creative computing

March 1981
vol 7, no 3
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the #1 magazine of computer applications and software

Emphasis on Education

Simulation of Competitive Business

n In-depth Report

Papert: Mindstorms

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Level

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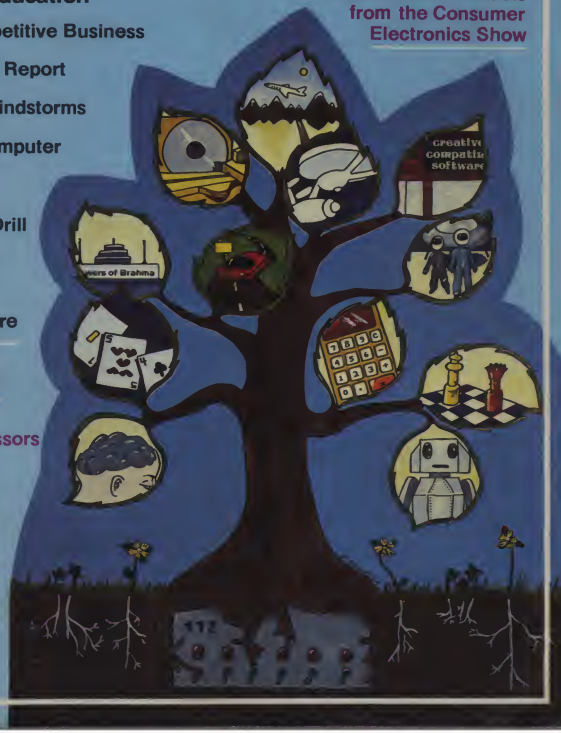
25 Fantastic New Products from the Consumer Electronics Show

Trucker: A Prize-Winning Simulation

Evaluations:
- PET Word Processors
- A2—FS1 Flight Simulator
- Fantasy Games
- Combat Games
- Show and Spell

Program Helps Cut Your Income Tax

Space Invaders Championship



Computer Music Record

A recording was made of the First Philadelphia Music Festival which is now available on a 12" LP record. It features eight different computer music synthesizers programmed to play the music of J.S. Bach, J. Pachelbel, Rimsky-Korsakov, Scott Joplin, Neil Diamond, Lennon & McCartney and seven others. The music ranges from baroque to rock, traditional to rag and even includes an historic 1963 computerized singing demonstration by Bell Labs. $6.00 [CR101].

Katie and the Computer

Fred D'Ignazio and Stan Gilliam. This is a delightful story told in words and full color drawings of Katie's adventures when she "falls" into a computer. In Katie's journey through the land of Cybernia she meets the Software Colonel, the Bytes, the Table Manager and even a ferocious Program Bug. Her journey parallels the path of a simple command through he stages of processing in a computer, thus explaining the fundamentals of computer operation to 4-10 year olds. Supplemental explanatory information is contained in the front and back end papers. 42 pp. hardbound $6.95.

Coming in April

Networks Large & Small
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- Ma Bell and the Personal Computer
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- Time-sharing with an Apple

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- Centronics 737
- 80 columns for the Apple
- Adventure Games
- Decathalon from Microsoft
- Atari Music Composer
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- Fog Index
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In This Issue

articles

applications - games

The cover is a painting by Kathy Comella of Morristown, NJ. It represents the many branches of education which are affected by computers.

evaluations & profiles

fiction & foolishness

departments

MARCH 1981 **VOLUME 7, NUMBER 3**

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et cetera

Where Is My Favorite Column?

You have probably noticed—or soon will—that many of our regular departments are missing from this issue. Fear not—this is not a permanent disappearance. We simply had so much excellent editorial material related to the use of computers in education that we decided to give the contributing editors a month's vacation. Look for them again in April.

—EBS

Computers in Education Conference

The Third Annual Computers in Education Conference will be held at Seattle Pacific University, Seattle, WA on May 1 — 2, 1981. This conference will feature panel discussions, talks, workshops, and exhibits. The special emphasis will be on the use of microcomputers in K - 12 classrooms of various disciplines. For further information contact Jerry Johnson, Seattle Pacific University, Seattle, WA 98119.

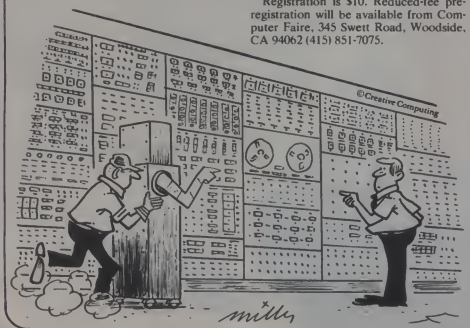
West Coast Computer Faire

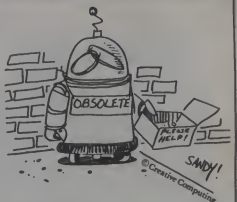
The 6th West Coast Computer Faire will be held in San Francisco, Friday—Sunday, April 3—5, 1981. It is the largest microcomputer-related conference and exposition in the United States, with an expected 20,000 to 24,000 attendees.

The trade and consumer exposition includes over 400 exhibits by most of the manufacturers and distributors of low-cost systems for small-business, school and home.

The conference program will include 50-120 speakers, who will provide tutorials for the novice, and state-of-the-art presentations for experts. Topics range from Computers in Education, Electronic Prosthesis for the Physically Impaired, Computer Art, Exotic Games, Information Utilities, Legal Aspects of Computing, and Biomedical Applications.

Registration is $10. Reduced-fee pre-registration will be available from Computer Faire, 345 Swett Road, Woodside, CA 94062 (415) 851-7075.





NCC Personal Computing Fest to Host AI Panel

Robotic/artificial intelligence buffs will gather in Chicago for 1981's National Computer Conference during the period of May 4 to 7 to debate "Do Machines Think?" Included on the roster are notables such as Ernest Kent, psychologist author of *Brains of Men and Machines;* Roger Garrett, inventor/roboticist, columnist; John Peers, Executive Director of US Robotics Society; Norbert Tagge, Air Force Aeronautics engineer; Dave Jasper, Minnesota Science Museum Hobart project head; Dave Ahl, publisher, educator, games expert; and several other surprises. The panel is headed by Ms. Abby Gelles, teacher, author of *Robotics Curriculum,* and current affiliate of Carnegie-Mellon's Robotics Institute.

NCC '81 McCormick Place, Chicago, Ill., May 4 to 7.

For more information, write: NCC '81 PCF, c/o AFIPS, 1815 N. Lynn St., Arlington, VA 22209.

Hypercon

The first public demonstration of the Xanadu Hypertext System is tentatively scheduled for Saturday, April 11, in Princeton, NJ, under joint sponsorship of the Princeton chapters of the Association for Computing Machinery and the Institute of Electrical and Electronics Engineers. For informtion, contact Doug Dixon, RCA Laboratories, Box 432, Princeton NJ, 07840; telephone (609) 734-3176.

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Input/ Output

Retorts Re Sorts

Dear Editor:

I am appalled that you would encourage the type of ignorance exhibited by W.D. Maurer ('Extremely Fast Sorting,' November, 1980).

I know of no reputable author who claims that n log n is an absolute lower bound on the number of steps required to place any set of records into some predefined order. And it is certainly no surprise that one can often make dramatic improvements in sorting speed by selecting an algorithm appropriate to the data under consideration.

For example, the following algorithm executes in n steps through 30-60 loop.

```
10  DIM DATA(100)
20  INPUT N                    'Number of data items'
30  FOR I = 1 TO N
40  INPUT KEY, INFO            'Data record'
50  DATA(KEY) = INFO
```

Finally, it is standard procedure for the practicing computer scientist, when introduced to a particular task, to see if the data itself might be exploited to simplify the analysis of the data. In this regard, Mr. Maurer has demonstrated passable competence as a practicing programmer. Unfortunately, he has also demonstrated his incompetence in the area of sorting in general.

Grady Early
Rt. 2,Box B8
Homestead Park #36
Chapel Hill, NC 27514

Dear Editor:

W.D. Maurer's "Extremely Fast Sorting" was unnecessarily hostile in tone. Had the author just been jilted by a sorting theorist?

I/O, continued...

Take the Train

Dear Editor:

As a software engineer and an FAA certified flight instructor, I was quite surprised to read David Phillips' article on aircraft weight and balance ("Weighting for Take Off", December 1980), and discovered several potentially dangerous errors in his program. Despite the fact that you publish a disclaimer noting that the article represented only the opinions of the author, I think that it would be important to Mr. Phillips and to others who might try to copy his program to know the answers produced could be grossly in error.

First, this program has been designed for only *one* Cherokee 180D—one whose empty weight is 1402 pounds. Since this number varies significantly even among 180Ds, the program is misleading to potential users unless they realize that the assignment statement on line 100 must be changed for each aircraft used, or replaced by an input request for this value.

Second, the program queries the user (at line 235) for baggage input. If the answer is "NO", the program proceeds to calculate a baggage weight (variable BG) as the difference between the maximum allowable gross weight and the total loaded weight. Clearly this leads to an error since answering "NO" presumably means the pilot is putting NO baggage aboard. Even so, the program calculates and uses a value ranging between 0 and 200 pounds.

Finally, the most significant (and dangerous) error results from the faulty logic used to determine whether or not the aircraft's weight and balance lies within the center of gravity envelope. An example will serve to demonstrate the point always immediately apparent. However, I can't quite see an excuse for sloppy testing and verification both on the part of Mr. Phillips and *Creative Computing* (expecially when someone's safety is concerned). Mr. Phillips says of his program, "It sure makes me feel more comfortable when I load up and take off!" It sure would make me feel more comfortable knowing that the rest of your articles were more carefully checked out than this one was.

Christopher D. Holley
744 Casterwood Court
San Jose, CA 95120

Pocketa—Pocketa—Pocketa

Dear Editor:

I found Mr. Hart's article on the TRS-80 Pocket computer in the December edition of *Creative Computing* to be very well written and generally accurate. There was, however, one idea which he set forth that may be misleading to potential owners.

Mr. Hart said, "A user who constantly requires trig functions might find a calculator faster than having to type in the function names, since the necessary function keys are immediately available".

This would be wholly true were it not for the eighteen reservable keys available on the PC. It is possible to program these keys to make the functions immediately available as they would be on a standard scientific calculator. More complex functions and formulae, used repetitively within the individual's scope of work can also be programmed to be available with a single key stroke.

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CIRCLE 157 ON READER SERVICE CARD

Report From the National Computer Shows

Random Ramblings

Betsy Staples

The National Computer Shows, organized by Gerald Milden were among the largest of the 1980 show season. The following reports from the three shows provide an overview for those who were not able to attend all three—or even one. Read on and see what you missed.

The MidAtlantic Computer Show

Reports from staff members who represented Creative Computing at the Washington, D.C., show focused almost exclusively on the intolerable climatic conditions. The show was scheduled for the third week in September, which should have ensured the pleasant, moderate temperatures of early fall. Mr. Milden was obviously counting on this when he booked the Washington National Guard Armory for the show.

"Can't we go home now? It's really hot here in the Armory."

The weatherman, as is his wont, failed to deliver, and August-like temperatures prevailed for the duration of the show—outdoors and in—for the Armory, not having been designed with creature comfort in mind, is also not air-conditioned.

People were not the only ones who reacted badly to the heat. Computers are well-known for their intolerance of high temperatures, and many of the machines on display had a difficult time carrying out their assignments. Were it not for the loan of a large fan by some friends in the area, our own TRS-80 would have collapsed, along with some of the less hardy of our booth personnel.

As has become the custom at such shows, Mr. Milden scheduled a series of seminars to run during exhibit hours. The seminars are usually conducted by well-known and knowledgeable people in the industry who volunteer their services, and attendance is usually included in the price of admission to the show. This was not the case in Washington (or Chicago). When the volunteer speakers arrived, they discovered that the price for seminar attendance was not only in addition to show admission, but was high enough to ensure very low attendance.

The new Lobo LCA22 controller for the Apple II microcomputers. It allows the use of a double density single or double sided 8 inch disk drive for up to 2 megabytes of storage. Lobo was also showing a high-speed 10 megabyte hard-disk system for the Apple II (price $4800). An 8 inch dual drive double sided double density goes for $2695 and single drive mini-floppy disk drives go for $425 with a one-year warranty.

The March of Dimes girl visited the Chicago show and made friends with two robots.

The Software Exchange had cute little, toy supermarket shopping carts filled up with software and t-shirts which they were using very effectively in their prime booth location in the front to promote sales of their software. The Software Exchange also very cleverly had their booth set-up like a small store, even going as far as putting a cash register at the exit.

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25 BROADWAY, NEW YORK, NY 10004 (212) 248-3994/3374

CIRCLE 206 ON READER SERVICE CARD

The Midwest Computer Show

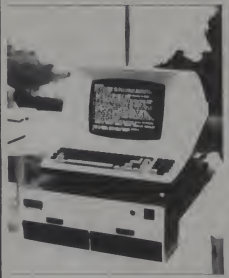
Publisher Dave Ahl made the following observations at the Midwest Computer Show held in Chicago.

In walking around the Midwest Computer Show one senses that it is a "different" show than many other hobbyist and personal computer show. In evidence are companies like Digital Equipment, IBM, Qantel, CPT (a manufacturer of word processing systems), Gandalf (a manufacturer of decoders and modems), Hewlett Packard, and Cado Business computers. As expected most of the personal computing regulars were there such as Radio Shack, Commodore, Computerland, Adventure International, North Star, Jade and others. But we sense it was a different kind of show with a different audience. Attendance on Thursday, the opening day of the show, was much larger than we have come to expect on the opening day of a computer show. There were more people asking novice-type questions. It was obvious that the general public had found its way into a computer show and they marvelled at what they saw. Also, unlike the general public that wandered into Gerry Milden's Boston Show last year, the people here were in a buying mood. The Jade booth, for example, did about $6,000 of business the opening day of the show, which they confessed was a little bit more than they normally do. Don Smith of QT also said he did about that amount on opening day.

Radio Shack was showing their new color computer at the show in their favorable location right at the entrance. It got a tremendous amount of attention from show goers.

Speaking of exhibitors, there is the universal and very strong feeling, that Gerry Milden's show hours are much too long and indeed lead to nothing but fatigue and crossness by the end of the day. The show hours run from 11 AM to 7 PM with no real loss in business or attendance. On the other hand, most exhibitors I spoke with were quite pleased at the attendance of the show and grudgingly admitted that Gerry Milden "sure pulls in the people."

The show was also interesting from the standpoint of having a wide range of exhibitors, some with very professional booths of the type that you normally see at the National Computer Conference and some with very amateurish booths with hand-lettered signs of the type that we usually see at Flea Markets. There was even one booth that had no signs whatsoever.

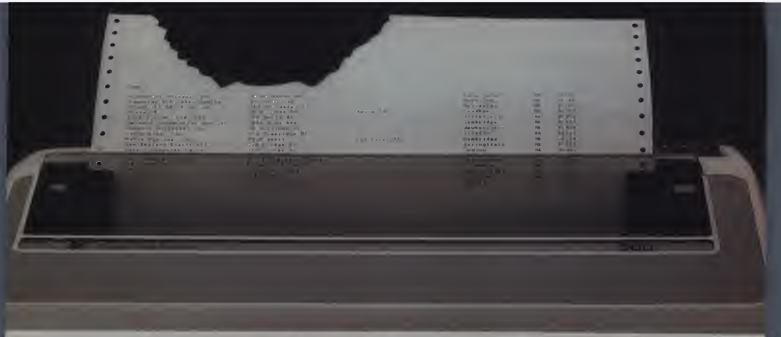


Bruce Tonkin was demonstrating The Creator, his program for generating data bases. Running under CP/M (a trademark of Digital Research) in Microsoft Basic, The Creator allows you to generate a data-base program in a simple, efficient manner. The user specifies the types of variables, allowable range of variables, titles, and other goodies. The computer then produces a program that accepts and files this input.

Although pushed against the back wall, our booth was a constant beehive of activity.

Many parents carried their children around in back packs.

Computer Station was showing a new digitizer, the Dithertizer, along with a very small Sanyo video camera for the Apple. They had some very clever software which converted the digitized image into a completely black and white image which was almost animated. (See description in January 1980 issue.) Both hardware and software will also be distributed by Perpherals Plus.



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Priced at Only $599, the TRS-80 Extended Color BASIC Computer is useful, entertaining and educational. Yet using it can be as simple as plugging in one of Radio Shack's instant-loading Program Paks. Come in and see what's already available. The computer attaches to your TV, or our own $399 TRS-80 Color Video Receiver. For just $24.95 you can add a pair of joysticks which add flexibility to games and video displays. A built-in serial interface lets you attach a printer or a modem. A tutorial Color BASIC instruction manual is included, of course.

More Good News. Extended Color BASIC is now available as an upgrade kit ($99) for the 4K Color Computer (16K RAM required — $119). There's a modest installation charge for each kit.

New TRS-80 VIDEOTEX Software [illegible] offers Color Computer owners [illegible] access to many kinds of information and data services. For example, our exclusive agreement with CompuServe[illegible] Information Service gets you local, national and international news, weather and sports from [illegible] newspapers and the Associated Press News Service, information on over 32,000 stocks and bonds, [illegible] news and reviews, nationwide Electronic Mail with other users and much more! You'll also access Dow Jones Information Services for Wall Street news, stock quotes and more.

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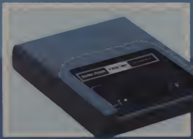

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Specificati[illegible]

Radio Shack

[illegible]

[illegible]

The Northeast Computer Show

The Northeast Computer Show was held in Boston the week before Thanksgiving. Creative Computing had reserved a four-booth island, but a week or so before the show, Gerry Milden called to say that "some of the quality island booths" had objected to our proximity, so he was moving us to a new non-island location.

After a five-hour drive in the company station wagon, we checked our packet of information and found that one of the entrances to Hynes Auditorium was for the use of exhibitors who wanted to drive their vehicles onto the show floor to unload. At that door, we were met not by a smiling John Dilks or Jim Warren on roller skates, but by a livid Gerry Milden who, with all the emotional maturity of a three-year-old, jumped up and down, pounding on the hood of our car and screaming "Creative Computing get out! Get out on the street!"

Needless to say, we were somewhat taken aback by this reception, but since the show organizer was blocking our path with his own nattily-attired body, there was not much we could do but go back to the street and unload from there.

Our non-island booth turned out to be located in the far corner of the smaller of the two exhibit halls smack in front of the freight elevator. With constant forklift traffic through the booth, we wondered if we would ever be able to set up. We needn't have worried. Like 90% of the other exhibitors we had no tables with which to begin set-up. So we waited...and waited.

Contributing Editor Peter Payack and Bookkeeper Pat Kennelly wind up a pair of Creative's popular Acrobots.

The Sinclair booth in Boston was mobbed. Apparently the showgoers liked what they saw, because over 200 of them purchased ZX80's.

Resting places were not provided for weary showgoers so many simply sat or lay on the floor.

Rams looking for Ramware.

A day or so later, one of our staffers fell into a conversation over lunch with one of the union workers from the auditorium. The man revealed that at about the time we had arrived, the teamsters had threatened to walk out on the show. Their complaint, it seems, was that Milden had told them to prepare for approximately half the number of exhibitors that he had actually booked. They felt there was no way they could do the job in the time allotted. Apparently the conflict was resolved, because most exhibitors were unaware of anything other than the inconvenience of having to wait for their booth furniture to arrive.

Thursday was a slow day. Thursday is always a slow day. We don't understand why show organizers insist on scheduling shows on Thursday. To us it seems like a waste of time and money.

Friday was reasonably busy, but Saturday was unbelievable. The crowds were so thick they could barely squeeze through the narrow isles. They seemed more interested in buying than last year's attendees, but many of them had difficulty plowing through the masses to get to the booth.

A few of the lucky folks who found space on the only unoccupied square of carpet in Hynes Auditorium.

Even IBM was represented at the National Computer Shows.

The shows were rather informal, but some visitors didn't get the word.

Milden goes to no expense to make things comfortable for attendees. There were no chairs for show-goers to relax upon; nor was there a trash can or ashtray in sight. The result was that tired folks had to flop on the floor along with discarded paper cups and cigarette butts. Those paper cups and cigarette butts that did not end up on the floor ended up in and on exhibits—and you know how much computers love Coke.

Nor did the exhibitors fare any better. Most show managements provide an exhibitors' lounge where free or low-cost beer and soft drinks are available during show hours. Not so the National Computer Shows—these are "plain pipe rack" shows, and don't you forget it.

Gerry Milden is angling to make his shows the biggest and probably the only computer shows in the country. Will he succeed? It's hard to tell. Exhibitors will probably continue to exhibit, but it will be because his shows do draw large crowds, not because Milden himself and the members of his organization are easy or pleasant to deal with. □

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CIRCLE 151 ON READER SERVICE CARD

EDUCATIONAL SOFTWARE

David Lubar

The programs discussed below cover a range from elementary to adult educational. For good measure, a few books are also reviewed.

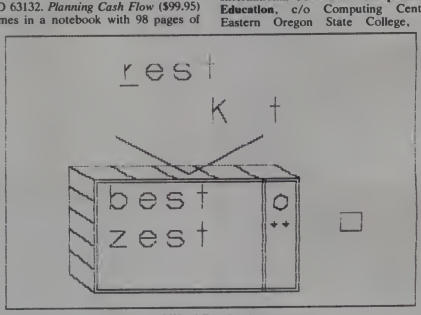
Krell Software, 21 Milbrook Drive, Stony Brook NY 11790, has a series of programs designed for those about to face SAT exams and other rituals of youth. The cassettes are available for a 16K TRS-80, PET, or Apple (with Applesoft). While the sample I received, *Word Relationships*, is straight drill and practice, it was effective. The program presents analogies, giving a pair of words followed by the first member of a second pair. The user has to pick the correct answer from four choices. After each question, the relationship involved is explained (for example, "tool and user," "opposites," "male and female"). This method helps the user look for the various types of relationships that might occur on the test. Each test consists of fifteen questions drawn from a large base of analogies. At the end, a score is given. The program is designed specifically as an aid in preparing for exams, and it fulfills that function well. In essence, it teaches you to play the SAT game. The SAT series, with seven programs on English and Math, is $79.95.

Hartley Software, 3268 Coach Lane #A Kentwood MI 49508, specializes in educational software. *Word Families* ($29.95) for a 48K Apple with disk and Applesoft in ROM, uses large-size letters drawn on the hi-resolution screen. The three programs on the disk deal with beginning consonants, final consonants, and medial vowels. In each case, the student is shown a word, along with four letters. He must pick whichever letters can replace the underlined letter in the word and produce another word. For instance, if the program showed him the word "cow," and the letters "g," "h," "q," and "l," the correct answers would be "h," and "l." The program keeps track of scores. The teacher is shown each word a student missed, along with a list of the incorrect responses. Another option allows the teacher to insert new words into the program or delete old ones. This is important since one or two of the words included did not accept certain answers which, while possibly not in the vocabulary of the average user, were, none the less, correct. With these editing facilities, the teacher can customize the program into a fairly useful classroom tool.

Moving to the adult world, we have the products of **Educational Programming Systems**, 1328 Baur Boulevard, St. Louis MO 63132. *Planning Cash Flow* ($99.95) comes in a notebook with 98 pages of text and two disks requiring an Apple with 32K and Applesoft in ROM. The actual instruction is all contained in the text. The five programs on the disk, each with an example included, are used for entering figures and determining such things as a working capital analysis and an inventory analysis. The computer takes little part in the instruction. If you need to make this sort of computation, the programs do the job, but if you want to learn how to plan cash flow, there are better ways to go.

Books

Teacher's Guide to Computers in the Elementary School and *School Administrators Introduction to Instructional Use of Computers*, by David Moursund, are two similar 48 page booklets from the **International Council for Computers in Education**, c/o Computing Center, Eastern Oregon State College, La



A game of Word Families in progress.

Grande, OR 97850. The booklets cost $2.50 each, with discounts for quantity orders, and contain enough information to help the novice teacher or administrator feel slightly more comfortable with that electronic thing which is invading the classrooms. The chapters include discussions of software, hardware, computer languages, and types of computer instruction, all presented in understandable terms.

Computers in Education, by James L. Poirot, from **Sterling Swift Publishing Company**, P.O. Box 188, Manchaca TX 78652, is another good handbook for educators who need a background in the field. After an historical overview, the book goes on to discuss computer literacy, software, applications, and current trends. A section of games is included. These aren't computer games, but games that teach computer concepts. The sections on selecting software, and recognizing quality software, are especially helpful.

Introduction to the Computer: an Integrated Approach, by Jeffrey Frates and William Moldrup, is a textbook from **Prentice-Hall, Inc.**, Englewood Cliffs NJ 07632. This 449 page book could serve as the basis for a course in computer literacy. The book covers a gamut of topics from large computers down to micros, making liberal use of cartoons, photographs and quotations from many sources, including several excerpts from *Creative Computing*, one of which actually included the required credit. The appendices contain explanations of and samples from Basic, Fortran, Cobol, and Pascal, giving the reader a taste of these languages.

CourseWare magazine represents a nice approach to educational software. Each issue contains educational programs with full documentation, along with a cassette containing the programs. There are versions available for Apple, PET, and TRS-80. The issue I received contained a spelling test and a utility that allowed teachers to generate statistics concerning missed questions on tests. This combination of good programs and extensive documentation represents a valuable tool for teachers. The magazine, created by Dan Isaacson, would be a good addition to any school's library. Single issues cost $12.95, a five issue subscription is $50.00 □

Show and Spell from Radio Shack

Isaac I. Bejar

As another long summer approached I found myself anxiously searching for a TRS-80 program that would help my son retain whatever reading skills he had acquired in kindergarten. The "Show and Spell" package from Radio Shack had just been released and seemed to fit the bill. Since the package includes five cassettes in an impressive black binder it also seemed to be a good deal at $29.99.

I first saw the program at a computer fair in Philadelphia. I had taken my son, and was able to get his opinion before purchasing the package. He was not enthusiastic about the prospect of spending the summer spelling words, and suggested instead that we buy the three-dimensional "Star Trek" game that was being demonstrated in a nearby booth. I mumbled something about the fact we did not own an Atari, but he did not find the reasoning persuasive. He suggested we exchange our TRS-80 for an Atari.

Despite my son's reluctance I bought the "Show and Spell" package. It was not without trepidation that I broke the cellophane wrapping as soon as we got home. My first disappointment came with the realization that among the five tapes were only two programs. The other tapes simply stored the graphical representations of the different drill words. The second disappointment was caused by a data tape which had apparently been created incorrectly. I called long distance ($$$) the Radio Shack store that operated the booth show. They suggested that I call another store who had actually provided them with the software. I did ($$$), and eventually located the correct person. He asked me to mail him the defective tape, which I did. Several weeks later I did receive not only a replacement for the bad tape but the entire package.

Isaac I. Bejar, Educational Testing Service, Princeton, NJ 08541.

Description

The package includes two programs. One program reads words and their graphical representation from the data tapes, presents the words, and scores the responses. The other program is used to create additional tapes with words of your own choosing, so the user is not limited to vocabulary included in the package. The minimum configuration required by the program is a TRS-80 4K Level II machine. The package includes, in addition to the five tapes, an informative and well-written 11-page user manual. The user must first CLOAD the main program. Upon entering RUN, the program will prompt you to choose a difficulty level and then to load a data tape. The content of each data tape is shown in Table 1.

As the relevant letters appear, they are moved to the center of the screen until the word is spelled.

Two modes of operation or difficulty levels are possible, "tutorial" and drill. In the tutorial mode the graphical representation of an object, say a box, is given on the right of the screen, while various letters of the alphabet cascade down the screen. As the relevant letters appear, they are moved to the center of the screen until the word is spelled. Then a question mark appears below each letter of the word and the child is supposed to "grab" that letter as it cascades by pressing any key when the right letter appears in the window. Alternatively the student can respond by actually entering the let-

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The K-8 Math Program used by the Asherton students features interactive skill-building exercises in numeration and arithmetic operations, a testing mode, an automatic placement mode, highly motivating reinforcement messages keyed to answers, plus a thorough progress report. K-8 Math is designed to operate with individual 16K Level II TRS-80 computers, or with Radio Shack's exclusive Network I System. (Network I connects up to sixteen TRS-80 student stations with a single TRS-80 Disk system, eliminating the need for loading programs from cassettes.)

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CIRCLE 101 ON READER SERVICE CARD

Table 1

Content of tapes included in the Show and Spell package

Tape	Contents
A	Programs
B	Alphabet letters, beginning sounds
C	Beginning sounds, ending sounds
D	Vowel/Blends, three letter words
E	Word patterns, action words, position words, compound words, days of the week, numbers

ters. If the child matches the spelling correctly a flashing "VERY GOOD" is displayed. Otherwise "LET'S TRY AGAIN" is displayed. In the drill mode the child is supposed to spell the word by himself, without the help of the computer, from just the graphical representation of the word. At the end of a tape a score is provided.

To maximize the usefulness of the package Radio Shack has included a utility program to permit the creation of additional words. With this program it is possible to enter additional words and their corresponding graphical representation. The program asks you to enter a word and then lets you draw a picture of it by means of a cursor which you can move up, down or sideways. Although the program is easy to use it has a serious flaw: if you inadvertently move the cursor beyond the upper boundary of the frame the program aborts and the graph you have created so far is destroyed.

Evaluation

According to the manual the package is designed "to assist young children (preschool through second grade) in developing fundamental spelling skills." What these fundamental skills are is not described. Educational software publishers should be expected to provide evidence of the effectiveness of the software they market. In the absence of such empirical information one must resort to non-empirical evaluations.

An obvious requirement of a successful educational product is that it be fun to use, or at the very least, not boring. The "Show and Spell" package does not score well in this department. It is very easy to select an unintended letter but there is no mechanism for "returning" the letter. If this occurs the child must complete the word; get a "wrong" and then start again.

Another serious limitation of the package is that it is not possible to start a tape in the middle. That is, if for some reason it is not possible to complete a tape, it is necessary to start at the beginning the next time. This is no small problem since it takes a considerable amount of time to complete a tape.

"Show and Spell" is flawed in a more fundamental way, namely, the absence of sound. Since spelling is the association of certain combinations of letters with sounds, it is hard to conceive a spelling program that does not include sound as an integral component of the system. The developers of "Show and Spell" not only managed that, but in addition expect a child who is about to learn to spell to understand the instructions that are printed on the screen.

Summary

It is possible to teach children to read by computer.* The work of R. C. Atkinson at Stanford University demonstrates that. Those attempting to develop programs to teach reading should examine this work closely, since it is based on a well-thought-out instructional curriculum. It was found to be effective even though none of the fancy graphics that are common today were available then. It did, however, include the ability to provide sound by digitizing lists of words and storing them on disk. That approach is now available to microcoputers, although still somewhat expensive for individual users. Another possibility—far less expensive—is to interface the TRS-80 to the Texas Instruments Speak & Spell through an interface developed by Percom Data. □

*Arkinson, R.C.; Fletcher, J.D. Teaching children to read with a computer. *The Reading Teacher*, 1972, 25 319-327.

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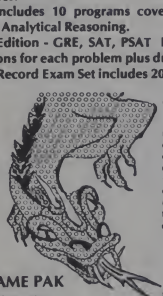

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L. Gehrig	J. Foxx	W. Stargell	H. Aaron
J. DiMaggio	H. Greenberg	W. Mays	L. Brock
J. Jackson	R. Hornsby	P. Rose	R. Carew
C. Sisler	H. Wilson	O. Cepeda	H. Killebrew
S. Musial	B. Terry	C. Yastremski	R. allen
T. Cobb	M. Mantle	W. McCovey	R. Lefore
W. Mays	H. Aaron	R. Jackson	B. Znk
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		B. Cuidry-P	T. Seaver-P

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CIRCLE 219 ON READER SERVICE CARD

Wordpro 1 Vs. CMC

Two Programs for the PET

Gary Greenberg

Word processing is one of the great uses for a computer.It takes much of the drudgery out of writing and permits you to increase the quantity and quality of your output.

Word processors enable you to type up your copy once and then electronically edit the material. Usually you use the screen on your computer to display the material and then make all your changes on the CRT. You also set different format commands to enable you to design the printout. Eliminated is all the difficulty of having to retype a page if you leave out a word or two by mistake. No more whiteout or liquid whitener will be necessary. And if you want to save the material for later, to be rearranged for other purposes, you can store the text as you would a computer file.

The two programs that I am reviewing here are both written for the PET and can be used on the 16K/32K models without the necessity for disks.

Wordpro 1 is produced by Professional Software, Inc., 166 Crescent Road, Needham, MA 02192. It is written in machine language and is a character-oriented processor. It sells for $29.95.

CMC's word-processing program is produced by Connecticut Microcomputer, 150 Pocono Road, Brookfield, CT 06804. It is written in Basic and is line oriented. It sells for $39.50.

It is not possible to say one of these two programs is better than the other. Both have advantages and disadvantages. The comparative benefits will have to depend on your needs. At the price they are selling for, even if both had fewer features they would each be a great buy.

The chief disadvantage of the CMC program based on my needs is the extremely slow printout rate. It takes about five minutes to produce a full page of printout with the CMC. The Wordpro 1 zips along at the full speed of the Commodore Printer and produces a very fast printout.

Another disadvantage of the CMC is that it is a little slow and clumsy in the editing process. This is due to both its being a line-oriented printer and its being written in Basic. Shortly, I will describe the differences between the line-oriented program and the character-oriented program.

No more whiteout or liquid whitener will be necessary.

Major disadvantages of the Wordpro 1 include the lesser amount of text that can be processed at one time compared to the CMC program. Other disadvantages are the lack of certain formatting features available on the CMC and the lack of enhanced characters.

One of the uses for my word processing is the preparation of a newsletter. The availability of enhanced characters with the CMC enable me to create standout headlines. I can't do that with the Wordpro 1. Also with CMC you can move blocks of text around. You can't do that on the Wordpro 1 either.

The CMC has much greater flexibility in formatting than does the Wordpro 1. Different parts of the CMC text can be subjected to different output formats. Margins can be changed in different places. The text can be left and right-justified or only left or right-justified. And this can be done in different places in the text. With Wordpro 1 you cannot right-justify only, and you cannot change formats in the middle of the text.

On the CMC the text is entered as a series of numbered lines. On your screen you see the line numbers followed by the text. You just enter the text and the program automatically enters the line numbers. When you wish to make changes, sometimes you have to retype major parts of the sentence or retype parts of more than one line. For each line you have to call the line to the screen and this is a slow process. The typing has to be accurate in reproducing the area being changed.

On the Wordpro 1 all text is entered directly to the screen without line numbers. You have full control over the cursor and can move it anywhere in the text to make corrections. You also utilize the insert and delete keys. An added excellent feature is that when you hold the key down you get repeat printing. That is, you don't have to hit the key each time to enter a given character repeatedly. The screen will also scroll up and down rapidly to locate the line of text needed.

One difficulty I have with the Wordpro 1 is the RETURN key. I have a strong tendency to press RETURN when I have completed a section of text. On the Wordpro 1 this could cause frequent loss of text. On the CMC you don't lose the text. You can just re-enter the text entry format.

One feature that left me very angry with the Wordpro 1 is the limited amount of text that can be entered at one time. It was written for an 8K PET that requires storage space for the program and little extra space to hold the text.

I don't know machine language, but it seems to me that it should be a simple matter to permit the program to take into account the larger memory space. The failure to program this feature in is an outrageous failure. When the descriptive material says that it runs on other CBM

Gary Greenberg, 35-63 80th Street, Jackson Heights, NY 11372.

memory configurations I almost feel cheated by this failing.

As matters now stand, the Wordpro 1 can barely hold one ordinary type-written page at one time. The CMC, however, is limited only by internal memory. In fairness, however, both programs permit the storage of text on tape, and you can link several pieces into a several-page text if necessary. But the CMC in the 32K PET can hold about 8 typewritten pages at one shot and provide much more flexibility.

Another advantage of the CMC's larger internal text capacity is the ability to use it for file editing. If the file fits into internal memory, you can edit your file with the CMC. I don't know if this can be done on the Wordpro 1. The size of the file that could fit into the Wordpro 1 is too small for my uses.

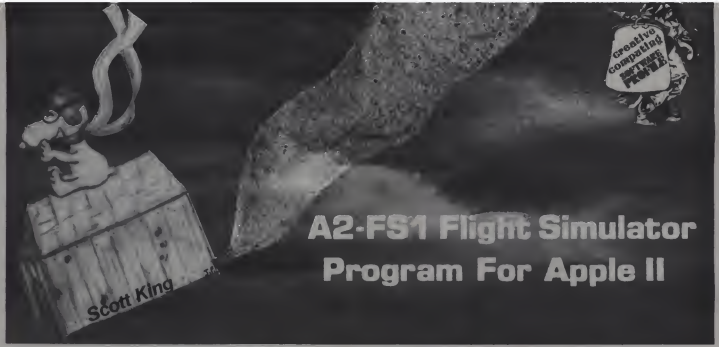
In summary, I can say I am extraordinarily envious of the speed with which the Wordpro 1 prints, but it is almost useless for my production of a newsletter.

One problem of switching back and forth between these two editing programs is that they operate in completely different manners and have extremely different instruction sets. There is much confusion and damage entailed in switching back and forth.

In summary, I can say I am extraordinarily envious of the speed with which the Wordpro 1 prints, but it is almost useless for my production of a newsletter, and the slower print speed of the CMC is a difficult but acceptable tradeoff.

I am very impressed with the great formatting flexibility of CMC.Two features that I especially like are the ability to address any character by its ASCII code permitting the use of enhanced characters, and the ability to format paragraphs permitting you to define how many lines to skip for a paragraph and how many spaces to indent for the beginning of the paragraph. Then, during the writing of the text, pressing one key will set up your paragraph.

But even with the greater format capabilities, if I could utilize my full machine memory, I would probably use Wordpro 1 for most of my routine writing. As things presently stand, I will be using the CMC with greater frequency. □



A2-FS1 Flight Simulator Program For Apple II

It's dawn, and the sun is just beginning to show over the mountains to the east. You are in your sopwith Camel, checking your gear while the ground crew tops off your fuel tank. "Switch On" you call out, as the ground crewman spins your prop over, "Contact!" and your 130 h.p. engine coughs to life. You advance the throttle and taxi across the parking pad to the taxiway. Down the path, a left turn brings your plane to the east end of the airstrip. You throttle down, and poke the brakes lightly to bring your plane to a stop. After a quick check of the controls, you pour on the throttle and start rolling westward, faster and faster picking up speed as your plane starts to bob-up and down, a slight pull on the stick and.... You're airborne! The ground drops away quickly as your altimeter winds upward.

Smoothly you move your stick to the left and your plane rolls easily toward the south. Your eyes are constantly scanning the horizon. Suddenly, your goal appears—the enemy fuel dump. As you fly toward it, bullets whiz by. Craning your neck, you see the Red Baron coming up quickly behind you! Cursing yourself for not being more observant you throw your plane into a dive hoping to lose him somehow... but you don't have a chance... you plane plummets to the ground and explodes! Are you dead? No, just upset! You reach over, press reset and start again. This time you'll get him..."CURSE YOU RED BARON!" Of course the reset button is on your Apple computer, and the reason you are still alive is because you have never left your chair. This has all been made possible by an excellent program from the people at Sub-Logic, 201 West Springfield, Champaign, Illinois ($25). The program comes as two parts: 1) A three dimensional flight simulator with through-the-windshield viewing and complete instrumentation and 2) British Ace, a WW1 war game where your mission is to destroy the enemy fuel depot (which is guarded by a enemy airbase with 5 planes.)

The program loads very easily and is in machine language form, so it will run fast (updating the screen as often as 5 times/sec). Once loaded, it comes up running, with your plane sitting on the fueling pad at a British airbase in the N.E. corner of the world. The World is a 6 mile by 6 mile square of land. You can fly off the edge of the world, but if you go too far, you could get lost and not find your way back. The program contains two data bases. A low level one gives you details of the airstrip for landing and taking off, and a high level one removes the detail work in order to increase the speed of the display. (You don't need to see the striped line on the runway from 10,000 feet anyway.) As you take off, you change data bases by using a landing gear switch. Although the Sopwith had rigid landing gear, this does make it easy to remember to switch data bases. Once in the air, your view out the windshield shows the horizon, and a mountain range to the north. The view is set up as though you were leaning slightly forward, looking out and down over the nose of the plane. Below you see another airport.

Cursing yourself for not being more observant you throw your plane into a dive hoping to lose him somehow...but you don't have a chance...your plane plummets to the ground and explodes!

This is the enemy airbase we've heard so much about in the previous paragraphs. The reason that the nasty ole Red Baron hasn't come up after us is because we aren't at war yet. It's easy though—just push a button "W" (not unlike these days in real life?) to go to war mode. Then you had better be ready to fight, because the bad guys are very hard to beat. But back to flying. Beneath the windscreen is a cockpit instrument panel with the minimum FAA required instruments, some of which are, Air Speed; Altimeter; Turn Rate; Compass heading; Rate of climb; and a bunch of engine monitoring gauges. Also included is a Radar Scope. (I'll bet you didn't expect a WW1 plane to have Radar, did ya?) Well this was included because with the simulator, you don't have the ability to turn your head and look out the sides and back.

As far as performance goes, the plane is very easy to handle. The simulator has been designed around a WW1 Sopwith F.1 Camel which just so happens to be very closely matched to a Piper Supercub 150 with a top speed of 150 mph and a maximum climb rate of 650 ft/mn. And for those of you who don't fly (I have never flown a small plane before either), you have nothing to worry about. The program comes complete with a manual that will teach you everything you need to know about flying and about flight in general. The manual explains what makes a plane fly, and what you can do to make it *not* fly! (CRASH!) The book suggests, (and I agree) that you should read the manual completely before you try to take off. I didn't and found myself upside down at 800 feet, the manual in one hand and the control stick in the

Scott King, 7905 59th Ave. N., New Hope MI 55428.

Find Your Way Around The New Apple® DOS With The Dakin5® Programming Aids 3.3®

Dakin5 Corporation, a Colorado software house, is making available to the public 12 utility programs on one 16 sector diskette, utilizing the new Apple DOS 3.3, which provides 23% more storage.

These menu-driven utilities will facilitate the development of your own microcomputer programs.

All of the **Dakin5 Programming Aids 3.3** programs are also compatible with the Corvus Disk Drive system.

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The Variable Cross Reference creates a display or a printed listing of all variable names used in an Applesoft BASIC program, showing all line numbers where a given variable name is used.

The Peeker displays or prints either all or selected records from a text file.

The Patcher allows you to display any sector of a given file or program, and then to update any data within that sector. Another option permits you to specify the sector you wish to update such as directory sectors and sectors occupied by DOS.

The Copier copies absolutely ANY type of file or program on a normally formatted diskette from one diskette to another. The name of the program or file is the ONLY information needed.

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The Screen Printer permits contents of the text screen to be sent to the printer at any time the keyboard is active (i.e. the cursor is visible). This Screen Printer program remains in effect until you press RESET or "reboot" the system.

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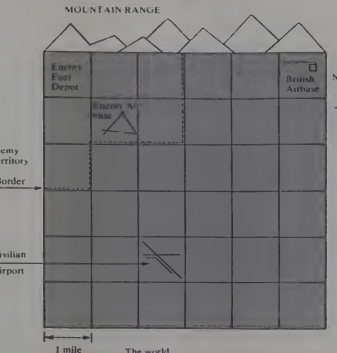
other. So read the manual before you fly! (Better keep it close by for your first couple of flights too.)

About the controls, the program is designed to support keyboard input as well as paddles. If you have a joystick *that will plug into the connector*, all the better. But it flys very well using the keyboard too. In either case the simulation is very realistic. There are a multitude of physical factors thrown into a formula that determines the responses and actions of your plane. A few of these factors are: Aircraft Altitude; Lift(Bernoulli); Lift(Angle of attack); Forward push due to prop thrust; Forward or rearward pull of gravity; Downward pull of gravity; Drag(induced); Drag (parasitic); Lift loss in turns; Momentum; Side forces due to bank; Prop stalling; Structural failure due to excessive speed or G's; etc. (Whew!)

