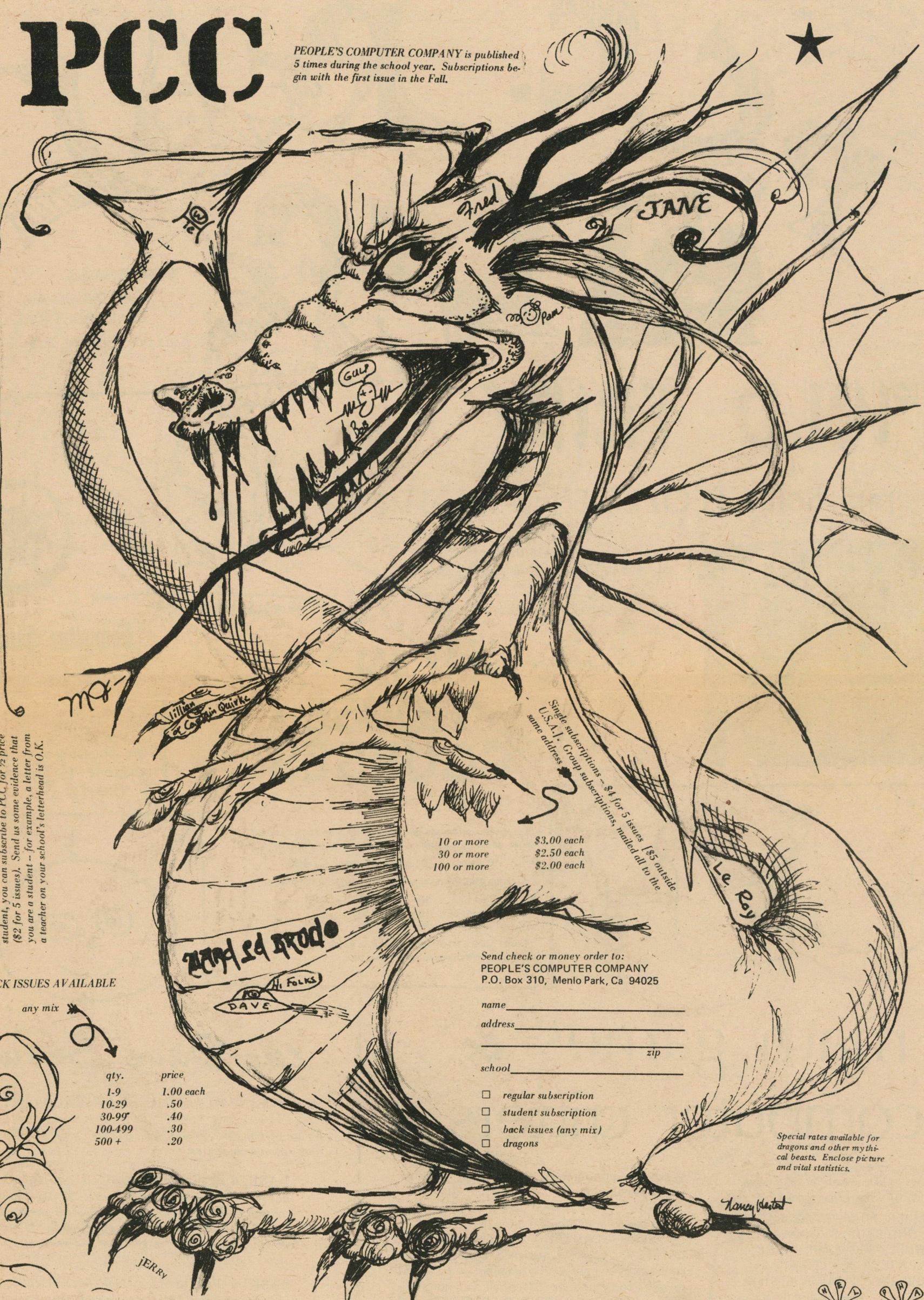


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