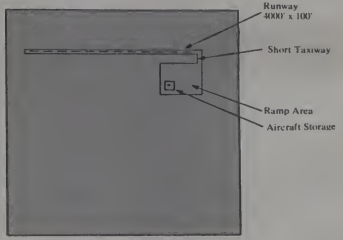
As you can see, there is a lot of computation going on in this program, and it does it very fast too. The scene moving in the windshield is very clean and smooth.

Conclusion

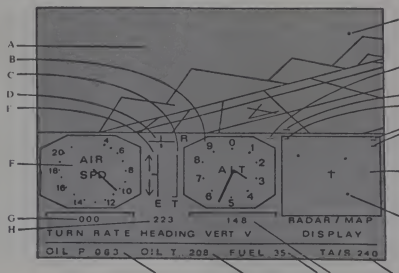
I have found that the A2-FS1 flight simulation program is extremely well written, and operates easily in a 16k Apple II computer. The only addition I would like to see, would be sound effects added in to the program. I suspect that the reason this was omitted was to keep the program size small enough to fit a 16K machine. Also at this time the low level data base only contains the high resolution data for the British air base, making it impossible to land at the enemy base, or the civilian one in the south side of the world. Once again I feel that this was a question of memory size. Perhaps in a later program Sublogic will make an expanded version for larger machines. But for the money, I feel this is probably one of the better programs on the market, and I highly recommend it. □



The world.

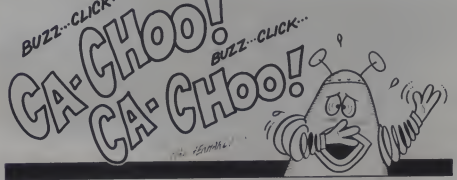


British airbase taxi chart.

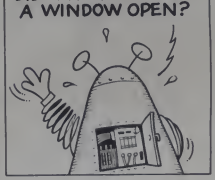


A Three-dimensional out-the-windshield display.
B Altimeter (feet)
C Throttle indicator
D Roll Rate indicator
E Elevator position
F Airspeed indicator (mph)
G Turn Rate indicator (degrees per minute)
H Heading indicator Gyro
I Compass (degrees)
J Oil Pressure (psi)
K Oil Temp (degrees F)
L Fuel (gallons)
M Vertical Velocity (feet per minute)
N Tachometer (rpm x 10) or Score during game
O Enemy aircraft on rador
P Radar Display
Q Enemy aircraft on radar
R Enemy in Gun Range indicator
S Enemy is Firing Guns indicator
T Stall indicator
U Enemy Aircraft on 3D display

Buzzy



Hal Gerhardt



Fantasy Games

Part 1

David Lubar

New fantasy games are being produced at such a rate that if you were to line them up and march them through a computer one at a time, the line would never end. This presents a problem for the games addict with limited wealth, and for the reviewer with limited time. Some late sessions, killing dragons while the sun rose somewhere in the real world, solved the temporal problem. The financial problem can be eased by avoiding games that don't suit your tastes or fail to give you your money's worth.

The phrase "fantasy games" is a catch-all designed to encompass adventures, dungeons and dragons, role-playing games, and anything else of similar bent. Some of the programs come in versions for TRS-80, Apple and PET, others are only available for one computer. The settings range from castles and dungeons to outer space and strange islands, with interaction that ranges from sentences to single-letter commands.

Apshai and Others

The first campaign of this review will be through the deadly labrynths created by **Automated Simulations**. The games, with such exotic titles as *Temple of Apshai* and *The Datestones of Ryn* are all similar in basic format. The player moves through a series of rooms, gaining experience and treasures while fighting monsters. Throughout the game, fatigue and wound levels are displayed. If your fatigue gets too great, you can't fight or move. If the wounds hit bottom, you're finished (though ressurection plays a part in several of the programs).

The combat portion is nicely conceived. The player's character can attack, thrust, parry, or fire an arrow. But he has to be facing the opponent. This involves some quick moves and quick thinking, especially since you only have a certain amount of time to make any move. The monsters don't wait while you try to remember the command for turning around. There are two slight weaknesses in this combat portion. First, you have no indication of the status of the attacker. Since his wounds and fatigue aren't displayed, you don't know whether he is full of fight or at death's door. Thus you could waste a precious magic arrow on a monster that could easily be felled with a simple sword stroke. Also, a new command is held while the present move takes place. For example, while one attack is in progress, you can hit the key which fires an arrow. If the attack resulted in the death of the monster, the arrow will still be fired. This can be slightly annoying when you are running low on arrows.

The real-time aspect of the game presents a challenge to the new player. While you are looking through the manual for a command, room description, or treasure description, a skeleton might be hacking you to pieces. A few hours of play are sufficient to become familiar with the commands and treasures. After that, you can give full attention to the vampire bat or animated armor which is coming in for the kill.

The games vary mostly in purpose and treasures. *Temple of Apshai* is a four level dungeon. You wander, building characteristics and attempting to gather all twenty treasures. Whenever you leave the dungeon, the innkeeper can give you a list of collected treasures, and also sell you weapons, armor, and healing salves. The program does not keep track of a player's money. You have to look up the values of your treasures, then tell the inn keeper how much silver you have. Those who like to cheat at solitaire can make use of this to add a bit of unearned wealth to their character's coffers.

Morloc's Tower is designed to be an easier game. Here, the goal is to kill Morlock. The catch is that you have to find him first. On the way, you gather treasures, some of which are aids, some of which are designed to increase the mortality rate.

Datestones of Ryn is also designed for beginners, though pros will find some challenge here. The play field this time is a cavern with corridors and rooms. Hidden within are datestones. Each stone that is brought out of the cave earns you some points. Here, you are fighting not just monsters, but time itself. You only have twenty minutes.

Rescue at Rigel moves from fantasy to science fiction. Your sword and bow are replaced by blasters and other futuristic

The hero fights a giant mosquito in a corridor of Apshai.

weapons. The treasures are now human captives which you must find and beam to safety. The multi-leveled alien ship has drop shafts, lift shafts, and teleport doors that make mapping a challenge.

Hellfire Warrior, the sequel to *Temple of Apshai*, extends the game potential greatly, adding new twists and improving some of the parts of play. For a closer look, see Dale Archibald's article, "Hellfire, Brimstone, and Fun," elsewhere in this issue.

A typical segment of play, using *Temple of Apshai* as an example, might run as follows. Your character, armed with a short sword, shield, and chain mail, has just left the inn and finds himself in a large room. There is a doorway to the East. After an unsuccessful search for secret doors, he moves forward. A treasure sits in the middle of the room. Before he can reach it, a giant rat attacks. The player sees he is out of line with the rat. Turning left, he moves up a few steps, then turns back and fires. The arrow strikes, but the rat keeps coming. Switching tactics, the player thrusts. The weakened rat strikes back, then succumbs to the wounds, leaving the adventurer to claim the treasure. He was slightly injured in the encounter, but doesn't yet want to use one of the few healing potions he managed to purchase. With a bit of experience under his belt, the brave fellow moves farther from the security of the exit, alert now for the next attack.

In design, concept, graphics, and entertainment, the games are good. The die-hard game player would probably want to own all of them. The person with only a mild interest in this area might find them too similar. Those who lie between these extremes would probably enjoy owning two or three of the games.

Now for prices and configurations. Note that all TRS-80 cassettes require a 16K Level II Model I system, TRS-80 disk versions need a 32K computer with TRSDOS, Apple versions on cassette require 32K and ROM Applesoft, Apple disk versions need 48K and ROM Applesoft. *The Datestones of Ryn*, at $19.95, is available on cassette for a TRS-80, Apple, or 16K PET. The disk version (same price) is available for a TRS-80 or Apple. *Morloc's Tower* ($19.95) comes on cassette for a TRS-80, Apple, or 24K PET. *Rescue at Rigel* ($29.95) is on cassette for the TRS-80, Apple, or 16K PET, with disk versions for the TRS-80 and Apple. *The Temple of Apshai* and *Hellfire Warrior* ($39.95 each) are on cassette for the TRS-80 or 32K PET, and on disk for the TRS-80 or Apple. **Automated Simulations** can be found at P.O. Box 4247, 1988 Leghorn St., Mountain View CA 94040. (Please add $1 for p&h, or they'll send a dragon to your doorstep.)

I Am Not a Number

If the above phrase brings a touch of nostalgia to your heart, you'll love **Edu-Ware's** psychological adventure set on an island prison. Based on the TV show, *The Prisoner*, this $29.95 disk for a 48K Apple with ROM Applesoft gives you a chance to escape from the island. For those who missed the series, it was a surreal story of a secret agent who had decided to resign from the service. Soon after posting his resignation, he found himself on a strange island populated by fellow inmates and members of the island hierarchy. During each episode, he tried to maintain his sanity and identity while trying to escape.

The program places you on an island with twenty rooms. You are given a special resignation code. If you reveal it, you lose. Each room on the island is a sort of mini-adventure. Usually there is more to discover than meets the eye. Some secrets are kept from you until you make the right move or acquire the necessary objects. While movement is accomplished though single-key commands, sections of the program allow full dialog between the player and the computer. The first room is a simple maze, though the walls aren't revealed until you bump into them. If you make certain mistakes, you get sent back to this room. After repeated trips, the maze becomes tedious, but this is good incentive not to make mistakes.

A full description of any of the rooms would spoil the fun, so they won't be discussed in detail. They include the hospital, library, diner, newsstand, and other facilities of the island. According to the instructions, the program makes use of devious psychological techniques such as subliminal messages. There is also a scoring system based on your ability to avoid conformity and submission. While it's nice to get a good score, your main goal is to escape. The game can be suspended at any point. When you return, you will start in the first room, but your score will be maintained, as will any possessions you have acquired.

A short segment of play might run this way. The Prisoner has left his room and is exploring the island. He wanders into a newsstand for a paper, then stops at the diner for some food. He tries to get into the library, but isn't admitted because he has no book to contribute. His next move puts him in the courthouse. The prosecutor speaks, then gives the Prisoner a chance to reply. He begins to type. At each keystroke, something is added to the picture on the screen. He pauses to think, then realizes the game his captors are playing. His next response proves his guess to be correct, but it is too late. He loses the game and is returned to the first room.

The island can be reached by way of **Edu-Ware Services, Inc.**, 22035 Burbank **223, Woodland Hills CA 91367.**

Almost Heaven

Avalon Hill, a leader in the field of war games, has expanded into the software market with half a dozen products, including a fantasy trip through the kingdom of Golconda. *Lords of Karma* ($20.00 plus $2.00 p&h) is sold as a single cassette containing 48K TRS-80, 32K PET, and 32K Apple versions of the program. The object of the game is to get to Heaven with as many Karma points as possible. These points are gained through acts of kindness, such as giving money to beggars, and acts of bravery, such as killing a giant spider. The display is straight text. You use the standard type of two-word commands, with single-letter entry for movements.

The program is large, and contains a lot of different locations, varying from underground mazes to open forest. After loading the machine-language tape, there is a wait of several minutes on the Apple and PET versions while the "board" is being set up. If you want to take a break, you can save the whole program back to tape, or save just the data. The instructions contain all the information necessary for doing this. The design of the program does have one flaw. When the game ends, you can't just run it again since the data contains an end-of-game condition. Instead, you have to go through the whole loading procedure again. The length of the game varies greatly between plays. One time, I was zapped to Heaven with only 11 Karma points. Another time, I was up to 270 points with no sign of salvation. After a while, I found myself avoiding anything that might increase my Karma and end the game before I had explored all the tricks and traps of Golconda. A typical portion of play might run like this. You find yourself in the central square of Golconda. Hitting "L" for "LOOK" you are told what can be seen in all directions. Picking up a coin from the ground, you move north, passing through a gate into a narrow valley. You meet a beggar and give him the coin. Your Karma goes up. Moving off the path into the woods, you encounter a ruffian with a young woman. While attempting to speak with him, he stabs you. You are reborn on a mountain top, and must descend to the world below since you don't have enough Karma to go to heaven. For further enlightenment, contact **The Avalon Hill Game Company**, 4517 Harford Road, Baltimore MD 21214.

Next month, a look at such goodies as *Odyssey, the Compleat Adventure* and *Wizardry*, a new program that has a great future. □

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Dale Archibald

For those of you who may have spent the last few years cloistered on some desert island, one of the hottest categories in computer games is the adventure.

Adventures arrive in all-text, text and pictures, and mostly pictures with a little text as a scoreboard. They take place in caves, in dungeons, in space, aboard ships or in haunted houses . . . anywhere a courageous soul might intrude.

The Temple of Apshai is a popular game published by Automated Simulations, P.O. Box 4247, Mountain View, CA 94040 some time back. It allows the player to control a continuing character as he or she traces the 200+ rooms spread over four levels in the demolished caverns of Apshai. The Temple was dedicated to the worship of insect gods, mainly giant ones. The adventure lies in mapping the levels, gathering treasures, and battling monsters. The effort goes for naught, of course, if you're killed. Treasures can be silver or jewels, or magic items; greater abilities are realized as experience points earned by killing monsters accumulate.

It is fascinating to watch an antman come swaggering down the corridor after your heroine or hero. Fire an arrow. Watch it fly and hit — or miss — the target. Grapple, and thrust, attack, or parry. You see the movement and struggle, and have direct control over the actions of your character. That means you control every action of your character, from the type of sword attack to how fast to run. You don't have a set menu of things you can do. In addition, you can use that character in every onslaught, name it, buy better weapons and armor, etc. These are two of the nicest features of the game.

Hellfire Warrior is Automated Simulations challenging sequel to *Temple of Apshai*. The formats are the same, yet the many new features give this game a different feel. The graphics are superior. There is more magical equipment and special effects. In effect, *Warrior* takes up where *Temple* leaves off.

Level five is The Lower Reaches of Apshai and musters similar giant insectoids.

Level six is Daedalus' labyrinth replete with minotaurs and other cross-bred bullheaded beasts. Your character is dropped in the center of the maze, and to survive has to find the secret way out.

Dale Archibald, 1817 Third Ave. N, Minneapolis, MN 55405.

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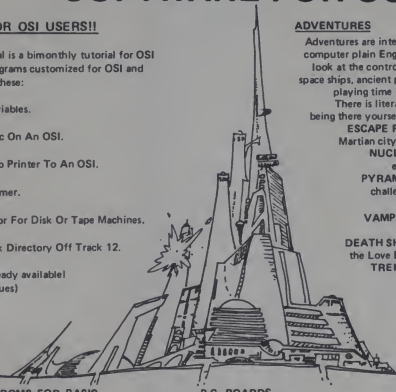

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This ROM adds full screen editing, software selectable scroll windows, keyboard correction (software selectable), and contains an extended machine code monitor. It has breakpoint utilities, machine code load and save, block memory move and hex dump utilities. A must for the machine code programmer replaces OSI support ROM. Spacify system $59.95

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ALIEN INVADERS with machine code moves -- for fast action. This is our best invaders yet. The disk version is so fast that we had to add selectable speeds to make it playable.

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SCREEN EDITORS

These programs all allow the aditing of basic lines. All assume that you are using the standard OSI video display and polled keyboard.

C1P CURSOR CONTROL -- A program that uses no RAM normally available to the system. (We hid it in unused space on page 2). It provides real backspace, Insert, delete and replace functions and an optional instant screen clear. $11.95

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Hellfire, continued...

Level seven offers assorted Undead: The tame skeleton of Apshai is tougher here and armed with two swords!

The warrior is on a quest to free the battle-maid Brynhild, enchanted in a ring of fire, from the lowest level of the dungeon: Hell. It is a more attractive game than *Temple* because it has this goal. You aren't forced to play for blood and plunder alone.

There are also elements of mystery in the game: certain treasures found on other levels come to their true potential in Hell. It's up to the player to divine how they must be used.

Unexpected humor enriches it. For example: by the time *Hellfire* begins, the ruins of the Temple have become so popular with adventurers a booming tourist industry has been founded. I was disappointed though when my wife's warrior-woman was hailed as "fellow" and "sirrah." *Temple* isn't sexist in that way. The instruction book attempts to make amends, I must point out.

Players can bargain for arms and armor in Gulik's shop, then take them to the Mage, Malaclypse, to be enchanted. (In addition to the arrows and magic arrows a character may fire in *Temple*, *Warrior* offers a blowgun and javelins as distance weapons. I think these may prove very valuable on the plains of Hell.)

Malaclypse is a particularly impatient and irritable wizard. Ignore this irascibility and you will get him down to your price. Malaclypse enchants arms and armor, plus sells a variety of magic talismans. Unfortunately, their function is not revealed. (Sometimes seven-league boots are in stock. These provide the special effect of doubling the distance traveled per move. The boots seem a novelty but are essential in the vast lower levels.)

You'll gaze long at the tantalizing potions Fnord the Apothecary purveys. Here are found such delicacies as Falcon Milk, Kraken Blood, Ambrosia, and many others. Alas, this is before the onslaught of the FDA; the effects of these draughts can be learned only by trial and error, as with the talismans. (I recommend the Oliphant Milk.) Note that none of these aids comes cheap!

It is not as easy to get rich in *Warrior* as in the *Temple*. The unit of exchange in *Temple* is the silver piece. *Hellfire Warrior* is on the gold standard. My character's bank account is in confusion as he flits back and forth between *Temple* and *Warrior*. Inflation has hit. I did not believe my eyes when *Taxes* were assessed on a rich treasure!

I have seen little of Hell, the eighth level. The warrior-woman my wife has used for months was tragically killed and eaten recently. (R.I.P. Andromeda, 500,000+ experience points). Her replacement must gain more experience before she can enter the lowest levels. My characters get chopped into catsmeat before they get past the first room. I have to be more patient.

Luckily, experience can be won faster in *Warrior* than in the *Temple*. Nothing in level five can kill a character as fast as those level four antmen (may their mandibles fall out!)

Two features *Warrior* offers that *Temple* doesn't are the abilities to save a game in progress, and to save a character. Unfortunately, I haven't been able to save a game in progress yet. It won't work with this disk, but I don't mind; I hate to give it up long enough to get a replacement.

The instruction manual claims "Owners of some versions may also save a character or a level after the character exits the dunjon. . . "? I don't know why this isn't available on all versions. The game asks if I want to save the information each time my character leaves a level, yet it doesn't save. So if the machine's turned off, or used for something else, that level is stocked with a fresh supply of monsters (and treasures) next time a character ventures in.

The book is as well-written and illustrated as its predecessor, with clear instructions and fine descriptions of the foe, from behemoths to zombies, that inhabit the corridors and plains. It also describes most of the treasures, and all the surrounds. A separate card contains short prompts of the various commands available.

All-in-all, *Warrior* is a fine game, one any true adventurer would be proud to own. It's available on disk for the 32K TRS-80, and 48K Apple with Applesoft in ROM for $39.95; on cassette for the TRS-80 16K Level II and Commodore PET, 32K, for $39.95. Add it to your treasure chest. □

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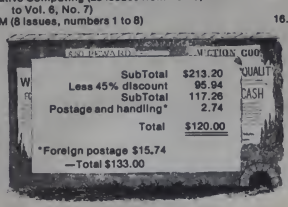
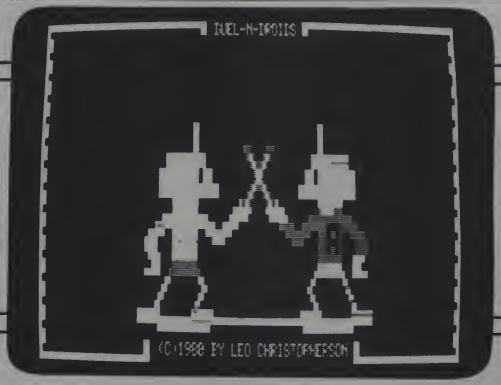
Save!





Soft Centered

David Lubar

This month, the focus is on three types of combat; hand-to-hand, ship-to-ship, and head-to-head. The hand-to-hand combat (actually sword-to-sword) takes place in Leo Christopherson's new TRS-80 graphics treat. The space battle involves an Apple Pascal program that can be run without a Pascal system. And the head-to-head battle takes place on a football field, courtesy of **On-Line Systems**.

Folled Again

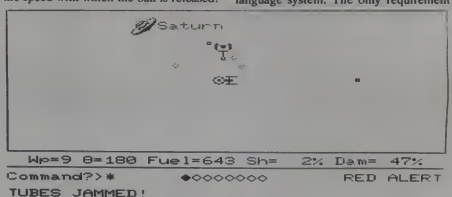
Duel-N-Droids from **Acorn Software Products, Inc.**, 634 North Carolina Ave, S.E. Washington D.C. 20003, brings the gladiatorial ring to your TRS-80. You start out with an untrained android. During each round of combat, four keys are used to control attack, defense, start, and retreat. The basic strategy is to stay with defense until there is an opening. A poorly timed attack will result in your Android being skewered by his opponent. At this stage of the game, the only penalty for a loss is no advancement to the next level. Once your Android has gained enough skill, you can enter him in tournaments, either against others of the same rank, or against randomly ranked opponents. The android must win all seven rounds to win the tournament.

During the tournament, there is little to do but sit back, watch, and root for your android. While the game is a great demonstration of graphics, there isn't any user interaction at this phase. In other words, if you like to watch the computer do its thing, the program is great; if you like to be involved at all times, you might find it a bit dull after a few tournaments. Still, with such excellent graphics and sound effects (through the cassette port by means of a recorder or amplifier), *Duel-N-Droids* is worth considering.

Also from **Acorn** is *Pinball*, complete with bumpers, rollovers, flippers, and gates. This machine-language program, with sound, is very well paced and has five speed levels. You can also control the speed with which the ball is released. And, unlike modern machines, you still get five balls per game. If you're the sort of person who can't walk by an arcade without dropping a few quarters, you'll like *Pinball*. Each program is available on a 16K Level II cassette ($14.95) or disk ($20.95).

Fly the Friendly Skies

Siro-Tech, 6 Main St., Ogdensburg NY 13669, has introduced *Galactic Attack* ($29.95), a Pascal program for the Apple II. Thanks to a new Pascal run-time package from Apple, the program can be used on machines that don't have the language system. The only requirement



A Kzinti encounter from Galactic Attack

FOR TRS-80*

EVEREST EXPLORER

by William Godwin & Don Knowlton

Towering above the clouds, the summit of Mount Everest is a forbidding spot. Only a handful of daring adventurers have made it to this five-mile-high pinnacle where the air is too thin to breathe, violent storms erupt with little warning, and danger lurks at every footfall.

Everest Explorer lets you challenge the world's highest mountain without ever leaving home. This remarkable simulation goes beyond most adventures, pitting you against challenges more terrifying than dragons and dungeons: the *real-to-life* horrors of one of man's most dangerous endeavors. It's an adventure so real that you may want to don a parka and climbing boots while playing.

Assigned an expedition budget, you must select the manpower, food, fuel, shelter and oxygen supplies you will need to support your quest. Now the adventure begins as you conquer the elements and terrain, establishing ever higher encampments.

Weather, route, season, camp placement, climbers' condition and morale all play key roles in the final question: Will you reach Everest's 29,028 foot summit alive?

Available for TRS-80* Level II, 16K for $14.95 on tape. 32K disk version, including "save game" feature and other enhancements, $20.95.

DUEL -N- DROIDS

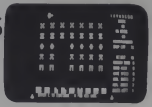
by Leo Christopherson

Your 'droid has already learned NIM, so now it's time to teach it how to wield a laser sword! Leo Christopherson, author "Android NIM," "Dancing Demon" and other animations, has developed a new type of animation and high-quality sound in his latest work.

Your 'droid starts out as a lowly clown. You teach it how to use a laser sword by controlling its movements—advance, attack, even retreat if necessary. After training it to be a "Grand Master," you enter the tournament against the program's skilled 'droid. Revel in the fanfares of the victorious—or hear the funeral dirges of the defeated! Entertainment for all ages.

Requires 16K. Available for $14.95 for tape version, $20.95 on disk.

INVADERS FROM SPACE



by Carl Miller

A fast machine language approach to this classic (and addictive) space game. As you play, the aliens drop bombs, move from side to side, and try to overrun your bases. Hold them off—and score—by shooting them down. But, just as you think you've got it all under control, the action speeds up.

Choose the game speed, enemy bomb frequency and accuracy, shots on screen and the number of your bases. Move your base and simultaneously fire at the Invaders—you cannot do this in most similar games. Full sound effects add even more excitement to the incredible speed and action of INVADERS FROM SPACE. Fun for all ages and skill levels.

Available for TRS-80* 16K Level II for only $14.95 on tape or $20.95 on disk.

*TRS-80 is a trademark of Tandy Corp

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These and other popular Acorn programs are available now at fine computer stores. Ask for them.

DEALER INQUIRIES INVITED

CIRCLE 147 ON READER SERVICE CARD

Soft Centered, continued...

in this case is DOS 3.3. The program pits your ship against Kzinti invaders, who have established bases on all the planets and major moons except for Earth and Luna. Your ship must travel through space, defeating Kzinti ships, strafing occupied planets, and recapturing these planets by beaming down armies. At the start of the game, the player has a chance to change the major parameters, including the number of Kzinti ships that can attack at any time, and the speed and power of torpedoes. During battles, you can use either torpedoes or phasers. The weapons have to be aimed using a coordinate system similar to that found in *Star Trek*, and accuracy counts. All control is through the keyboard.

At any time, you can request information about any of the planets. The computer will display the number of armies occupying the planet, and the range and bearing of the planet. Once you get into orbit around an occupied planet, you can drop your shields and begin strafing. During this action, the armies on the planet are shooting back. Strafing can continue until there are three armies on planet. At this point, you have to switch tactics and beam down your own armies. The catch is that, at the start of the game, you can only carry one army. This number increases as you successfully destroy Kzinti ships, but it takes a while to reach a level where you can carry enough armies to conquer a planet. This is not a quick, shoot-em-up game, but a long campaign requiring quick reactions and careful planning.

The program is designed so that input is always being registered, even while action is taking place, allowing for true real-time play. *Galactic Attack* is tough to beat and fun to play. **Sleo-Tech** has several other excellent products, including a great dungeon campaign with the potential to become a classic. That program will be covered next month in an article on fantasy games.

Huddled Masses

Finally, there is an arcade-type football game for the Apple, with full animation and paddle control. *Hi-Res Football*, from **On-Line Systems**, 36575 Mudge Ranch Road, Coarsegold CA 93614, is a game for one or two players. Each team has seven players, represented as X's or squares, and the game can be played at two different skill levels. The one-player mode is mostly for practice, though the computer is a fierce opponent. The player is always on offense, and regains possession back at the twenty whenever he loses the ball. Plays are chosen using the paddles. As the paddle turns, the names of the plays appear. By pressing the button, a play is chosen. On offense, the player can control the motion of the quarterback. The rest of his team follows whatever pattern is dictated by the chosen play. A press of the button throws a pass. If the pass is successful, the offensive player now has control over the direction the receiver will run.

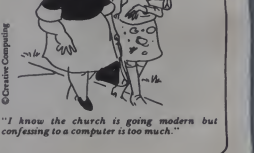
In the two-player version, the defense controls the defensive back. If the back manages to touch a pass, it is incomplete. If he is directly between the quarterback and the receiver, he gets an interception. The defense can also let the man under his control rush the quarterback. While this can result in a sack, it can also result in a big gain for the offense if a pass is completed.

It takes a while to get used to controlling the runner. The left paddle, when rotated fully counterclockwise, causes the man to run toward the bottom of the screen. As the paddle is moved clockwise, the direction of the run changes, also moving clockwise. Kicks are controlled in the same way. On the extra point, if your paddle isn't set properly, the ball will go off to the sides. After a bit of practice, you can have your man running with the skill of Jim Zorn.

Hi-Res Football gives two players a chance for an exciting evening of strategy gaming. When both players have had a chance to practice, the action can be quite exciting. The disk costs $39.95 and will run on any Apple.

What's Next?

When home computers first became available, the popular games were fairly simple. After a while, *Star Trek* took hold, spawning a large variety of space-combat games. Then adventures became available. These have grown more complex and sophisticated. That raises an interesting question: What is next? Will some completely different type of game appear, spawning an entire field of software? Maybe one of you is already writing or conceiving the next hot item. If you are about to market such a product, send in a copy for review. If you haven't gone to market yet, get in touch with our software department; they're always looking for exciting new products. □



"I know the church is going modern but confessing to a computer is too much."

The First National Space Invaders Competition

Matt Mihovich

Winner Bill Heineman meets the press.

Following three months of regional competition among some 10,000 entrants, five finalists emerged to battle for the title in the First National "Space Invaders" Competition sponsored by Atari. The finals were held on November 10 at the New York headquarters of Warner Communications Inc. (Atari is a division of Warner) amidst a small audience predominantly composed of press and media people. While a spokesperson for Atari admitted that the competition was a media event designed to "help popularize the game," the finalists saw it differently. They were there to find out who was the best player in the U.S. — a search that's replayed in candy stores, arcades, and homes all across the country.

If Las Vegas had been taking bets before play began at 10 a.m., the odds-on favorite would have been fourteen-year-old Frank Tetro. A finalist from the New York area, Frank came in with the highest playoff score of 110,125 points; sixteen-year-old Bill Heineman from the Los Angeles area was a distant second with 83,475 points. The others in the finals were: Steve Marmel, 15, from Chicago with 76,220 points, Robert Marek, 16, from Dallas/Forth Worth with 72,570 points, and Hing Ng, 16, from San Francisco with 64,185 points.

Simultaneous competition was restricted to two hours of play, which necessitated speed as well as accuracy in shooting down the alien critters. Using Atari's video game version of "Space Invaders," which has 112 possible variations, they played game selection number one, "A" difficulty. This meant that each player was limited to three ships fighting squadrons of thirty-six aliens (6 x 6 configuration), and there were no obstacles, no thumping heartbeat sounds, and no sideline critters cheering for each hit. Afficionados of the game (of which this writer is one) would have noted that the last alien in the squadron did not move as fast as Bally's arcade version or Creative Computing's home computer version for the Apple computer. All the same, there were plenty of booming explosions and laser beam zaps, and the need for speed made the playing tense.

Moving too fast got Steve Marmel zapped out at around 40,000 points; while the other finalists each broke 100,000 and lasted the full two hours.

New Official High Score

When the cosmic dust had settled, a new official high score of 165,200 points was achieved by Bill Heineman of Whittier, CA. He was awarded First Prize of an "Asteroids" Table Top Video Game. Second Prize, an Atari 800 Personal Computer, was awarded to Hing Ng of San Francisco with a score of 153,300 points. And Frank Tetro of Yorktown Heights, NY, scored 133,300 points to earn the Third Prize of a $500 shopping spree.

After the competition, Bill Heineman felt "tired physically, great mentally!" Though he has an Atari Video Computer System (each of the finalists had one), Bill thinks Bally's arcade version of "Space Invaders' is tougher because "the aliens shoot more."

None of the finalists owned a personal computer going into the competition, but all would like to have one someday.

Matt Mihovich, 502 9th Street, Brooklyn, NY 11215.

Bill Heineman (left) on his way to a new record — 165,200 points.

Top three finishers Frank Tetro, Bill Heineman, and Hing Ng

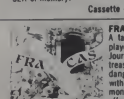
Software for the Apple II and Apple II Plus*

ASTEROIDS IN SPACE™
By Bruce Wallace
An exciting space action game! Your space ship is traveling in the middle of a shower of asteroids. Blast the asteroids with lasers, but beware — big asteroids fragment into small asteroids! The Apple game paddles allow you to rotate your space ship, fire its laser gun, and give it thrust to propel it through endless space. From time to time you will encounter an alien space ship whose mission is to destroy you, so you'd better destroy it first! High resolution graphics and sound effects add to the arcade like excitement that this program generates. Runs on any Apple II with at least 32K of RAM and one disk drive.
On Diskette - $19.95

FASTGAMMON™ By Bob Christiansen.
Sound, hi res, color, and musical cartoons have helped make this the most popular backgammon playing game for the Apple II. But don't let these entertaining features fool you — FASTGAMMON plays serious backgammon. Runs on any Apple II with at least 24K of RAM.
Cassette - $19.95 Diskette - $24.95

ASTROAPPLE™ by Bob Male.
Your Apple computer becomes your astrologer, generating horoscopes and forecasts based on the computed positions of the heavenly bodies. This program offers a delightful and stimulating way to entertain friends. ASTROAPPLE produces natal horoscopes (birth charts) for each person based on his or her birth data. Any two people may be compared for physical, emotional, and intellectual compatibility. The program is written in Applesoft BASIC with machine language subroutines. It requires either RAM or ROM Applesoft and at least 32K of memory.

Cassette - $14.95 Diskette - $19.95



FRACAS™ by Stuart Smith.
A fantastic adventure game like no other! Up to eight players can participate in FRACAS at the same time. Journey in the land of FAROPH, searching for hidden treasure while warding off all sorts of unfriendly and dangerous creatures. You and your friends can compete with each other or you can join forces and gang up on the monsters. Your location is presented graphically and sound effects enliven the battles. Save your adventure on diskette or cassette and continue it at some other time. Both integer BASIC and Applesoft versions included. Requires at least 32K of RAM.
Cassette - $19.95 Diskette - $24.95

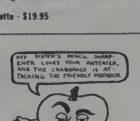
BENEATH APPLE MANOR™ by Don Worth.
Descend beneath Apple Manor into an underground maze of corridors, rooms, and secret passages in quest of rich and powerful treasures. The dungeon complex consists of many floors, each lower level more dangerous than the last. If you can reach the lowest level, you may even find the ultimate object of your quest, the fabled golden apple of Apple Manor. Strategy is extremely important as you deal with a variety of monsters, each with its own characteristics. Written in integer BASIC with machine language subroutines. Requires integer BASIC and at least 16K of RAM on cassette or 32K of RAM on diskette.

Cassette - $14.95 Diskette - $19.95

BATTLESHIP COMMANDER™ by Erik Kilk and Matthew Jew

A game of strategy. You and the computer each start out by positioning five ships of different sizes on a ten by ten grid. Then the shooting starts. Place your volleys skillfully — a combination of logic and luck are required to beat the computer. Cartoons show the ships sinking and announce the winner. Sound effects and flashing lights also add to the enjoyment of the game. Both Applesoft and integer BASIC versions are included. Requires at least 32K of RAM.
Cassette - $14.95 Diskette - $19.95

BABBLE™ by Don Worth.
Have fun with this unique software. You write a story, entering it as a BABBLE program. As you write the story you specify certain words to be selected by the computer or entered from the keyboard at execution time. Run the program and watch BABBLE convert your story into an often hilarious collection of incongruities. The ways in which BABBLE can entertain you are limited only to your imagination. You can compose an impressive political speech or write poetry. You can plan a dinner menu. You can even form images on the screen or compose musical tunes with the help of BABBLE. The cassette version requires at least 16K of RAM and the disk-ette version requires at least 32K of RAM. BABBLE is written in machine language and runs on any Apple II computer.



Cassette - $19.95 Diskette - $24.95

LINKER by Don Worth.
Turn your Apple II or Apple II Plus into a powerful and productive software development machine with this superb linking loader/editor package. LINKER does the following and much more:

- Dynamically loads and relocates suitably prepared machine language programs anywhere in RAM.
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Linker works with virtually any assembler for the Apple II. Requires 32K of RAM and one disk drive.
Diskette - $49.95
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WHERE TO GET IT: Call us at (213) 344-6599 for the name of the Quality Software dealer nearest you. If necessary you may order directly from us. Mastercard and Visa cardholders may place orders by telephone. Or mail your check or bankcard number to Quality Software, 6660 Reseda Blvd., Suite 105, Reseda, CA 91335. California residents add 6% sales tax. SHIPPING CHARGES: Within North America orders must include $1.50 for first class shipping and handling. Outside North America the charge for airmail shipping and handling is $5.00. Pay in U.S. currency.

CIRCLE 195 ON READER SERVICE CARD

Competition, continued...

especially Bill, who "loves working with computers every chance I get." He likes to take them apart and then reassemble them, and can program in Basic and "a little in Z-80."

Young Heineman emphasized that he's not a pinball player though his first encounter with "Space Invaders" came about two years ago with the arcade version.

A Bit of History

"Space Invaders" was developed in Japan in 1978 by Taito Inc. and quickly took the country by storm. Some 350,000 coin-operated machines supplanted pachinko (traditional Japanese pinball) as the most popular game. It even drove Howagiken Ltd., the largest pachinko manufacturer, into bankruptcy and forced other manufacturers to update their products with so-called "Invader-Pachinko."

Meanwhile, Bally Manufacturing Co. brought the arcade version to America and, in the first 23 months, placed 60,000 coin-operated "Invaders." Now they're devoting their full attention to "Galaxian," a more sophisticated follow-on entry in the video-game field.

There are several personal computer versions of "Space Invaders," including "Super Invasion" marketed by Creative Computing Software for Apple and "Alien Invasion" by Software Innovations for TRS-80. Atari, Inc. acquired exclusive rights to market the home video game version, and has made it the #1 seller of their forty video games.

William F. Grubb, vice president of marketing and sales for Atari's Electronic Entertainment Division, assured everyone present at the competition that the National "Space Invaders" Competition would become an annual event. The finalists were happy to hear that, particularly Bill Heineman, who will "never give up playing [Space Invaders]."

Time and time again, he wiped out the entire squadron and got the bonus ship in under sixty seconds!

The Winning Strategy

Bill's winning strategy (similar to that used by the other finalists) was simply this: At each reset, moving from extreme left to right, he zapped the entire bottom line (two lines whenever possible). He then eliminated the entire right column, moved back to the extreme left, and systematically destroyed each column as he moved back to the right. Time and time again, he wiped out the entire squadron and got the bonus ship in under sixty seconds!

He's looking forward to defending his title and to playing "Asteroids," which he says is much tougher, because when zapped, big asteroids merely break up into little ones that are equally destructive.

Bill and others who are taking to Asteroids, will be happy to know that Atari is considering a separate competition for "Asteroids." Atari, by the way, markets both the arcade and home video game versions; while Quality Software markets its own version, "Asteroids in Space," for the Apple computer.

All in all, this First National "Space Invaders" Competition was a good one with a new official high score, in two hours of regulation play, of 165,200 points. There's a score for all Invader-addicts to aim for. How long is this likely to go on as an annual competition? Before you answer, bear in mind that 20 minutes after the competition was over, all of the finalists (and a few members of the press) were playing "Asteroids" in an adjoining room! □

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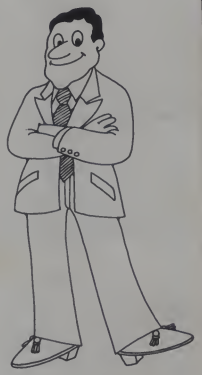

Businessware for Professionals

Using Super-Text ($150) as your word processing editor, the Form Letter Module ($100) allows you to create complex form letters which can be customized for each person or business entered in the Address Book Mailing List ($50). On screen prompts and menus facilitate operator entry of additional information and allow piecing together of complex documents. Runs on the Apple II or II plus with 48k and disk drive.

Data Plot's easy editing features allow you to create and modify a wide variety of full color graphic representations of numerical information. Bar charts, including additive bars, as well as single and multiple line charts may be plotted individually or cumulatively. Pie charts are easily sliced. All figures may be output to a graphics printer. Runs on an Apple II or II plus with 48k, Applesoft ROM and disk drive.

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Apple II is a trademark of Apple Computer Corp.

CIRCLE 225 ON READER SERVICE CARD

Bally, Interact and Video Brain

David H. Ahl

The response is in. In the September issue I asked information on Bally, Interact and Video Brain. Here's what we got.

Video Brain

Nothing, zip, zero. People wrote to us wondering where to get cartridges, repairs, et al. But that was it. No one gave us any leads to current dealers or sources. It's almost as though the company, their dealers and most of their customers vanished to another planet.

Interact

A different story here. In the December issue we told you about David Ross of Micro Video. They are continuing to market and support the unit and are still selling computers (for $375), an RS-232 interface and several software packages.

Protecto Enterprizes markets the 16K model R for $249. They also have a $399 package which additionally includes Level II Basic and documentation, service manual, two joystick controllers and three tapes of software. B.J. Badger of Protecto writes that they "support the Model R to the greatest extent." Their price list shows an interface port, 16K expander, telephone modem, service manuals and over 30 software tapes.

Manu-tronics was the actual manufacturer of the Interact computer. Today, they sell the Level II unit with two joysticks and one program tape for $299. (They ran a special price prior to Christmas of $269. It may or may not still be available.)

Addresses of these companies are:

Micro Video
PO Box 7357
Ann Arbor, MI 48107
(313) 996-0626

Protecto Enterprises
P.O.Box 502
Franklin Park, IL 60131
(312) 382-5244

Manu-tronics
9115 26th Avenue
Kenosha, WI 53140
(414) 694-7700

A press release photo of the Interact Model One distributed at the 1979 summer Consumer Electronics Show.

Prototype of the Bally keyboard unit which was never manufactured.

Bally

Quite a story behind this one. And most of it hasn't yet been aired.

In early 1977, Bally engineers put the finishing touches on the design of a home computer. The home computer was to come in two parts. The first part was an arcade game and the second part was a keyboard add-on module that would come later and complete the system. Bally then reached an agreement with Joseph Sugarman that his company, JS&A, would be the one to introduce and be one of the few to market the unit nationwide. JS&A had achieved an excellent and well-deserved reputation of being able to introduce and market high-technology, high ticket items. It was JS&A that introduced countless calculators, digital watches, "Pocket CB," an electronic burglar alarm, a remote telephone answering machine and scores of other "space age" devices.

Although the Bally computer was one of the most expensive devices JS&A had ever handled, Sugarman was confident that his style of informative advertising could sell the unit. Sugarman took several months getting totally familiar with the unit and another two months writing and re-writing the ad. He confessed that it was one of the most difficult he ever wrote. Also one of the best. It ran in September 1977 as one-half page in the *Wall Street Journal* and in *Scientific American* as a two-page spread.

In which we sell a 386 page, $11.95 book for just 2¢.

Liquidation Giveaway

Byte magazine. You've seen it. It's the fat technical one.

Back when *Byte* was first publishing independently, *Creative Computing* and *Byte* cooperated in many areas. We ran joint promotions, directed articles to each other and the like.

In 1976, Creative published *The Best of Creative Computing, Volume 1*. I proposed to Virginia Londoner, publisher of *Byte*, that we also publish articles from *Byte* in book form. She agreed, and so we published *The Best of Byte, Volume 1*. It's a huge book of 386 pages with articles on hardware, software, technical tutorials, how-to materials and even some philosophy.

Although some of the technical material in *The Best of Byte* is out of date today, it nevertheless provides a good historical framework for the personal computing field. Not at all out of date are most of the software articles and tutorials. Similar books of other publishers are selling for $20 and up, so at $11.95, this one is quite a bargain.

Big Hearted

About the same time we were preparing *The Best of Byte* for publication, Nat Wadsworth of Scelbi approached Byte about doing a similar book. Virginia wanted to be nice to everyone, so she gave permission. Thus was born the *Scelbi-Byte Primer*.

Unfortunately, about half of the content of the two books was identical. Thus *Byte* was faced with a dilemma of which book to endorse and sell through their magazine. Inexplicably, they chose the Scelbi book. Thus we were left with twelve skids of *The Best of Byte*.

Hidden Away

In the next three years we sold a lot of these books. In fact, after we ran a special in 1979, we thought we had sold out.

However, we just moved to new quarters. In the move we found, lurking away in the back of our old garage, four skids of *The Best of Byte*. After some fitting words, the boss said "for 2¢, I'd give them away." So that's what we're doing.

Our Ridiculous Offer

The original price of *The Best of Byte* was $11.95. If you order $11.95 worth of any of our other books or records, we'll throw in *The Best of Byte* for 2¢.

Thus you could order *The Best of Creative Computing, Vol. 3* ($8.95) and *Computer Coin Games* ($3.95). The toal price is $12.90. For $12.92 you also get *The Best of Byte*. Shipping and handling on all book orders is $2.00.

Here are the books you can use to come up with an $11.95 or greater total:

Best of Creative Computing, Vol. 1	$8.95
Best of Creative Computing, Vol. 2	8.95
Best of Creative Computing, Vol. 3	8.95
Basic Computer Games	7.50
More Basic Games (Microsoft)	7.95
More Basic Games (TRS-80)	7.95
Computer Coin Games	3.95
Be A Computer Literate	3.95
Computers in Mathematics	15.95
Problems for Computer Solution (Student)	4.95
(Teacher)	9.95
Computers in Society Bibliography	17.95
Katie and the Computer	6.95
Computers For Kids (TRS-80)	3.95
Computers For Kids (Apple)	3.95
Tales of the Marvelous Machine	8.95
Colossal Computer Cartoon Book	4.95
Computer Rage Game	8.95
Computer Music Record	6.00
Computer Myths Explained Prints	3.00

Limited Supply

We expect a heavy response to this offer, so order today to be sure of getting *The Best of Byte* for just 2 cents.

Send us your order for books of $11.95 or greater plus 2¢ for *The Best of Byte* and $2.00 postage handling. Send payment or Visa, MasterCard or American Express number and expiration date to the address below or call our toll-free number.

Don't delay; order today.

creative computing

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Morristown, NJ 07960
Toll-free **800-631-8112**
(In NJ 201-540-0445)

Bally, continued...

The orders poured in. First a trickle and then a flood–8000 in all. Prompt delivery was promised. But then Bally slipped delivery to October. JS&A notified customers. Some cancelled. Then another slip. Notify customers. More cancellations. Finally a few units were ready in January.

But by this time Bob Wiles had joined Bally as marketing vice president. He wanted to show Bally management that he could turn things around. He ignored the previous arrangements with JS&A and started to set up a dealer network. To make sure the dealers were successful, products were shipped to them first and a small percentage to JS&A even though JS&A still had thousands of back orders.

Unfortunately, most of the first production units were defective and they were returned. The problem was ironed out and a new batch shipped out two months later. Lo and behold—another problem and fifty percent of this batch came streaming back.

Around this time, Bally decided they would put off manufacture of the keyboard unit indefinitely. It had originally been promised for delivery in early 1978. When JS&A responsibly passed this piece of information along to their customers, hundreds more units were returned from people who had bought it for eventual use as a computer.

By late 1978, Bally had committed to putting up a huge casino in Atlantic City. This would require a substantial outlay of cash so they scaled back some of their less profitable operations like home computers. Sugarman was getting pretty fed up with the whole deal so finally, in November 1979, he decided to liquidate the remaining Bally computers he had in stock (some new, some returns) for a bargin basement $49.95 each. Unfortunately the ad was rushed into print and contained a few statements that Bally didn't like. We've reproduced it here—see if you can find the two statements that caused Bally to demand Sugarman run a retraction.

Incidentally, JS&A ran a retraction and Bally got a court injunction prohibiting JS&A from running more ads. JS&A appealed and the case was reversed by the District Court of Appeals. Bally has appealed to the Illinois Supreme Court and the case is still pending.

JS&A's retraction advertisement raised yet another controversy. In it they offered to sell 60 defective Bally units for 2 cents each. The ad mentioned that these could be sent to Bally and repaired for the flat fee of $25 and the repair job came with a 90-day limited warranty. Well Bally didn't like this at all and said, in court again, that they never quoted $25 for repair. Unfortunately for Bally, JS&A had tape recorded a conversation with Bally's service manager in which he cited the $25 fee several times.

That's kind of a long-winded story of

Can you find the statements in this ad that caused Bally's lawyers to demand that JS&A run a retraction?

Bally and JS&A. But wait. There's more.

In 1980, Bally finally got fed up with their entire Consumer Products Division (casinos and coin-op games were more profitable) and sold it to Astrovision. They reactivated the keyboard project and showed several prototype units with a Zgrass graphics package at the winter CES. August 1981 availability is promised. The current price for the "Bally Professional Arcade" alone is $299.

Dick Konopa of Bally's (former) Consumer Products Division stated that "Bally Manufacturing Corp will continue to honor warranty and service obligations on those units purchased from Bally Consumer Products Division." This is being handled by Rex Television Service Co.

Several other companies are producing software for the Bally such as George Moses Co. (all 15 of Bach's 2-part Inventions on one tape), Wavemakers (mostly games) and Anderson R&D (speech recognition system and games). Perkins Engineering is producing a device called a Blue Ram which facilitates adding a keyboard or more memory.

Many users told us about two Bally owner clubs, both of which publish newsletters, the Arcadians and Cursor. The Arcadian newsletter is entering its third year, price is $12.50 per year. Cursor started publishing in January 1980; price is $19.50 per year (12 issues) or $9.75 for six issues.

Fred Cornett, President of Cursor, wrote me a long letter on October 3 describing Cursor and sending me three back issues. I planned to give them prominent mention in this follow-up. But then, a week and a half later, before I even had chance to respond to Fred's letter, he shot a three-page letter to *InfoWorld* accusing me of doing a "hatchet job" on Bally (in the September issue in which I was soliciting additional information for this follow up). In his letter he stated, "obviously Mr. Ahl feels he has so much credibility he doesn't need to check the facts anymore. He merely prints conjecture and readers accept it as fact. What compounds this problem is articles such as Mr. Osborne's which heap even more credibility on the undeserving Mr. Ahl." It goes on. *InfoWorld* had the letter in type but apparently had second thoughts about running it. I would have too.

I could respond further to Fred, but it hardly seems necessary and I've probably rambled too long anyway. Here are the addresses of companies mentioned in the Bally section:

Anderson Research and Design
1611 Lacota Lane
Burnsville, MN 55337

Arcadian
c/o Robert Febris
3626 Morrie Drive
San Jose, CA 95127

Astrovision
6460 Busch Blvd., Sutie 225
Columbus, OH 43229
(800) 848-4377

Cursor
PO Box 266
North Hollywood, CA 91603

George Moses Co.
110 E. North St.
Brighton, MI 48116

JS&A
One JS&A Plaza
Northbrook, IL 60062

Rex Television Service Co.
6011 South Pulaski Rd
Chicago, IL 60629

Wavemakers
Box 94801
Schaumburg, IL 60193 □

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FOR TRS-80*		
CCI-100 TEAC	5¼", 40 Track (102K Bytes) for Model I	**$314**
CCI-100 MPI	5¼", 40 Track (102 K Bytes) for Model I	$319
CCI-280	5¼", 80 Track (204K Bytes) for Model I	$429
For Zenith Z89		
CCI-189	5¼", 40 Track (102K Bytes) add-on drive	$394
Z-87	Dual 5¼" add-on drive system	$995

NEW • S-100 CCS CARDS

MAINFRAME, Z-80 CPU, CONTROLLER, RAM, and 2P + 2S CARDS $CALL

8" SHUGART SA801R DISK DRIVES $425

DISK OPERATING SYSTEMS

PATCHPAK #4 by Percom Data $ 8.95
CP/M* for Model I, Zenith $145 • for Model II, Altos $189
NEWDOS Plus 40track $79 • **NEWDOS 80** $135

DISKETTES — Box of 10 with plastic library case

5¼"	**Scotch $35**	**Maxell $40**	**BASF/Verbatim $24**
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CLEAR PLASTIC CASE-Holds 50 5¼" diskettes $19

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APPLE II-16K $1075 • **APPLE III-96K** $3749
Call for other Apple products
TRS-80* Model II-64K $3499 • **Model III-16K** $899
Used TRS-80* Model I Computers, tested and guaranteed $CALL
ZENITH Z89, 48K all-in-one computer $2395
ZENITH Z19 $735
TELEVIDEO 920C $748
ATARI 400 $479 **ATARI 800** $769
APF Game Only $95 **Complete System** $489
MATTEL INTELLIVISION $229

MONITORS

LEEDEX	12" B & W Video 100	$129
ZENITH	13" Color	$379
SANYO	9" B & W VM4509	$155
SANYO	12" B & W DM5012	$226
SANYO	12" Green Screen DM5112	$238
SANYO	13" Color DMC6013	$416
APF	9" B & W TVM-10	$120

TELECOMMUNICATIONS

LIVERMORE STAR MODEM 2-year guarantee $145
UNIVERSAL DATA SYSTEMS UDS-103 $179
D-CAT HARD WIRED DIRECT MODEM $189
AUTO-CAT Auto Answer, Direct Connect Modem $229

PRINTERS

NEC Spinwriter
Letter Quality High Speed Printer
Includes TRS-80* interface software, quick change print fonts, 55 cps, bidirectional, high resolution plotting, graphing, proportional spacing: R.O. $2395
R.O. with Tractor Feed $2595 KSR with Tractor Feed $2895

C.ITOH Starwriter, 25 CPS, daisy wheel printer $1795
C.ITOH Starwriter II, 45 CPS, daisy wheel printer $1995
Letter quality printers. Use up to 15" paper. 1 year warranty on parts. 3 months on labor. Proportional spacing and bidirectional printing. Same as VISTA V300.

EPSON MX-80		$CALL
PAPER TIGER	**IDS 445** Graphics and 2K buffer	$699
	IDS 460 Bidirectional, 160 cps, graphics and 2K buffer	$1050
	IDS 560 132 Columns, graphics	$1599
ANADEX	DP-9500/01 $1345 DP-8000	$849
OKIDATA Microline 80 Friction and pin feed		$499
Tractor Feed, friction, and pin feed		$625
Microline 82 Bidirectional, friction and pin feed		$719
Microline 83 Bidirectional, 120 cps, uses up to 15" paper		$995
CENTRONICS		
737 Friction & pin feed		$780
730 Friction & pin feed		$595
779 Tractor feed		$969
EATON LRC 7000 + 64 columns, plain paper		$269
TI-810 Includes TRS-80* software and Compressed print, vertical form control		$1865

16K RAM KITS 2 for $56 $30

200 ns for TRS-80*, Apple II, (specify): **Jumpers** $2.50

ACCESSORIES

Z-80 SOFTCARD: Your key to software expansion. The plug-In Z-80 Softcard transforms your Apple into a Z-80 while keeping all the benefits of the 6502. Comes with CP/M in two disk format, MBASIC and GBASIC, full documentation and utility programs. $339.00

SCOTCH HEAD CLEANING DISKETTE: Cleans drive Read/Write head in 30 seconds; specify 5¼" or 8". $25.00
FLOPPY SAVER: Protection for center holes of 5¼" floppy disks. Installation tools and rings for 25 diskettes. $ 11.95
Re-orders of rings only $ 6.95

VIDEX BOARD	80 Column, U/L case conversion card	$279.00
CRT FILM: Helps eliminate external glare, 9"		$ 29.00
RF MODULATOR: Adapts video to TV		$ 29.00
TRS-80 & OTHER MYSTERIES		$ 18.95
NEC SPINWRITER THIMBLE $11.95	**RIBBON**	$ 6.00
CCS CARDS: Parallel or serial printer interface cards		$115.00
RS232: For Radio Shack Interface.		$ 84.00
DISK-DRIVE EXTENDER CABLES: Fits all mini-disk drives.		$ 16.95
SIX (6) PRONG ISOLATOR: ISO-2		$ 54.00
AC FILTER/6 PRONG POWER STRIP		$ 39.00
DISK DRIVE CABLES: 2 drive $29.00 4 drive		$ 35.00
DUST COVERS: TRS-80/Apple		$ 7.95
PLASTIC DISKETTE HOLDER: For ring binder, holds 20		$ 8.00

COMMUNICATIONS SOFTWARE

CCI-TELNET COMMUNICATIONS PACKAGE:
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For fast delivery, send certified checks, money orders or call to arrange direct bank wire transfers. Personal or company checks require two to three weeks to clear. All prices are mail order only and are subject to change without notice.

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5 Dexter Row, Dept. K02M
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Hours 10AM-6PM (EST) Mon.-Fri. (Sat. till 5)

Technical Information call 617/242-3361
Massachusetts Residents add 5% Sales Tax
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master charge The interbank card VISA*

CIRCLE 171 ON READER SERVICE CARD

INTERNATIONAL WINTER CONSUMER ELECTRONICS SHOW

David H. Ahl

January 8-11, 1981

Las Vegas Convention Center
Hilton Hotel/Jockey Club

FOR THE TRADE ONLY
NO ADMISSION CHARGE
MINORS UNDER 18 YEARS OF AGE
WILL NOT BE ADMITTED

The semi-annual gathering of the manufacturers and retailers, writers and ad reps, innovators and imitators in the consumer electronics industry: it's a fabulous show, lasting four days in Las Vegas every January. This year, over 55,000 people in the consumer electronics industry gathered to find out about the newest, latest, the most creative, the best and indeed, the worst in the consumer electronics industry. CES is a trade-show. Most of the products shown there are not immediately available. In fact, many manufacturers, particularly those from Hong Kong, Japan and Korea are sending up trial balloons—they show products hoping to take home enough orders to justify manufacturing them. In many cases just a prototype has been built and in some cases the prototype isn't even a working model.

The big U.S. manufacturers in the hi-fi, television, car radio and related fields spend big at the Consumer Electronics Show. At a typical computer show the average booth size is 200 or 300 square feet; at the Consumer Electronics Show typical booth sizes run 1000-1500 and even 2000 square feet. Some of the manufacturers actually erect two story booths on the show floor. The second story is a maze of rooms where buyer and seller sit together hammering out terms and delivery agreements on products for the coming year.

The entertainment and displays at the Consumer Electronics Show are lavish. At the Sanyo hospitality suite over 20 huge bowls of shrimp were brought out in less than one hour. This is not unusual. Texas Instruments introduced Bill Cosby as their new advertising spokesman and had him give a private show to TI's distributors and employees. Even smaller manufacturers hold lavish cocktail parties with hot hors d'oeurves in the hotel suites.

This was the year of the video disk. The video disk, introduced some five years ago by Phillips/MCA, has now assumed the position of the most important growth product of the consumer electronic industry. Over eight manufacturers were showing new versions of video disk systems. Initially we had hoped that there would only be one design of the video disk so it would not lead to the same situation that now exists in the video tape field with two competing formats. We had hoped that with Phillips behind it the rest of the consumer electronics field would adopt their design much as they had with the Phillips compact cassette design introduced many years ago and now the industry standard. But, alas, it was not to be. There are now three major competing designs of video disks in the field (as discussed in *Creative Computing*, January 1981).

One other reason that we were hoping for the adaptation of the Phillips video disk is that it lends itself to interfacing with a computer. A small company, **Blue Lakes Sales**, headed by Jim Armstrong has just introduced a product called "OmniScan Laser Disk Controller." It interfaces a laser scan video disk (the Phillips/MCA type) with an Apple computer. But not just any laser scan video disk; it requires one with frame search capability. The MCA, Maganavox, Phillips, and Sony all use laser scan technology, but at this point only the US Pioneer unit has the frame search capabilty necessary for "intelligent" interfacing with a computer. Price of the Apple/Video disk interface is $250. For more information write Blue Lakes Sales, 3240 University Ave., Madison, WI 53705; telephone (608) 233-6502.

Computers

The computer field may be starting to shake out a bit. Very few truly new computers were introduced at CES. The expected introduction by Sharp of its computer that they have been selling in England, did not materialize.

Casio

One surprise introduction came from Casio with their FX-9000P computer. The unit looks very much like the HP 85 and 83 machines. It has a relatively small (5 inch) CRT, full keyboard and numeric keypad, and plug-in memory modules built into the main unit. The major innovation is that the "slot-in" memory packages have an on-board battery power system so that you can turn off the computer and remove the memory cartridges and they will not forget what you have programmed into them. The screen has a high resolution 256 x 128 pixel graphic display; together with its graphic command software, graphs, diagrams and charts can be displayed. At the show they had a cute display of a time clock with a little man walking continuously across the screen.

The Casio FX-9000P has removable memory units with on-board battery power.

The FX-9000P has a powerful set of graphic commands built-in to its basic language. These commands allow points, straight lines, curves and rectangles to be drawn relative to the X and Y axis. For example, a circle could be drawn with the following very simple one statement program. "DRAW (COS(A),SIN(A))."

October availability is promised for this system. Price for a 12K system with 4K Basic is projected at $1000.

APF

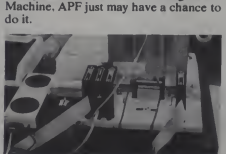
APF introduced the Imagination Machine II. Several versions of this system exist, however the System III was the one being most highly touted at CES. It features an 11K RAM, a powerful Basic in a 14K ROM, complete 53-key keyboard and a 32 character by 16 line screen format. It also features alphanumerics in up to eight colors, built-in sound synthesizer and built-in dual track cassette tape.

The APF Imagination Machine II is self-contained and priced from $399.

The expansion box that plugs into the back of the Imagination Machine can't help but remind one of a hobbyist's bread board kludge into which plug 8-track-size boxes containing memory and various interfaces.

The System III has an optional a mini-floppy disk which stores 72K bytes per single side diskette. Two floppy disks can be handled with the mini-floppy disk interface.

In the System III, the game playing machine is no longer a separate component to be set in the top of the keyboard unit. Rather it is a self-contained unit of CPU, keyboard and cassette with place for the video monitor to sit on top of them. The System III is priced at $1195. The computer alone sells for $395; this is a $200 reduction from last year's price. According to Sy Lipper, it is APF's intention to compete and beat Radio Shack despite the built-in advantage of Radio Shack's 6,000+ stores. With this new configuration of the Imagination Machine, APF just may have a chance to do it.



Back side of an APF imagination machine showing interface unit and four I/O modules.

Bally/Astrovision

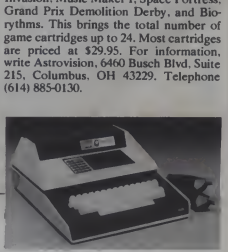
Another former video game manufacturer has taken the next step into a computer system. Although Bally announced a keyboard unit for their video game system a few years ago, it was never put into production. Now Astrovision has shown and promised us a computer keyboard, "The Z-Grass-32," to go along with the Bally Arcade. The Arcade plugs into the keyboard unit and gives the user an additional 32K of memory and 24K of ROM. The additional 24K of ROM contains system software that "makes this the easiest computer to use."

Astrovision has elected not to go along with the industry-wide movement to Basic only. The Z-Grass system has several powerful capabilities for creating graphs, visual displays, interactive teaching systems, advanced video games, electronic music and video animation.

Z-Grass itself is a programming language. The software includes a full-screen text editor, point, line, box, and circle commands; 160 x 100 pixel resolution in four colors; and string manipulation including match, concatenation and replacement. It also includes multi-dimensional arrays and string arrays and advanced user extensiblity at several levels.

In addition, with the basic Arcade video game unit, Astrovision has elected to include the audio cassette interface and the Basic programming cartridge. Although the keyboard with the basic Arcade unit is not a full-stroke keyboard it is possible to write programs in Basic and save them on cassette tape. Consequently this is now one of the lowest cost basic programming units ($299.95) and one of the most powerful, extensible units with the Z-Grass keyboard. Delivery is promised in August 1981. Price of the keyboard unit is $599.

Astrovision also introduced five new game cartridges for the Arcade: Galactic Invasion, Music Maker I, Space Fortress, Grand Prix Demolition Derby, and Biorythms. This brings the total number of game cartridges up to 24. Most cartridges are priced at $29.95. For information, write Astrovision, 6460 Busch Blvd. Suite 215, Columbus, OH 43229. Telephone (614) 885-0130.



Astrovision promises a keyboard and Zgrass graphics system for the Bally Arcade later this year.

CES, continued...

Atari

Another company that started primarily in the video game field, Atari today has one of the most comprehensive consumer computer systems available. On the hardware/pricing side of things, Atari has cut the price of the 400 System with 8K of memory to $499.95 (down from $630) and has lowered the price of the 16K system to $630.

More exciting is the tremendous array of software available from both Atari and third party vendors for the system. In the recreational area, Atari introduced three programs: SCRAM, an educational simulation of a nuclear power plant; Missile Command and Asteroids, both of which are personal computer versions of the popular Atari arcade games.

SCRAM requires the player to produce as much energy as possible before either shutting down a nuclear reactor or experiencing a melt-down. The program uses a graphic display of an entire nuclear plant showing pumps, generators, cooling systems and the reactor. As "Plant Manager" the player must find and fix problems as they develop. As skill at the simulation rises, the "risk" factor can be increased by locating the reactor in an earthquake-prone area or skimping on maintenance.

Asteroids and Missile Command both have been incredibly successful Atari arcade games. In converting the games to the personal computer, the programs have been enhanced by the use of color graphics, sound effects and the, now-expected, multiple game variations.

Two educational programs were introduced: Conversational Spanish, and PILOT. Conversational Spanish consists of five cassette tapes and a manual. It was produced by Thorn/EMI in England and is one of the most outstanding language teaching packages we've seen. Words and phrases are carefully pronounced and spelled out on the screen. Graphics, audio and practice sessions help the user grasp the material.

PILOT is an easy-to-learn programming language for novice computer users, children or adults. Its widest use to date has been in the classroom setting where teachers produce lessons and tutorial material to be later used by students. The powerful part of the Atari implementation of PILOT is that it allows the use of joysticks, paddle controllers and the light pen in addition to the normal keyboard. (We will have a review of PILOT on these pages in the September issue).

In the business area Atari introduced an accounting package consisting of a general accounting system, accounts receivable, and inventory control system. by Arthur Young & Co., a well-known independent accounting firm. The system is backed up by a comprehensive operations manual and Atari has installed a "user hot-line" to provide immediate response to questions about the operation of the system.

A word processor has been released for the production of text reports and letters. One innovative feature of the Atari word processor is that it is the only small system which allows the user to preview page and paragraph layout graphically on the screen before it is printed in finished form.

Commodore

At CES Commodore announced the much heralded and previously leaked VIC 20. The VIC (video interface computer) connects to any television set or monitor and provides an impressive array of features for its low price. They include color, sound, programmable function keys, full keyboard, external expansion ports, high resolution graphics with a graphics character set, joysticks, paddles, light pen, external plug-in memory and program cartridges. The basic unit comes with 5K of memory but is expandable to 32K.

The Commodore VIC20 has 5K of memory, color graphics and is priced at $299.

The color graphics features include 8 character colors, 8 border colors and 16 screen colors. Resolution of the display is 176 x 176 pixels or 22 characters by 23 lines. The VIC has four internal amplifiers including three music generators and a sound effects generator. Each amplifier has a range of three octaves. The sound uses the television speaker.

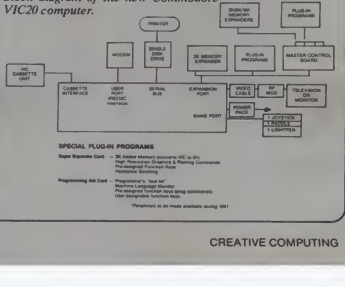
The keyboard is a full stroke unit and has screen editing keys and PET keystroke graphics. As might be expected, the language used is PET Basic.

Commodore is emphasizing the "user friendly" aspect of the VIC. Along this line they are encouraging outside software vendors to write and produce software for the VIC to be sold either independently or through Commodore. In addition they have commissioned several books and manuals to go along with the VIC which are written on a much lower level than most other computer manuals.

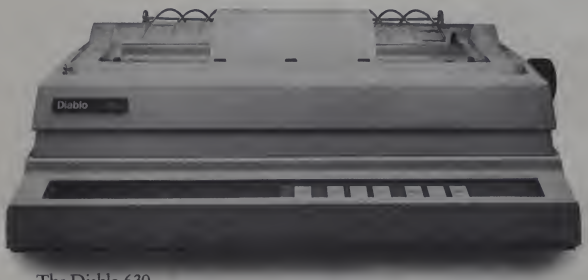
Price of the VIC is $299.95. Availability is April 1981. For more information write Commodore Business Machines Inc., 950 Rittenhouse Rd., Norristown, PA 19403. Telephone (215) 666-7950.

Atari's SCRAM is a comprehensive simulation of a nuclear reactor written by the talented Chris Crawford.

Block diagram of the new Commodore VIC20 computer.



If you want a choice in print wheels, there's only one choice in printers.

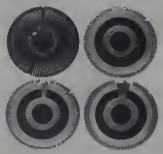


The Diablo 630.

It's the only printer that lets you use either metal or plastic print wheels. So you can choose the print wheel that's just right for the job.

The 630 works as well with a 96-character plastic daisy print wheel as it does with an 88-, 92-, or 96-character metal daisy print wheel. In over 100 different type styles.

Every 630 has fewer moving parts than competitive printers, which makes it more reliable. And it offers unsurpassed print quality. Compatibility with Diablo supplies. And bi-directional printing capability.



The 630 is the only printer in the world that uses both metal and plastic wheels.

So if you want to change your print wheels, you'll just have to change your printer.

To a Diablo 630 printer.

Diablo Systems

XEROX

Diablo® and XEROX® are trademarks of XEROX CORPORATION

CIRCLE 135 ON READER SERVICE CARD

CES, continued...

Texas Instruments

TI, like Atari, concentrated mainly on software at the winter CES. Indeed, one of the major press releases put out by TI emphasized third party software development. It described an assembly level graphics programming language (GPL) developed by TI to provide a combination of machine-code, compaction, execution speed and ease of programming development for the TI-99/4 home computer. It "offers the programmer more capability and flexibility for color, music, sound effects, high resolution graphics and synthetic speech than does TI Basic."

In addition, third-party software authors have the option of using UCSD Pascal on a new low cost TI development system. This new system has several features including: a Pascal compiler to compile programs in "p-code," a low-level code that is interpreted into machine language for the TI-99/4. Another feature is an assembler and linker which allows programming in assembly language, an editor to develop full screen editing capabilities and a filer which will help manage disk files.

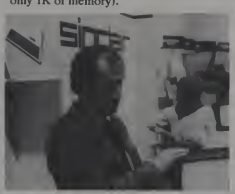
For more information on third-party software development programs write Texas Instruments, Consumer Relations, P.O. Box 53, Lubbock, TX 79408. Telephone (800) 858-4565. (In Texas call (800) 692-4279.)

TI has entered into an agreement with Source Telecomputing in McLean, Virginia to develop and expand a home information and communications service for users of the TI-99/4. This service is designated TEXNET and will be available over telephone lines. It will offer all the services of The Source Information Utility plus new databases that take advantage of the unique color graphics, sound, music, and speech capabilities of the TI-99/4. Major subjects available to Source subscribers include the services of the United Press International Newswire, world airline schedules and travel services, restaurants and wine guides, consumer buying services, the New York Times news, an electronic mail service, and several other local information banks.

In another, not-very-surprising move, TI lowered the price of the TI-99/4 computer to $649.95. All other prices remain the same, however, this could well be the catalyst that causes a wider cross section of retailers to take on the TI home computer line. Then again, it may not because, as one person remarked to us at our booth, "it's too little and too late."

Sinclair

As expected Sinclair announced the 16K memory module at CES. It has received FCS0certification and should become widely available in the first quarter of 1981. Retail price is $99.95. Housed in a small plastic box the size of two cassette tapes the module plugs into the existing ZX80 and increases its storage capacity by 16 times (one must remember that the ZX80 comes with only 1K of memory).



Nigel Searle of Sinclair discusses a finer point of the ZX80 with a visitor.

At $199.95, the ZX80 is the lowest priced personal computer on the market today. Second source software vendors jumped into the ZX80 market both in the U.K. and the U.S. broadening its applications and appeal substantially. For more information write Sinclair Research Ltd., 56 Staniford St., Boston, MA 02114. Telephone (617) 742-4826.

Mattel Electronics

For the fourth CES in a row Mattel Electronics "introduced" Intellivision and the corresponding keyboard component. The master component, actually a game playing unit, was finally put on the market in mid-1980. We are told that the keyboard unit will be available in April 1981, however, it has been slipped 4 times already and the press releases cautiously state only that the keyboard component "will be introduced in 1981."

The graphics of the master component are very impressive as are the games. At CES, seven new games were added to the library including: Sea Battle, Auto Racing, Tennis, Skiing, Word Fun, Golf, and Horse Racing. Twelve games are currently available and five others are scheduled for release in 1981.

Yet another prototype of the Mattel Intellivision keyboard unit. Big question: when on the market?

Software promised to be released in conjunction with the keyboard component includes: a Stock Analysis program, Conversational French, a physical conditioning program, and of course the Basic computer language.

We've been impressed each time we have seen the prototype keyboard and master component units at previous CES shows. The keyboard component has 16K of 10-bit memory with expansion to a whopping 8 megabytes. The built-in tape cassette drive records and plays two digital and two audio tracks in one direction opening up a tremendous number of possibilities not available on other computers. The graphics resolution is 160 x 192 pixels and it displays 24 lines of 40 characters in alpha-numeric mode.

The master component has 16 colors, a built-in sound generator capable of producing three parts, and two of the nicest hand controllers that we have seen. They have a 12-button numeric keypad, plus four action keys and a sensitive disk which permits 16-direction object movement.

The big question with Mattel is not capability or design, but delivery. For more information write Mattel Electronics, 5150 Rosecrans Avenue, Hawthorne, CA 90250. Telephone (213) 978-5150.

CES, continued...

NEC

Although shown at NCC last June, the NEC PC-8001A was not offered for sale in the U.S. until now. One of the best selling personal computers in Japan, the PC-8001A reminds one of the Sorcerer in physical appearance. It has an 82-key keyboard which includes a numeric/function keypad. The character set includes upper- and lower-case Roman, Japanese Katakana and a comprehensive set of graphics characters. Medium-resolution graphics (160 x 100 pixels) and characters can be displayed simultaneously on the screen in eight colors in several formats. Characters alone are displayed in 25 lines of 80 characters per line.

The processor is a Z80A running at 4 MHz. Cassette interface is the Kansas City format at 600 bps (bits per second). Yes, it's slowish but highly reliable. An RS232C interface is built-in while an expansion interface handles up to four disk drives, one parallel and two serial ports and the IEEE-488 bus.

The NEC 12" color monitor is one of the finest we've seen and NEC, understandably is planning to market it separately. It uses a dot screen face (rather than the vertical rectangles on standard TV sets) and drives this with a non-interlaced scan circuit.

The 24K NEC Basic was produced by Microsoft but has several extensions of standard M-Basic. Called N-Basic, it has nine commands for controlling the color graphics as well as five other extensions not found in M-Basic. For example, the command MOTOR toggles the motor relay.

The NEC PC-8001A has impressive high-resolution color graphics.

All told, a remarkable system. Ultimate success, of course, will depend upon price (not fixed yet) and distribution. For more information, write NEC Consumer Products, 130 Martin Lane, Elk Grove Village, IL 60007, (312) 640-3750.

(Continued on page 60)

Computerized Medicine

Have you ever been sick in a strange town and wondered what you would do if you got sicker? Would you subject yourself to the indignities of a hospital emergency room? Try to find someone to recommend a local physician? Fly home? Hope for a swift and painless death?

Well, your editor faced exactly this situation and collection of possible solutions at the Consumer Electronics Show in Las Vegas. After three days of aches, fever and sore throat with no improvement in sight, I sought the advice of the desk clerk at our hotel. He was apparently blessed with perfect health and disavowed any knowledge of medical services in the city, but suggested I try the computerized information console in the lobby.

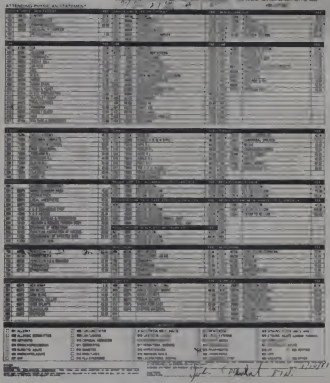
I pressed "27" for "medical services" and was heartened to see a promise of "24-hour medical assistance." I called the number indicated and was told to call back Monday as the doctor was not in on Saturday. I protested, saying that Monday I would be either dead or on a plane to New Jersey, so the answering service gave me the number of General Practice Associates.

Upon my arrival at GPA, I was asked to fill out a form which requested personal information and superficial medical history. While I was still writing, a young attendant was looking over my shoulder and keying the information into a computer terminal.

A moment later a nearby printer spewed forth a four-part form with my name, birthdate and newly-assigned patient number printed neatly at the top, and a myriad of possible tests, diagnoses and cures listed below. An hour later I was ushered to a scale by one young attendant and had my temperature taken with an electronic thermometer by another. Finally, a doctor appeared, checked me over amid the mandatory "umhumms" and "ahaahs," prescribed a shot of penicillin, made a few marks on the four-part form and left. A few minutes later an LPN arrived to administer the shot.

At the checkout counter I was presented with a bill, which I paid—how else—with MasterCharge!

—Betsy Staples

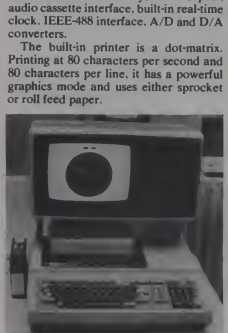


CES, continued...

OKI

OKI introduced a very impressive system, the IF800 models 10 and 20. The higher end model 20 has built-in full stroke keyboard, numeric keypad, printer, ROM cartridge, color graphics display, and dual floppy disk. The processor is built around a Z80A MPU. It contains 64K of memory, RS232 port, audio cassette interface, built-in real-time clock. IEEE-488 interface, A/D and D/A converters.

The built-in printer is a dot-matrix. Printing at 80 characters per second and 80 characters per line, it has a powerful graphics mode and uses either sprocket or roll feed paper.



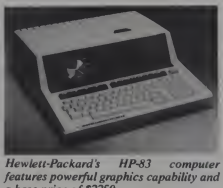
OKI introduced the IF800 Model 20 with every feature a small computer user could desire.

The high resolution video display has a 640 x 200 pixel resolution. With text it displays 80 characters per line by 25 lines and can use up to eight colors. It reminded us very much of the CompuColor monitor. On the monitor unit itself are ten programmable "super function keys." The dual 5" floppy stores 280K per disk on the dual sided, double density disks.

Projected availability and prices for the OKI IF800 computers were not available. OKI is represented in the United States by BMC International Inc., Union Bank Building, Suite 600, 11222 La Cienga Blvd., Englewood, CA 90304. Telephone (213) 641-4588.

Hewlett-Packard

HP introduced a new computer, the HP-83, at a base price of $2250. Coming from HP obviously it is designed for business and technical professionals. The HP-83 is identical to the HP-85 introduced a year ago, except that the HP-83 does not come with an integrated tape cartridge drive and thermal printer. Although the



Hewlett-Packard's HP-83 computer features powerful graphics capability and a base price of $2250.

HP-83 is priced $1,000 lower than the 85 it seems aimed at a higher end market since it is designed to couple to a floppy disk and/or large printer.

The HP-83 and -85 have full keyboards with numeric keypads. They both run a very powerful superset of ANSI Basic with more than 150 commands and statements. Memory includes a 32K ROM operating system and 16K of RAM. Memory is expandable to 112K.

Hewlett Packard also introduced a double-sided, double density disk memory unit. Each 5" disk drive is capable of storing 270K bytes. An 8" disk drive was also introduced with a capacity of 1180K bytes. These are impressive numbers and the prices are reasonable also. A single 5" disk drive costs $1500, while an 8" disk drive costs $4750 for the first drive and $3750 for each additional drive.

Hewlett Packard is well known for its software and that introduced with the 83 is no exception. Most impressive is VisiCale Plus, an enhanced version of the VisiCalc program available for Apple, Atari and other computers. The enhancements include the ability to analyze rows, columns, and groups of figures against many statistical measures, curve fitting and the ability to produce four-color charts and graphs from the VisiCalc tables.

Another piece of software, the "Information Management Pac," is a database management tool for accessing, modifying, searching and sorting data. Database totaling and statistics are included, as are report and graphics generation. This pac should be useful for creating, updating and printing customer lists, inventory records, catalogues and other data bases.

A "Graphics Presentation Pac" is a versatile set of programs that lets the user make four color overhead projection transparencies or report copies of text, bar charts, pie charts and line charts.

A new graphics tablet, the HP9111A, was also introduced. This tablet lets the user trace existing documents, design pictures, add text, and plot either built-in or user-defined shapes. The price of the graphics tablet is $1950.

A parallel printer interface was also introduced which allows connection of the HP-83 and -85 to printers such as the Epson, IDS, and Centronics.

For more information write Inquiries Manager, Hewlett Packard Co., 1507 Page Mill Rd., Palo Alto, CA 94304.

Image Computer Products

Image introduced several new software packages for the Atari, TRS-80, Apple and TI computer systems. These include Dungeon Campaign, and Typing Tutor for the Atari system; three strategy packs, most consisting of three programs, and an action pack of four programs for the TRS-80; and three utility programs including a disk fixer, time manager, and monitor extender for the Apple.

The quality of the software and the full color packaging of the Image line is very impressive. We'll be reviewing many of these programs in *Creative Computing* in up-coming months. If you can't wait for the review, write for more information to Image Computer Products, 615 Academy Dr., Northbrook IL 60062. Telephone (312) 564-5060.

At CES, anything goes to get the attention of the show goers.

CES, continued...

Automated Simulations

Several new games were introduced by Automated Simulations at CES. An interesting three-pack from EPYX includes The Datestones of Ryn, Morloc's Tower and Rescue at Rigel. In the Datestones of Ryn the player has twenty minutes to find the datestones of the Ducal calendar stolen by Rex Reaver and his band of robbers. The adventure takes place in a labyrinth of caves and tunnels. Throughout the adventure the player can choose from 14 command options, while excellent graphics display a map of the dungeon. Versions of this three-pack are available on disk for the PET, TRS-80 and Apple for $49.95.

In Morloc's Tower, from Automated Simulations, the player must hunt through a maze for the elusive Morloc.

EPYX by Automated Simulations also introduced an outer space game, Star Warrior. In this game the player must take on an entire planetary force of storm troopers and nine types of military vehicles—alone. A variety of commands allow the player to walk, jump or even fly over swamps, forests and mountains.

EPYX also introduced Hellfire Warrior, a sequel to the Temple of Apshai game. This is a fantasy role-playing adventure game, but with more magic, more detail and more command options than previous games. Hellfire Warrior lets the player take on the role of his favorite hero. The game has more than 200 rooms riddled with trap doors, bottomless pits and filled with monsters and treasures. The player must kill the great bat-winged demon, cross bridges of flames, face death itself and live before the adventure is complete.

These games will all be reviewed in upcoming issues of *Creative Computing*. For more information write Automated Simulations, P.O. Box 4247, Mountainview CA 94040. Telephone (415) 964-8021.

Toshiba showed a phototype 2" LCD flat screen TV set.

Overview of the hi-fi and auto sound portion of the winter Consumer Electronics Show in Las Vegas.

Video Game/ Computer Systems

Mego Corporation

A surprise introduction from Mego was its Video Voice System. Each of the two controllers on this system has 15 keys and when they are put back-to-back in the unit,they form a 30-key keyboard. Each controller also has a joystick control.

At $219, Mego's Video Voice System is an intriguing cross between a video game unit and personal computer.

The computer system itself has an interface to an external cassette recorder which allows the reading and saving of programs. It also is expandable to 16K, a feature not normally found in game units.

It's called the Video Voice System because it has a built-in voice synthesis chip which allows speech to be easily put into programs and games.

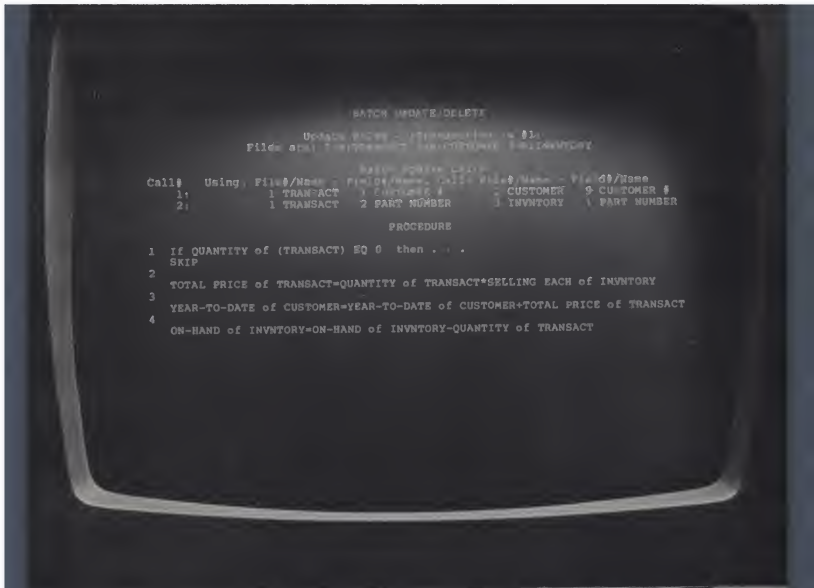
Unfortunately the details about the Mego System were somewhat sketchy. However, we hope to have a complete review of it in an upcoming issue of *Creative Computing*. Projected price for the Video Voice System is $219.95. For more information write Mego Corporation, 41 Madison Avenue, New York, NY 10010. Telephone (212) 532-6333.

Atari

Atari, the acknowledged leader in video games, unveiled a remote controlled video system. Functionally the same as the existing video system, the new unit has sleek futuristic styling. Most important the two controllers can be used at distances of 20-30 feet away from the unit itself.

The controllers are an advance over the existing controllers in that they combine both a paddle and joystick in one unit. The firing buttons are heat sensitive, finger-tip touch controls, which should allow faster action than the existing switched unit.

We recently burned out a chip in our video computer system with a zap of static electricity, a common problem in northern homes in the dry winter months. With the new remote control system we probably would still be playing games today.



The Ultimate Application Development System

Nothing can compete with the brain when it comes to information storage capacity and speed of data entry and recall — but we're working at it.

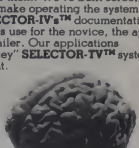
Our **SELECTOR-IV™** data base management system will let your microcomputer operate with the flexibility available (up to now) only on larger systems. You can create, maintain and report on files limited in size only by your *CP/M™ compatible operating system or disk storage capacity.

The basis of the power of **SELECTOR-IV™** is our unique method of cross-indexing the information in your files. You can immediately recall records by the contents of any piece of information required — from account numbers to ZIP codes to the date of your last audit. You can update records, individually or all at once. You can create new, uniquely, selected sub-files from existing ones (in the same or a different format), and perform computations in the process. You can define procedures to generate computed invoices, personalized letters, or gummed labels with the information coming from several files at once, and invoke them whenever needed. You can add new items to a record definition and change or delete them at will.

We've come a long way since we released the first information management system in microcomputers. We've listened to your suggestions and incorporated the best of them. We've built screen editing functions into the system which make operating the system as convenient as possible. We've had **SELECTOR-IV's™** documentation produced by our experts emphasizing its use for the novice, the applications developer, as well as, the retailer. Our applications specialists can provide you with a "turnkey" **SELECTOR-IV™** system customized for virtually any requirement.

With **SELECTOR-IV™** and a good word processor program, chances are you won't need any other software.

Look for SELECTOR-IV™ at your local computer retailer, or call:



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CIRCLE 167 ON READER SERVICE CARD

Asteroids from Atari for their video computer system provides color and variations not found on the coin-op machine.

Atari also introduced four new game cartridges, bringing the total line-up to 42. The new ones include Asteroids, the home video version of the popular arcade game. All of the action of the arcade game is captured in the home game and in addition the home game has many game variations and includes colored asteroids and ships.

Warlords is a game of defense and capture with a medieval theme. A king hides behind castle walls in each corner of the TV screen. The Warlord's role is to protect his king, defend his castle and destroy the opposing castle. Essentially, Warlords is a four cornered breakout/pong type of game with the added dimension of being able to both attack and defend at the same time.

Each of Atari's 42 game cartidges had a seperate video computer system and TV set at their booth.

Video Pinball is an extended version of the dedicated Atari video pinball game marketed several years ago. It has all the equipment you would hope for—bumpers, spinners, dropped targets, roll-overs, and bonus multipliers. The fourth game introduced was Othello. Reviews of all of these and previous unreviewed Atari video computer games will appear in the June issue of *Creative Computing*. For more information write Atari Consumer Division, 1265 Borregas Ave., Sunnyvale CA 94086.

Activision

At CES, Activision showed four new cartridges for the Atari video computer system. "Laser Blast" puts the player in command of a fleet of space craft under attack by forces on a hostile planet. To survive, the player must blast away attackers with his ship's laser while dodging radar directed laser fire from below. Laser Blast is one of the best space action games we have seen for the Atari. However a full evaluation will have to wait until the June issue of *Creative*.

"Tennis" is a very nifty game, differing considerably from the popular pong-type tennis games. In the game the player is on the near-side of a tennis court and uses a realistic-looking player who can serve, hit from the baseline, rush the net and hit anything from drop shots to cross-court passing shots. The graphics provide a unique perspective on the court, and the movement of play is so realistic that the ball even has a shadow following it.

Laser Blast from Activision for the Atari video computer system has fast action and dynamite sound effects.

Skiing features a wide-variety of slalom and down-hill ski runs at varying skill levels. The player controls a skier using the joystick controller and can race against the clock or glide easily down hill dodging trees and jumping moguls along the way.

For the bridge player, "Bridge" plays almost exactly like real bridge. The player controls the strength of hands to be dealt and the play of the game. Millions of hands can be dealt at random by the program. The computer bids as a partner and plays as opponents once a contract is established.

For more information, write Activision, 759 East Evelyn Ave., Sunnyvale, CA 94086. Telephone (408) 245-5421.

Chess Systems

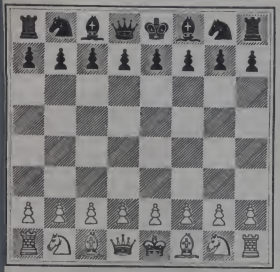
This apparently was the year to bring over chess-playing computer systems from Europe as no less than three of the new introductions at the winter CES were successful European contenders.

Novag

Since 1978 the Novag chess computers have been among the most successful ones in Europe. There are four computers in the current line introduced in the United States and they are very impressive. The two top-of-the-line systems use the very powerful MYCHESS program written by Dave Kittenger. In this 24K program, the computer looks up to nine moves ahead and solves mate-in-7 problems. Moves are executed on an LCD chess board by simply touching the piece symbol with your finger-tip then the square that you want to move it to. As soon as your move is completed the computer responds automatically. The Savant system also allows you to trace backwards, take back a move, and to trace forward through a game. The Savant can be hooked to a printer which can print a graphical representation of the game at any point, a history of the game using standard chess notation, or a beginner's notation with graphical piece symbols. A portion of this printout is reproduced above.

The same MYCHESS program is also used in the Novag Robot Adversary system. This top-of-the-line computer has a robot arm which comes out and picks up pieces to make the move. For your side you simply move the piece to the next position. After all of the pieces have been cleared from the board, the robot has the ability to place them back on the board and start another game. Both the Savant and Robot Adversary have many famous games stored in their memory which you

The Novag Robot Adversary is a tough contender with David Kittinger's MYCHESS program.



can have the computer review in their entirety or halt at any point from which you take over one or the other players. An optional chess clock may be plugged into either unit to keep track of time as in a standard tournament. The chess clock can also be used as a tournament clock.

Novag Super Sensor IV uses an 8K program also written by David Kittenger. It has a wide variety of openings. Moves are indicated by LED lamps positioned vertically and horizontally along the chess board. The unit can solve chess and mate problems as well as play the game.

Novag Microchess measures only 4 1/2" x 6" x 1 1/2" and features sensor technology. It has a 4K program which plays on 8 different skill levels. Aimed at the novice, the Microchess unit can suggest moves or allow you to renege on your last move.

For more information on Novag write the American distributor, California Intermarket Center Ltd., 11444 Washington Blvd., Suite B, Los Angeles, CA 90066. Telephone (213) 821-1007.

SCISYS

Another line of chess machines from Europe was introduced by Scisys. There are five units in the line, two of which incorporate a very easy-to-read LCD chessboard. One of these, Executive Chess, allows the player to move the pieces with a small cursor that moves around the LCD board. Not quite as easy to use as the sensory units from Novag, nevertheless, Executive Chess was very easy to use. With a memory capacity of 32K, this unit has 8 levels of play and includes now-expected features of automatic castling en passant moves and pawn promotions. It also solves mate-in-two problems and allows you to set up special opening positions.

The larger Chess Partner 2000 has similar features but is played with actual chess pieces on a sensory board attached to the computer.

The compact Chess Traveler system has eight skill levels. It can play against itself, solves mate-in-two problems, and plays either white or black. Moves are displayed on the more traditional LED display. For more information on these systems write SCISYS, 1 World Trade Center, Suite 7967, New York, NY 10048. Telephone (212) 432-8529.

Fidelity Electronics

The reigning champion of the microcomputer chess world, Fidelity Electronics, introduced three new chess systems and three other game systems at the winter CES.

Champion Sensory Chess Challenger uses an even better program than the one that won the first microcomputer chess tournament in London last September and the North American Microcomputer Chess Tournament in San Jose. This unit thinks on its opponent's time to give it an overall faster response, has time controls which are user settable for both time and number of moves. It has the ability to back one or two moves if you decide to change the direction of your game and has an improved chess clock.

Decorator Challenger combines "old world craftsmanship and space age technology." The full size chess board is made of hardwood and is complete with hand-carved playing pieces. It has 10 levels of playing difficulty, plays 40 book opening variations with approximately 1200 book opening moves. As a teacher the unit will suggest your best move, teach end game situations and allows use of a problem mode to set up specific piece positions and problems. Like its cousin, Voice Chess Challenger, Decorator Challenger has a voice feature to tell you all the computer moves and repeat your moves in any one of four languages (English, German, French, or Spanish).

Mini-Sensory Chess Challenger is battery operated and uses the more traditional LED and beep-tone to indicate moves. However, instead of keying in moves, you simply press down on the piece you are moving and LEDs light up to show your "from" location. You then press the piece down on your "to" location and the computer knows which piece was moved and where it was moved to. This unit has three levels of play and includes mate-in-two problems. Like the larger units it is able to play either white or black, allows you to set up positions to work out problems, and allows you to change the level while playing a game.

The three other products from Fidelity include: Reversi Challenger; Card Challenger, which plays Gin Rummy or several other games available on plug-in cartridges; and Dame Challenger, a popular intercontinental version of checkers.

Fidelity introduced Reversi (Othello) Challenger with sensory playing surface and nine skill levels.

For more information write Fidelity Electronics Ltd., 8800 N.W. 36th St., Miami FL 33178. Telephone (305) 888-1000.

Applied Concepts

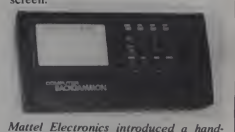
New from Applied Concepts is the Great Game Machine. This is a multigame machine which can play Chess, Checkers, Reversi, Kriegspiel and Blackjack simply by plugging in a different cartridge. Applied Concepts also has a line of individual machines which play each game on a dedicated basis. The top-of-the-line HANDroid has a robot hand which comes out and lifts the pieces on the computer side of the board. For more information write Applied Concepts Inc., 207 N. Kirby, Garland TX 75042.

Mattel Electronics

Joining the dedicated computer chess marketing race is Mattel with a beautiful little unit; it has an LCD screen with cursor movement controls. The unit has four levels of play, allows a player to go back 1, 2, or 3 moves and gives hints on what move would be best in a particular situation.

A "save game" feature permits opponents to return to a match in progress up to several days later. Problems may be set up and the computer will exchange places with the player at any point in the game or even play itself.

Mattel also introduced a portable computer backgammon system with an LCD screen.



Mattel Electronics introduced a hand-held computer backgammon with LED display.

IT'S HERE

GET THE BEST

The Data Factory was nationally rated as the best selling data base on the market and now we have made it even better. It will help you solve your problems. Thousands of people have chosen The Data Factory since we introduced it nationally last June. MAJOR CORPORATIONS use The Data Factory to handle jobs that they do not want to put on their large computers, or that would be too time consuming or costly to program. SMALL BUSINESSES use The Data Factory to control their accounts receivable and accounts payable. Mailing lists and sales records are easily maintained with the Data Factory. CHURCHES, CLUBS, HOSPITALS and SCHOOLS can keep their financial, inventory, and individuals records up to date. At HOME, your hobbies and collection lists, bank statement reconciliations, taxes, and appointment or subscription renewal calendars keep your life organized! At work or at home, The Data Factory solves problems.

WE ADDED YOUR IDEAS

We now have the next version of the Data Factory ready on 3.3 DOS. This new version, 4.0, has over 40 new and expanded features that were not in the 3.0 version. We have increased your efficiency by expanding the Data Factory's usefulness and the ease of operation. When users called us with suggestions we listened. When users wrote to us asking for new features we considered them all. We have been responsive to your needs and have given you a better and more valuable investment. The upgraded DOS gave us more space to add the new features. We used it all and still had more to give you. A SECOND PROGRAM DISK was needed to include everything!

If you have our EXTENDED WARRANTY, now selling for an annual rate of $30, send us ONE original program disk and we will replace it with the TWO disk system at no additional cost. Any renewals needed due to "blown" or damaged disks will be replaced as well during that period. If you have not yet purchased it, be sure to do so at once, as users with this Extended Warranty have priority on receiving the 4.0 version. Without an Extended Warranty, any upgrades or renewals are always $10 per disk. Extended Warranties may be purchased anytime from your local dealer or from Micro Lab.

We found that while adding more power and features to the Data Factory, it became larger than some people needed as a beginning system. We decided that there should be a way to introduce a user to the Data Factory on a more limited basis.

THE MINI FACTORY IS HERE

The Mini Factory is the EASIEST WAY TO LEARN the Data Factory System. The Mini Factory has the major routines of the original program and is on one program disk in 3.3 DOS. You can still add or delete fields after your information has been entered, do the same 20 level search, and find records that are from one date to another date. You may also choose to seach for items by entering only a few characters within the record, replace information in your records with a constant, and much of what was available in the 3.0 edition. The Mini Factory will NOT have a periodically updated version. The data that you store on the Mini Factory WILL be compatible with the big Data Factory if you decide to upgrade to the larger system. Many people may find that the Mini Factory is all that they need, but it is reassuring to know that if your needs expand, the Data Factory is there to grow with you. The Mini Factory is at your Micro Lab Dealer now.

THE SYSTEM GROWS

Micro Lab will be introducing its first "Data Factory Compatible" BUSINESS SYSTEM shortly. You will be able to use all the Data Factory features on this powerful but easy to use system. Check with your Micro Lab dealer for more information.

REQUIREMENTS AND COSTS

To operate the Data Factory or the Mini Factory you must have Applesoft in ROM and a 48K machine. You need only one disk drive but two are recommended. A printer is helpful but optional. Your Micro Lab Dealer has our products at the following prices, although some dealers supply other services along with the sale of our products so prices may vary.

The Data Factory	$150.00
The Mini Factory	75.00
The Mini-Data upgrade	90.00

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CIRCLE 156 ON READER SERVICE CARD

Electronic Toys

The main show for introducing the years new toys is the Toy Fair held in New York every February. We will be reporting on this in a later issue of *Creative Computing* and will include the details of the toys introduced at the Consumer Electronics Show with that roundup. However, it is probably worth mentioning some of the new developments in electronic toys that appeared at CES.

Vodex, a Votrax company, introduced a speech synthesizer chip which produces 64 phonemes; it can be used in a wide variety of toys and games. With the great popularity of the Texas Instruments line of the Speak and Spell family of games, other manufacutures are trying to get on the speech bandwagon.

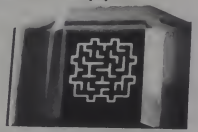
Tiger Electronics is the first one to use the Vodex chip in their games. A talking, learning computer the "K-2-8" offers a 1500 word vocabulary and 15 modes of operation in mathematics, spelling, reading reddiness and science activities. The hardware includes a 2" speaker, 56-key membrane letter/number board and a vacuum fluorescent light display. Software is promised in a wide variety of modules for grades K-8.

Tiger's "K-2-8" talking learning computer talks to its user with a 1500-word vocabulary.

Tiger also introduced a "Talking Picture Book" geared for 2-6 year olds. The 25 story pages in the unit offer children fingertip access to some 200 objects and corresponding words to teach word/picture relationships, reinforce correct answers and encourage early learning.

Tiger also introduced a "Talking Chalk Board" and several other electronic games including a "5-in-1 Sports Stadium" with football, baseball, hockey and soccer in one unit.

A new company, **NPI Corporation** has been recently formed and has brought to the market a line of table-top electronic games. These games have 5" screens and represent a nice cross between the smaller hand-held games and a full video game. Initial introductions include Space Invaders/Galaxia, Maze (an electronic simulation of a labyrinth game), Slap Shot Air Hockey,and Triangular Skittle Ball (for 1, 2 or 3 players).



"Maze," from NPI gives the player 25 seconds to get through an electronic labyrinth.

Labyrinth games seem to be the rage this year and **Mattel Electronics** has introduced Dungeons and Dragons along this line. They term it a "Computer Labyrinth Fantasy Game." The computer generates the labyrinths players must solve to discover the location of the treasure and of the dragon lurking around the prize. The game is complete with sound effects: as you near the treasure you will hear the dragon awakening and flying over maze walls to defend the treasure and perhaps chomp you, in which case there is a death knell sound effect. If you successfully remove the treasure you get a victory salute.

Mattel also introduced two other hand-held games: Ticker Tape Fever, a computer stock market game and Invisible Alien Neutralizer, which "allows earthlings to seek out and destroy unseen invaders from outer space." Three other more traditional games include World Championship Football and World Championship Baseball, and for the younger set, a "Look Alive!" line of games including football, baseball and basketball. These games are designed to test a child's skill from the "eye view" of the ball carrier or batter. A "tilt" action bowling game is also new.

Mattel Electronics showed "Dungeons & Dragons," a labyrinth fantasy adventure game.

Coleco augmented their popular Head-to-Head line of electronic games with two new units, baseball and soccer. Baseball is a very comprehensive game which has batters with actual batting averages, stealing, bunting, tagging up, hit and run, double plays, curve balls, power hits and even the song "Take Me Out To The Ballgame" that begins every contest. Electronic soccer features five offensive players that may pass the ball from one to another setting up a shot while the defensive player attempts to block. On the defensive side the game has a five-position movable goalie who can guard the goal with pass, block, shoot, and rebound features.

Coleco's Head-to-Head Baseball game has programmed batting averages and many other features that go beyond the current crop of baseball games.

Coleco also introduced an electronic learning machine which has over 250 learning activities of the multiple choice and true-false variety. Continuing their

CIRCLE 184 ON READER SERVICE CARD

CIRCLE 221 ON READER SERVICE CARD

CIRCLE 141 ON READER SERVICE CARD

CES, continued...

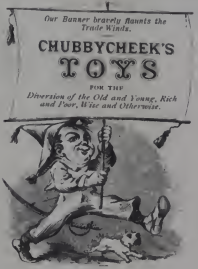
support of the Quiz Wiz line, Coleco introduced six additional cartridge quiz books for this popular question and answer game unit.

Copying Coleco's Head-to-Head format, **US Games Corp.** has introduced three 2-player electronic games: baseball, football and air disc. The football game is quite comprehensive with two teams which can select one of two formations and control subsequent play action using running, passing, kicking, field goals and safetys.

Video Technology Ltd., also introduced four 2-player games including two versions of basketball, hockey and soccer. Video Technology also introduced an electronic mini-game machine which plays four games: Grand Prix, Blackjack, Code Hunter (a version of Bagels) and Sub Hunt. It is a clever unit reminiscent of APF's Mathemagician but not quite as comprehensive. Another item from Video Technology is a Memory Van, a radio controlled car with a hand-held controller which stores directional instructions. The unit is very similar to Brain Buggy and Big Trak except that it is radio controlled. The "computer memory" can store 24 instructions for over 15 minutes of totally automatic driving. In addition, Memory Van can be operated as a standard radio control car. These units, all from Hong Kong, are distributed by The House of Games in the United States.

Speaking of programmable cars, **Vanity Fair** has introduced the "programmable Think Tank." Like Big Trak and Brain Buggy, the programmable unit is built into the tank itself and stores up to 48 moves. In addition it has five different programs which are in memory and can be called up automatically. Vanity Fair also introduced a Computer Matician which presents over 6500 preprogrammed math questions in addition, subtraction, multiplication, and division. It has several skill levels which allow the child to progress along with the machine.

"Think Tank" from Vanity Fair is a keyboard programmed unit with 48 steps (right, left, straight, stop, etc.).



One of our favorite electronic toys from last season, Electron Blaster from Vanity Fair has now been augmented by electronic, full court, 2-player basketball and a Starburst Electronic Pinball Machine.

Atari's "Cosmos" is a table top electronic game with a 3-D holographic image. Plug in cartridges cost only $9.95.

Perhaps the most innovative electronic table top game is Cosmos from **Atari**. It is a revolutionary new game system that combines 3-dimensional holoptic images along with standard LEDs and sound effects to provide amazingly challenging games. The system is "programmable" and initially eight game cartridges will be available including: Asteroids, Superman, Football, Roadrunner, Sea Battle, Space Invaders and Outlaw. Because one of the two microprocessors in the unit is dedicated entirely to sound, Cosmos has some of the most innovative and realistic sound effects available in any electronic game. Each game can be played by one player against the computer or by two players pitted against each other. There are two different skill levels for each player and each game and two separate holographic images on each game cartridge.

Entex also introduced an innovative line of seven new electronic games including Galaxian II, Escape 1000 Mazes, 3-D Grand Prix, and four other games.

Taking the award for the least innovative electronic game introduced, **Imaginamics** of Don Mills, Ontario introduced "Electronic Bingo" and a line of Exec-U-Play "toys for the big boys" such as roulette, dice and one finger bandit. These toys feature absolutely nothing except a random number generator in a shiny chrome package. We were not impressed.

New Disk Drive and Software for Zenith Z89

A recent announcement from Zenith Data Systems provides details of that company's "multi-million dollar commitment which has paved the way for extending the versatility of the ZDS Z89 microcomputer."

The Z89 is a desktop, stand-alone system consisting of a Z80 microprocessor-controlled computer, built-in 5 1/4" floppy disk drive, keyboard numeric pad and "smart" video terminal in a single unit. It has a memory capacity of up to 64K bytes of RAM which can be addressed by the operator. The video display can show up to 2000 characters at one time, and 33 special graphics for business presentations are available.

A new 8" dual-sided, dual-density floppy disk system, the Z47, can provide up to 2 1/2 million bytes of data and program storage when used with the built-in 5 1/4" drive. Data may be transferred between the 8" and 5 1/4" disks at any time.

The Z47 attaches to the Z89 (FA) with a special interface board and 40-conductor flat cable. Earlier Z89 systems can use the new drive when retrofitted with the Z89-6 and Z89-7 upgrade kits. The suggested retail price of the Z47 is $3695.

New Software

Six system and language software packages offered for the Z89 are designed for use with either the 8" or the 5 1/4" disk drive. They include, CP/M 2.2, HDOS and UCSD Pascal and Basic, Fortran and Cobol.

HOW TO TURN AN APPLE INTO A TANK.

With **Computer Conflict**™ and a little imagination, we'll transform your staid and respectable Apple computer into the fearsome war machine of the Soviet Red Army. Computer Conflict actually consists of two fast-paced, action-packed war-games played on full-color mapboards of Hi-Res graphics: **Rebel Force** and **Red Attack!**

REBEL FORCE puts you in the role of a Soviet commander whose regiment must face a computer-directed guerrilla uprising which has overrun a vital town. Armed with your tank, heavy-weapons, and infantry units, your mission is to regain the town through the annihilation of the Rebel Force.

Your advance will be brutally opposed by minefields, ambushes, militia, and anti-tank guns — all skillfully deployed by your computer. Survival and success of your units will depend on your ability to take advantage of the variable terrains – open, forest, and rough – each of which has different movement costs and shelter values.

In this finely-balanced solitaire wargame, every move is played under real-time conditions: Procrastinate and lose. At the same time, caution cannot be cast aside; severe unit losses will only result in a Pyhrric victory at best.

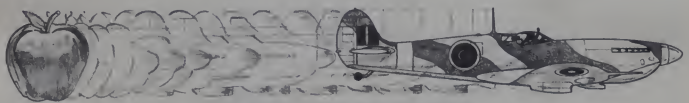
With its five levels of difficulty (plus one where you make up your own), the computer can and will stress your tactical skills to their fullest.

RED ATTACK! simulates an invasion by a mixed Soviet tank and infantry force against a defending battalion. As the defender, your task is to deploy your infantry units effectively to protect three crucial towns — towns that must not fall!

As the Russian aggressor, your objective is to crush the resistance by taking two of these three towns with your tanks and infantry. With control of these strongpoints, the enemy's capitulation is assured.

Red Attack! is a two-player computer simulation of modern warfare that adds a nice touch: At the start of each game, the computer displays a random setup of terrains and units, providing every game with a new, challenging twist.

Computer Conflict, for $39.95, comes with the game program mini-disc and a rule book.



OR A SPITFIRE.

After you're done playing Computer Conflict, you may be in a mood for something other than ground-attack wargames. In that case, **Computer Air Combat**™ is just what you need.

With Computer Air Combat, your screen lights up with an open sky generated by Hi-Res graphics offering global and tactical plots. Squint your eyes a bit, let loose your mind, and you'd swear your keyboard has melted into the throttle, rudder, altimeter, and other cockpit instrumentation of a World War II combat plane. In fact, any of 36 famous fighters or bombers, from a Spitfire and B-17 Flying Fortress to the Focke-Wulf 190 and A6M5 Zero. Each plane is rated – in strict historical accuracy and detail – for firepower, speed, maneuverability, damage-tolerance, and climbing and diving ability.

Practically every factor involved in flying these magnificent airplanes has been taken into account, even down (or up?) to the blinding sun. Climb, dive, twist, and turn. Anything a real plane can do, you can do. However, the computer prevents all "illegal" moves – such as making an outside loop (which in real life, would disastrously stall a plane).

PLAY THE COMPUTER. Aside from being the game's perfect administrator and referee, the computer will serve as a fierce opponent in the solitaire scenarios provided: Dogfight, Bomber Formation, radar-controlled Nightfighter, and V-1 Intercept. There's even an Introductory Familiarization Flight (with Air Race option) to help you get off the ground.

With the number and type of planes and pilot ability variable, you can make the computer as challenging as you want to give you the ultimate flying experience.

PLAY A HUMAN. Two can play this game as well, in dogfights and bomber attacks. Given a handicap of more or better planes or an ace pilot (or all of the above), even a novice at Computer Air Combat stands a chance to defeat a battle-hardened veteran.

For $59.95, Computer Air Combat gives you the game disc, a rule book, two mapboard charts (for plotting strategies between moves), and three player-aid charts.

Credit card holders, if you own an Apple®II 48K (Applesoft ROM) and a mini-floppy disc drive, call **800-227-1617** ext. 335 (toll free) and charge your order to your VISA or MASTERCHARGE. In California, call 800-772-3545, ext. 335.

To order by mail, send your check to: Strategic Simulations Inc, Dept. ST, 465 Fairchild Drive, No. 108, Mountain View, CA 94043. All our games carry a 14-day money back guarantee to assure your satisfaction.

While you're at it, you can also get our other games:

- ☐ **Computer Bismarck** for your Apple: $59.95
  Computer Bismarck, TRS-80® 48K Disc: $59.95
  Computer Bismarck, TRS-80 32K Cassette: $49.95
- ☐ **Computer Ambush** (a tactical simulation of man-to-man combat in WWII) for your apple: $59.95
- ☐ **Computer Napoleonics**, the Battle of Waterloo for your Apple: $59.95
- ☐ **Computer Quarterback** (a real-time strategy football game): $39.95

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TRS-80 is a registered trademark of Tandy Corporation.

CIRCLE 201 ON READER SERVICE CARD

Zenith, continued...

CP/M 2.2 was chosen because of the large amount of compatible business software available. Programs that run under CP/M will function on a variety of ZDS equipment combinations. The HDOS operating system will continue to be supported and developed.

Microsoft Basic and Interpreter is available with CP/M and HDOS, and the Basic Compiler is designed to run with CP/M.

Zenith Data Systems Z47 8" Dual Disk Drive.

With the availability of Microsoft Fortran, users of the Z89 will have access to scientific and engineering programming capabilities. Microsoft Fortran compiles up to 1200 lines per minute in a single pass. It requires less than 25K bytes of memory and interfaces with machine language subroutines. Fortran is available to run with both CP/M and HDOS.

Microsoft Cobol, designed for business applications, is said to be the most complete implementation of Cobol for microcomputers. It operates with CP/M.

Zenith Data Systems Corporation, 1000 Milwaukee Ave., Glenview IL 60025. (312) 391-8860.

Texas Instruments Announces New Prices, Software and Support

Apparently in response to criticism centering around high cost and lack of software support, Texas Instruments has announced new prices, software and support for the TI 99/4 home computer.

The new suggested price for the 99/4 is $649.95. Complementing this reduction in the price of the computer is a reduction in price for the RF Modulator from $75 to $50.

To promote the development of additional software for the computer, TI Extended Basic and UCSD Pascal are being made available to third-party authors. Also new is the Memory Expansion unit which adds 32K bytes of RAM to the 16K resident in the TI 9/4 console.

TI Extended Basic

TI Extended Basic, which will soon be available to users as a plug-in Solid State Software command module, features the following new statements:

ACCEPT AT and DISPLAY AT: These two statements and associated options allow information to be entered and read from any part of the screen. For example, using DISPLAY AT statements, a form could be created and then filled-in using ACCEPT AT statements. With the ACCEPT AT statement, it is possible to have only certain characters accepted on the screen, and to limit the number of characters that can be entered.

SPRITES: Through the use of SPRITE statements, up to 28 objects can be moved around the screen, each with its own direction and speed. Objects can be accelerated, decelerated, magnified or reduced in size. It is also possible to detect the coincidence of two or more objects as they cross the same location.

SUBPROGRAMS allow the programmer to write true subroutine programs that can have arguments passed to them and also can have their own local variables. Not only does this allow for smaller programs, but it eliminates a frequent source of hard-to-find mistakes that arise from duplication of variable names. This feature also allows commonly used routines, such as musical sequences or sorting routines, to be stored on a diskette and then added to a program through a MERGE command.

ERROR HANDLING: This feature allows the programmer to choose the type of action to be taken if an error occurs. Control of the program can be stopped, passed on to the next line, or passed to another line number. The CALL ERR statement allows the program to determine the cause of an error.

UCSD Pascal

UCSD Pascal, Version IV.0 is being released in conjunction with a lower-cost software development system which includes a modified TI 99/4 computer console, a Solid State Software command module designed for debugging assembly language programs, two disk drives, a disk controller, a modified RS-232 interface, and a prototype UCSD p-System software development peripheral.

Version IV.0 is an expanded version of the original language developed by the University of California at San Diego. It is said to be more portable than previous versions and to offer new features and characteristics in the area of memory management and scheduling services as well as new options for the applications program developer.

According to the manufacturer, programs developed for the TI 99/4 using UCSD Pascal can be run on other computers, often with no modification, through the use of a pseudocode, or p-code, compiler. Likewise, programs developed for other computers can be run on the 99/4 with little modification.

Music Enrichment Program

TI has also released two music enrichment programs. "Mystery Melody" a program in which one or two players are called upon to identify popular tunes after listening to the first few bars played by the computer. The program includes 50 melodies, and up to 50 more may be added by the user. It is available on cassette ($9.95) or disk ($14.95).

"Music Skills Trainer" is an educational package that includes four drills designed to test musical ability and improve listening skills: Pitch Trainer helps train the user's musical ear to recognize specific notes; Interval Recognition tests the student's ability to determine the interval between two notes played by the computer; Chord Recognition is a drill to test the ability to identify types of chords; and Phrase Recall is designed to improve aural memory by asking the student to repeat a sequence of notes played by the computer. The program is available on cassette ($24.95) or disk ($29.95).

Texas Instruments Incorporated, P.O. Box 53, Lubbock, TX 79408. 800-858-4565; in Texas, 800-692-4279.

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GAMBIET/80

By Win Rens from Microtrend
The new "King of micro chess" is here! Fresh from a victorious introduction at the London Tournament (which included top ranked programs like Sargon II, Rook, Boris, Albatross and Fofner), GAMBIET/80 is rated the best chess program on the market. But don't let its credentials fool you. It is suitable for players at all levels, and is an excellent learning tool as well.

This new champion offers six levels of play, a chess clock (if equipped with RS expansion interface), "take back" facility, continuous display of moves, and printout capability for recording games. GAMBIET-80 averages 30 moves in 60 minutes in tournament mode - more than twice the speed of Sargon II. And the display not only indicates each move GAMBIET/80 considers, it shows which one is currently best. Play GAMBIET/80 and learn the meaning of the word "awesome!"

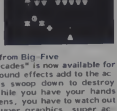
16K tape (transferrable to disk)...$39.95

LORDS OF KARMA

From Avalon Hill
A new adventure through the magical universe of Karma. While just staying alive may be tough enough, the Lords of Karma are watching your every move for deeds of kindness and bravery. You must explore the verdant forests, twisting trails, rugged mountains, and labyrinthine caverns in order to learn their secrets and complete your tasks. If successful, you will earn your place among the Lords, if not . . . ?

48K TRS 80, 32K Pet & Apple II Tape.....$19.95

GALAXY INVASION



By Hogue & Konyu from Big Five
"The rage of the arcades" is now available for TRS-80! Exciting sound effects add to the action as the invaders swoop down to destroy your base. Even while you have your hands full battling the aliens, you have to watch out for the Flagship! Super graphics, super action, super fun!

Level I or II, tape...$14.95

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By W. Godwin & D. Knowlton from Acorn
Challenge the world's highest moutain without ever leaving home. This remarkable simulation goes beyond most adventures, pitting you against challenges more terrifying than dragons and dungeons: the real-to life horrors of one of man's most dangerous endeavors.

Assigned an expedition budget, you must select the manpower and supplies you will need to support your quest. Now the adventure begins as you conquer the elements and terrain, establishing ever higher encampments. Will you reach Everest's 29,028 foot summit a live?

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32K disk version (with "save game" feature and other enhancements)...$20.95.

Unbelievable Realtime 3-D Graphics!

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From Sub-Logic
The wait is over! If 3 D graphics seem impossible on the low resolution TRS 80, you haven't seen this brilliant program. During FLIGHT SIMULATION, you instantly select instrument flight, radar, or a breathtaking pilot's eye view. But be sure to strap your self in — you're liable to get dizzy!

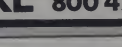
Once you put in some air time learning to fly your TRS 80, head for enemy territory and try to bomb the fuel depot and airstrip while fighting off five enemy warplanes. Good Luck!

Level I or II Tape...$25.00

SAVAGE ISLAND

By Scott Adams from Adventure International
A small island in a remote ocean holds an awesome secret. Will you be the first adventurer to uncover it? Wander the beach, uncover a bottle of rum, and make friends with a mean ol' bear. This is Scott Adams at his best and it's only the first installment of a new, multi part adventure!

16K tape...$14.95 32K disk...$20.95



INVADERS FROM SPACE

by Carl Miller from Acorn
A fast machine language approach to this classic (and addictive) space game. As you play, the aliens drop bombs, move from side to side, and try to overrun your bases. Hold them off and score by shooting them down. But, just as you think you've got it all under control, the action speeds up.

Choose the game speed, enemy bomb frequency and accuracy, shots on screen and the number of your bases. Move your base and simultaneously fire at the invaders — you cannot do this in most similar games. Full sound effects add even more excitement to the incredible speed and action of INVADERS FROM SPACE. Fun for all ages and skill levels.

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By J. Warshawer from Adventure Int.
Meet Tex, Slim, Bart, Doc and "The Kid" as you play five card draw against these computer opponents. This delightful program lets you play out a favorite fantasy - a table stakes game against a group of crafty high rollers. Not a bad way to brush up on your poker skills, either.

TRS-80 Level II, 16K tape (transferrable to disk)...$12.95
Apple II 24K disk....$19.95

OMNIKEY

From Discovery Bay
Bring your keyboard to life with new OMNI KEY. Single keystroke entry of 26 Basic statements, auto repeat on all keys, and selectable upper/lower case (if your keyboard is so equipped) speed Basic program entry immensely. In edit mode, OMNIKEY's arrow -controlled cursor can be placed anywhere on the screen to perform auto insertion, deletion, statement merging, even line repitition and repositioning! Once you've used OMNI KEY, you won't program without it.

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Graphic Simulation

Terry Kepner

Mrs. Sandburg sighed. She was rather upset with Mr. Sandburg. Here it was the twelfth day of his two-week vacation and she had seen and talked to him for all of one hour in that entire time.

Oh, she could go watch him, of course, sitting in front of his silly computer, pounding away on the keyboard and working on his "Project." But he wouldn't notice her standing there. In fact, he rarely noticed anything except his notes and the computer.

God, if she had known what he was getting into when he bought that thing last year, she would have chucked it in the garbage at the first opportunity.

But she had foolishly thought that it was just one of his expensive toys, like the sailboat that had sat in the backyard for the last two years until he sold it last month and purchased that ten megabite, or megabyte, or whatever-it-was box for his computer.

She sighed again, staring out the kitchen window at another one of his toys, their three-year-old Porsche.

Oh well, she thought, I'd better check and see if he found the lunch I fixed for him.

Not only wasn't it eaten, but neither were last night's dinner, nor this morning's breakfast; all of which were partially buried beneath the printer's used paper. However, he had managed to find and eat the two pound box of chocolate chip cookies, five bags of potato chips, three six-packs of beer and one Dr. Pepper.

"Hmmmm, I didn't think we had any Peppers left," she mumbled to herself.

"Jim."

No Response.

"Jim."

"Huh?"

"Will you please eat something substantial?"

"What? Oh, yeah. It was delicious," he waved one hand vaguely in the direction of the door, not turning, typing away with his other hand.

"I'm almost through, just a little while longer..." his sentence trailed away, the end forgotten in his concentration on the keyboard.

He had said that before, well over a week ago.

Mrs. Sandburg sighed, knowing from long-past experience that she would just have to wait until he tired of this latest craze of his. Although this particular one had far outlasted any of his previous pursuits.

She took one last look around what had once been a spotless work den. Her husband was seated in front of a color T.V. (oops, a color monitor, she reminded herself), the keyboard upon which he was rapidly typing, and the Altair computer that had started this whole mess. To his left was that Corvus thing, to his right was the Cromemco Z-something, on top of which was the Ohio Challenger. Scattered around the floor were reams of computer paper, books, manuals, notes empty potato chip bags, and God knew what else. The walls of the room, where they weren't hidden behind shelves and stacks of books, were covered by posters, diagrams, and at one spot by a chalk board. Funny, she had never noticed that there before.

The room was a disaster area, with the normal furnishings hidden or buried. She could hear the stereo playing softly, but there were no signs of it or its speakers. The sound seemed to emanate from outside the window behind the computers, but that didn't make any sense.

She shook her head, closed the den door (after pushing a pile of debris out of the way), and returned to the kitchen to begin supper. Even if Jim wasn't hungry, she was and so would be the kids when they returned home from their friends' houses.

For three of the last four months he had been carefully gathering and coding data on every curve, every surface, every vital piece of information about his subject.

Jim brushed his hair out of his eyes as he leaned back in his chair, taking a moment to try to rub the soreness out of them. God, they felt as if they were lubricated with sand. He felt fatigue wash over him in an almost irresistible tide. His lead-weighted arms fell back to the chair rests as he relaxed, his mind drifting over the last year or so.

It had really started almost eighteen months ago when he had been playing with a friend's computer and he had realized the potential that existed within the machine. It was only after he had bought his own that just what it was capable of doing was brought home to him. It had taken him only six months to exhaust the local University's library of books on mathematics, and an additional two months to discover that no one could answer his questions. He was actually in the forefront of mathematical research on Real-Time Material Simulations. If he wanted answers he would have to create and solve the equations himself.

For three of the last four months he had been carefully gathering and coding data on every curve,

Terry Kepner, P.O. Box 481, Peterborough, NH 03458

every surface, every vital piece of information about his subject, down to every nut and bolt. At last, only four short weeks ago, he had begun inputting the data and equations to his computers.

One hour after he had started, he had run out of memory. The thought of the moment when he had realized that fact still made him shudder.

Fortunately for him, the 40 meg disk drives had just entered the market. With the sale of his sailboat (and that had hurt), he had just enough cash to get two.

He had spent every evening from the time he got home after work until midnight, plus every waking moment of the weekends, pounding the keyboard, refining and honing the displacement equations, running and rerunning, crashing again and again as the flaws in his logic became apparent and were repaired.

His vacation had arrived far too soon, as far as he was concerned. He had been on a marathon of No-Doz and coffee in a frantic effort to complete the debugging before time ran out.

Now, with only four (or was it six?) days of vacation left, he was finally getting the program to work properly for more than just a few seconds of time.

Realizing he was on the verge of falling asleep (with the mid-afternoon sun shining in), Jim shook his head and leaned over the keyboard once more.

Staring at the monitor, it took him a few seconds to notice that he was through with this last session of editing the equations and was ready to try again.

He almost fell asleep during the ten minutes required to initialize his equations with the starting data, even though the program was written in machine language.

The video monitor's picture flickered, wavered, and oscillated. For a moment he thought it was going to crash again, just as in the previous attempts; then it suddenly sharpened into clarity. The image of his silver Porsche was so sharp and clear that it took his breath away. It was hard to believe that this was just a standard color monitor—he could almost swear that it was the real thing he was looking at. Quietly, he said, "My God, it works."

All thoughts of sleep vanished as he gently, almost caressingly, began to type commands to the program. He ordered the program to rotate the car left, then right, then upside down. He pulled back to view the car from fifty yards away, then zoomed in to mere inches from the grille. The image was clear and sharp in every view. He could actually see the individual bolts and welds along the bottom of the car, although that surely had to be his imagination. He knew that the monitor didn't have that kind of resolution.

An hour passed, then two. They seemed to take only minutes. Every detail was there, right down to the little ding on the inside of the trunk where his son's barbell had slid against it on a fast stop in the shopping center.

So far, so good. He decided to try the second, third, and fourth degree backup equations; he decided to pull in the time transformations.

He ran it back in time six hours. No bomb-out. He became a little braver and then ran it back to last week. Still no bomb-out, but also no change. He worried about that for a moment, then realized that he would have to run it back to some distinct point in time when something noteworthy had happened to the car.

With a muttered "Of course," he set the program for six months ago, just before that kid in the grocery parking lot had backed into the Porsche's fender.

Sure enough, as he watched, in came the dent, exactly as his data said it should. The time subroutines were working.

Now came the crucial test. Putting in the data on the past had been easy; there had been records to follow. All he had had to do was take the information, code it and put it in the computer, which was what he had done. Everything that had ever happened to the car was in his data bank. But the future was different. All he could supply here were generalities and statistics on the fates of cars.

He brought the simulation up to the present and it worked perfectly.

Then he called up the fifth and sixth degree equations and gradually integrated them into the system.

No crash.

He heaved a sigh of relief, and again marveled at the incredible clarity the simulation presented on the monitor. He could almost believe that the simulation on the screen was the car. Almost. He knew better.

He slowly moved the car into the next week. No outward change.

Next month.

Still no change.

He thought for a moment, snapped his fingers together and moved his point of view into the driver's seat.

The odometer indicated a higher mileage than it was right now. The extrapolation equations appeared to work.

Yep. The odometer indicated a higher mileage than it was right now. The extrapolation equations appeared to work.

Jim was becoming exhausted again. His sense of interest and alertness had only been temporary and he was once more about to fall asleep.

He sat with eyes closed for a moment, thinking.

One last test.

He typed quickly and shot the simulation three years into the future.

There was virtually an explosion of parts on the monitor, so realistic that he ducked in reflex to avoid the flying pieces.

He stared at the screen in disbelief.

All that remained of the Porsche were the scrap pieces one might expect to find at a junkyard.

He stared.

Slowly a smile grew on his face, turning into a grin as the answer dawned upon him.

"Well I'll be a..."

He had succeeded beyond his wildest dreams. The computer and the equations, taking his generalized data into consideration, had correctly predicted the eventual demise, scavenging of parts and general breakdown of the car. All this from the sparse details of the future and the abundance of facts of the past. His slaving over creating valid equations was rewarded.

Mrs. Sandburg screamed.

Normally Mr. Sandburg would barely have noticed, but this was no ordinary scream. This was a scream of an absolutely horrified woman, it penetrated.

When Mr. Sandburg arrived in the kitchen, stumbling in his haste, all Mrs. Sandburg could do was to point out the kitchen window at the decaying pile of junk sitting in the driveway where their Porsche had been just a few minutes before. □

A PET Lizzard

Peter Ripin
and
Krishna Narayan

After the great dying, all the dinosaurs were gone, and it was left to the lizards to carry on the family traditions. As the ages passed, even the lizards had to adapt in order to survive. With the coming of the animal who walks on two legs, many more species perished, and it was necessary for the lizards to find a source of food that would always to plentiful. Since the two legged ones created conditions that were ideal for houseflies, they became the perfect lizard food. Your role in the preservation of this species is to train a member of the lizard family to capture the new delicacy.

LIZZARD is an eye-hand coordination game played against a three minute timer. The player tries to snatch a fly from the air with its tongue. Key 7 on the PET keyboard operates the tongue, which must come up exactly behind the fly for a successful capture. This is an excellent game to introduce small children to computers. □

Peter Ripin, 11 Donna Rd., Framingham, MA 01701.


```
 90 PRINT"□"
 100 PRINT TAB(16)"■LIZZARD"
 110 REM PROGRAMMED BY PETER RIPIN
 120 REM FRAMINGHAM PUBLIC SCHOOLS
 125 REM FRAMINGHAM,MA.01701
 130 PRINT PRINT PRINT"THE LIZZARD WILL TRY TO SNAG A FLY WITH ITS TONGUE."
 140 PRINT PRINT"TO WORK THE TONGUE, PRESS ■7■ ."
 150 PRINT PRINT"PRESS ■7■ TO BEGIN PLAY."
 160 GET Y$ IF Y$<>"7" THEN 160
 180 PRINT"□" PRINT TAB(14)"■■■■■■■■■■■■GET READY"
 190 FOR AA=1 TO 1000 NEXT AA
 200 TIME$="000000"
 210 IF TIME/60<180 THEN 1060
 220 PRINT"□"
 230 R=0 R1=INT(RND(1)*4)+R
 240 IFR1=0 THEN 230
 250 IF R1=1 THEN 250
 260 IF R1=2 THEN 290
 270 IF R1=3 THEN 300
 280 L=32779+INT(RND(1)*29) POKE L,42 GOTO 310
 290 L1=32819+INT(RND(1)*29) POKE L1,42 GOTO 310
 300 L2=32859+INT(RND(1)*29) POKE L2,42 GOTO 310
 310 FOR X=33696 TO 33726
 320 POKE X,121 POKE X-1,37 POKE X-2,37 POKE X-3,37
 330 POKE X-4,37 POKE X-5,61 POKE X-6,61 POKE X-7,61
 340 POKE X-8,64 POKE X-40,122 POKE X-39,76
 350 POKE X-9,32 POKE X+39,60 POKE X+38,32 POKE X+36,62
 360 POKE X+35,32
 370 PRINT TIME$
 380 PRINT"■"
 390 GET A
 400 IF A<>7 THEN 520
 410 FOR N=X-80 TO X-840 STEP-40
 420 POKE N,103
 430 NEXT N
 440 FOR T=X-880 TO X-960 STEP-40
 450 IF PEEK(T)<>42 THEN 500
 460 FOR H=1+40 TO T STEP 40 POKE H-40,32 POKE H,81 FOR AA=1 TO 5 NEXT AA,H
 470 POKE X-39,32 POKEX-40,32 FOKEX,98 POKEX+1,98 FORHA=1TO50 NEXT AA POKEX,100
 480 POKE X+1,100  GOTO 1000
 490 POKE T,103 POKE T,32
 500 NEXT T
 510 GOTO 210
 520 POKE X,32 POKE X+1,32 POKE X-40,32 POKE X-39,32
 530 NEXT X
 540 GOTO 210
 1000 PRINT"MM-M...MMM M...MMMM M"
 1010 PRINT"THAT WAS GOOD!"
 1020 Z=Z+1 PRINT
 1030 IF Z>1 THEN 1050
 1040 PRINT PRINT Z,"FLY HAS BEEN EATEN" GOTO 1060
 1050 PRINT PRINT Z,"FLIES WERE EATEN."
 1060 FOR AA=1 TO 1000 NEXT AA
 1070 GOTO 210
 1080 PRINT PRINT PRINT
 1090 PRINT"YOUR 3 MINUTES ARE UP." PRINT
 1100 PRINT Z,"FLIES WERE EATEN."
 1110 PRINT PRINT PRINT"ITS BEEN FUN EATING WITH YOU!"
 1120 REM LINES 90-190 DIRECTIONS
 1130 REM LINES 180-210,360-380 3MINUTE            TIMER
 1140 REM LINES 230-300 RANDOMLY PRODUCES          THE FLY
 1150 REM LINES 310-360,590 ANIMATES               LIZZARD
 1160 REM LINES390-520 ANIMATES TONGUE
 1170 REM POKE 42(*),POKE 121( ■ ),POKE 37(% POKE 61(=),POKE 32(BLANK)
 1180 REM POKE 62(>),POKE 98( ■ ),POKE 100( _ ),POKE 103( ■ )
 3000 END
READY.
```

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Computers and Computer Cultures

Seymour Papert

This material is a condensation of Chapter 1 of **Mindstorms** *by Seymour Papert, published in 1980 by Basic Books, Inc. of New York City at $12.95. Those who find themselves stimulated by this presentation will find it profitable to read the entire work.*

In most contemporary educational situations where children come into contact with computers the computer is used to put children through their paces, to provide exercises of an appropriate level of difficulty, to provide feedback, and to dispense information. The computer programming the child. In the **LOGO** environment the relationship is reversed: The child is in control: The child programs the computer. And in teaching the computer how to think, children embark on an exploration about how they themselves think. Thinking about thinking turns the child into an epistemologist, an experience not even shared by most adults.

After five years of study with Jean Piaget in Geneva, I came away impressed by his way of looking at children as the active builders of their own intellectual structures. To say that intellectual structures are built by the learner rather than taught by a teacher does not mean that they are built from nothing. Like other builders, children appropriate to their own use materials they find about them, most saliently the models and metaphors suggested by the surrounding culture.

Piaget writes about the order in which the child develops different intellectual abilities. I give more weight than he does to the influence of the materials a certain culture provides in determining that order. For example, our culture is very rich in materials useful for the child's construction of certain components of numerical and logical thinking. Children learn to count; they learn that the result of counting is independent of order and special arrangement; they extend this "conservation" to thinking about the properties of liquids as they are poured and of solids which change their shape. Children develop these components of thinking preconsciously and "spontaneously," that is to say without deliberate teaching. Other components of knowledge, such as the skills involved in doing permutations and combinations, develop more slowly, or do not develop at all without formal schooling.

Many children are held back in their learning because they have a model of learning in which you have either "got it" or "got it wrong." But when you learn to program a computer you almost never get it right the first time.

The computer presence might have more fundamental effects than did other new technologies, including television and even printing. The metaphor of computer as a mathematics speaking entity puts the learner in a qualitatively new kind of relationship to an important domain of knowledge. Even the best of educational television is limited to offering quantitative improvements in the kinds of learning that existed without it. **Sesame Street** might offer better and more engaging explanations than a child can get from some parents or nursery school teachers, but the child is still in the business of listening to explanations. By contrast, when a child learns to program, the process of learning is transformed. It becomes more active and self directed. The knowledge is acquired for

a recognizable personal purpose. The child does something with it. The new knowledge is a source of power and is experienced as such from the moment it begins to form in the child's mind.

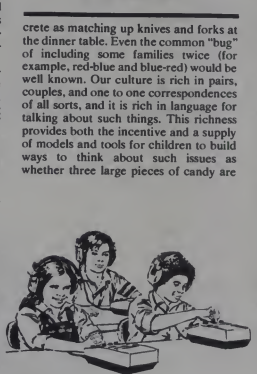
I have spoken of mathematics being learned in a new way. But much more is affected than mathematics. Piaget distinguishes between "concrete" thinking and "formal" thinking. Concrete thinking is already well on its way by the time the child enters first grade at age 6 and is consolidated in the following several years. Formal thinking does not develop until the child is almost 12, give or take a year or two, and some researchers have even suggested that many people never achieve fully formal thinking. I do not fully accept Piaget's distinction, but I am sure that it is close enough to reality to help us make sense of the idea that the consequences for intellectual development of one innovation could be qualitatively greater than the cumulative quantitative effects of a thousand others. My conjecture is that the computer can concretize (and personalize) the formal. Seen in this light, it is not just another powerful educational tool. It is unique in providing us with the means for addressing what Piaget and many others see as the obstacle which is overcome in the passage from child to adult thinking. I believe that it can allow us to shift the boundary separating concrete and formal. Knowledge that was accessible only through formal processes can now be approached concretely. And the real magic comes from the fact that this knowledge includes those elements one needs to become a formal thinker.

This description of the role of the computer is rather abstract. I shall concretize it by looking at the effect of working with computers on two kinds of thinking Piaget associates with the formal stage of intellectual development: combinatorial thinking, where one has to reason in terms of the set of all possible states of a system, and self referential thinking about thinking itself.

In a typical experiment in combinatorial thinking, children are asked to form all the possible combinations (or "families") of beads of assorted colors. It really is quite remarkable that most children are unable to do this systematically and accurately until they are in the fifth or sixth grades. Why should this be? Why does the task seem to be so much more difficult than the intellectual feats accomplished by seven and eight year old children? Is its logical structure essentially more complex? Can it possibly require a neurological mechanism that does not mature until the approach of puberty? I think that a more likely explanation is provided by looking at the nature of the culture. The task of making the families of beads can be looked at as

constructing and executing a program, a very common sort of program, in which two loops are nested: Fix a first color and run through all possible second colors, then repeat until all possible first colors have been run through. For someone who is thoroughly used to computers and programming there is nothing "formal" or abstract about this task. For a child in a computer culture it would be as concrete as matching up knives and forks at the dinner table. Even the common "bug" of including some families twice (for example, red-blue and blue-red) would be well known. Our culture is rich in pairs, couples, and one to one correspondences of all sorts, and it is rich in language for talking about such things. This richness provides both the incentive and a supply of models and tools for children to build ways to think about such issues as whether three large pieces of candy are more or less than four smaller pieces. For such problems our children acquire an excellent intuitive sense of quantity. But our culture is relatively poor in models of systematic procedures. Until recently there was not even a name in popular language for programming, let alone for the ideas needed to do so successfully. There is no word for "nested loops" and no word for the double counting bug. Indeed, there are no words for the powerful ideas computerists refer to as "bug" and "debugging."

Our culture is relatively poor in models of systematic procedures.



Without the incentive or the materials to build powerful, concrete ways to think about problems involving systematicity, children are forced to approach such problems, in a groping, abstract fashion. Thus cultural factors can explain the difference in age at which children build their intuitive knowledge of quantity and of systematicity.

While still working in Geneva I had become sensitive to the way in which materials from the then very young computer cultures were allowing psychologists to develop new ways to think about thinking. In fact, my entry into the world of computers was motivated largely by the idea that children could also benefit, perhaps even more than the psychologist, from the way in which computer models seemed to be able to give concrete form to areas of knowledge that had previously appeared so intangible and abstract.

I began to see how children who had learned to program computers could use very concrete computer models to think about thinking and to learn about learning and in doing so, enhance their powers as psychologists and as epistemologists. For example, many children are held back in their learning because they have a model of learning in which you have either "got it" or "got it wrong." But when you learn to program a computer you almost never get it right the first time. Learning to be a master programmer is learning to become highly skilled at isolating and correcting "bugs," the parts that keep the program from working. The question to ask about the program is not whether it is right or wrong, but if it is fixable. If this way of looking at intellectual products were generalized to how the larger culture thinks about knowledge and its acquisition, we might all be less intimidated by our fears of "being wrong." This potential influence of the computer on changing our notion of a black and white version of our successes and failures is an example of using the computer as an "object to think with." It is obviously not necessary to work with computers in order to acquire good strategies for learning. Surely "debugging" strategies were developed by successful learners long before computers existed. But thinking about learning by analogy

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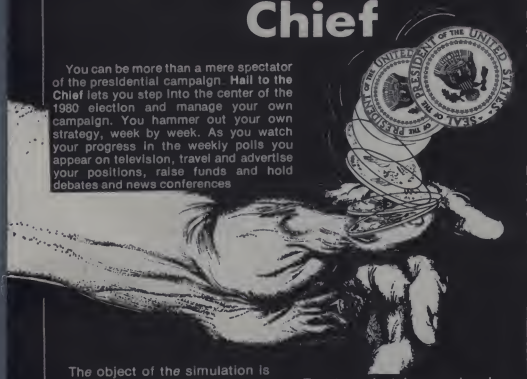

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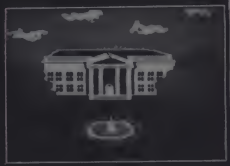

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Computer Cultures, continued...

with developing a program is a powerful and accessible way to get started on becoming more articulate about one's debugging strategies and more deliberate about improving them.

My discussion of a computer culture and its impact on thinking presupposes a massive penetration of powerful computers into people's lives. That this will happen there can be no doubt. The calculator, the electronic game, and the digital watch were brought to us by a technical revolution that rapidly lowered prices for electronics in a period when all others were rising with inflation. That same technological revolution, brought about by the integrated circuit, is now bringing us the personal computer.

There really is no disagreement among experts that the cost of computers will fall to a level where they will enter everyday life in vast numbers. Some will be there as computers proper, that is to say, programmable machines. Others might appear as games of ever increasing complexity and in automated supermarkets where the shelves, maybe even the cans, will talk. There is no doubt that the material surface of life will become very different for everyone, perhaps most of all for children. But there has been a significant difference of opinion about the effects this computer presence will produce. I would distinguish my thinking from two trends of thinking which I refer to here as the "skeptical" and the "critical."

Skeptics do not expect the computer presence to make much difference in how people learn and think. I have formulated a number of possible explanations for why they think as they do. In some cases I think the skeptics might conceive of education and the effect of computers

Knowledge that was accessible only through formal process can now be approached concretely.

on it too narrowly. Instead of considering general cultural effects, they focus attention on the use of the computer as a device for programmed instruction. Skeptics then conclude that while the computer might produce some improvements in school learning, it is not likely to lead to fundamental change. In a sense, too, I think the skeptical view derives from a failure to appreciate just how much Piagetian learning takes place as a child grows up. If a person conceives of children's intellectual development (or, for that matter, moral or social development) as deriving chiefly from deliberate teaching, then such a person would be likely to underestimate the potential effect that a massive presence of computers and other interactive objects might have on children.

The critics, on the other hand, do think that the computer presence will make a difference and are apprehensive. For example, they fear that more communication via computers might lead to less human association and result in social fragmentation. As knowing how to use a computer becomes increasingly necessary to effective social and economic participation, the position of the underprivileged could worsen, and the computer could exacerbate existing class distinctions. As to the political effect computers will have, the critics' concerns resonate with Orwellian images of a 1984 where home computers will form part of a complex system of surveillance and thought control. Critics also draw attention to potential mental health hazards of computer penetration. Some of these hazards are magnified forms of problems already worrying many observers of contemporary life; others are problems of an essentially new kind. A typical example of the former kind is that our grave ignorance of the psychological impact of television becomes even more serious when we contemplate an epoch of super TV. The holding power and psychological impact of the television show could be increased by varying the content to suit the tastes of each individual viewer, and by the show becoming interactive, drawing the viewer into the action. Critics already cite cases of students spending sleepless nights riveted to the computer terminal, coming to neglect both studies and social contact.

In the category of new problems, critics have pointed to the influence of the allegedly mechanized thought processes on how people think. Marshall MacLuhan's dictum that "the medium is the message" might apply here: If the medium is an interactive system that takes in words and speaks back like a person, it is easy to get the message that machines are like people and that people are like machines. What this might do to the development of values and self image in growing children is hard to assess. But it is not hard to see reasons for worry.

Despite these concerns I am essentially optimistic—some might say utopian—about the effects of computers on society. I do not dismiss the arguments of the critics. On the contrary, I too see the computer presence as a potent influence on the human mind. I am very much aware of the holding power of an inter-

active computer and of how taking the computer as a model can influence the way we think about ourselves. In fact the work on **LOGO** to which I have devoted much of the past ten years consists precisely of developing such forces in positive directions. For example, the critic is horrified at the thought of a child hypnotically held by a futuristic, computerized super pinball machine. In the **LOGO** work we have invented versions of such machines in which powerful ideas from physics or mathematics or linguistics are imbedded in such a way that permits the player to learn them in a natural fashion, analogous to how a child learns to speak. The computer's "holding power," so feared by critics, becomes a useful educational tool. Or take another, more profound example. The critic is afraid that children will adopt the computer as model and eventually come to "think mechanically" themselves. Following the opposite tack, I have invented ways to take educational advantage of the opportunities to master the art of *deliberately* thinking like a computer, according, for example, to the stereotype of a computer program that proceeds in a step-by-step, literal, mechanical fashion. There are situations where this style of thinking is appropriate and useful. Some children's difficulties in learning formal subjects such as grammar or mathematics derive from their inability to see the point of such a style.

A second educational advantage is indirect but ultimately more important. By deliberately learning to imitate mechanical thinking, the learner becomes able to articulate what mechanical thinking is and what it is not. The exercise can lead to greater confidence about the ability to choose a cognitive style that suits the problem. Analysis of "mechanical thinking" and how it is different from other kinds and practice with problem analysis can result in a new degree of intellectual sophistication. By providing a very concrete, down to earth model of a particular style of thinking work with the computer can make it easier to understand that there is such a thing as a "style of thinking." And giving children the opportunity to choose one style or another provides an opportunity to develop the skill necessary to choose between styles. Thus instead of inducing mechanical thinking, contact with computers could turn out to be the best conceivable antidote to it. And for me what is most important in this is that through these experiences these children would be serving their apprenticeship as epistemologists, that is to say learning to think articulately about thinking.

The intellectual environments offered to children by today's cultures are poor in opportunities to bring their thinking about thinking into the open, to learn to talk about it and test their ideas by externalizing them. Access to computers can dramatically change this situation. Even the simplest Turtle work can open new opportunities for sharpening one's thinking about thinking: Programming the Turtle begins by making one reflect on how one does oneself what one would like the Turtle to do. Thus teaching the Turtle to act or to "think" can lead one to reflect on one's own actions and thinking. And as children move on, they program the computer to make more complex decisions and find themselves engaged in reflecting on more complex aspects of their own thinking.

In teaching the computer how to think, children embark on an exploration about how they themselves think.

In short, while the critic and I share the belief that working with computers can have a powerful influence on how people think, I have turned my attention to exploring how this influence could be turned in positive directions.

The central open questions about the effect of computers on children in the 1980s are these: Which people will be attracted to the world of computers, what talents will they bring, and what tastes and ideologies will they impose on the growing computer culture? I have observed children in **LOGO** environments engaged in self-referential discussions about their own thinking. This could happen because the **LOGO** language and the Turtle were designed by people who enjoy such discussion and worked hard to design a medium that would encourage it. Other designers of computer systems have different tastes and different ideas about what kinds of activities are suitable for children. Which design will prevail, and in what subculture, will not be decided by a simple bureaucratic decision made, for example, in a government Department of Education or by a committee of experts. Trends in computer style will emerge from a complex web of decisions by foundations with resources to support one or another design, by corporations who may see a market, by schools, by individuals who decide to make their career in the new

field of activity, and by children who will have their own say in what they pick up and what they make of it. People often ask whether in the future children will program computers or become absorbed in pre-programmed activities. The answer must be that some children will do the one, some the other, some both, and some neither. But which children, and most importantly, which social classes of children, will fall into each category will be influenced by the kind of computer activities and the kind of environments created around them.

As an example, we consider an activity which may not occur to most people when they think of computers and children: the use of the computer as a writing instrument. For me, writing means making a rough draft and refining it over a considerable period of time. My image of myself as a writer includes the expectation of an "unacceptable" first draft that will develop with successive editing into presentable form. But I would not be able to afford this image if I were a third grader. The physical act of writing would be slow and laborious. I would have no secretary. For most children rewriting a text is so laborious that the first draft is the final copy, and the skill of rereading with a critical eye is never developed. This changes dramatically when children have access to computers capable of manipulating text. The first draft is composed at the keyboard. Corrections are made easily. The current copy is always neat and tidy. I have seen children move from total rejection of writing to an intense involvement (accompanied by rapid improvement of quality) within a few weeks of beginning to write with a computer. Even more dramatic changes are seen when the child has physical handicaps that make writing by hand more than usually difficult or even impossible.

This use of computers is rapidly being adopted wherever adults write for a living. Most newspapers now provide their staff with "word processing" computer systems. Many writers who work at home are acquiring their own computers, and the computer terminal is steadily displacing the typewriter as the secretary's basic tool. The image of children using the computer as a writing instrument is a particularly good example of my thesis that what is good for professionals is good for children. But this image of how the computer might contribute to children's mastery of language is dramatically opposed to the one that is taking root in most elementary schools. There the computer is seen as a teaching instrument. It gives children practice in distinguishing between verbs and nouns, in spelling, and in answering multiple choice questions about the meaning of pieces of text. As I see it, this difference is not a matter of a small and technical choice between two teaching strategies. It reflects a fundamental difference in educational philosophies. More to the point, it reflects a difference in view on the nature of childhood. I believe that the computer as writing instrument offers children an opportunity to become more like adults, indeed like advanced professionals, in their relationship to their intellectual products and to themselves. In doing so, it comes into head-on collision with the many aspects of school whose effect, if not whose intention, is to "infantilize" the child.

Word processors *can* make a child's experience of writing more like that of a real writer. But this can be undermined if the adults surrounding the child fail to appreciate what it is like to be a writer. For example, it is only too easy to imagine adults, including teachers, expressing the view that editing and re-editing a text is a waste of time ("Why don't you get on to something new?" or "You aren't making it any better, why don't you fix your spelling?").

The critic is horrified at the thought of a child hypnotically held by a futuristic, computerized super pinball machine.

As with writing, so with music making, games of skill, complex graphics, whatever: The computer is not a culture unto itself but it can serve to advance very different cultural and philosophical outlooks. For example, one could think of the Turtle as a device to teach elements of the traditional curriculum, such as notions of angle, shape, and coordinate systems. And in fact, most teachers who consult me about its use are trying to use it in this way. Of course the Turtle can help in the teaching of traditional curriculum, but I have thought of it as a vehicle for Piagetian learning, which to me is learning without curriculum.

There are those who think about creating a "Piagetian curriculum" or "Piagetian teaching methods." But to my mind these phrases and the activities they represent are contradictions in terms. I see Piaget as the theorist of learning without curriculum and the theorist of the kind of learning that happens without deliberate teaching. To turn him into the theorist of a new curriculum is to stand him on his head.

But "teaching without curriculum" does not mean spontaneous, free form classrooms or simply "leaving the child alone." It means supporting children as they build their own intellectual structures with materials drawn from the surrounding culture. In this model, educational intervention means changing the culture, planting new constructive elements in it and eliminating noxious ones. This is a more ambitious undertaking than introducing a curriculum change, but one which is feasible under conditions now emerging.

Suppose that thirty years ago an educator had decided that the way to solve the problem of mathematics education was to arrange for a significant fraction of the population to become fluent in (and enthusiastic about) a new mathematical language. The idea might have been good in principle, but in practice it would have been absurd. No one had the power to implement it. Now things are different. Many millions of people are learning programming languages for reasons that have nothing to do with the education of children. Therefore, it becomes a practical proposition to influence the form of the languages they learn and the likelihood that their children will pick up these languages.

Throughout the course of this chapter I have been talking about the ways in which choices made by educators, foundations, governments, and private individuals can affect the potentially revolutionary changes in how children learn. But making good choices is not always easy, in part because past choices can often haunt us. There is a tendency for the first usable, but still primitive, product of a new technology to dig itself in. I have called this phenomenon the QWERTY phenomenon.

The top row of alphabetic keys of the standard typewriter reads QWERTY. For me this symbolizes the way in which technology can all too often serve not as a force for progress but for keeping things stuck. The QWERTY arrangement has no rational explanation, only a historical one. It was introduced in response to a problem in the early days of the typewriter: The keys used to jam. The idea was to minimize the collision problem by separating those keys that followed one another frequently. Just a few years later, general improvements in the technology removed the jamming problem, but QWERTY stuck. Once adopted, it resulted in many millions of typewriters and a method (indeed a full blown curriculum) for learning typing. The social cost of change (For example, putting the most used keys *together* on the keyboard) mounted with the vested interest created by the fact that so many fingers now knew how to follow the

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QWERTY keyboard. QWERTY has stayed on despite the existence of other, more "rational" systems. On the other hand, if you talk to people about the QWERTY arrangement they will justify it by "objective" criteria. They will tell you that it "optimizes this" or it "minimize that." Although these justifications have no rational foundation, they illustrate a process, a social process, of myth construction that allows us to build a justification for primitivity into any system. I think we are well on the road to doing exactly the same thing with the computer. We are in the process of digging ourselves into an anachronism by preserving practices that have no rational basis beyond their historical roots in an earlier period of technological and theoretical development.

The use of computers for drill and practice is only one example of the QWERTY phenomenon in the computer domain. Another example occurs even when attempts are made to allow students to learn to program the computer. Learning to program a computer involves learning a "programming language." There are many such languages—for example, Fortran, Pascal, Basic, Smalltalk, and Lisp, and the lesser known language **LOGO**, which our group has used in most of our experiments with computers and children. A powerful QWERTY phenomenon is to be expected when we choose the language in which children are to learn to program computers. I shall argue in detail that the issue is consequential. A programming language is like a natural, human language in that it favors certain metaphors, images, and ways of thinking. It would seem to follow that educators interested in using computers and sensitive to cultural influences would pay particular attention to the choice of language. But nothing of the sort has happened. On the contrary, educators, too timid in technological matters or too ignorant to attempt to influence the languages offered by computer manufacturers, have accepted certain programming languages in much the same way as they accepted the QWERTY keyboard. An informative example is the way in which the programming language Basic has established itself as the obvious language to use in teaching American children how to program computers. The relevant technical information is this: A very small computer can be made to understand Basic, while other languages demand more from the computer. Thus, in the early days when computer power was extremely expensive, there was a genuine technical reason for the use of Basic, particularly in schools where budgets were always tight. Today, and in fact for several years now, the cost of computer memory has fallen to the point where any remaining economic advantages of using Basic are insignificant. Yet in most high schools, the language remains almost synonymous with programming, despite the existence of other computing languages that are demonstrably easier to learn and are richer in the intellectual benefits that can come from learning them. The situation is paradoxical. The computer revolution has scarcely begun, but it is already breeding its own conservatism. Looking more closely at Basic provides a window on how a conservative social system appropriates and tries to neutralize a potentially revolutionary instrument.

Giving children the opportunity to choose one style or another provides an opportunity to develop the skill necessary to choose between styles.

Basic is to computation what QWERTY is to typing. Many teachers have learned Basic, many books have been written about it, many computers have been built in such a way that Basic is "hardwired" into them. In the case of the typewriter, we noted how people invent "rationalizations to justify the status quo. In the case of Basic, the phenomenon has gone much further, to the point where it resembles ideology formation. Complex arguments are invented to justify features of Basic that were originally included because the primitive technology demanded them or because alternatives were not well enough known at the time the language was designed.

An example of Basic ideology is the argument that Basic is easy to learn because it has a very small vocabulary. Its small vocabulary can be learned quickly enough. But using it is a different matter. Programs in Basic acquire so labyrinthine a structure that only the most motivated and brilliant ("mathematical") children do learn to use it for more than trivial ends.

One might ask why the teachers do not notice the difficulty children have in learning Basic. The answer is simple: Most teachers do not expect high performance from most students, especially in a domain of work that appears to be as "mathematical" and "formal" as programming. Thus the culture's general perception of mathematics as inaccessi-

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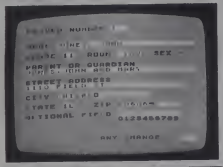

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ble bolsters the maintenance of Basic, which in turn confirms these perceptions. Moreover, the teachers are not the only people whose assumptions and prejudices feed into the circuit that perpetuates Basic. There are also the computerists, the people in the computer world who make decisions about which languages their computers will speak. These people, generally engineers, find Basic quite easy to learn, partly because they are accustmed to learning such very technical systems and partly because Basic's sort of simplicity appeals to their system of values. Thus, a particular subculture, one dominated by computer engineers, is influencing the world of education to favor those school students who are most like that subculture. The process is tacit, unintentional: It has never been publically articulated, let alone evaluated. In all of these ways, the social embedding of Basic has far more serious consequences than the "digging in" of QWERTY.

There are many other ways in which the attributes of the subcultures involved with computers are being projected onto the world of education. For example, the idea of the computer as an instrument for drill and practice that appeals to teachers because it resembles traditional teaching methods also appeals to the engineers who design computer systems: Drill and practice applications are predictable, simple to describe, efficient in use of the machine's resources. So the best engineering talent goes into the development of computer systems that are biased to favor this kind of application. The bias operates subtly. The machine designers do not actually decide what will be done in the classrooms. That is done by teachers and occasionally even by carefully controlled research experiments. But there is an irony in these controlled experiments. They are very good at telling whether the small effects seen in best scores are real or due to chance. But they have no way to measure the undoubtedly real (and probably more massive) biases built into the machines.

We have already noted that the conservative bias being built into the use of computers in education has also been built into other new technologies. The first use of the new technology is quite naturally to do in a slightly different way what had been done before without it. It took years before designers of automobiles accepted the idea that they were cars, not "horseless carriages," and the precursors of modern motion pictures were plays acted as if before a live audience but actually in front of a camera. A whole generation was needed for the new art of motion pictures to emerge as something quite different from a linear mix of theater plus photography. Most of what has been done up to now in the name of "educational technology" or "computers in education" is still at the stage of the linear mix of old instructional methods with new technologies.

We are at a point in the history of education when radical change is possible, and the possibility for that change is directly tied to the impact of the computer. Today what is offered in the educational "market" is largely determined by what is acceptable to a sluggish and conservative system. But this is where the computer presence is in the process of creating an environment for change. Consider the conditions under which a new educational idea can be put into practice today and in the near future. Let us suppose that today I have an idea about how children could learn mathematics more effectively and more humanely. And let us suppose that I have been able to persuade a million people that the idea is a good one. For many products such a potential market would guarantee success. Yet in the world of education today this would have little clout: A million people across the nation would still mean a minority in every town's school system, so there might be no effective channel for the million voices to be expressed. Thus, not only do good educational ideas sit on the shelves, but the process of invention is itself stymied. This inhibition of invention in turn influences the selection of people who get involved in education. Very few with the imagination, creativity, and drive to make great new inventions enter the field. Most of those who do are soon driven out in frustration. Conservatism in the world of education has become a self-perpetuating *social* phenomenon.

Basic is to computation what QWERTY is to typing.

Fortunately, there is a weak link in the vicious circle. Increasingly, the computers of the near future will be the private property of individuals, and this will gradually return to the individual the power to determine patterns of education. Education will become more of a private act, and people with good ideas, different ideas, exciting ideas will no longer be faced with a dilemma where they either have to "sell" their ideas to a conservative bureaucracy or shelve them. They will be able to offer them in an open marketplace directly to consumers. There will be new opportunities for imagination and originality. There might be a renaissance of thinking about education. □

Microcomputers and Hyperactive Children

Glenn Kleiman, Mary Humphrey and Peter H. Lindsay

Introduction

Recent advances in computer technology have made powerful microcomputers affordable for widespread use in schools. The overall aim of our research is to determine how best to capitalize on the potential benefits of these computers for hyperactive and other attention deficient children. This report is a brief summary of some pilot work and an initial experimental study conducted at the Child Development Clinic, Hospital for Sick Children. This research compared children's performance on arithmetic problems administered by computer with problems given in a standard paper and pencil format.

The children in the project were referred to the Clinic for problems of hyperactivity. They participated in the computer study during their free time between scheduled appointments in which they were being assessed for drug effects on their hyperactivity. Since the evaluation of drug effects was not part of the computer study, all children were tested during times when they were not subject to effects of previous medication.

Seventeen children served as pilot subjects in the initial phase of developing the computer program. Observations and interviews with these children resulted in significant changes in the program, including a modification of the display to make it more readable, altering feedback timing, giving the child control of problem pacing, and adding special graphics and prompt messages. The detailed characteristics of the program are outlined below.

Eighteen children, ranging from 6 to 14 years of age, participated in the experimental study. Each child did addition problems on paper one day, and on a PET computer another day. The difficulty level of the problems was adjusted for each child, and was the same for the problems presented on paper and the computer. On each day, the child was asked to "do as many problems as you want and stop when you think you have done enough." The study compared the accuracy, number of problems attempted, and rate of problem solving in the computer format and the paper and pencil format.

The Computer Program

The computer program I used in this study had a number of characteristics that should be considered in the design of any program for children:

1) The level of problem difficulty could be individually tailored for each child (i.e., whether or not carrying was required, the number of addends, and the number of digits in each addend).

2) The display format on the computer was designed to be easily readable (e.g., extra spacing between characters; vertical problem format; prompt arrows).

3) The answer format on the computer was designed to be as similiar to the pencil and paper format as possible. The answers were entered into the computer from right to left rather than the usual computer format of left to right; carrying could be marked above the appropriate column of numbers with a special key; another special key allowed the child to erase mistakes.

4) Problem solving was completely self-paced: When the child was satisfied with an answer, he or she could press a button to get the answer recorded and obtain feedback; when ready to proceed to the next problem, the child could press another key and the computer would proceed.

5) Motivational features were incorporated such as graphic displays and praise statements following correct answers. For incorrect answers, the mesage "Wrong, the correct answer is ..." was given.

6) There were several built-in messages that were specifically related to the child's problem of hyperactivity--special messages appeared whenever a child answered incorrectly too quickly, took too long to respond, or simply made too many inappropriate button presses (i.e., "STOP IT!).

In addition to controlling all of the problem generation, the display and the feedback material, the computer automatically recorded the child's response, the time taken to make the response, the time taken to request another problem, the number of erasures, if any, and the occurrence of any special messages.

The problems for the pencil and paper test were generated by the same computer algorithm so that the difficulty levels of the problems would be comparable. During the paper and pencil sessions, an observer, located behind a one-way mirror, recorded the time the child spent on each problem.

Results and Conclusions

The results were very clear-cut. There were no differences *between* paper and pencil and computer work in the proportion correct, the average time to do problems, or the average time between problems. The differences appeared in the number of problems the children voluntarily chose to do in the two mediums. On the average, the same children working on the same level of problems did almost twice as many problems on the computer as they did with paper and pencil. Table 1 gives the averages across the 18 children.

	# Problems done	% Correct	avg. time to do problems	avg. time between problems	Total time working problems
Computer	31.4	74	37.8 sec.	6.8 sec.	23.3 min.
Paper & Pencil	17.6	76	36.5 sec.	6.6 sec.	12.6 min.

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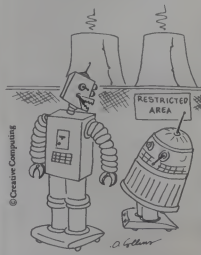
Mary Humphrey and Peter Lindsay, Ontario Institute for Studies in Education.

Children, continued . . .

Apparently, hyperactive children are willing to spend significantly more time working problems on the computer, without any significant loss of accuracy or speed. The children spent an average of over 23 minutes working on the computer—an unusually long time for hyperactive children to voluntarily stay on one task. Informal interviews with the children confirmed their strong preference for the computer. Among the comments they gave were that the problems seemed to be easier on the computer, it was nice not to have to write down the answers, and they liked the rapid feedback. Many were eager to return and wanted to know when they would have a chance to work on the computer again. None of them requested more paper and pencil drill.

These results are from a single study and need to be replicated and extended before strong claims can be made. Our current work investigates longer term effects of computer presentation on learning rates and changes in children's interest and confidence related to working with computers. However, the present results do encourage optimism as to the potential use of microcomputers as a classroom tool. Microcomputers provide a way of doing drill and practice which children find motivating, can do with minimal adult supervision, can be tailored to each child's needs, and provides immediate feedback. Well designed programs may be able to dramatically increase the time children with attention problems will spend on some school tasks. □

A version of this program, revised for classroom use rather than data collection is available from Teaching Tools: Microcomputing Services, P.O. Box 12679, Research Triangle Park, NC 27709.



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Computer-Assisted Instruction is Not Always a Drill

James W. Hutcheson

If you say you have computer-assisted instruction in your school, many educators will think of drill work delivered by a computer. Some will think of simulation activities in which students "run city government" or "mix dangerous chemicals." Others who have had computer-programming experiences will think of problem solving. While teaching a statistics class, I discovered still another use of the computer to aid instruction.

Calculators have been used in my introductory course in statistics to facilitate a "number crunching" aspect of the course. Recently, a microcomputer was added to the list of materials supporting the course. Prior to the time the computer assisted in the instruction, I had some difficulty in teaching a particular concept in sampling. Most students understood that generalizations could be made from the sample to the population when the size of the sample almost equaled the size of the population. However, they were skeptical when the sample represented a smaller portion of population.

Initially, the students examined the information on Table 1 and Table 2.

TABLE 1
Ten Samples of Size 10 Drawn from a Population of Size 1000

Samples	Means	Standard Deviations
10	16.4	11.2
10	19.9	12.0
10	20.1	15.4
10	20.4	8.8
10	23.7	16.4
10	25.5	10.7
10	26.5	17.6
10	27.1	14.0
10	27.3	14.6
10	29.0	15.6
Population	25.5	14.4

James W. Hutcheson, Muscogee County School District, Columbus, GA 31901.

Table 1 indicates the means of ten samples of size 10 drawn at random from a population of size 1000. Table 2 indicates the means of ten samples of size 50 drawn from the same population. The students compared the differences in the population mean and standard deviation and the means and standard deviations in the two different size samples. The students found a smaller range of means on Table 2 than on Table 1. They concluded that the trend of a smaller range of sample means with larger and larger samples would continue. My current statistics class was treated to a similar activity, but with more dramatic results.

Instead of distributing the two tables to the students, the class was allowed to choose its own small sample size and large sample size. Summary sheets similar to the tables were generated on the microcomputer and displayed on the screen (see Table 1 in the Appendix for the program). This live demonstration sparked the students to begin speculating on the effects of selecting even more sample sizes. A discussion of random selection and sample size followed that seemed to involve more students than had ever been involved before. The students selected their own sample sizes and speculated on the range of sample means. Occasionally, a large sample size resulted in in an unusually large range of sample means. Initially, students were puzzled at the "error." Then one student remarked, "But, that's just the nature of random numbers!!" This insight helped others to internalize what had happened. I felt most of the benefits of the lesson were over. I was wrong.

TABLE 2
Ten Samples of Size 50 Drawn from a Population of Size 1000

Samples	Means	Standard Deviations
50	21.8	14.8
50	22.5	15.0
50	22.8	13.5
50	26.1	14.7
50	26.3	15.5
50	26.8	13.5
50	27.4	14.9
50	27.5	13.0
50	27.5	14.2
50	28.2	15.3
Population	25.5	14.4

Later in the course, we were discussing control groups and experimental groups. Several students remarked that it was possible to select two samples at random from the same population and have the samples be significantly different. They each referred to the computer activity that was previously cited, where samples were selected from the same population at random. The comment was made, "How do you know we didn't accidentally select a large sample and a small sample?" No student had recalled this idea when I used the summary sheets as handouts.

Perhaps computers can assist instruction by developing mathematical concepts that are remembered better through a live demonstration. Other live demonstrations have been used where students predicted what would happen and then let the computer verify (or refute) their predictions.

Usually the development of linear regression has included a brief comment

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CIRCLE 153 ON READER SERVICE CARD

about other predictive procedures. The students understood that the line that best fit a scattergram might not be straight. However, I had no success in developing an intuitive feeling for multiple linear regression. A computer program was used that was successful in developing this intuitive feeling. The program generated three tests A, B, and C and produced correlation coefficients between Test A and C and Test B and C. The user was prompted to pool Test A and Test B to form a new test, Test X. The computer indicated a correlation between Test X and Test C. The scores in Test X were formed by the equation

$$X = (\ )A + (\ )B.$$

The user supplied the weightings for Test A and Test B. A copy of the computer program appears in Table 2 in the Appendix. A sample run with coefficients appears in Table 3.

After a few trials, all students seemed to know which test to give more weight in the pooling process. I asked if the weighting had to be positive, and immediately several suggestions for negative weightings were tried by the students.

Following the computer activity, the students reported that the test with the higher correlation should be given more weighting. I asked how the process could be extended to Test A, B, C, and D. A student suggested a formula for generating scores for Test X,

$$X = (\ )A + (\ )B + (\ )C,$$

along with the proper order for weightings on Tests A, B, and C.

I was pleased with the results of the introductory activities and quite pleased that the total time for the computer activity and discussions was less than twenty minutes.

TABLE 3

YOU TRIED $X = (3)A + (4)B$

TEST A	TEST B	TEST X	TEST C
1	2	11	5
2	1	10	8
3	9	45	15
3	6	33	8
6	16	82	12
0.615	0.703	0.692	

IS THERE A BETTER CORRELATION WITH A DIFFERENT WEIGHTING?

Computer programs such as these have helped me to emphasize statistical thinking and de-emphasize the arithmetic of statistics. Perhaps this shift in emphasis has been the most important aspect of using computers in the classroom to aid instruction. □

TABLE 1. APPENDIX

```
1 REM .... JIM HUTCHESON, TRS-80, LEVEL II
2 REM .... PROGRAM GENERATES POPULATION OF 1000 RANDOM #S
3 REM .... EACH 1-50. USER SELECTS SAMPLE SIZES
4 REM .... PROGRAM RETURNS MEAN & SD OF 10 SAMPLES ORDERED
5 REM .... ON MEANS... PROGRAM RETURNS POPULATION MEAN & SD
10 CLS
20 PRINT"PROGRAM IS LOADING 1000 NUMBERS FOR THE POPULATION"
25 PRINT:PRINT
30 PRINT"A SHORT PAUSE...(ABOUT A MINUTE)..."
35 S = 0:SI = 0
40 DIM A%(1000),M(10),S(10)
50 FOR J = 1 TO 1000
55 A%(J) = RND(50)
60 PRINT@475,J;A%(J)
70 S = S + A%(J):SI = SI + A%(J)↑2
80 NEXT J
90 PRINT@475,"POPULATION LOADED"
100 FOR J = 1 TO 300:NEXT:CLS
110 PRINT"NOW SELECT A SAMPLE SIZE...10 SAMPLES WILL BE SELECTED"
120 PRINT"FROM THE POPULATION AT RANDOM"
130 PRINT:PRINT"THE MEANS AND STANDARD DEVIATIONS WILL BE GIVEN"
140 PRINT"THE COMPUTER WILL ORDER THE SAMPLES ON THEIR MEANS"
150 PRINT:PRINT"HOW LARGE DO YOU WANT EACH SAMPLE TO BE";
160 INPUT N
170 CLS
180 FOR J = 1 TO 10
190 A = 0:B=0
200 FOR K = 1 TO N
210 X = A%(RND(1000))
220 PRINT@475,"SAMPLE";J;"SELECTED";K
230 A=A+X:B=B+X*X
240 NEXT K
250 M(J) = A/N
260 S(J) = SQR((B-A↑2/N)/(N-1))
270 NEXT J
280 CLS:PRINT"NOW ORDERING ON SAMPLE MEANS"
290 FOR J = 1 TO 9
300 FOR K = J+1 TO 10
310 IF M(J)<=M(K) THEN 350
320 H = M(J):M(J) = M(K):M(K)=H
330 H = S(J):S(J) = S(K):S(K) = H
350 NEXT K
360 NEXT J
370 PRINT:PRINT"SAMPLE SIZE      MEAN      STANDARD DEVIATION"
380 FOR J = 1 TO 10:PRINTN,M(J),S(J):NEXTJ
390 PRINT:PRINT"POPULATION MEAN ";S/1000,SQR((SI-S↑2/1000)/1000)
400 PRINT"PRESS <ENTER> TO GENERATE OTHER SAMPLES";
405 INPUT Y
410 CLS:GOTO 150
```

APPENDIX

Note: The TRS-80, Level II Basic uses several functions that are different from other versions of Basic

1. CLS—clears the screen
2. RND(X)—returns a random number 1 to X if X is greater than 1
3. PRINT@—prints at a position on the screen. The positions are 0-1023

The programs are written in an 'endless loop' style. The user is required to depress the BREAK key. This style was chosen over the more conventional END statement or the escape to END question for two reasons:

1. The END statement required the author to anticipate the number of attempts a particular user would need. This varied too often to be practical.

2. The escape question would normally appear at the end of the user's sample selection or weighting. The students in the statistics class made too many typing errors to risk an additional user input. Further, the escape question tends to break the train of thought when the students are concentrating on the output of the computer.

TABLE 2. APPENDIX

```
10 REM    JIM HUTCHESON. TRS-80. LEVEL II
20 REM    MULTIPLE LINEAR REGRESSION
30 REM    USER ENTERS WEIGHTINGS - COMPUTER SHOWS PEARSON'S R
40 REM    USER TRIES TO GET A BETTER R WITH BETTER WEIGHTINGS
50 REM    PROMPT OF NEGATIVE WEIGHTINGS IS NEEDED
60 REM
70 REM
80 DIM A(5),B(5),C(5),T(5)
90 CLS:PRINT"POOLING SCORES IN A MULTIPLE LINEAR REGRESSION TEST"
100 PRINT:PRINT"TESTS ARE A,B AND C"
110 PRINT"SAMPLE NUMBERS ARE ALREADY LOADED"
120 S1=0:S2=0:S4=0:S5=0:S6=0:S7=0:S8=0
130 FOR J = 1 TO 5
140 READ A,B,C
150 A(J)=A:B(J)=B:C(J)=C
160 S1=S1+A:S2=S2+A*A
170 S3=S3+B:S4=S4+B*B
180 S5=S5+C:S6=S6+C*C
190 S7=S7+A*C:S8=S8+B*C
200 NEXT J
210 DATA 1,2.5,2.1,8,3.9,15.3,6.8,6,16.12
220 PRINT"PEARSON'S R FOR TEST A AND TEST C"
230 R1 = (S7-S1*S5/5)/SQR((S2-S1^2/5)*(S6-S5^2/5))
240 R1=INT(1000*R1+.5)/1000
250 PRINT" R1 =";R1
260 PRINT:PRINT"PEARSON'S R FOR TEST B AND TEST C"
270 R2 =(S8-S3*S5/5)/SQR((S4-S3^2/5)*(S6-S5^2/5))
280 R2=INT(R2*1000+.5)/1000
290 PRINT" R2 =";R2
300 PRINT:PRINT"SUPPOSE YOU FORMED A NEW SCORE, SAY X, BY"
310 PRINT"POOLING THE SCORES IN TEST A WITH THE SCORES IN TEST B"
320 PRINT"PRESS <ENTER> TO CONTINUE":INPUT J
330 CLS:PRINT"TEST A AND TEST C     TEST B AND TEST C"
340 PRINTTAB(1);R1;TAB(24);R2
350 PRINT:PRINT"TEST X WILL BE FORMED LIKE:  X = (1)A + (4)B
360 PRINT"WHAT WEIGHTING SHOULD BE        ↑          ↑"
370 PRINTTAB(33);"HERE    HERE"
380 PRINT:PRINT"LOOK AT THE TWO CORRELATION COEFFICIENTS AND"
390 PRINT"SUGGEST A WEIGHTING. THE COMPUTER WILL FORM TEST X"
400 PRINT"AND COMPUTE PEARSON'S R FOR TEST X AND TEST C."
410 PRINT:PRINT"PRESS <ENTER> TO CONTINUE":INPUT J
420 CLS:PRINT"R1                              R2"
430 PRINT R1,R2
440 PRINT:INPUT"ENTER WEIGHING FOR TEST A";W1
450 INPUT"ENTER WEIGHING FOR TEST B";W2
460 C1=0:C2=0:C3=0
470 FOR J=1TO5
480 T=W1*A(J)+W2*B(J)
490 T(J)=T
500 C1=C1+T:C2=C2+T*T:C3=C3+T*C(J):NEXTJ
510 CLS
520 R3=(C3-S5*C1/5)/SQR((C2-C1^2/5)*(S6-S5^2/5))
530 PRINT"YOU TRIED X = (";W1;")A + (";W2;")B" PRINT
540 PRINT"TEST A";TAB(16);"TEST B";TAB(32);"TEST X";TAB(48);"TEST C"
550 FOR J=1TO5:PRINTA(J),B(J),T(J),C(J):NEXTJ
560 R3=INT(R3*1000+.5)/1000
570 PRINT:PRINTR1,R2,R3
580 PRINT:PRINT"IS THERE A BETTER CORRELATION WITH A DIFFERENT WEIGHTING?"
590 GOTO 440
```

What Do We Tell the Administrators?

Nick Solntseff

Convincing administrators and non-computer oriented teachers that computers can be effective and economical in the classroom is one of the biggest hurdles faced by those introducing computers in schools. Here is a model to simplify the task.—EBS

Introduction

In a recent article, Helena C. Martellaro discussed the conditions that create barriers to the rapid introduction of computers in our schools. She reviewed the work of Everett Rogers and F. Floyd Shoemaker who have identified five factors that affect the rate of adoption of innovations.

Briefly, these can be described as follows: 1) computers have to be perceived to offer advantages over the traditional manner of performing a given task; 2) the use of computers has to be seen to be no more complicated than that of traditional tools; 3) computers have to be easily accessible so that the prospective user can experiment with them; 4) the use of computers has to be easily observable by persons contemplating their use; 5) the values, experiences, and needs of teachers and administrators should be "in tune" with the integration of computers into the system. Resistance to the widespread use of computers is bound to occur unless all of the above conditions are met.

One of the problems facing the proponent of computers in the classroom is the task of persuading resisting colleagues and administrators that computers should be tried in the school. Attempts to explain what computers can do are often countered by assertions that "Computers are too complicated to understand" or questions such as "Why should money be spent on gadgets when traditional methods of teaching seem to be working quite well?" This article addresses this two-fold problem by presenting a model of what a teacher does in order to be a teacher and, only after this analysis, offering suggestions on how these activities can be supported by computers.

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The Model

There are five activities that describe the work of a teacher. They are: 1) scheduling of resources, 2) organization of information, 3) document preparation, 4) storage of information, and 5) transmission of information. A more detailed examination of these activities allows one to establish the type of computer support useful to the teacher.

Resource scheduling involves not only managing time, but also making sure that space, equipment, and so on are available when needed. Traditional techniques for resource and time scheduling make use of the pocket or desk diary, timetables prepared by the school administrative section and the secretary.

Organization of information includes such activities as reading, making notes, arranging material into lessons and courses, as well as interacting with other people with whom the teacher can share his experiences. Support for this activity is provided by textbooks, the teacher's own notes from years past, curriculum guidelines set by the education board or other controlling bodies, as well as libraries of various kinds. It is interesting to note that research in the case of university teachers is also covered under this heading since research is the first step in the organization of knowledge.

Document preparation covers everything the teacher does to produce "hard-copy" materials, be they class notes, memoranda research papers, reports to administrators, or letters to his colleagues and others. The equipment necessary to assist the teacher in this activity ranges from pencils and paper to typewriters and copiers. People are involved too—typists, secretaries, printers, etc.

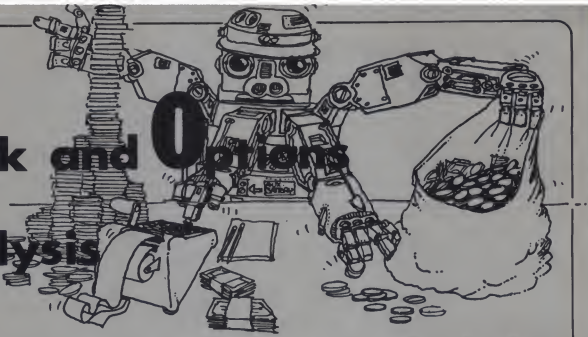
Information transmission is probably the most visible of the teacher's activities. He stands in front of a class and delivers lessons. In addition, if he is a researcher, he presents research papers at conferences and publishes them in academic journals. The audience can be the teacher himself if he jots down an *aide memoire*; it can also be a classful of students, or a group of his peers attending a conference or reading a journal. In all of these cases, the teacher is rated according to the efficacy of his communication and his career progression is closely tied to how well he performs this activity. In this, he is aided by the blackboard, the slide projector, video recorder, and other teaching aids.

Information storage is unavoidable if the teacher intends to refer to his notes, a memorandum, a letter, a book, or other communication subsequent to its generation or reception. Some of the stored information will be shared with others and so it must be made available to them. The support needed for this activity comprises a filing cabinet; the school library, so that, for example, course notes can be available to students; the report repository of learned society, so that information can be made available to other researchers in the field; and, finally, the national library where copies of a book have to be filed under copyright laws. This implies that the support people will include secretaries, filing clerks, librarians, and others whose responsibility is the management of stored information.

Computer Support

With the help of the above model and a list of the traditional support needs of the teacher, it is possible to establish the type and nature of the computer support that may be provided to increase the efficiency with which the five activities are

Stock and Options Analysis



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Administrators, continued...

Activity	Access to private facilities	Access to public facilities
Schsduling	automatic diary	data-base system
Organization	data-base system data gathering system	message-passing system data-base system
Publication	word processor data base system	word processor data-base system
Transmission	CAI system	CAI system message-passing system
Storage	filing system data-base system	library network data-base system

Table 1.

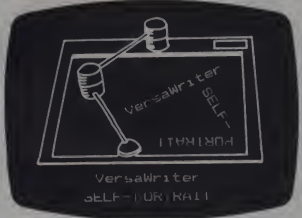
performed. It is clear that the computer support falls naturally into two areas: that provided by a personal computer which will be used to augment the private side of all activities (and here, the use of data gathering computers to aid research must not be overlooked), and that provided by a public data-base and message-passing system to aid the teacher's interactions with others. Table I lists some of the computer support required by the teacher.

A more comprehensive examination of the needs and the means required to satisfy these needs are best left to a more technical discussion of the model.

Summary

As the result of a system analysis of the teacher's activities, it has been possible to establish the nature of the support needed to make the teacher function more effectively. The activity list makes it possible for us to talk to an administrator and the non-expert in a language that can be more readily understood than computer jargon. It also provides us with the means to analyze the support requirements in general terms. The computer is introduced at the last stage in order to define the role that it can play in augmenting and improving the teacher's effectiveness. It should be noted that this model embraces both educational and research uses of computers at the university level and removes a dichotomy which has created some confusion in the past. As the computer is placed in a proper perspective, this allows us to examine the tradeoffs involved in replacing traditional modes of support by the electronic-school techniques of tomorrow. □

PRICE BREAKTHROUGH



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Other programs included in the software are: the Textwriter, with which text can be added to graphics (UPPER & lower case, choice of color, text size, direction of text, starting point of text). Area/Distance-this program allows you to calculate distances (or perimeters) by establishing a measuring unit (of your choice) and tracing the shape or map route with the drawing arm. Areas of figures are calculated in the same way-this includes irregular and open figures. A very simple calibration program is also on this software disk.

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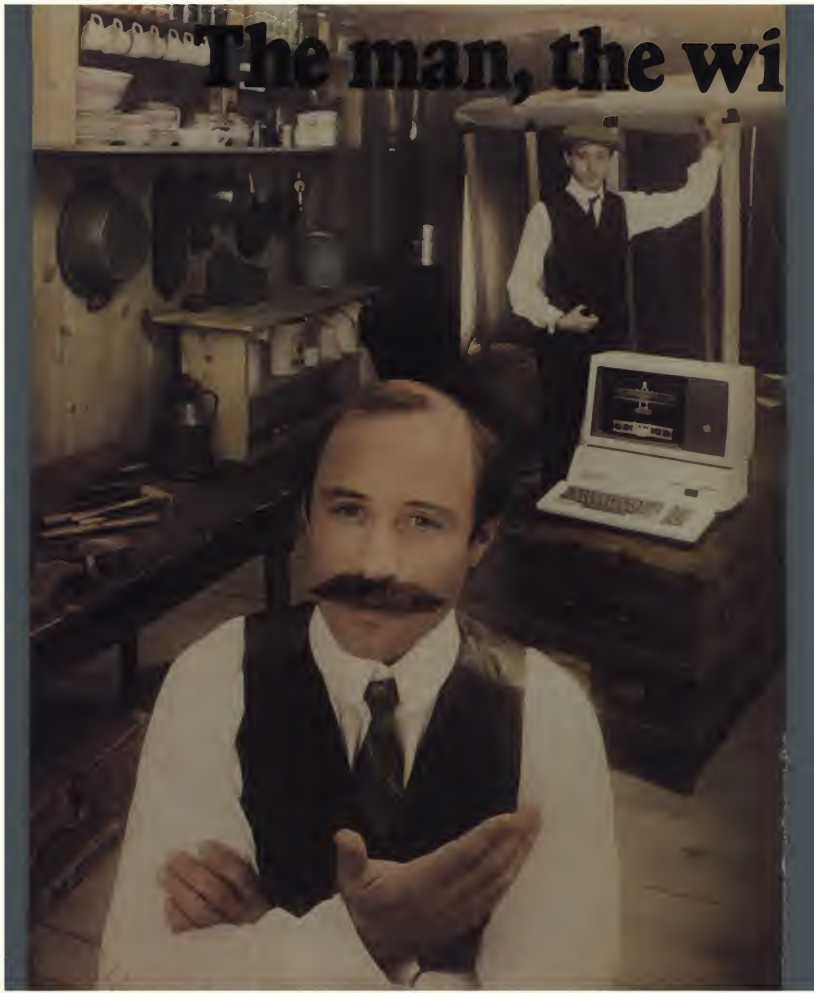
The man, the wi

ng and the Apple.

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that's unparalleled for analyzing alternative paths of design and modeling a wide variety of physical processes.

Want more memory? Depending on your choice of system, Apple has memory expandable to 64K bytes or 128K bytes. Prefer wide displays? Choose 40 or 80 characters. Need to control instruments in the lab? Get on the IEEE 488 bus. Over 100 companies also supply peripherals for Apple because Apple is the most popular personal computer with the least complicated interface.

Want an efficient system of data storage and access? Apple's 5¼" disk drive not only offers you increased application versatility, but high density (143K bytes), high speed and low cost. You can even add up to four or more drives to your Apple system. With proven reliability, no wonder it's the most popular drive on the market today.

Wilbur determined that birds didn't have to constantly flap their wings to fly. With an Apple, he could've determined the fixed-wing design of the Kitty Hawk Flyer much faster.

FORTRAN that helped to design a 20th century flying machine.

Fluent in the same language that helped to design the '747, Apple FORTRAN lets you tackle differential equations at the touch of a key. And since more the 170 companies also offer software for the Apple family, you can have one of the most impressive program libraries ever...including vast subroutine libraries for math, science, engineering and statistics. When you write your own programs, the Apple also speaks in languages other than FORTRAN: Pascal, BASIC, PILOT and 6502 assembly language.

Where to learn more about Apple, the small-yet-serious solution.

Let your imagination soar with Apple.

Discover the 20th century tool versatile enough to monitor quality controls and manufacturing schedules, orchestrate tolerance tests and determine alternative parts selection. Learn why Apple emerges as the technological leader of reliable personal computer products that increase your productivity.

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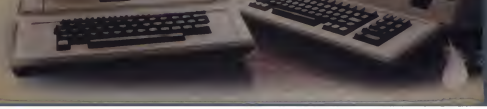
apple computer inc.



CIRCLE 118 ON READER SERVICE CARD

Van Helps Schools Select The Right Computer

Betsy Staples

Which is the best computer? Which software should we buy? What can we actually do with a computer? How can we teach people to use it? Who will fix it when it breaks?

These are only a few of the questions that confront a school system when it first begins to consider the purchase of a small computer or computers for classroom use. Sometimes the questions are never answered adequately. Sometimes teachers and students are unhappy with computer hardware and software chosen in a haphazard fashion.

What seems to be needed is a systematic approach to the selection of hardware and software for classroom use. The Pennsylvania Department of Education offers just such an approach to almost 500 schools in the Commonwealth in the form of the Multi Media Training Van, a vehicle which provides information and training in everything from writing to photography to computers. The van, staffed by Media Specialist Shirley Douglas, travels around the state visiting various school districts which have requested its services. The project is currently a joint effort of the Pennsylvania Department of Education and a Title IV-C project at the Colonial Northampton Intermediate Unit, Nazareth, PA. The program is coordinated through the state's Intermediate Unit Instructional Materials Service department.

In addition to the normal array of audio-visual paraphernalia, the training van carries a Bell and Howell Apple, a TI 99/4, and a TRS-80. When a school system decides to investigate the benefits of computers in the classroom, teachers and administrators may request copies of "A Guide to Microcomputers" and "A Guide to Instructional Microcomputer Software" both compiled by Ms. Douglas and Gary Neights, Coordinator of the Instructional Materials Service Programs in the state. These booklets provide information on computer literacy and guidance in developing purchase criteria.

The district may also request one of the "In-Service Programs" offered by Shirley in the van. Her introductory half-day course is entitled "Microcomputers," and assists participants in developing the criteria and purchase specifications mentioned in the booklets. It offers hands-on experience as well as discussion and demonstrations.

Shirley Douglas prepares to board the van.

In "A Guide to Microcomputers," prospective purchasers are urged to identify the specific uses to which the new computer will be put. A list of "Projected Uses" (Figure 1) serves as a guide during this initial phase of the selection process.

PROJECTED USES

I. Initially determine curriculum areas of use and possible other uses.

Subject Areas	Other Uses
____ math	____ guidance
____ science	____ library science
____ social studies	____ media
____ health	____ management
____ industrial arts	____ computer literacy
____ home economics	____ other _____
____ reading	_____
____ language arts	
____ foreign language	
____ business education	
____ physical education	
____ other _____	

II. If the microcomputer is to be used as an instructional tool (i.e.: math, art, music, etc.) the next step is to determine the microcomputer's utilization by the classroom teacher and the student.

Classroom Teacher Application	Student Application
____ curriculum (subject area teaching)	____ discovery learning
____ computer operation and programming	____ problem resolution
	____ graphics development
____ computer literacy instruction	____ musical exploration
	____ computer programming
____ testing	____ computer awareness
____ classroom management (teacher's record keeping)	____ counseling and guidance
____ other _____	____ other _____

Figure 1

Charts and questions reprinted from "A Guide to Microcomputers" and "A Guide to Instructional Microcomputer Software" with permission of the authors, representing the Pennsylvania Department of Education.

III. If the microcomputer is to be used beyond that of an instructional tool, the following applications should be considered.

Media	Library
_____ program development	_____ instruction
_____ inventory	_____ book location
_____ utilization and maintenance records	_____ card file
_____ budget	_____ inventory
_____ video	_____ budget
_____ circulation control	_____ circulation control
_____ graphics generation	_____ other _____
_____ other _____	

Management	Support Services
_____ attendance	_____ word processing
_____ letter file	_____ teacher assignment
_____ class registration	_____ student assignment
_____ student scheduling	_____ other _____
_____ bus routing	_____
_____ fiscal and budget control	
_____ inventory control	
_____ other _____	

Guidance	Buildings and Grounds
_____ student tracking	_____ security
_____ occupation selection	_____ maintenance schedules
_____ college selection	_____ inventory
_____ confidential student files	_____ other _____
_____ other _____	

IV. From the varied uses indicated, more than one microcomputer system may be necessary. The potential locations of these systems will be an additional factor to consider and thus determine the quantity of microcomputers necessary to meet the potential needs.

LOCATION:

Classroom

_____ a. permanent location

_____ b. shared (mobile between classrooms)

c. estimate number needed:

_____ permanent

_____ shared

Other

_____ school office

_____ library

_____ TV studio

_____ media office

_____ business office

_____ administration building

_____ guidance office

_____ other _____

_____

When evaluating a microcomputer, use the comment sheet. Write notes about that particular model and brand. To better evaluate the computer, use the criterion questions 1-16 on pages 10 and 11. The notes on the comment sheet will be translated into numbers on the tally sheet.

COMMENT SHEET

CATEGORY	BRAND Spacetron MODEL 007	BRAND MODEL
1. COST--TOTAL	795 - 16K 995 - 32K	
2. FLEXIBILITY	reg. power source no spec. environ controls need durability tested	
3. MAINFRAME INTERYACE	none	
4. KEYBOARD LATOUT	Standard w/calculator	
5. ADDITIONAL PORTS	5ports uses RAM	
6. EXYCUTION TIME & LOADING SPEED	LS - 5sec 1.2sec E.T.	
7. MEMORY CAPABILITY		
8. SYSTEM EXPANSION	48K	
9. EDITING	none	
10. INPUT AND OUTPUT DEVICES	printer, plotter, disk,	
11. SOFTWARE	5programs math manuals	
12. GRAPHICS/CHARACTERS	Hi Resolution	
13. COLOR	14 color stand TV monitor	
14. VOICE COMMAND AND VOICE GENERATION	no	
15. MUSIC GENERATION	no	
16. SERVICING	none	
17. USER TRAINING	none	
18. TOTALS		N/A

Figure 2.

On the tally sheet using a scale ranking (1-5) assign a rank value for each category from the comment sheet. If the cost is high give it a 1. If it is easily movable and compact then flexibility may be a 5. If no service is available category (16) is assigned a 0, etc. When all categories have been assigned a scale ranking, multiply them by the importance factor you originally assigned. The end results are added together. The highest total (18) will indicate the microcomputer best suited for your uses and needs. Be as sincere as possible to get an unbiased evaluation. Color of the case, unnecessary extras or the salespersons personality should not effect the choice.

TALLT SHEET

CATEGORY	IMPORTANCE FACTORS	BRAND SPACETRON	
		SCALE RANKING	RATING
1. COST--TOTAL	5	1	5
2. FLEXIBILITY	5	5	25
3. MAINFRAME INTERFACE	10	0	0
4. KEYBOARD LAYOUT	3	5	15
5. ADDITIONAL PORTS	10	4	40
6. EXECUTION TIME & LOADING SPEED	10	3	30
7. MEMORY CAPABILITY	10	2	20
8. SYSTEM EXPANSION	8	5	40
9. EDITING	10	0	0
10. INPUT AND OUTPUT DEVICES	9	3	27
11. SOFTWARE	10	2	20
12. GRAPHICS/CHARACTERS	8	5	40
13. COLOR	5	5	25
14. VOICE COMMAND AND VOICE GENERATION	5	0	0
15. MUSIC GENERATION	3	0	0
16. SERVICING	10	0	0
17. USER TRAINING	10	0	0
18. TOTALS	—	—	297

Figure 3.

Once the uses have been defined, the people who will use the machine are asked to consider such criteria as cost, flexibility, mainframe interface, keyboard layout, execution and loading speed, memory capability, system expansion and many others. A tally sheet lists 17 of these criteria; the prospective user assigns a number between one and ten to indicate how important he or she considers each feature. If the school plans to use the computer in more than one area, or for more than one application, all prospective users should assign "importance factors" based on their individual needs.

When importance factors have been assigned, individual computers can be considered. Based on promotional literature, information provided by sales people, or experience with one of the machines in the van, a "Comment Sheet" can be completed. Figure 2 shows a comment sheet for the mythical Spacetron 007.

On the final tally sheet, users are asked to consider again the 17 criteria and assign a value between one and five for the computer in question. "If the cost is high, give it a 1. If it is easily movable and compact then flexibility may be a 5." These "single rankings" are then filled in on the tally sheet and multiplied by the importance factors to produce a rating for each criterion. (See Figure 3.) When the ratings are totalled, the user has a number which can be compared to the totals for other machines or for the same machine in other departments. While obviously not infallible, this technique provides a method of quantifying what might otherwise be left to someone's gut feeling. The instructions conclude by cautioning: "Color of the case, unnecessary extras or the salesperson's personality should not affect the choice."

Software Selection

Once the computer system has been selected, the problem of which software to purchase may be overwhelming. Very few manufacturers are willing to send sample programs, and it may be difficult to find educational software in the local computer store. Here comes the van again.

The story behind the two best selling computer games books in the world.

Computer Games

by David H. Ahl

Everybody likes games. Children like tic tac toe. Gamblers like blackjack. Trekkies like Star Trek. Almost everyone has a favorite game or two.

It Started In 1971

Ten years ago when I was at Digital Equipment Corp. (DEC), we wanted a painless way to show reluctant educators that computers weren't scary or difficult to use. Games and simulations seemed like a good method.

So I put out a call to all our customers to send us their best computer games. The response was overwhelming. I got 21 versions of blackjack, 15 of nim and 12 of battleship.

From this enormous outpouring I selected the 90 best games and added 11 that I had written myself for a total of 101. I edited these into a book called 101 Basic Computer Games which was published by DEC. It still is.

When I left DEC in 1974 I asked for the rights to print the book independently. They agreed as long as the name was changed.

Contents of *Basic Computer Games* (right) and *More Basic Computer Games* (below).

Converted to Microsoft Basic

The games in the original book were in many different dialects of Basic. So Steve North and I converted all the games to standard Microsoft Basic, expanded the descriptions and published the book under the new name Basic Computer Games.

Over the next three years, people sent in improved versions of many of the games along with scores of new ones. So in 1979, we totally revised and corrected Basic Computer Games and published a completely new companion volume of 84 additional games called More Basic Computer Games. This edition is available in both Microsoft Basic and TRS-80 Basic for owners of the TRS-80 computer.

Today Basic Computer Games is in its fifth printing and More Basic Computer Games is in its second. Combined sales are over one half million copies making them the best selling pair of books in recreational computing by a wide margin. There are many imitators, but all offer a fraction of the number of games and cost far more.

The games in these books include classic board games like checkers. They include challenging simulation games like Camel (get across the desert on your camel) and Super Star Trek. There are number games like Guess My Number, Stars and Battle of Numbers. You'll find gambling games like blackjack, keno, and poker. All told there are 185 different games in these two books.

Whether you're just getting started with computers or a proficient programmer, you'll find something of interest. You'll find 15-line games and 400-line games and everything in between.

The value offered by these books is outstanding. Every other publisher has raised the price of their books yet these sell for the same price as they did in 1974.

Moneyback Guarantee

Examine one or both of these books and key some games into your computer. If you're not completely satisfied we'll refund the full purchase price plus your return postage.

Basic Computer Games costs only $7.50 and More Basic Computer Games just $7.95 for either the Microsoft or TRS-80 edition (please specify your choice on your order). Both books together are $15. Send payment plus $2.00 shipping and handling to Creative Computing Press, Morris Plains, NJ 07950. Visa, MasterCard and American Express orders should include card number and expiration date. Charge card orders may also be called in toll-free to 800-631-8112 (in NJ 201-540-0445).

Order today to turn your computer into the best game player on the block.

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CIRCLE 350 ON READER SERVICE CARD

Questions to Ask About a Computer System

1. **Cost:** This is a factor to be considered. Micros generally range from $500 to $3,000 to establish a system. This cost is to be with all peripherals needed to operate.

2. **Flexibility:** (Size, portability, cords and modules, environment) Depending upon needs can the unit be readily moved? Is it necessary for the unit to be moved? Is it sturdy and reliable to survive moving around? Has it been tested for durability? How much does it weigh? Is it necessary to be near an outlet or telephone lines? Do the learners have to be brought to the unit or does the unit have to be taken to the learners? Can the unit be accessed other than being right at the microcomputer itself? How many cords necessary to operate the micro? Is there a need for special environmental controls, i.e., temperature, humidity, dust? (Protection from exterior electrical interference, i.e., other computers, static charges, another electromagnetic field)

3. **Mainframe Interface:** Does the unit have the ability to interface with available mainframe computers to function as a smart terminal?

4. **Keyboard Layout:** Most micros come with a standard typewriter layout. If the unit does not, will it fit your needs? Does it have a calculator layout on it? Is a calculator layout necessary or can the standard typewriter numbers fulfill the calculation needs?

5. **Additional Ports:** Can other peripheral devices be connected to the unit, i.e., printers, plotters, phone lines, disks, etc.? Are there sufficient ports to substantiate your operational needs? Do these ports use memory (RAM) that would otherwise be available?

6. **Execution time and loading speed:** How long does it take the microcomputer to execute an operation? How fast can information be loaded into the unit? Is the execution time, problem, operation or loading of a program too long for student attention spans?

7. **Memory capability:** How much ROM memory is the unit capable of? How much RAM memory can be taped? RAM is found in varying forms. If strictly for running of prepackaged materials then usually 16K will suffice but generally self-generated programs will take more bytes of memory (RAM).

8. **System Expansion:** Can the system be expanded easily? What are the limits of the expansion? What peripherals are available? Are peripherals needed? With the current state of advances new items for purchase are always being developed, such as light pens, graphics, tablets, voice synthesizers, etc. Maybe even keys for the blind or some other new advances are in the making as this pamphlet goes to publication.

9. **Editing:** Can editing take place immediately as mistakes occur? Is editing simple? After the program is completed can editing be done? Can changes in the program to suit needs be done? Will the unit identify specific program errors?

10. **Input and Output Devices:** As specified for purchase what input and output devices are included in the package, i.e., cassette, disk, TV monitor, printer, plotter, graphics tablet, light pen, voice synthesizer?

11. **Software:** Are there sufficient manuals, reference and program material available to support the microcomputer? Are there programs suited to the user's needs? Have outside companies (other than the original designer) make additional software programs? Is there enough software available to fulfill needs? Can programs be made to fulfill the user's needs? Have the programs been validated (field tested with students)? Cost of prepared programs? Ease of self-generated programs?

12. **Graphics/Characters:** Is the unit capable of low or high resolution graphics? How many characters per line are available on the micro? How many lines on the CRT are visible? What is the screen size? Graphics tablet? Light pen?

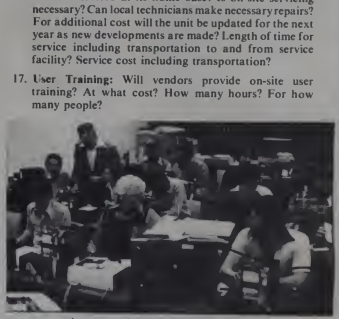
13. **Color:** Is color necessary for your operations? If color is necessary, does the CRT monitor have to be a special monitor?

14. **Voice command and voice generation:** Does the unit have voice synthesizers, to generate voice, does it have or can it be adapted to accept voice commands?

15. **Music Generation:** Is there music capability? Does it have an internal speaker or separate speaker system for sound?

16. **Servicing:** What are the warranties available? Can the unit be serviced at its home base? Is on-site servicing necessary? Can local technicians make necessary repairs? For additional cost will the unit be updated for the next year as new developments are made? Length of time for service including transportation to and from service facility? Service cost including transportation?

17. **User Training:** Will vendors provide on-site user training? At what cost? How many hours? For how many people?



Instructional Materials Service Technicians learn to service and repair the Bell and Howell Apple.

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Sunnyvale, CA 94086

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CIRCLE 150 ON READER SERVICE CARD

80-U.S. TRS-80 User's Journal New "How-To" info for the serious TRS-80 user

80-U.S. is expanding with more pages, programs and color with heavy emphasis on advanced TRS-80 applications...plus a regular Exatron Stringy/Floppy feature.

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Van, continued...

Shirley purchases single copies of educational programs from many different vendors and makes them available in the van to educators who want to consider them for adoption. If a teacher decides to adopt a given program or package, it must be purchased through his or her school district. Software carried in the van may not be copied.

The software evaluation form (Figure 4), found in "A Guide to Instructional Microcomputer Software," is designed to assist in the selection of software. First an instructional objective must be stated. Then the objective is compared to the features of the program with regard to grade level, validation, correlation with text, instructional strategies and instructional design features. It also includes room for a description of the program and an overall evaluation.

After hardware and software are chosen, teachers may avail themselves of a second In-service program which deals with "Microcomputer Classroom Applications." During the full-day course, participants learn to operate the computer, run programs, and even write a short program in Basic.

Other Services

The van staff has taken special care to reach administrators, since they are most frequently in decision-making positions. The Microcomputer Administrators Days Workshops, in which administrators get an overview of small computers in education as well as specific information on hardware specifications and evaluation and software evaluation, have reached over 50% of the school district administrators in the state.

Perhaps the most innovative program in this innovative program was the repair seminar conducted in March 1980, in which Bell and Howell Apple personnel trained approximately 20 of the state's Instructional Materials Service Technicians to repair their computer. Negotiations are underway with several other computer manufacturers to provide similar sessions.

Shirley points out the participants in these and other courses and services provided by the van are expected to be "multipliers." Key personnel are trained to train others in the school or district. The van enables one person and a few pieces of audio-visual and computer equipment to serve many people and many school districts all over the state. □

MICROCOMPUTER INSTRUCTIONAL SOFTWARE EVALUATION FORM

Instructional Objective Desired: _____

Desired Instructional Needs	Program Title _____ Producer _____ Cost _____
A. Objective (Above)	A. Objectives Met: ___Yes ___No Content: ___Good ___Fair ___Poor
B. Grade Level ___	B. Grade Level ___
C. Validation	C. Number of Times Tested ___ Number of Times Revised ___ Students Tested: Number ___ Grade Level ___
D. Current Text in Use: _____ _____	D. Correlated With: _____ _____
E. Instructional Strategies Needed: ___Drill and Practice ___Simulation/Gaming ___Inquiry and Dialogue ___Problem Solving ___Information Retrieval ___Tutorial	E. Instructional Strategies Employed: ___Drill and Practice ___Simulation/Gaming ___Inquiry and Dialogue ___Problem Solving ___Information Retrieval ___Tutorial
F. Instructional Design Features: 1. Student Instructions ___Audio ___Written 2. Built-in Clock ___Yes ___No 3. ___Linear ___Branching 4. Student Progress ___Daily ___Cumulative 5. Prescription or Homework Assigned ___Yes ___No	F. Instructional Design Features: 1. Student Instructions ___Audio ___Written 2. Built-in Clock ___Yes ___No 3. ___Linear ___Branching 4. Student Progress ___Daily ___Cumulative 5. Will the program prescribe study assignment or develop homework? ___Yes ___No

Description of the Program:

Recommended for
(Include grade level, course and student ability level)

Overall Evaluation:

___Excellent ___Good ___Fair ___Poor ___Unacceptable

Figure 4.

Something to Think About

L.G. Mendershausen

Something I would like to know
Is where do old computers go?

When they have terminated thinking
Do they stop that nervous blinking,
Cease those fretful peeps and squeals
And calm those jerking, spinning reels?

I've been told that they may be
Almost human like you and me.

But, if they act as humans do
Would it not be also true
That they would suffer human ills
Like hemorrhoids and unpaid bills?

And, like humans, overtired,
Couldn't they become unwired?

And won't it make them very cranky
Seldom having hanky-panky?

I've heard it said by someone wise
That when an old computer dies
A newer, better one is born . . .

If this is true then may I plead
A chance to watch computers breed?

L.G. Mendershausen, 2927 Marconi #70, Sacramento, CA 95821.

PLL

W.D. Eisenburg

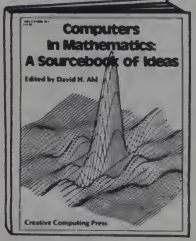
Instructions say,
"You need not guess
how to debug
your TRS,"

but I run straight
into the jaws
of every one
of Murphy's Laws.

W.D. Eisenburg, 5380 Old Berwick Road, Bloomsburg, PA 17815

Sourcebook of Ideas

Many mathematics ideas can be better illustrated with a computer than with a text book.



Consider Baseball cards. If there are 50 cards in a set, how many packs of bubble gum must be purchased to obtain a complete set of players? Many students will guess over 1 million packs yet on average it's only 329.

The formula to solve this problem is not easy. The computer simulation is. Yet you as a teacher probably don't have time to devise programs to illustrate concepts like this.

Between grades 1 and 12 there are 142 mathematical concepts in which the computer can play an important role. Things like arithmetic practice, X-Y coordinates, proving geometric theorems, probability, compounding and computation of pi by inscribed polygons.

Endorsed by NCTM

The National Council of Teachers of Mathematics has strongly endorsed the use of computers in the classroom. Unfortunately most textbooks have not yet responded to this endorsement and do not include programs or computer teaching techniques. You probably don't have the time to develop all these ideas either. What to do?

For the past six years, *Creative Computing* magazine has been running two or three articles per issue written by math teachers. These are classroom proven, tested ideas complete with flowcharts, programs and sample runs.

Teachers have been ordering back issues with those applications for years. However, many of these issues are now sold out or in very short supply.

So we took the most popular 134 articles and applications and reprinted them in a giant 224-page book called *Computers in Mathematics: A Sourcebook of Ideas*.

Ready-to-use-material

This book contains pragmatic, ready to use, classroom tested ideas on everything from simply binary counting to advanced techniques like multiple regression analysis and differential equations.

The book includes many activities that don't require a computer. And if you're considering expanding your computer facilities, you'll find a section on how to select a computer complete with an invaluable microcomputer comparison chart.

Another section presents over 250 problems, puzzles, and programming ideas, more than are found in most "problem collection" books.

Computers in Mathematics: A Sourcebook of Ideas is edited by David Ahl, one of the pioneers in computer education and the founder of *Creative Computing*.

The book is not cheap. It costs $15.95. However if you were to order just half of the back issues from which articles were drawn, they would cost you over $30.

Satisfaction Guaranteed

If you are teaching mathematics in any grade between 1 and 12, we're convinced you'll find this book of tremendous value. If, after receiving it and using it for 30 days you do not agree, you may return it for a full refund plus your return postage.

To order, send your check for $15.95 plus $1.00 postage and handling to Creative Computing Press, Morris Plains, NJ 07950. Visa, MasterCard, and American Express orders may be called in toll-free to 800-631-8112 (in NJ 201-540-0445). School purchase orders should add an additional $1.00 billing fee for a total of $17.95.

Don't put it off. Order this valuable sourcebook today.

creative computing

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Toll-free **800-631-8112**
(In NJ 201-540-0445)

Problem

The world is full of intriguing problems that never got into a textbook.

Ninety intriguing and fascinating problems, each thoroughly discussed and referenced, make an excellent source of exercises in research and preliminary investigation. Eleven types of problems are provided in the following areas: arithmetic, algebra, geometry, trigonometry, number theory, probability, statistics, calculus and science. Author Stephen Rogowski of SUNY-Albany has included several problems which have never been solved. He feels that some research and an attempt to solve these will sharpen students' insight and awareness.

Some of the problems are not new like the one asking how much the $24 the Indians were paid for Manhattan would be worth today had it been deposited in a bank. However, this problem was revised to have a variable interest rate so it would be a challenge to program. Of course, many of the problems are new and have never been in print before.

The student edition has 106 pages and includes all 90 problems (with variations), 7 appendices and a complete bibliography. Cost is $4.95.

The 182-page teacher edition contains solutions to the problems, each with a complete listing in Basic, sample runs, and in-depth analyses explaining the algorithms and theory involved. Cost is $9.95.

To get one or both books send payment plus $2.00 shipping and handling per order to *Creative Computing*. Credit card orders may be called in toll-free to the number below.

Order yours today. If you are not completely satisfied, return it for a full refund plus your return postage.

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MINNESOTA EDUCATIONAL COMPUTING CONSORTIUM

David H. Ahl

Introduction

The Minnesota Educational Computer Consortium is one of the largest and most highly respected organizations using computers in education. Founded in 1973, the impetus for MECC came from reasons such as increasing demand for computing services and the desire to provide equality of educational opportunity. Negative influences such as educational funding constraints and educator's fear of non-educational agencies also affected the forming of the organization.

Walking a tightrope between the governor's office, the state department of education and the state university and college systems, the MECC Board of Directors establishes the objectives and policies to be carried out by the 54-person MECC staff.

The $5.6 million budget is divided into four major areas. The first is Administration and Planning ($330,000). The functions of this group include budgeting, accounting, personnel management, purchasing publications and public relations.

Management Information Services with a budget of $1.3 million provides administrative data processing services to schools throughout the state. Two major statewide computer applications are now operational: a finance system and a payroll/personnel system. Final programming is now underway for a student data base system.

The Special Projects Division with a budget of $298,466 is involved in four major projects: developing a high school economics course on videodisc and computer, a telecommunications study and two computer literacy studies.

MECC GOALS

Economy of scale in computer hardware utilization

Cost-effective communications networking

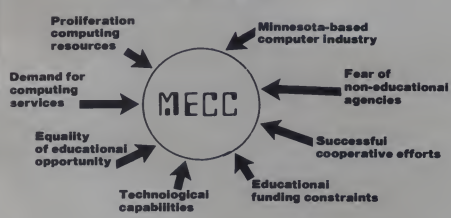
Minimization of system design & developments costs

Sharing of expertise and successful applications

Uniformity and compatibility of data

Training of educators

Impetus For MECC



The largest division is Instructional Services with a budget of $3.76 million and staff of 33. This division provides timeshare computing, in-service training, assistance with hardware acquisition, and courseware development and distribution.

Creative Computing interviewed Ken Brumbaugh, director of instructional services, about the background and current activities of MECC. We talked to Rick Nordin and Mark Rustad about the timesharing system and programs and Marge Kosel about courseware development. David Lubar interviewed Allen Glenn about MECC research with video disc technology. This special section on MECC ends with a discussion by Ken Brumbaugh on the relative merits of time share and microcomputers. □

Interview With Ken Brumbaugh

Brumbaugh: In 1973, when we decided to have something called MECC, the demand for computing was beginning to show more and more. The major factor was the educational opportunity. We felt the same opportunities in computing should be open to a rural resident as to anyone in the suburbs or Twin Cities. Technological capabilities were beginning to come on the scene. Funding these things was a problem even then. MECC was a cooperative effort. It was a unique effort, in that it was a cooperative effort from various member systems in education. In few places do you see any effort that includes elementary-secondary through higher education. One thing to our advantage is that Minnesota has a highly computerized industry base, with 3M, Univac, Honeywell, and Control Data. IBM has major facilities in Rochester. That makes a big difference when you are trying to sell the concept. A lot of people had heard about computers or made their living with computers.

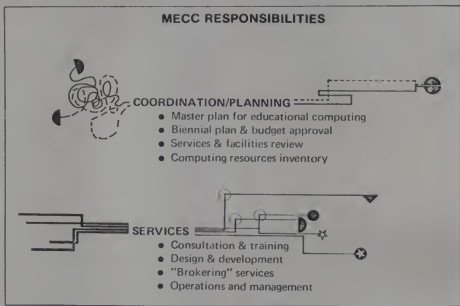
Ahl: Aren't these same factors operative in many other states? Why do you suppose that nobody else has followed your lead in coming up with a statewide organization?

Brumbaugh: Our timing was important. It would be very difficult to start this up right now, even in Minnesota. At the time it seemed that the willingness was there, the need was there, the interest was there, and there weren't any little domains already established. The only three that were really in operation in instructional computing in Minnesota were the TIES group, University of Minnesota and Mankato State University. They were only serving about 14% of the enrollment in the state.

Now other states could follow our lead but they are unsure about getting the massive amounts of funding for the telecommunications support for time-sharing or administrative computing. To get agreement on one way of doing something once many people have started it is extremely difficult. Furthermore we see Minnesota as being liberal in its education practices and policies, and we pay very high taxes as a result. This is not confined to the computing; for example, in drug programs Minnesota is a leader.

The original goals were to achieve economy of scale in computer hardware, to create a cost effective communications network to minimize the systems design and development costs (primarily in the area of administrative computing) to share expertise and applications, to have uniformity and compatibility of data (administrative area again) and to train people in the use of the system.

The responsibilities fall into two categories; A. coordination and planning and B. services.



We are responsible for assisting and putting together master plans, whether they are for one year, two years or for long range periods. We are also responsible for reviewing deviations from those plans. We keep a computing resources inventory that could even tell you how many couplers there are in the state and what building they are in. We know all of our customers, what their enrollment is, how they get into the time-share system, how many Apples they have, what kind of service they get. We have this kind of data in a variety of forms which allows us to supply proper information to the people who really need to make decisions about funding and support.

If you are doing the coordination, planning and review, how can you also be providing part of the services without a conflict of interest? In the early days when someone wanted to purchase some mini time-sharing system MECC would say "No you can't do that, your option is to buy the system from us." That doesn't seem to be as much of a problem in the instructional area as it used to be. We set up a lot of state wide master contracts, for teletypes, card readers, microcomputers, etc. Over the 6-7 years we have been in existence, we feel we have saved about $750,000 through master contracts. The private sector sometimes complains—"Why are you doing it when that is our livelihood?" We used to sell teletypes through master contract, but when the private sector was competing with one another and set itself up to provide the service then we got out. We may get out of the microcomputer selling business. We had a hard time looking at whether or not to extend the Apple agreement for the third year. We looked at our pricing and delivery system and made a decision that we should extend it one more year. People *do not* have to buy from us, it is an option.

Ahl: They get a better price.

Brumbaugh: On a disk and a communications card, much better. We add on an administrative charge. We sell a 32K Apple II Plus for $1050. A lot of retailers are getting close to this price now. But the difference is that we have sold them for a year at that price, while dealers may offer that price for a special sale of two weeks.

Ahl: What about the administrative side of the organization?

Brumbaugh: There is a management information services group. Their primary responsibility is to work with the elementary and secondary shools. They have developed a state-wide information system including a finance system. All school districts in the state of Minnesota are using the same finance system with identical data format. They are developing a personnel system and a student support system and they may develop an instruction management system. These are fairly significant packages. MECC works closely on the admin-

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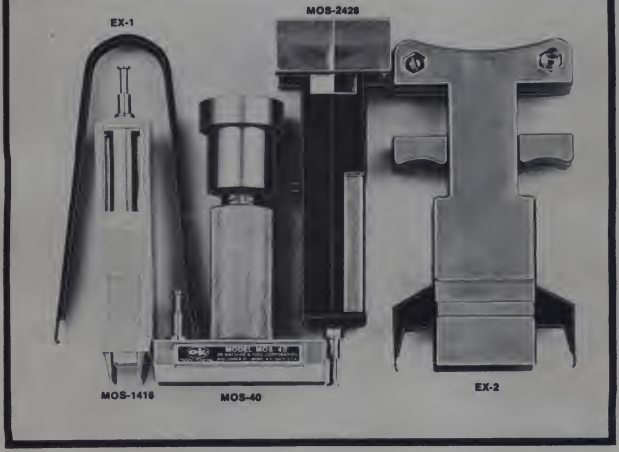

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CIRCLE 179 ON READER SERVICE CARD

Brumbaugh, continued...

istrative side with the State Department of Education. If you are talking about coordination of planning, data and reporting standards, software, common applications, unique applications or conversion or actually providing on-line service, it is the responsibility of either MECC or the State Department of Education.

Instructional computing came up and running without any guidelines to follow. Everyone was learning by the trial and error method.

The student system is being put together now. They asked the users throughout the state what information needed to be in the system for an individual student in a school district. We indentified 1462 variables. That may seem inconceivable but you may have a child that is from a family in which the parents were divorced, have remarried and recive a certain type of welfare payments; who gets the report card? Some say that's a variable that this system needs to know. Locker number and miles to the bus stop are other examples. It's probably going to be so big and so powerful that it will be costly to maintain. I think they asked for a lot to be done and did not realize that these things cost money. There is a group of approximately 30 people whose job is to develop administrative software and train the regions how to implement it on their systems. Once the package is put on the regional system, MECC goes back to a maintenance role.

Regional centers are the key groups in the delivery of the MIS services for elementary and secondary systems. MECC develops the materials, user manuals, programs, training materials, and sets up the standards.

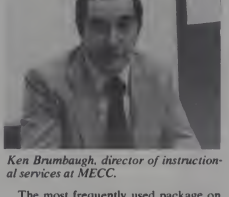
Our most popular features are the instructional services. We do a variety of things, including time-share computing, providing a telecommunications network. We provide in-service training, and assist in hardware acquisition, courseware development and distribution. To accomplish these things we organized groups for development, technical services, telecommunications and user services. We have approximately 33 full time people and some part time and unclassified people.

When we talk about instructional computing for the elementary and secondary schools, University of Minnesota, state universities, community college systems and private schools, three groups are involved. The first one is the total number of schools or institutions, the second is the ones participating on time-share, and the third area includes schools that purchased Apple microcomputers from MECC.

While 396 customers want MECC time-share service, 352 have purchased Apple microcomputers. I suspect that within the next two or three months the customers who are currently getting time-share from MECC will also have Apple microcomputers.

It is interesting to see who is getting the microcomputers: elementary and secondary schools have approximately 82% of them. The University of Minnesota has 8%, community college systems 3%, and the state university system 2.5%.

Our various groups have two primary functions. One is to operate the computer and the other is to maintain and develop the operating system in order to keep response time acceptable, accommodate more users, and run larger and more complex programs. We are increasing the use of time-share service in Minnesota in every possible indicator, i.e., log-ins, connect-time, information-in, information-out, resources used. Every indicator has gone up every month for the last 14 months. That is the same period of time that the micros have been going in massive numbers. It seems to indicate that the major problem in educational computing has been and continues to be lack of equipment.



Ken Brumbaugh, director of instructional services at MECC.

The most frequently used package on our system is the career planning aid. We have made that free to people and that has increased use. In a few weeks we are going to be announcing a data-base system with time-share system which will also increase use.

Ahl: Who do you think will be the major user of the data-base system?

Brumbaugh: We are going to promote small applications for individuals. Historically what has made MECC successful in instructional computing is that we have provided some applications for everyone. We haven't provided everything for someone. The economics teacher looking for a complete curriculum has not found that. The dietician can plan the menus for the school cafeteria using the time-share system. Guidance, math, science, woodshop, etc. will find the system useful.

Before MECC got started, 18% of the school districts had access to computing, now it is 79%. Of the school enrollment, 52% of the students in schools in 1973 had computing service. Now it is 96%. MECC provides 420 ports of time-share service, the University of Minnesota offers 150 ports, and approximately 50 are sold through MECC to the state universities. Even though 21% of the districts don't have time-share service, they only represent 4% of the enrollment. About half of the people who have computing time-share service live outside of the metro area. This balances out to about the same as the legislature, enrollment, and population. We have two guidance applications, a share system called GIS and one that was developed in Minnesota called MCIS. We also have major home economics packages. In mathematics we have two work sheet generators, one called CGMM and one called COMPUTE with all the objectives for computational mathematics. There are several thousand objectives in each one. The CGMM has 21 million characters. Mathematics teachers for almost any grade level can sit down and run either of these two programs to generate a worksheet, and that worksheet could be made up of problems of the same objective or problems from any one of several thousand objectives. A lot of people run these systems. Some school districts have trained their janitors how to type in the objectives and run out worksheets at night. Because we had COMPUTE as a computational math worksheet generator and since a data base was there with all of the objectives we spent a couple of man-years and put together our own drill and practice program, because we couldn't afford to pay approximately $20 per port per month. Our drill and practice package is a very good interactive package where the students can be registered and their programs can be monitored.

We have a readability analysis that almost every school district uses on text books before they order to check the graded reading level of the texts. In fact, almost every publisher in the country has bought this package from us so they can check out their own books. It has about 30 different readability indicators so cross checking can be done.

We have a state-wide mail system so any user in the time-share system can send messages to anyone else. It is heavily used for a variety of purposes. The non-instructional uses range from "Is it snowing in Crookston? We are ready to leave with the basketball team, should we

leave?" to "I'm five foot two etc."

The Cyber-73, Model 36 was installed in July 1977. The maximum number of people that we have ever had on it is 350, with 430 ports configured. We have approximately 150,000 people sign on each month. People generally stay on the time-share system for 30 minutes and use up 1.6 central processor seconds each time.

In the telecommunications area we have network planning and network maintenance In maintaining it there are sometimes 13 different vendors involved in delivering the service. Thus it is important to have someone who can check and determine where the problems are occurring.

The MECC telecommunications network is a multiplexer based network that has multiplexers in 23 different towns. About two-thirds of the users come into the system by way of time-division multiplexing unit. The cost of that is substantial.

The key group in MECC's history has been the User Services Group. They are the arm of MECC that reaches out and touches the end user. Their primary function is user education and communication with those users. They do workshops, give school presentations, and conduct conferences. They are available for visits to schools, they put out newsletters, and offer telephone consulting service and mail assistance. Last year there were over 600 visits to installations, over 450 presentations, over 275 workshops, more than 25 advisory group meetings and more than 30 newsletters. We believe that 40% of the micros are going into new installations. It is a new technology and to understand how to use it or use it better requires user services or user training. There is just more and more training required. The User Services Group has been responsible for keeping our customer base there. We have gone through three different time-share systems in our history—with the problems of conversions, different syntax, different languages, different instruction sets—and we have done it without ever losing one day of service. What startles a lot of people is to walk up to our time-share system console in the morning when the system comes up and see 300 people sign on within 5 seconds.

One of the most successful accomplishments has been the contribution of course-ware from the MECC user community into a share-pool. We have a specific documented procedure set up, handled on-line where users can contribute programs that they think will be useful to others into a holding category, where they are evaluated by their peers and by MECC staff and advisory groups. If accepted they go into a share library, where there is a catalogue so users can find out what's been contributed. We generally have about 200 things accepted out of 400 submitted each year and the cost has been around $800 to $1000. We get about 10 to 15 good time-share applications each year coming right from the grassroots level. We are doing something similar with the Apple.

One of the major goals in the Instructional Systems Development Group is to set up some documentation standards. We are using word processing machines so we can have standard formats and ease of revision of documentation as it is being prepared.

MECC's service was demonstrated when Apple decided to go with the 3.3 disk operating system. In most places the transition is going to happen very slowly. However, 94% of the Apples purchased through MECC already are on 3.3; in another two weeks they all will be.

MECC put together an instruction booklet, which we believe is better than Apple's, that tells you how to run your old disk, how to convert if you are using a single disk drive, and how to convert if using a dual disk drive. These kinds of things, telling people what is happening, getting things set up so it makes it easy transfer for them, giving them appropriate instructions, are good examples of MECC services.

Interview With Rick Nordin

Ahl: The MECC computer room houses one of the oldest operational Cyber 70 systems. Basically the Cyber 70 goes back to 1964. It has its heritage in the early Control Data 6600 and 3600 series from the mid 60's. In the early 70's it changed its skin and is now masquerading as a Cyber 70. I gather that it has been very reliable for you people.

Nordin: Yes, we have a 99% reliability.

Ahl: How many user ports do you have into the system?

Nordin: Over 440. The maximum number of simultaneous users last year was over 342.

Ahl: What is the average number of users on the system?

Nordin: It depends on the time of the year; in the fall there is less usage than in the spring as people become more experienced. The average during the year as people get going is 220-300.

Ahl: What is the response time when it is loaded like that?

Nordin: Four to five seconds.

Ahl: Is the system now, with all of the Apples out in the school districts, being used as heavily, more heavily, or less so? What has been the effect of the microcomputers?

Nordin: It appears that they aren't taking any usage away from us. In fact, the users came on faster this year (when the new academic school year started). We were surprised at how soon the number of users grew.

Ahl: Do you think there has been a shift in what is being used? For example, are

Operator console, four-tape drives and six disk drives of MECC Cyber 70.

programs that can run on the Apple being run there and larger things that require a big data base being run here?

Nordin: I think we are seeing more Cobol and Fortran done on the large system now. It used to be very heavily into Basic (and still is) but it is leaning more towards the languages you can't always find on a micro.

Ahl: What about programs like Career Planning, and things that require data bases?

Nordin: That is the one area that we know the time sharing system will be able to out perform the micros. For example, something called the Minnesota Career Information System (MCIS) is used quite heavily. We are currently developing a data base manager. We certainly have more storage than the typical Apple.

Ahl: How much?

Nordin: 100 megabytes on each of 16 disks.

Ahl: What about applications such as downloading programs on to the Apples? Is that something the system supports?

Nordin: Yes, we have a program that runs on the Apple and one on the Cyber and will shift files back and forth over communication lines. That gets used about 50 times per day to move files from one processor to the other.

Ahl: Who uses the system?

Nordin: We have two different types of users on the system because of geography. We have local users within the metro area and we have remote users. They access the system in several ways: local ports, modems, and multiplexers. Each major city such as Austin, Windham, Duluth and Mankato are served by a multiplexer. For example, a school in Winona calls a local number and is connected to the multiplexer which is connected by a high speed link to a port here.

Ahl: Does that multiply the number of users that can be on a system at a time, in other words, from Winona can several people call into that multiplexer?

Nordin: Absolutely, one of those multiplexers can support a theoretical maximum of 20 lines, the actual number to be determined by the demand, by the baud

rate of each individual line, as well as the baud rate of the highspeed line that interconnects the multiplexers.

Ahl: What are most of the people using as terminals?

Nordin: There are a large number of teletypes. We have a significant amount of 110 baud service. However, in the last few years there has been a significant shift to 300 baud service.

Ahl: What terminal is that predominantly?

Nordin: There is none. That is one of the problems with out network actually. We can't write programs to take advantage of any particular terminal characteristic because we have everything from ASR 33's on up to things more intelligent like Apples. DECwriters, Teletype 43's and many other types.

AHL: You mentioned earlier that there are problems with the front end system.

Nordin: Yes, we are trying to overcome these deficiencies, by undertaking a development effort of our own.

Over here the Digital Equipment VAX minicomputer system is going to take over the current functions of all those C96's and all four 2550's and in addition will provide significantly more intelligent processing than the 2550's are able to deliver. This will improve the flexibility of our network enormously, in terms of handling more intelligent protocalls and possibly in communicating with other computer systems. It may be possible with the increased flexibility to be able to configure our network a little differently to save a significant amount of communication money, which is important.

It should improve the performance of the Cyber itself because we can take some of the functions that the Cyber has to perform now and move them out here into the VAX. In addition to the mundane communication type stuff, we'll give our users some enhanced features for the terminals. We might be able to tailor our processing just a bit for the kind of terminal you have. I mentioned earlier the wide variety of terminals.

Ahl: In hooking these 400 lines onto the VAX and the other front end work, are you going to be doing all the software development internally?

Nordin: Yes.

Ahl: No help from DEC or anybody?

Nordin: No.

Ahl: That sounds like a fairly long-term project. How much time do you envision until the system gets operational?

Nordin: That is the $64,000 question. I think we will probably try for under 18 months. If we get it working, it may not do everything we want, but we would like to get it on the air in that time. It is kind of a unique computer, do you know anything about it?

Ahl: Let's pretend that I don't.

Nordin: The Cyber, in addition to its reputation as being just a big, fast number

One bay of back plane wiring for the Cyber 70. On-line memory is 131K 60-bit words.

Operator console of Cyber 70. Routines have been developed by MECC to transfer data to and from the Cyber 70 to Apple systems (left foreground).

cruncher, also has perhaps the worlds first microcomputer.

Ahl: What do you mean by that?

Nordin: Well, the Cyber CPU can't do any I/O, it has no access to I/O. All it can do is compute and so the machine has separate little computers that do all the I/O. Our particular machine has 17 of them, they come in sets of 10. Here's one chassis with 10 peripheral processing units in it and each one of these little blocks has a core storage module, real 'core' storage, and each module holds 4096 twelve bit words. That is in fact the amount of memory a single peripheral processor has. Back in 1964, it was not feasible to produce 10 of these or 17 of these with separate processors, obviously it was just too expensive. Seymour Craig, who designed this machine, built one processor and essentially it executes one cycle for each peripheral processor, one after another, in sequence.

The biggest problem is that this machine has no parity; there is no error checking anywhere.

The effect is of having 10 processors that are 1/10th the speed of the processor itself. Each processor has about 4K of memory. Think of an Apple with 4K in it! You are really strapped, we're strapped and we write software for this piece. The only thing that makes them usable at all is the fact that they are connected to a Cyber which has lots of memory and lots of I/O ability so you can overlay programs readily and get some help from the CP/U. It is the architecture of the system that makes it possible for us to do what we do. If it weren't for the architecture of the PP's and so forth, we would really be strapped.

We have five of these units. The word size of the CPU is 60 bits. If you open up the storage module it looks an awful lot like a PP chassis, because there are five storage modules across and so the same components are used. So the PP's also have the fast memory even though they really don't need it. One of the problems with a machine this powerful, especially back in 1964, was getting the heat out. This machine is built with just 3 transistors. You won't find a chip in here, they didn't exist. This braided thing here is carrying freon into the chassis. So they pump freon through here and carry all the heat out and then in the end of each

Rick Nordin, senior systems analyst, next to one of the PP (peripheral processor) bays of the Cyber 70. Rick describes each PP as a sort of 1964-vintage microcomputer.

of these there is a compresor that exchanges the heat with water, so there is cold water coming in and hot water goes out. We have a chiller/cooler that exchanges the heat out to a unit on the roof to get rid of it. It releases a lot of heat.

You can't really tell by looking at it because normally, if something is generating heat, you can put your hands over it and see how hot your hands get from the air coming off. This machine doesn't produce any heat of that nature, it's all hidden; but it produces a lot of heat. You can hear a refrigeration unit here in the ECS bay; it also is cooled with freon.

Just to refresh your memory, we talked a little bit about: PP's with their own memory, there are also CPU's. Both the PP's and the CPU's can access the central memory of the CPU. Our machine has 131,000 60 bit words. We also have an extended memory which can be accessed by the CPU. In our case, our extended memory is somewhat degenerate because it is the same size as our central memory, while theoretically it should be larger. This memory is unique. It is a monstrous single core plane. Although the access time is slower, on the order of several microseconds, it is capable of sustaining a transfer rate in terms of words per second equal to what the fast central memory in the CPU can take. The way this is done is to organize it into 480 eight-bit words, basically 8 sixty-bit words. The actual transfer rate is 1/8 of the speed but since they are getting 8 words at a shot, it can keep the CPU totally busy. That transfer rate is 10 million 60 bit words per second. Nice fast device.

Ahl: Particularly for 1964.

Nordin: Yes, that is why this machine does so well, even by today's standards, it is maybe the 10th fastest machine in the world. It's a little old, but its performance isn't bad.

Here we have disk controllers which are used to interface between PP channels and the disk drives. (We happen to have an empty bay here where you can get a better look at the cables stuffed in there.) They are all shielded coax because of the high speeds involved. Expensive cables too.

Ahl: What are the maintenance problems with this much hardware and this many discreet components?

Nordin: Surprisingly, the maintenance problems aren't too bad. The CPU is extremely reliable, considering the kind of parts that are in it. The biggest problem is that this machine has no parity; there is no error checking anywhere. Thus if you are going to find an error, you must write diagnostic programs that are going to detect the error, or alternatively, not only detect the error, but reproduce the error, make it happen. If the hardware just had error detecting circuitry you could have a much better handle on those things. The new Cybers have all that and that is probably the biggest single problem in this machine. That would be one of the best features of going to a new machine, along with lower light bills, etc.

Now here, this is just one of the storage modules I referred to. At first glance it looks like a PP chassis, but there are ten more down there. This has 16,000 sixty-bit words of storage right here. There are a few more in the machine to get us up to what we actually have. You can swing the bays open and nothing crashes. It's never crashed on a demo yet.

We've got various peripheral controllers here, card reader, line printer, etc. The unit there is called a DDP, which is very strange. It hangs on a channel like a peripheral, but it interfaces to the ECS controller which allows the PP's to access the ECS. The PP programs have so many overlays because of their memory constraints. They can load their overlays very rapidly from ECS rather than having to go out to disk for them. If we didn't have the ECS we couldn't run 100 users.

We have all of our disk drives. There are about 110 million characters per spindle—and we have 16 spindles. We have them all configured for different purposes. That one over there happens

Part of the communications front end for the Cyber. The system has 440 user ports.

Nordin, continued...

to have the system on it. These next four are used for roll in and roll out—for moving jobs out of the system's memory when they become idle etc. Then 8 other devices are used for permanent file storage and a couple of other miscellaneous devices. We spend a lot of time analyzing data to decide exactly what devices should be doing what functions. If we have certain devices getting too busy it is going to hold things back. You want to kind of spread the usage out as much as you can. Each disk can be accessed from two channels.

We have a total of 8 disk channels, 8 disk controllers, 16 drives. That gives us two drives per controller. But since each drive can be accessed from two controllers we can take four drives, connect them to two controllers and have each drive accessible from either controller. Now the software in the system has recently become smart enough to assign them. When someone out on a PP wants to get at a disk, it can assign the PP which ever channel is currently not busy, to complete its transfer. Our old operating system tried, but its algorithm on moderately loaded systems would not work well. When working fully loaded, systems become worst case. With the new operating system we installed CDC has corrected that problem and performance is significantly better for us.

The Cyber 70 console has a peripheral processor dedicated to refreshing the console showing active jobs, peripheral usages and response time.

Interview With Mark Rustad

Ahl: Is the MECC operating system more or less a standard CDC system?

Rustad: It is more standard than our frontal system was. We had several hundred thousand lines of changes in it. We tried to keep it as standard as possible because we will be going to new releases in CDC and we have to convert all that stuff. "We" isn't very many people. We do have some very significant changes in the system that improve performance enormously. Some of them are for validation, others for accounting, some are just plain features and conveniences. Our performance is less than it otherwise might be. If there is any reason for the quality of software that the Cyber has it is the console. The console is a refresh device. There is a dedicated PP that is constantly rewriting what is on the screen; as a result, in a system that is very busy and highly interactive like ours, where conditions change millisecond to millisecond, you can use the console to see what is going on. With something like a 9600 baud CRT, you just wouldn't make it.

We have produced a code in the program which allows a single copy of a program to interact simultaneously with several users. The program has to keep track of what each terminal that it is talking to is currently doing, e.g. at what point was that guy in the program the last time I was talking to him?, and be able to recover his state and at that point continue processing as he receives input from the various users. We have produced a modified version of the Basic compiler; we literally took the Oregon Source unmodified and compiled it with a different Basic compiler. Now it runs in multi-user environments and is pretty simple. The MCIS data base is in multi-user Basic, as is the system mail program, Oregon, and Dungeon (an Adventure-like program). Users can write multi tasks too. That was another thing that hurt us a lot. We would have things like inter-terminal games and talk programs running in the system and these things would come in and just pound on the permanent file system. We implemented multi in such a way that any user at any time he wants can write his own task and put it up and run it and other people can run it too. There are some problems because of our relationships with phone companies, FX lines etc. We can't really efficiently support a talk program. We could have written a very efficient talk program ourselves without the phone problems, but politically it was impossible. So what we did was depoliticize it a bit by making it possible for a user to write an efficient talk program and then it is the users problem, not ours—we just made the system efficient. This is one change that got us out of hot water.

Interview With Marge Kosel

Kosel: On the MECC time sharing system we have approximately 500-600 applications in the system library. Users contribute programs to a share library. We go through these programs one or two times a year to see which ones are run a lot and which ones need more documentation. Using either staff or field personnel, we clean them up and put them in the system library. At that point most of the programs do have documentation.

The main application that is more or less unique to the time share system is the occupational research service. We are now working on a data base which probably won't work on micros.

Ahl: Is that the MCIS?

Kosel: Yes, and we are working on a data base manager. So we are looking at moving the time-share system into applications that we can't do on micros. We went through the time-share system library to determine what could be converted easily to micros and we have done all of that conversion. Now we are undecided whether to take them off of time share.

Ahl: From a very broad aspect, what kind of subject areas are most likely to use the computer? I know you have applications in math, science and social studies, but which ones really use the system?

Kosel: Math definitely uses the system, more from a programming aspect. We have a lot of Agriculture groups, not so much in classroom use, but from the farmer.

Ahl: What do they do?

Kosel: They do applications in farm management, financial accounts for farms, predictions on what they should plant. They will tell you how much feed you need if you have a herd of pigs.

Ahl: Are these used in school for instruction of future farmers?

Kosel: Not only for instruction, but also on the farm for management.

Ahl: Do private individuals have access to the MECC time-sharing system?

Kosel: There are a few circumstances through the County Agents and State Agencies. There is a grant in Southeastern Minnesota where individual farmers have access to it. Some of the students access the system through their schools but their big use is actually the farm. There is not as much use in science as you would imagine. Social Studies probably gets more use than science. We have a lot of counsellors using the Guidance program.

Ahl: From a philosophical perspective why do some uses sort of pop to the top? I realize that you can easily do mathematical calculations on the computer, but you have just as many exciting simulation programs in science as in social studies. Is it that teachers aren't excited about it, is it that the books don't have a place for it in the curriculum or is it that the curriculum is too full of other things that enough time isn't allowed for use of the computer?

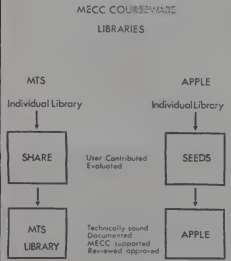
Kosel: I think it is that when we get a major application in a particular area, we see a real increase in usage. We see that happening in business right now, because we are getting some major applications for business education teachers and all of a sudden the use of small computers in business education has gone way up. In guidance and agriculture, for example, we have major applications versus something that would find use just one time in a classroom during a year. Teachers have a tendency to avoid single-use applications because there is a lot of extra work involved in learning to use them. If the computer can become an integral part of their classroom, then they will bring it in and take the time to make it part of their instruction.

Ahl: What types of things are they doing in Social Studies?

Kosel: Mostly simulations such as Oregon Trail and Civil War.

EXISTING MECC INSTRUCTIONAL COMPUTING PROGRAMS

Subject Area	Timeshare Programs	Apple Programs
Mathematics	40	18
Science	90	15
Language Arts	15	45
Social Science	45	25
Business	40	9
Fine Arts	8	20
Agriculture	24	5
Home Economics	9	-
Athletics	13	-
Guidance	2	-



MECC COURSEWARE COVERS MOST SUBJECT MATTER AND GRADE LEVELS

A lot of our development comes from the users.

DOCUMENTATION MODEL

Table of contents
Introduction & Acknowledgements
Index to programs on diskette
Documentation for each program
- Program name
- 3-4 Word description
- Topic
- Role of the computer
- Readability Level
- Description
- Objectives
- Background information
- Use in an instructional setting
- Correlated materials
- Sample runs

Appendices

Kosel, continued...

Ahl: Do programs get into the system library mainly when somebody develops a program and it goes through a process of refinement and documentation and testing to get the stamp of approval?
Kosel: Some of the development that we do is MECC directed. We will decide that development has to be done in a certain area and we will go and do that development. But a lot of our development comes from the users. Where they will come up with an idea, contribute that idea and we will take an refine that idea, have documentation for it, go through a fairly rigorous testing procedure for it and then move it over into the library. The same thing happens with the Apple programs. We do some of the development from scratch here and some of it comes from the user community. Then we have steps that we actually put it through in our testing procedure. Both the diskette and the documentation as well as a review process; subject to other state department people reviewing it before we release it.

Marge Kosel of the MECC courseware development group feels that documentation is the weakest part of most educational software.

Ahl: When I was in the marketing of computers back in the early 70's, I found that most timesharing systems had a great, huge library of programs. Documentation existed for one or two of them and generally the documentation was for a different version than the one that was currently on the system. How do you get the documentation? Let's face it, most programmers do not like to write documentation. Perhaps most don't speak English, their excitement and thrill comes from writing a new program and making changes to things that they have written.
Kosel: No documentation is done by educators.

Ahl: Is it done here?
Kosel: It all goes through here at some point in its life. A lot of the documentation does originate from here. We will say we've got a program and need to document it, then go out and find someone to do that documentation or we'll start it off and then get someone to review it. In the timeshare library, approx. 20-25% of the programs are documented. For the Apple every single one will be documented. We will not be putting out programs any longer that do not have documentation.
Ahl: In the near future?
Kosel: Everything out currently will have documentation by January 1,1981 and then we will not release anything that doesn't.
Ahl: That sounds pretty ambitious.
Kosel: The time schedules are up on the wall. We are about half way there right now. We won't be releasing any new disks without the documentation being done. That is a new policy. We used to release diskettes without the documentation to go along with them.
Ahl: How many people are in the Instructional Systems Development division?
Kosel: A total of four, right now. Myself, a secretary, one curriculum developer and an editor. All our programmers are part time university students, 5 of them. We also have word processing people part time, who are used to type the documents. One fifth of the time of each instructional employee is devoted to work on development. They contribute to the whole process, do a lot of reviewing, do a lot of the original writing, do a lot of contacts with schools for testing and will test the products. □

Programs that are potential library material are reviewed according to the following criteria.
1) Accuracy ... Is all spelling and grammar correct? Does each question provide for a correct and appropriate response?
2) Audience ... Is the intended audience (primary grades, elementary, junior high, senior high, vocational, higher education or adults) served by the degree of difficulty and scope of the program? Is the reading level of the text material suitable for the intended audience?
3) Clarity ... Are explanations and instructions sufficient, clear and straight forward? Is the presentation well formatted?
4) Documentation ... Does the program need documentation to be used effectively? If so, does the documentation exist and is it available to MECC users?
5) Function ... Is the program predominantly educational in nature?
6) Programming ... Does the program provide for user input? Does the input allow for abbreviated responses, like Y for YES and N for NO? Is the range of appropriate user responses made clear?
7) Randomness ... In a drill exercise are the questions randomly given?
8) Remarks ... Are there remark statements to identify the authors, files used by the program, other programs that are chained, and all appropriate background for future dissemination?
9) Source ... Was the program adapted from another existing program on a timeshare or microcomputer system? If so, by whom? Will MECC have the right to disseminate this program and make changes?
10) Graphics ... If the program is for the APPLE II, does it use graphics? If so, are the graphics appropriate and sufficient in quantity?

Interview With Allen Glenn

David Lubar

Creative Computing: Could you tell me about the work you are doing with video discs?
Allen Glenn: MECC has a division called Special Projects. This Special Projects has a grant from the Rockefeller family fund to use the microcomputer and what's called the "commercially used videodisc player" to develop materials for classroom use. There are other projects that are using the industrial disc model videodisc player, but one of the provisions of our grant was to use just the one you would go into the store and buy. This was to see what kinds of interactive materials could be developed or used with secondary school students. We are working in the area of economics. We chose that because in some schools that is one subject that has been cut. This is on the high school level. What the project is doing is not building a total curriculum, but rather a model package that shows one what is involved in the whole developmental process. People still have a very unrealistic assumption that with a couple of hundred dollars you should be able to write a course.

They need to see it, look at it, almost need to touch it. You can't let them touch it, but you can let them interact with it.

Creative: You're using the Apple?
Glenn: Yes, with 48K. We're using a

Glenn, continued...

monitor on the Apple and then another screen (TV) for the use of the disc; the assumption being that it is important for the student to look away from the monitor—to go from the monitor on the Apple, to the TV screen on the disc. To visually, physically move. Right now we are using a tape unit (Sony BetaMax) with an interface to the computer. It clicks on automatically, accesses what we need.

Creative: Are you using separate specialists—in other words, programmers and people in economics?

Glenn: Yes, what we have tried to do is put together a team of people and we have a programmer who is available to us, then work with my area (I am also a dean at the University of Minnesota in Education—Social Studies). Ken Kerber, the director of the project, is a computer expert. We are putting together teams of people who want to review the material as well as the whole developmental process.

Creative: How much would you say your efforts would be hurt if there was no video disc—no special technology except the computer?

Glenn: It could be done, but I think we are doing a better job with the video technology, with the tape, in being able to provide the motion pictures, being able to provide real photos—which you can't get with good graphics. There are a lot of good graphics around but this adds another dimension. We do a thing on natural resources for example where we show actual film footage and we have the student interact. To check his acquisition of the concept we use still frames so that they are not looking at a graphic of a tree or whatever but they can look at an actual photo frame.

Creative: Have the programs been field tested?

Glenn: We are going to start that this fall. We have a very small operation, in a few schools, to get student reaction. We have gotten critiques by teachers and by economists, but as far as running programs over an extended period, we are going to try to do so this fall.

Creative: What kind of acceptance do you feel you will receive in the schools? Do you think that will be an obstacle?

Glenn: It's always an obstacle, but I think in the area, for example, of economics, most social studies teachers are not trained in economics. Many of them are always looking for something to help them, support them. Economics is one of the areas in our developmental program. We are trying to make it as self-instructive as possible. In some school districts, particularly in the smaller school districts in Minnesota, that class has been dropped in favor of consumer economics etc. There are people asking for something for accelerated kids—something that kids who are really into economics could take and do.

Creative: Will you be moving into different subject areas or will that be left to others?

Glenn: We would like to do some more things, but that is dependent upon funding as to what can be done. Right now, the thrust of the project is to say "Let's see what we can do with the interaction of various components." We would hope that we could continue in the area of social studies in particular. It is an excellent area in which the video disc and the microcomputer can be used.

Creative: Did you design the controller card, or was that available?

Glenn: That was purchased. We did not design it.

Creative: You do most of your work in Basic?

Glenn: Yes, Applesoft.

Good software is expensive; pretty soon they will give you the machine and the equipment but will charge you an "arm and a leg" for the software.

Creative: What aspect of your work are you most excited about?

Glenn: Again, opening up ways of teaching kids. Because kids don't all learn alike.

Creative: In a sense, the program itself learns how to pace the student?

Glenn: Yes, and provides a way of instruction. For some kids, observing and looking at films and reflecting on that is a very effective way. Other kids have to be doers. For example, you take a video disc and you show it to a group of kids. A few kids in that class could learn effectively from just watching, but the majority of the kids would not learn effectively from just watching. They would have to be doing something, interacting. What we are combining is some of the good visuals—kids are always fascinated with the graphics on computers but they know they are not real pictures. The figures go across and that is good and impressive, but that is not as good as *the* picture of whatever the thing is. That is what the video disc is about. It gives a much clearer, better picture, which is necessary. A lot of kids are what I call "concrete learners." They need to see it, look at it, almost need to touch it. You can't let them touch it, but you can let them interact with it. You could go to a simulation, which, with branching techniques, allows kids to make decisions and then visually get more than just a printout. We have now gone another step from the graphic stage—we can show you pictorially what might happen.

Creative: Any thought given to using the computer as a control device to put special effects or controls in the actual video film?

Glenn: We are still in the beginning state—what we are trying to do is to provide something that would be affordable, useful, can be plugged in and wouldn't be so sophisticated and so technology oriented that the teacher is going to back off. The problem is not the kids and the computer, the problem is the teacher and the computer because the teacher still remembers black and white television.

Creative: There is a bill pending to establish national computer centers that will be giving out grants. One of their big areas will be curriculum development in schools?

Glenn: I think that the realization that has come is that good software is expensive; pretty soon they will give you the machine and the equipment but will charge you an "arm and a leg" for the software. Because the realization is that good educational software is hard to come by.

Creative: Do you see a lack of standardization as hurting the video disc?

Glenn: Yes, in some areas. Sony (I think) is coming out with a disc that will be able to be used on several players. Their disc will be able to be played on Pioneer, Sony, etc. The educator isn't concerned with competition in the market—all he wants is a videodisc player that will play any disc.

Creative: Anything else you'd like to mention?

Glenn: One of the keywords I don't hear much about is "interaction." If you speak with educators, you must talk about interaction—how does this fit in, etc.

Creative: Interaction being more than just having the computer say, "Answer yes or no"?

Glenn: By all means. It is interaction with text, with others, with video, with the computer, etc.

Creative: It would be comparable, perhaps, to an arcade game where you know the rules, you see the effects of your actions, and no one yawns?

Glenn: Yes, that is the same goal that teachers have—not to have anyone yawn. □

Microcomputers vs. Timesharing

Ken Brumbaugh

Many people ask if they should go with timeshare or with microcomputers. If you ask what they are doing—data analysis, drill or information retrieval—many of these terms are meaningless to most people. If someone does know those different strategies of use, which ones seem to relate better for time-

According to Ken Brumbaugh, the annual cost to maintain a heavily-used 2-year old microcomputer could be as high as 40% of the original equipment cost.

sharing or microcomputing? A better comparison might be what is important to the user—ease of use, responsiveness, a lot of student time, feedback, printed output, graphics, a lot of data, student recordkeeping, multiple languages, large amounts of text, sound. If these questions can be answered—perhaps either in using the time-share system or in using the microcomputer. There is a bit of the mental set that says—"Microcomputers are it." That is a concern, because I feel one should never be too quick to discard what got you to your present position. The time-share systems are the backbone of the instructional computing. In the Minnesota system most instructional computing people are familiar with the time-share system.

I feel we need to develop applications such as data-base management for time-share systems. In this state people are saying —— "cut down the telecommunications cost." My response to them is a simple one—3 or 4 years ago the cost of telecommunications was X—now it is sill X. In the mean time we have more than doubled the number of computing stations in the state. In one perspective that is reducing the telecommunications cost.

In some cases it doesn't matter if the microcomputer is cheaper—familiarity with the time-share system will outweigh some needs because it works for them. The cost and quickness is not always a good comparison factor. Telecommunications are a much higher cost factor. Maintenance and operational aspects are not really being looked at as they should. Right now, more than one-half of the Apples that MECC has purchased are in for repair. Educational computer users should start to ask "How long will these things last?" Some people simply assume they will last forever. The time-share system kind of just stays there—someone else takes care of it. You pay a fee and really don't have any problems. We have schools with forty or fifty micros—if five or six of these are in the repair shop that is a significant impact. If they have general access to time-share, their program isn't being impacted that much. Operation and maintenance is a regular budgeted and planned for factor in time-share service. I

I think that time-sharing and microcomputing go together very well.

MECC does most Apple repairs in-house.

don't think the people in the microcomputer business have really taken a look at this. When the computers go down, they don't have a back-up on the shelf, or they don't have extra parts or the training on how to fix it themselves or they have to put it on a greyhound bus and send it to the nearest repair center or UPS it some place. The cost of maintaining a standard microcomputer system for a machine that is two or three years old could be approaching 40% of the cost of the equipment. I am beginning to wonder what the next few years are going to tell us. I think that time-sharing and microcomputing go together very well. I don't believe we should throw out the time-share system. I think we ought to transfer some of the applications off the time-share system and encourage or require people to use them in microcomputer applications. But for the heart of certain instructional programs, I feel we need to have one as a back up for the other. □

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CIRCLE 163 ON READER SERVICE CARD

Software Close-up

Walter Koetke

The Minnesota Educational Computing Consortium (MECC) was formed to assist users and educational member Systems within Minnesota in the coordination and utilization of computing resources and to provide current computing methods and materials. During the early 70's MECC instructional activities were properly focused on time-sharing terminals. In the late 70's, MECC was one of the first educational organizations to take a major step toward microcomputer utilization. Those early steps coupled with wise management and a talented staff have resulted in a plethora of superior educational courseware for the Apple II microcomputer.

MECC's choice of the word "courseware" rather than "software" is most appropriate. All MECC programs for the Apple are accompanied by supporting materials for the teacher. These materials include background information, suggested program applications, worksheets, answer keys and sample runs. MECC support materials are quite simply the finest I have seen, and only a few commercial packages are even close. Not only is the quality impressive, but a single program disk is often accompanied by over sixty pages of support material.

Fortunately for all of us, the MECC courseware is now available to educational agencies throughout the country. There are twenty disks full of programs, each accompanied by appropriate courseware. The subject matter and level included can be briefly summarized as:

Elementary School	6 disks
Science	2 disks
Mathematics	2 disks
Social Studies	1 disk
Agriculture	1 disk
Industrial Arts/Drivers Ed.	1 disk
Special Needs	1 disk
Teacher Utilities	1 disk
Shape Tables	1 disk
Programmers Aid	1 disk
Demonstration	1 disk
Micas	1 disk

Let's take a look at the programs on the demonstration disk as these provide a nice cross section of the type of material available on other disks. Let's also begin this review with the conclusion. The MECC courseware is fantastic! All twenty disks belong in the library of every elementary and secondary school in the country that has access to an Apple microcomputer. I am not aware of any courseware that is so consistently well done.

The MECC Demonstration disk is accompanied by a thirty-two page support booklet. This booklet is thinner than most because of its special intent to merely sample other material. I find this courseware package an excellent base on which to build an inservice presentation demonstrating the instructional applications of a microcomputer that are available today. The booklet contains program descriptions (11 pages), sample lesson plans and worksheets (4 pages), transparency masters to assist classroom presentation (8 pages), appendices and miscellaneous (9 pages). The appendices include an introduction to the critical components and important keys of the Apple written for the novice. Included also is a step-by-step description of the procedure for using a disk with the Apple. This description will help the courageous beginner load and use a disk without any additional help.

All of the MECC disks are menu driven. Loading the disk and turning on the Apple produces a brief commercial followed by a menu of all the programs on the disk. The MECC Demonstration disk contains the eight programs:

1. Apple Features
2. Drill and Practice—Music
3. Drill and Practice—Industrial Arts
4. Tutorial—Mathematics
5. Simulation—Science
6. Material Generation—language Arts
7. Educational Game—Mathematics
8. Problem Solving—Mathematics

The Apple Features program itemizes the features of the Apple microcomputer and shows how these features might be used in instruction. The features illustrated and their educational applications are:

Speed and Accuracy

1) performs experiments where time is a factor
2) helps solve mathematical models or equations
3) allows for random events which provide variety and realism

Color

1) serves as non-verbal reinforcement
2)highlights selected aspects of cor. cept development
3) provides visual motivation

Graphics and Animation

1) creates motivation
2) simulates creativity
3) explains concepts in detail by adding visual images to the printed words

Sound

1) stimulates motivation
2) provides auditory reinforcement

Apple Features demonstrates each of these characteristics rather than merely listing them. For example, speed is illustrated by having the computer alphabetize thirty-three names, graphics is illustrated with a United States map, and sound is illustrated by playing a tune. Most notable is the illustration of animation. To demonstrate the use of the prefix "un", the word "load" is displayed above a full dump truck. As "load" changes to "unload", the truck dumps its load and moves across the screen.

Musical drill and practice provides users with the opportunity to practice both reading and listening to music. The program allows the user to select the maximum number of sharps and flats in the key signature and the largest interval in each five note phrase. The computer then creates, displays and plays a five note staff, with one note played incor-

Close-up, continued...

rectly which the user must identify. The user can hear the phrase as often as required before selecting the incorrect note. After the user's response is identified as right or wrong, the five notes actually played are displayed on a staff beneath the original staff. The user can then replay the correct and incorrect phrases. This program combines high resolution graphic, color, audio response and some well-implemented instructional techniques to provide an individual drill and practice that is unrealistic to obtain any way other than with an individual tutor.

A second drill and practice program, this one in the area of Industrial Arts, teaches the student how to use a micrometer. The program makes very nice use of high resolution graphics. There are seven optional frames of instruction that include animation and changing labels. As part of the instruction, the student is asked to read a micrometer in three steps. First the barrel reading is entered, then the sleeve reading, and then the actual measurement. If an incorrect answer is entered, the student is given a useful suggestion and another chance to respond. If the second response is also incorrect, the correct answer is given.

After the instructional section is completed, students are asked to use a simulated micrometer to measure an object. The animation here is excellent as the object appears, the micrometer opens, the object moves into the micrometer, and the micrometer closes on the object. The user is then given two opportunities to enter the correct measurement. After completing the requested number of problems, the results are displayed. The program reports the number of problems attempted, the number correct on the first response, and the number correct on the second response. Note that all items reported are positive, an example many other programs should follow.

A tutorial program for English measurement conversions is the fourth program on this disk. Certainly the same format could be adopted for the currently more popular metric conversions. Although the high resolution graphics of this program are excellent, it is one of the weakest examples in this package. My basic objection is not the programming which is well done, but rather the fact that the subject matter can be done equally well with worksheets and/or class instruction. In this particular program, the computer provides an alternate form of the same type of instruction rather than a form of instruction not otherwise available as it did in the other programs.

The fifth program is a science simulation called *Odell Lake*. *Odell* is an excellent example of how the computer can be used to provide a form of instruction that cannot be provided by any other means.

MECC Software now available from Creative Computing

Creative Computing is now an authorized distributor of M.E.C.C. courseware. The following three diskettes are currently available for the Apple. All require 32K Applesoft in ROM or Apple II Plus. with DOS 3.2.

To order, send payment plus $2.00 shipping and handling to Creative Computing Software 39 E. Hanover Ave. Morris Plains, NJ 07950.

MECC Software Demonstration

MECC-701 $19.95

A sampling of different applications in drill and practice, tutorial, simulation, problem solving and worksheet generation. Samples from music, science, social studies, industrial arts, reading and mathematics are included.

Elementary, Volume 1
Mathematics

MECC-702 $24.95

Programs for the elementary mathematics classroom. Includes games of logic such as Bagels, Taxman and Number; Drill and practice programs such as Speed Drill, Round and Change: and programs about the metric system such as Metric Estimate, Metric Length and Metric 21.

Elementary, Volume 4
Mathematics and Science

MECC-705 $24.95

Two mathematics programs. Estimate and Mathgame provide reinforcement on estimating and basic facts. Food chains in fish and animals can be studied through Odell Lake and Odell Woods. Solar Distance teaches the concepts of distances in space and Ursa is a tutorial on constellations.

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cluded with the MECC courseware package labeled *Science 3* and is worth a closer look. The twelve pages of documentation begins with topic key words (biology, ecology in this case), the reading level (5-6) and the grade level (4-10). The program is then described concisely, with six instructional objectives for its use clearly stated. Over three pages of background information are provided—the simulation does try to represent a real event. The model used in the simulation is then presented along with the very important delineation of assumptions on which the simulation is based. The teacher is offered suggestions for using the program ideas for follow-up, a work sheet with answer key, and several samples of program execution. Let me repeat myself—this is typical documentation for a single MECC program. MECC has done an extraordinary This simulation provides for role-playing of fish in a mountain lake and making decisions regarding their survival based on instinctive animal behaviors and both natural and chance events. To aid in understanding food chains through observing relationships in Lake Odell, the computer program provides role-playing of the following fish:

1. white fish
2. chub
3. blueback salmon
4. rainbow trout
5. mackinaw trout
6. dolly varden

While role-playing one of the above fish, large birds, mammals, other fish, plankton, and insects will be encountered. In an encounter a decision must be made to:

1. Attempt to escape to deeper water
2. Attempt to escape in the shallow water
3. Ignore the encounter
4. Attack and attempt to prey
5. Attempt to chase out of the territory

Using some very clever, effective animation the fish whose role is being played by the student swims about in Odell Lake. Also visible is whatever animal is currently being encountered. After the student enters his choice of behavior appropriate for the simulated encounter, the results of his decision are animated. Unsuccessful decisions result in being eaten or starving. There's even a chance of being caught by the ever present fisherman. This program should become a classic example of an appropriate application of the computer in support of the instructional process.

Although not in the documentation of the MECC Demonstration disk, the supporting documentation for *Odell Lake* is typical of that available for most MECC programs. The full documentation is in-job with this essential but often overlooked aspect of software production. If only the commerical publishers will follow their lead, schools will indeed make excellent use of microcomputers.

Word Find is the sixth program on the demonstration disk, and perhaps the weakest program in the collection. *Word Find* is offered as a time saver for the teacher. The teacher can enter a list of words, then make several different puzzles with those words. Puzzles such as this are popular with elementary school students, and they can be applied in many different subject areas. The program contains a rather nice option that allows the user to specify whether the puzzles should contain all words hori-

Computer Store of the Month

Byte Shop of Milwaukee

The widespread use of computers in today's society has caused computer stores to open in communities over the country. These computer stores are helping to make computers more accessible and understandable for everyone. This month, Creative Computing will spotlight Byte Shop of Milwaukee for their contributions to the computer industry.

The Byte Shop of Milwaukee, located in the Milwaukee suburb of Greenfield, was opened in February, 1981, by Curt and Kathy Preston. They sell and support the Apple, North Star, Commodore Business Machines, The APF Imagination, TRS-80 peripherals, and many other brands of microcomputer hardware. The store sells Creative Computing Magazine, Press, and Software, as well as running programming classes to help everyone make the most of their computers.

"We feel that local support is the primary benefit we can offer our customers. We try to make people feel at home with computers and spend a large amount of time demonstrating to individuals, schools, businesses, and special interest groups."

The Byte Shop is open from 1-8PM on Monday through Friday and 10-4 on Saturday. They are located at 6019 West Layton Avenue in Greenfield, Wisconsin. If you are in the Milwaukee area, stop in and see them.

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Close-up, continued...

zontally, all vertically, or some combination of horizontal, vertical and diagonal. The standard version of the program also includes a printer option. Because of the type of material generated, the program would have little value if a printer was not available. My objection to the program is that the puzzles it produces are rather dull. The several examples I tried all resulted in puzzles containing words that almost never intersected even though there were multiple opportunities for doing so. In this single case, I've seen much better examples in several magazines as well as from several software houses.

Would you believe the sample educational game is yet another version of *Hurkle*? Even more surprising is that fact that MECC's version is clever, is fun, and is better than most others you've seen. The program includes cute animation—you can actually see one of the little devils, and audio reinforcement of student responses. *Hurkle* is usually offered as a way to introduce students to a coordinate system. This version can be used rather nicely to teach students to locate points on a horizontal line, vertical line, 0 to 10 grid or -5 to 5 grid.

The final program on the MECC Demonstration disk will plot linear equations on the coordinate axes. This is done using high resolution graphics with a different color used to represent the graph of each equation requested. This is an impressive implementation of a standard program. I have no doubt that this would be an invaluable aid when graphing linear equations or solving sets of linear equations is introduced. Because students rather quickly adopt the attitude that they can write any program others can write, this program is an excellent goal for the novice programmer as writing it will reinforce several important mathematical concepts. The creative teacher can also use this program with such topics as slope, intercept, parallel lines, perpendicular lines, triangles, quadrilaterals and distance.

Do recall that the eight programs discussed in this review represent only one of MECC's twenty disks, each with supporting courseware. All twenty disks contain enough well done instructional material to keep you smiling and students learning for a long time. MECC has more than one pricing structure—all quite reasonable. Specific information can be obtained by writing: MECC, 2520 Broadway Drive, St. Paul, MN 55113, and asking for the "MECC Publications and Programs Price List."

MECC software is also available commercially through Creative Computing software (se box on page 136). They also have a catalog which may be obtained by writing Creative Computing, 39 E. Hanover Ave., Morris Plains, NJ 07950. □

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MANUAL AND DEMO DISK: Instruction Manual and demo disk illustrating capabilities of both programs $95

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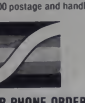
FREE CATALOG-All programs are supplied on disk and run on Apple II w/Disk & Applesoft ROM Card & TRS-80 Level II and require 32K RAM unless otherwise noted. Detailed instructions included. Orders shipped within 5 days. Card users include card number. Add $1.50 postage and handling with each order. California residents add 6½% sales tax. Foreign orders add $5.00 postage and handling



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Suggested Reading Material

Microcomputers and Education

Dr. Antonio M Lopez, Jr.

The editors of Creative Computing *receive frequent requests from readers asking for guidance in locating information on various topics related to personal computing. The following is a list of sources for those interested in computers in education. — EBS*

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MAGAZINES/NEWSLETTERS:
    APPLE EDUCATION NEWS, P.O.BOX 20485, SAN JOSE, CA 95160.
    APPLE EDUCATOR'S NEWSLETTER, 9525 LUCERNE, VENTURA, CA
      93003.
    BYTE, 70 MAIN STREET, PETERBOROUGH, NH 03458.
    COMPUTER - USING EDUCATORS, MOUNTAIN VIEW HIGH SCHOOL,
      MOUNTAIN VIEW, CA 94041.
    CREATIVE COMPUTING, P.O.BOX 789-M, MORRISTOWN, NJ 07960
    80-MICROCOMPUTING, PINE STREET, PETERBOROUGH, NH 03458
    KILOBAUD MICRCOMPUTING, PINE STREET, PETERBOUROUGH, NH
      03458.
    NIBBLE MAGAZINE, P.O.BOX 325, LINCOLN, MA 01773.
    RECREATIONAL COMPUTING, 1263 EL CAMINO REAL, BOX E, MENLO
      PARK, CA 94025.
    TEACHING COMPUTER PROGRAMMING, 1112 GLACIAL DR, MINOT, ND
      58701.
    THE COMPUTING TEACHER, C/O COMPUTER CENTER, EASTERN OREGON
      STATE COLLEGE, LA GRANDE, OR.

SOURCES OF INFORMATION:
     CONDUIT, P.O.BOX 388, IOWA CITY, IA 52244.
            NEW CURRICULUM MATERIALS FOR MICROCOMPUTERS ARE
            AVAILABLE FROM THIS NATIONAL SCIENCE FOUNDATION
            FUNDED ORGANIZATION THAT REVIEWS, TESTS, AND
            DISTRIBUTES COMPUTER-BASED INSTRUCTIONAL
            MATERIALS.
    DATAPRO RESEARCH CORP, 1805 UNDERWOOD BLVD, DEBRAN, NJ
            08075.
            DATAPRO OFFERS A DIRECTORY OF MICROCOMPUTER
            VENDORS THAT INCLUDES 497 SOFTWARE VENDORS AND 448
            PERIPHERAL VENDORS.
    DRESDEN ASSOCIATES, P.O.BOX 246, DRESDEN, ME 04342.
            SCHOOL-MICRO-WARE IS A DIRECTORY OF INSTRUCTIONAL
            MICROCOMPUTER SOFTWARE FOR PRE-COLLEGE EDUCATORS.
    MINNESOTA EDUCATIONAL COMPUTING CONSORTIUM, 2520
            BROADWAY DR, ST. PAUL, MN 55113.
    NATIONAL COORDINATING CENTER FOR CURRICULUM DEVELOPMENT
            STATE UNIVERSITY AT STONY BROOK, STONY BROOK, NY
            11794.
    EASTERN KENTUCKY UNIVERSITY, PROFESSOR JOHN WERNEGREEN,
            DEPARTMENT OF NATURAL SCIENCES, 200 MEMORIAL
            SCIENCE, RICHMOND, KY 40475.
            CATALOG OF APPLE SOFTWARE FOR EDUCATORS.
    INDEPENDENCE HIGH SCHOOL, MR W. DON MCKELL, 1776
            EDUCATIONAL PARK DR, SAN JOSE, CA 95133.
            CLASSROOM APPLICATIONS OF MICROCOMPUTERS IN GRADES
            K-12.
    PERIODICAL GUIDE FOR COMPUTERISTS, E. BERG PUBLICATIONS,
            622 EAST 3RD, KIMBAL, NE 69145.
            AN INDEX TO MAGAZINE ARTICLES ON A WIDE VARIETY OF
            MICROCOMPUTING SUBJECTS.
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Dr. Antonio M. Lopez, Jr., Department of Mathematical Sciences, Loyola University, New Orleans, LA 70118.

UNIVERSITY EOUCATORS INVOLVEO IN MICROCOMPUTING..............

BILLINGS, KAREN; COLUMBIA TEACHERS COLLEGE, NEW YORK CITY, NY.

BORK, ALFRED; UNIVERSITY OF CALIFORINIA, IRVINE, CA.

BOWLES, KENNEITH; UNIVERSITY OF CALIFORNIA, SAN OIEGO, CA.

BRAUN, LUOWIG; STATE UNIVERSITY OF NEW YORK, STONY BROOK, NY.

CRITCHFIELO, MARGOT; UNIVERSITY OF PENNSYLVANIA, PITTSBURGH, PA.

OWYER, TOM; UNIVERSITY OF PENNSYLVANIA, PITTSBURGH, PA.

EOWAROS, JUOY; NORTHWEST REGIONAL EOUCATIONAL LABORATORY, PORTLANO, OR.

KHERIATY, LARRY; WESTERN WASHINGTON UNIVERSITY, BELLINGHAM, WA.

LOPEZ, ANTONIO; LOYOLA UNIVERSITY, NEW ORLEANS, LA.

LUEHRMANN, ARTHUR; UNIVERSITY OF CALIFORNIA, BERKELEY, CA.

MOURSUNO, OAVIO; UNIVERSITY OF OREGON, EUGENE, OR.

PAPERT, SEYMOUR; MASSACHUSETTES INSTITUTES OF TECHNOLOGY.

TAYLOR, ROBERT; TEACHERS COLLEGE, COLUMBIA UNIVERSITY, NEW YORK CITY, NY.

ZINN, KARL; UNIVERSITY OF MICHIGAN, ANN ARBOR, MI.

OTHERS INVOLVEO IN MICROCOMPUTER EOUCATION.............

ALBRECHT, BOB; PEOPLE'S COMPUTER COMPANY, MENLO PARK, CA.

BUCHLA, OAVIO; PROGRAM EFFECTIVENESS THROUGH SERVICE, MARYVILLE HIGH SCHOOL, MARYVILLE, CA 95901.

CHARP, SYLVIA; PHILAOELPHIA PUBLIC SCHOOLS, PHILAOELPHIA, PA.

COOK, JOHN; CAI CONSULTANT, AREA EOUCATION AGENCY SIX, 9 WESTWOOO ORIVE, MARSHALLTOWN, IOWA 50158.

HAKANSSON, JOYCE; CHILORENS TELEVISION WORKSHOP, NEW YORK CITY, NY.

SOME EOUCATIONAL SOFTWARE IS AVAILABLE FROM................

ACORN SOFTWARE PRODUCTS, INC., 634 NORTH CAROLINA AVE S.E., WASHINGTON, OC.

APPLE-CATIONS, 21650 W. ELEVEN MILE RO., SOUTHFIELO, MI 48076.

APPLE FOR THE TEACHER, 5848 RIOOIO ST., CITRUS HEIGHTS, CA 95610.

BLS, INC. 2501 SILVERSIOE ROAO, SUITE ONE, WILMINGTON, OL 19810. (BELL & HOWELL)

COMPUTER SYSTEMS OESIGN GROUP, 3632 GOVERNOR OR., SAN OIEGO, CA 92122.

CREATIVE COMPUTING, BOX 789-M, MORRISTOWN, NJ 07960.

EOUCATIONAL ACTIVITIES, INC., P.O.BOX 392, FREEPORT NY 11520.

EOUCATIONAL SOTWARE, 801 E 6TH AVE., HELENA, MT 59601.

HAYOEN BOOK CO., 50 ESSEX ST., ROCHELLE PARK, NJ 07662.

HIGH TECHNOLOGY, INC., SOFTWARE OEPT., P.O.BOX 14665, OKLAHOMA CITY, OK 73113. (APPLE)

INSTANT SOFTWARE, INC., PETERBOROUGH, NH 03458.

MATH SOFTWARE, 1233 BLACKTHRON PL, OEERFIELO, IL 60015

MICRO EO, INC., BOX 24156 MINNEAPOLIS, MN 55424. (PET)

MICRO LEARNINGWARE, BOX 2134, MANKATO, MN 56001.

MICROCOMPUTER SOFTWARE SYSTEMS, INC., 4716 LAKEWOOD OR., METAIRIE, LA 70002. (TRS-80)

MICROGNOME, 5843 MONTGOMERY RO, ELKRIDGE, MO 21227.

MICROSOFT CONSUMER PROOUCTS, 10800 NE 8TH, SUITE 507, BELLEVUE, WA 98004.

MILLEKEN PUBLISHING CO., ST. LOUIS, MO

MUSE SOFTWARE, 330 N. CHARLES ST., BALTIMORE, MO 21201

NITS SOFTWARE, 680 NORTH ARROWHEAO AVE, RIALTO, CA 92376

PROGRAM OESIGN, INC., 11 IOAR COURT, GREENWICH, CT 06830

PROGRAMMA INTERNATIONAL, INC., 3400 WILSHIRE BLVD, LOS ANGELES, CA 90010.

PROGRAM STORE, 4200 WISCONSIN AVE N.W., WASHINGTON, OC 20016.

QUEUE, 5 CHAPEL HILL OR., FAIRFIELO CT 06432.

RAOIO SHACK SOURCEBOOK (ALL STORES -- TRS-80).

ROANOKE EXCHANGE TRS-80 INSTRUCTIONAL PROGRAMS, C/O CRAIG COUNTY PUBLIC SCHOOLS, P.O.BOX 245, NEW CASTLE, VA 24127.

SRA, 155 NORTH WACKER OR, CHICAGO, IL 60606. (APPLE ANO ATARI)

STERLING SWIFT PUBLISHING CO., P.O.BOX 188, MANCHACA, TX 78652. (TRS-80 ANO APPLE)

SOFTWARE EXCHANGE, 6 SOUTH STREET, MILFORD, NH 03055.
THESIS; P.O.BOX 147, GAROEN CITY, MI 48141. (ATARI)
TYCOM ASSOCIATES, 68 VELMA AVE, PITTSFIELD, MA 01201.
WEINTRAUB SOFTWARE, 690 MOUNTAIN VIEW ROAD, EL CAJON, CA 92021.

ARTICLES ON THE USE OF MICROCOMPUTERS IN EDUCATION:
****

ALLEE, J AND WILLIAMS R;"LANGUAGE ARTS CAI DEVELOPMENT", CREATIVE COMPUTING (SEP 1980).
BARBARELLO, J;"MATH FLASH", 80-MICROCOMPUTING (SEP 1980).
BARNETT, B;"GRADING MADE EASY", CREATIVE COMPUTING (SEP 1980).
BARSTOW, D;"COMPUTERS AND EDUCATION: SOME QUESTIONS OF VALUE" CREATIVE COMPUTING (FEB 1979).
BEJAR, I;"MILLIKEN MATH SEQUENCES", CREATIVE COMPUTING (SEP 1980).
BELL, F;"CAN COMPUTERS REALLY IMPROVE SCHOOL MATHEMATICS?", THE MATHEMATICS TEACHER (MAY 1978).
BELL, F;"CLASSROOM COMPUTERS: BEYOND THE 3R'S", CREATIVE COMPUTING (SEP 1979).
BERENSON, H;"THE WORD BOARD",CREATIVE COMPUTING (APR 1980).
BILLINGS, K;"MICROCOMPUTERS IN EDUCATION: NOW AND IN THE FUTURE", KILOBAUD MICROCOMPUTING (JUN 1980).
BLANK, G;"OUTPOST: ATARI EDUCATIONAL SOFTWARE", CREATIVE COMPUTING (SEP 1980).
BRAUN, L;"COMPUTERS IN LEARNING ENVIRONMENTS: AN IMPERATIVE FOR THE 1980'S", BYTE (JUL 1980).
BRISSON, D;"MAKING THE GRADE AT KEENE HIGH SCHOOL", KILOBAUD MICROCOMPUTING (JUN 1980).
BUSZTA, R;"AN APPLE A DAY KEEPS A KIO OCCUPIED", KILOBAUD MICROCOMPUTING (MAR 1980).
CARLSON, R;"READING LEVEL DIFFICULTY", CREATIVE COMPUTING (APR 1980).
CARR, E;"COMPUTER SURVIVAL COURSE FOR KIDS", KILOBAUD MICROCOMPUTING (JUN 1980).
CECIL, D;"DIVINE PROPORTIONS", 80-MICROCOMPUTING (SEP 1980).
CHAMBERS, J AND SPRECHER J;"COMPUTER ASSISTED INSTRUCTION: CURRENT TRENDS AND CRITICAL ISSUES", ACM COMM (JUN 1980).
CHARTIER, J AND GOLDNER C;"COMPUTER EDUCATION: MOST POPULAR 8TH GRADE CLASS IN FLORIDA", 80-MICROCOMPUTING, (JUL 1980).
CLARK, D; COLETTE, T; AND TUMA, D;"COMPUTER AIDED SIGHT READING: A NEW APPROACH TO TEACHING MUSIC", CREATIVE COMPUTING (JUN 1980).
COOK, W;"MATH TEACHER",KILOBAUD MICROCOMPUTING (JUN 1980).
D'IGNAZIO, S;"THE WORLD INSIDE THE COMPUTER", CREATIVE COMPUTING (SEP 1980).
DERFLER, F;"ALL OF THE ABOVE OR NONE OF THE ABOVE?: A CAI PRIMER", KILOBAUD MICROCOMPUTING (MAY 1980).
DWYER, T;"BOOKS AS AN ANTIDOTE TO THE CAI BLUES", BYTE (JUL 1980).
DWYER, T AND CRITCHFIELD, M;"SOLO COMPUTING IN THE HOME: SHORT COURSES FOR PARENTS AND THEIR CHILDREN", CREATIVE COMPUTING (SEP 1979).
FRENZEL, L;"THE PERSONAL COMPUTER -- LAST CHANCE FOR CAI", BYTE (JUL 1980).
FRIEL, S AND ROBERTS, N;"COMPUTER LITERACY BIBLIOGRAPHY", CREATIVE COMPUTING (SEP 1980).
GERALD, C;"GRAPHING WITH THE TRS-80", KILOBAUD MICROCOMPUTING (MAY 1979).
GOODMAN, D AND SCHWAB S;"COMPUTERIZED TESTING FOR READABILITY", CREATIVE COMPUTING (APR 1980).
HAKANSSON, J AND ROACH, L;"A DOZEN APPLES FOR THE CLASSROOM", CREATIVE COMPUTING (SEP 1979).
HALLGREN, R;"A MULTIPLE-MACHINE LOADER FOR CLASSROOM COMPUTERS", BYTE (OCT 1980).
HANSEN, C;"COMPUTER COUNTDOWN", CREATIVE COMPUTING (SEP 1980).
HASTINGS, D;"PRE-SCHOOL MATH", 80-MICROCOMPUTING (APR 1980).
HAUSMANN, K;"STATEWIDE EDUCATIONAL COMPUTER SYSTEMS: THE MANY CONSIDERATIONS", CREATIVE COMPUTING (SEP 1979).
HEUER, R;"READING COMPREHENSION FOR THE SOL-20", CREATIVE COMPUTING (APR 1980).
HINES, T;"QUIZ WHIZ", KILOBAUD MICROCOMPUTING (APR 1980).
HUBIN, W;"THE MICROCOMPUTER IN THE UNDERGRADUATE SCIENCE CURRICULUM", BYTE (JUL 1980).
JOFFE, A;"EQUATIONS", 80-MICROCOMPUTING (MAR 1980).

JOHNSON, B;"TAKE A COMPUTER TO SCHOOL", KILOBAUD MICROCOMPUTING (JUN 1980).
JOHNSON, O; ANDERSON, R; HANSEN, T; AND KLASSEN, O; "COMPUTER LITERACY -- WHAT IS IT?", MATHEMATICS TEACHER (FEB 1980).
KEEN, O AND DISCHART, O;"KIOSTUFF", 80-MICROCOMPUTING (SEP 1980).
KENDALL, W;"YOU CAN'T HURT IT BY PRESSING THE KEYS", KILOBAUD MICROCOMPUTING (MAY 1980).
KOETHE, W;"COMPUTER BLACKBOARD", KILOBAUD MICROCOMPUTING (SEP 1980).
LARSEN, S;"KIOS AND COMPUTERS: THE FUTURE TODAY", CREATIVE COMPUTING (SEP 1979).
LEVENTHAL, L;"COMPUTERS IN THE CLASSROOM: TEACHING THE TEACHERS",KILOBAUD MICROCOMPUTING (JUN 1978).
LICHTMAN, O;"SURVEY OF EDUCATOR'S ATTITUDES TOWARD COMPUTERS", CREATIVE COMPUTING (JAN 1979).
LOPEZ, A;"NIGHT SCHOOL: A CONTINUING EDUCATION PROGRAM WITH THE TRS-80", 80-MICROCOMPUTING (JAN 1980).
LOPEZ, A;"MORE NIGHT SCHOOL: ADVANCED CONTINUING EDUCATION PROGRAM WITH THE TRS-80", 80-MICROCOMPUTING (APR 1980).
LOPEZ, A;"MICROCOMPUTERS IN EDUCATION", ACM SIGCSE BULLETIN (JUL 1980).
LUBAR, O;"EDUCATIONAL SOFTWARE", CREATIVE COMPUTING (SEP 1980).
LUEHRMANN, A;"COMPUTER ILLITERACY -- A NATIONAL CRISIS AND A SOLUTION FOR IT", BYTE (JUL 1980).
MARTELLARO, H;"WHY DON'T THEY AOOPT US? (CLASSROOM COMPUTERS AND INNOVATION THEORY", CREATIVE COMPUTING (SEP 1980).
MCCABE, J;"A SCHOOL COMPUTER, YOURS FOR THE ASKING", CREATIVE COMPUTING (SEP 1980).
MCCLUNG, J;"MUSIC NOTE RECOGNITION", 80-MICROCOMPUTING (SEP 1980).
MCLEAN, R; LOPEZ, A; SCHMIT, J; AND GRIFFIN, O;"MASTER BASIC COMMAND LIST", RECREATIONAL COMPUTING (SEP-OCT 1979).
MOLNAR, A;"THE NEXT GREAT CRISES IN AMERICAN EDUCATION: COMPUTER LITERACY", THE JOURNAL (JUL-AUG 1978).
MOODY, O;"SPELLING BEE", KILOBAUD MICROCOMPUTING (DEC 1978).
NOODINGS, N;"WORD PROBLEMS MADE PAINLESS", CREATIVE COMPUTING (SEP 1980).
O'NEIL, O;"PHYSICS TEACHER", KILOBAUD MICROCOMPUTING (JUN 1980).
PAPERT, S;"NEW CULTURES FROM NEW TECHNOLOGIES", BYTE (SEP 1980).
PIELE, D;"MICROS GOTO SCHOOL", CREATIVE COMPUTING (SEP 1979).
POTTS, M;"SMART PROGRAMS, OUMB PROGRAMS", CREATIVE COMPUTING (SEP 1980).
PRICE, C;"MICROCOMPUTERS IN THE CLASSROOM", THE MATHEMATICS TEACHER (MAY 1978).
RICHMAN, E;"HAVE COMPUTER WILL TRAVEL", CREATIVE COMPUTING (SEP 1979).
RINE, O;"PERSONAL COMPUTING: AN ADVENTURE OF THE MIND" ACM SIGCSE BULLETIN (FEB 1980).
RODGERS, J;"THE FIRST R",CREATIVE COMPUTING (APR 1980).
ROPES, G;"BRINGING MICROCOMPUTER INTO SCHOOLS"; KILOBAUD MICROCOMPUTING, (JUN 1980).
SAUNDERS, J;"WHAT ARE THE REAL PROBLEMS INVOLVED IN GETTING COMPUTERS INTO THE HIGH SCHOOL?", THE MATHEMATICS TEACHER, (MAY 1978).
SCHWARTZ, M;"INTEGRATING CAI AND VIDEOTAPE", CREATIVE COMPUTING (SEP 1980).
SIPSER, K AND SIPSER M;"COMPLEXITY THEORY AND ELEMENTARY MATHEMATICS", CREATIVE COMPUTING (APR 1980).
SONTSEFF, N;"AN ADULT EDUCATION COURSE IN PERSONAL COMPUTING", ACM SIGCSE BULLETIN (FEB 1980).
SPERO, S;"THE TRS-80 AS A CLASSROOM TEACHING TOOL", CREATIVE COMPUTING (SEP 1979).
STARK, P;"COMPUTER EDUCATION AND VOCATIONS", KILOBAUD MICROCOMPUTING (JUN 1980).
STONE, O;"COMPUTERS AT AN ALTERNATIVE SCHOOL", CREATIVE COMPUTING (SEP 1980).
STOUTEMEYER, D;"SYMBOLIC MATH USING BASIC", BYTE (OCT 1980).
TAYLOR, R;"KINDERGARTEN COMPUTING",CREATIVE COMPUTING (SEP 1979).
WALSTROM, J AND RINE, O;"THE ROLE OF PERSONAL COMPUTING", ACM SIGCSE BULLETIN (FEB 1980).
WILLIAMS, R;"SENTENCE CONSTRUCTION WITH A COMPUTER", CREATIVE COMPUTING (APR 1980).
YASAKI, E;"KIOS LOVE THE OP SCENE", DATAMATION (JUN 80).

Simulation of Competitive Business

Just as the computer can create a mythical land of caves, perils and treasure, it can create a mythical land of businesses, products and competition.

Stephen E. Auyer

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A problem in teaching an 8th grade course in Consumer Economics is that very few of the students have any exposure to American business. Thus, many common concepts of business are unfamiliar to the students, and more difficult concepts such as interaction of advertising, sales and profits are even more difficult to get across. Of course the students can be organized into "companies" and play bargaining games with candy bars, but the real world doesn't work this way. Then too, concepts learned this way are often forgotten as soon as the "product" is consumed. The solution? A computer simulation of a competitive business world.

This program simulates a marketplace where several companies compete. The examples use six companies but this figure is not critical. For a class of thirty students, this produced groupings of five students per company. The "presidency" of each company rotated through the students. Thus each student got to manage his company once every five weeks. A group leader is needed, for the discussions between the students as to how to manage the company can get pretty heated. Then too, the attention span of 8th graders is limited and letting the simulation run for five periods seemed to work out well. Long enough to get the concepts across, short enough to keep attention.

The choice of what "product" the firms should manufacture isn't critical—the program can be easily modified to fit a wide range of products. This particular class was car crazy—so cars were logical choice. Each week then, the students in each firm have to make the following decisions:

1) What price to charge for their car.

2) How much to spend advertising their car.

3) How much to spend developing design improvement and new models.

The students also get to choose the name of their company and car. What actually happened was that the president-of-the-week renamed his company after himself each week.

Along with the student's decisions, the instructor decides:

1) The total number of cars sold that week.

2) The cost to manufacture each car (variable cost).

3) Each firm's fixed costs for plant, equipment, utilities, etc.

All these inputs are used by the program to calculate how the imaginary "public" will respond to, and buy the

GAME RESULTS FOR WEEK 4

TOTAL SALES WERE 9,997 CARS
FIXED COSTS WERE $4,000,000
VARIABLE COSTS WERE $3,500 PER CAR

COMPANY	DAVID	CARRIE	LORI	TODD	ERICA	GAIL
CAR NAME	TRANS-AM	FOX-FIRE	USA#1	M-MOBILE	TR7	TRANS-AM
CAR PRICE	11000	10000	10000	9500	10000	8500
ADVERTISING	3100000	3200000	3300500	3500000	3100000	300000
IMPROVEMENTS	3000000	3300000	3500000	3000000	3100000	300000
OLD MARKET SHARE	14	18	24	23	15	5
NEW MARKET SHARE	14	19	26	24	15	3
SALES	1384	1870	2554	2446	1486	257
THIS WEEK'S PROFIT	140000	827500	2900250	2088000	-541000	-3315000
TOTAL PROFIT	2933250	3954500	9160250	5602750	-88000	-3795750

Figure 1

products of, each firm. After each firm's sales are known, operating expenses and profits are calculated and a summary sheet showing each firm's relative performance is printed out (Figure 1). This sheet shows the students how their decisions compared to those of the other students. It also shows them how their share of the market increased, or decreased, and summarizes their firm's sales, profit and total profit to date.

In addition to the summary sheet, the program prints out a financial statement for each company. (Figure 2 shows the statement for company number 2 at the end of the forth week of simulation). The financial statement simply presents the details of the profit calculation. But the real reason for the financial statement is to give the students exposure to income, expenses and taxes and how all these factors affect profit. Most of the students ignored the financial statement at first, concentrating only on the bottom-line profit. But the first week that their firm loses money, watch them dig in to find out why—

So, how well did the students do in managing their firms? At the end of the fourth week of the simulation, one firm was far ahead of the others in total profits, and two had gone bankrupt. Figure 3

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```
      COMPANY NUMBER = 2
      COMPANY NAME   = CARRIE
      CAR NAME       = FOX-FIRE

      SELLING PRICE..................... $10,000.00
      ADVERTISING.....................  $3,200,000.00
      IMPROVEMENTS.....................  $3,300,000.00
      OLD MARKET SHARE.....................      18  PERCENT
      NEW MARKET SHARE.....................      19  PERCENT
      SALES................................    1870  CARS
-------------------------------------------------------------------

 YOUR COMPANY'S BALANCE SHEET FOR WEEK 4

      INCOME
      ------

           FROM SALE OF CARS.............................. $18,700,000.00

      EXPENSES
      --------

           COST OF CARS SOLD.....  $6,545,000.00
           ADVERTISING...........  $3,200,000.00
           IMPROVEMENTS..........  $3,300,000.00
           FIXED COSTS...........  $4,000,000.00
           TOTAL.......................................  $17,045,000.00

      PROFIT BEFORE TAXES.....................................  $1,655,000.00

      INCOME TAXES............................................    $827,500.00

      THIS WEEK'S PROFITS.....................................    $827,500.00

 YOUR TOTAL PROFITS SO FAR ARE     $3,854,500.00

 YOUR TOTAL SALES SO FAR ARE      $68,755,000.00

 YOUR PROFIT MARGIN IS    5.61 PERCENT
-------------------------------------------------------------------
```

Figure 2

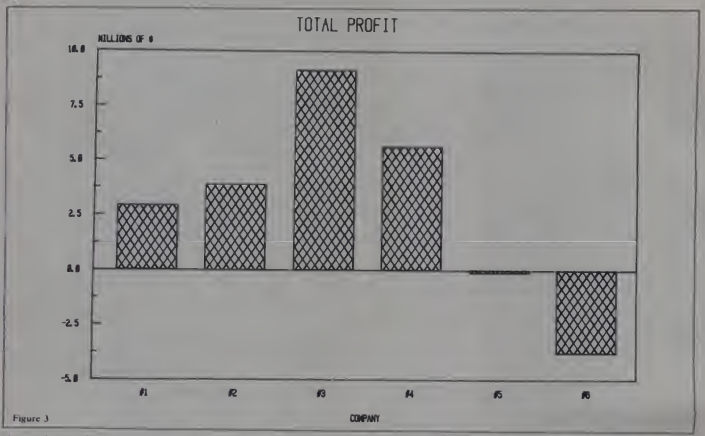

Figure 3

shows the profit picture for the firms. What happened was that firms 5 and 6 had made a number of unwise decisions for price, advertising and improvements. These mistakes caused their market share to erode rapidly. And in the end, their sales were so low that the sales revenue was too low to cover their fixed costs. Figure 4 illustrates the erosion of market share for these two firms. One of the features of the program is that it uses a data file to "remember" each firm's previous performance and makes the new market share a function of the old market share. Thus a firm cannot immediately spring back from a mistake. It may take them several weeks of no further mistakes to regain their market position.

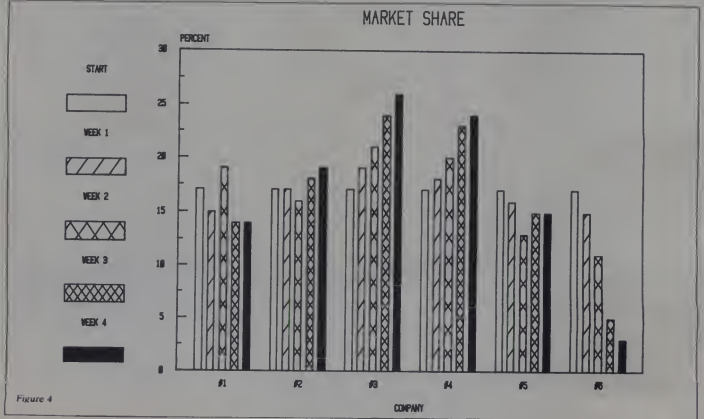

Figure 4

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Business, continued. . .

There are actually two programs involved in the simulation. The first one is run only once and serves to set up and initialize the data file used by the simulation program. Figure 5 shows the listing of the initialization program and the dialogue you go through to define the competitive market. Basically all that this program does is to open the data file, set up the names of the firms and their products, set initial total sales and profits to zero, and make an initial allocation of market share. To be fair, each of the six firms were started with 17% of the market. But if you wish you can start a particular firm out at a disadvantage by giving it a relatively small initial share of the market.

After the data file has been created, you need only collect the student's decisions before running the simulation. In class, each group of students was given a form to fill in indicating their firm's decisions. The group would then break off and hold a meeting where the president for the week would solicit comments (or, in case of some students, give orders) and make decisions for the firm. My particular system was not portable so the student's decisions were fed into the simulation program and run during the evening. Since class met once a week, this left ample time for running multiple copies and making any desired summary charts. Then, in class the next week, the results from the previous week's decisions were passed out and new forms distributed for a new set of decisions.

When the simulation program is run, it issues a series of requests for the data from the students and for the instructor's inputs. A sample dialogue is shown in Figure 6. The last three lines: sales, fixed costs and variable costs are the instructor's decisions and can be varied to illustrate various points. After the inputs are complete, the program pauses for form positioning and then prints out the summary sheet, followed by balance sheets for each firm. Note that after the simulation program has run, the data file will have been updated to reflect new market shares, total sales and profits. As a word to the wise; it's worthwhile to maintain two copies of the data file so that if wrong data is inadvertently fed into the simula-

```
LIST
1000 REM - PROGRAM TO INITIALIZE DATA FILE USED BY 'MKTSIM' PROGRAM.
1010 REM
1020 REM - WRITTEN IN MICROSOFT BASIC FOR THE HEATH H8 COMPUTER
1030 REM
1040 PRINT "     "
1050 PRINT "BEGINNING CREATION OF 'MKTSIM' DATA FILE."
1060 PRINT "     "
1070 OPEN "O",#1,"GAMEDATA"
1080 REM - WEEK NUMBER
1090 PRINT #1,0
1100 INPUT "NUMBER OF TEAMS ";NO
1110 PRINT #1,NO
1120 INPUT "EQUAL MARKET SHARES TO START ('YES' OR 'NO') ";NS
1130 MT=0
1140 REM - SET UP NAMES, MARKET SHARES, PROFITS
1150 FOR I=1 TO NO
1160 PRINT "     "
1170 INPUT "COMPANY NAME ";CS
1180 PRINT #1,CS
1190 INPUT "PRODUCT NAME ";CS
1200 PRIN #1,CS
1210 REM - ORIGINAL MARKET SHARE
1220 IF LEFT$(NS,1)="Y" THEN 1270
1230 INPUT "STARTING MARKET SHARE (10% = .10, ETC.) ";M
1240 PRINT #1,M
1250 MT=MT+M
1260 GOTO 1290
1270 PRINT #1,1/NO
1280 MT=1
1290 REM - ORIGINAL PROFITS
1300 PRINT #1,0
1310 REM - TOTAL SALES
1320 PRINT #1,0
1330 NEXT I
1340 CLOSE #1
1350 PRINT "     "
1360 PRINT "DATA FILE CREATED."
1370 IF MT>.98 AND MT<1.02 THEN 1400
1380 PRINT "BUT THERE MAY BE AN ERROR SINCE THE TOTAL MARKET DOES NOT"
1390 PRINT "EQUAL 100%.  TOTAL MARKET =";MT
1400 END
OK

RUN

BEGINNING CREATION OF 'MKTSIM' DATA FILE.

NUMBER OF TEAMS ? 6
EQUAL MARKET SHARES TO START ('YES' OR 'NO') ? YES

COMPANY NAME ? DAVID
PRODUCT NAME ? TRANS-AM

COMPANY NAME ? CARRIE
PRODUCT NAME ? FOX-FIRE

COMPANY NAME ? LORI
PRODUCT NAME ? USA#1

COMPANY NAME ? TODD
PRODUCT NAME ? M-MORILE

COMPANY NAME ? ERICA
PRODUCT NAME ? TR7

COMPANY NAME ? GAIL
PRODUCT NAME ? TRANS-AM

DATA FILE CREATED.
OK
```

Figure 5

CIRCLE 192 ON READER SERVICE CARD

CIRCLE 224 ON READER SERVICE CARD

CIRCLE 181 ON READER SERVICE CARD

CIRCLE 208 ON READER SERVICE CARD

tion program, the data file can be restored and the simulation rerun.

Figure 7 is the listing of the simulation program. Lines 1160-1560 open the data file, read the past week's results and input this week's decisions from the console. Lines 1570-2100 calculate each firm's market share and then, from the market share, sales and profits. Lines 2110-2430 print out the summary sheet and lines 2440-3010 contain the loop that prints out each firm's financial statement.

The real heart of the program is lines 1600 and 1870. Line 1600 models buyer resistance to high prices. That is, this model assumes that buyers will continue to purchase cars until some maximum average price, or "trigger" price, is reached. Once this price level is exceeded, total sales begin to fall off. (Buyers will still favor a firm with lower-than-average price, but a high average market price reduces the total demand.) Line 1870 contains the function that determines each firm's share of the market. This particular model rates relative price and advertising to be twice as effective as design improvements. Price has an inverse effect—as price rises, market share falls off. This particular model assumes, that for any particular firm, there is no such things as a "too high" price. A very high price will reduce sales but some cars will still be sold. And in fact, the result of this assumption is that a firm can be very successful by setting a very high price, accepting a small share of the market, but making a very high profit on each car sold.

An advantage of this simulation is that it is easy for you, the user, to shape the "marketplace" to match how you feel the *Real World* operates. As an example, you might feel that there is some price so high that buyers will revolt and the firm will sell no cars at all. If so then you could substitute the equation shown under REMarks in lines 1830 and 1840 for the equation of line 1870. This equation will allow a firm's market share to hit zero if a very high price is chosen. The effect of this assumption is shown in Figure 8. Note that when price is increased, sales fall off strongly. Up to some point, the added profit per car offsets the sales decline—and thus there is an "optimum" price. But this optimum price varies from week to week as the other teams change their decisions. So the firm that can't react to the changing environment is in trouble.

Depending upon your concept of how the world operates, you can:

1. Cut total planned sales to illustrate the effects of a recession, depression or foreign imports.

2. Increase variable costs to illustrate, for example, a government requirement to add mandatory safety devices to the cars (this one really upset the students).

3. Increase fixed costs to show how a requirement to reduce pollution (by adding additional factory equipment) can reduce profits.

In short, this simulation of the marketplace should be viewed as a starting point for you to test your theories of how the world does (or should) operate. □

```
RUN
                 **KTSIM**
SIMULATION OF A COMPETITIVE MARKETPLACE

BEGINNING RUN FOR WEEK 5

COMPANY # 1
NEW COMPANY NAME ?
NEW CAR NAME ?
SELLING PRICE ? 11000
ADVERTISING ? 3100000
IMPROVEMENT ? 3000000

COMPANY # 2
NEW COMPANY NAME ?
NEW CAR NAME ?
SELLING PRICE ? 10000
ADVERTISING ? 3200000
IMPROVEMENT ? 3300000

COMPANY # 3
NEW COMPANY NAME ?
NEW CAR NAME ?
SELLING PRICE ? 10000
\DVERTISING ? 3300500
 MPROVEMENT ? 3500000

COMPANY # 4
NEW COMPANY NAME ?TODD
NEW CAR NAME ?
SELLING PRICE ? 9500
ADVERTISING ? 3500000
IMPROVEMENT ? 3000000

COMPANY # 5
NEW COMPANY NAME ?
NEW CAR NAME ?
SELLING PRICE ? 10000
ADVERTISING ? 3100000
IMPROVEMENT ? 3100000

COMPANY # 6
NEW COMPANY NAME ?
NEW CAR NAME ?
SELLING PRICE ? 8500
ADVERTISING ? 3000000
IMPROVEMENT ? 300000

THIS WEEK'S SALES ? 10000
FIXED COSTS ? 4000000
VARIABLE COSTS ? 3500
```

Figure 6

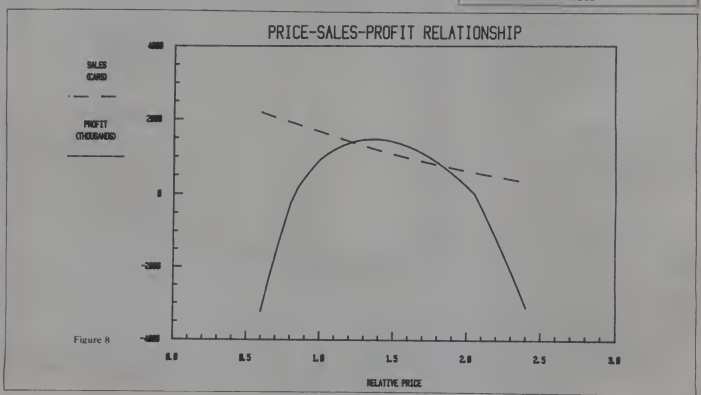

Figure 8

Basic In A Nutshell

Name: Step-By-Step
Vendor: Program Design, Inc., 11 Idar Court, Greenwich CT 06830
Price: $49.95
Purpose: Teaches how to program a TRS-80 using BASIC
Documentation: Outstanding
Loading: OK – Level 6, not critical
Implementation: This is a case of a BASIC program that teaches BASIC programming. It starts out with the assumption that the student only knows how to turn the TRS-80 on. Three cassette tapes are mounted in the cover of a loose-leaf notebook that also contains supplementary information frames. The course is divided into ten two-part lessons. From a simple PRINT "HI" through arrays and graphics to complex programs, all of the Level II commands and statements are exercised.

The instruction method consists of explanation, example, trial and testing. Commands and statements are presented and explained, examples are shown both on the screen and in the notebook, and then the student is presented with some problems to solve using the BASIC elements under discussion. If an incorrect answer is given, two more tries are allowed, and then the correct answer is displayed. Each lesson ends with a test that is administered and scored by the computer. The results are then entered into the student's progress chart. More comprehensive examinations are given at the end of Lesson 5 and at the end of the course.

Suitability: This is the kind of educational programming that personal computing needs more of. The student (my teenage son) learned much more quickly than I could have taught him, and at his own pace. However, this course isn't just for youngsters but for anyone who wants to be able to program effectively using the BASIC language. In a household where there isn't anyone to do the teaching, this course would be especially useful. I'd like to see a similar course for assembly-language programming.

Other software available from the same vendor: IQ Builders (four different kinds), Memory Builder and Story Builder.

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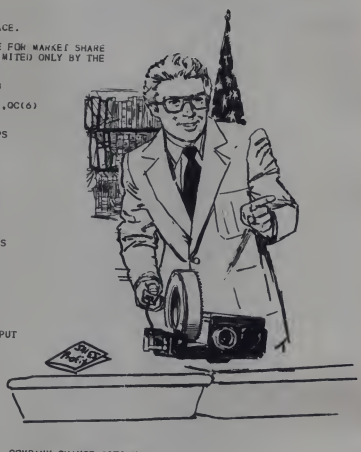
80 Microcomputing, February 1980

Figure 7

```
LIST
1000 REM - PROGRAM TO SIMULATE A COMPETITIVE MARKETPLACE.
1010 REM
1020 REM - THIS PROGRAM LETS UP TO 6 COMPANIES COMPETE FOR MARKET SHARE
1030 REM - AND PROFITS. (THE NUMBER OF COMPANIES IS LIMITED ONLY BY THE
1040 REM - DESIRE TO 'NICELY' FORMAT THE PRINTOUTS.)
1050 REM
1060 REM - WRITTEN IN MICROSOFT BASIC FOR THE HEATH H8
1070 REM
1080 DIM OWS(6),NWS(6),COS(6),CNS(6),TP(6),WP(6),AC(6),OC(6)
1090 DIM SP(6),CS(6),SWF(6),TS(6)
1100 REM
1110 DEFINT I-K                    'REM - SPEEDS UP THE LOOPS
1120 REM
1130 PRINT "                       "MKTSIM"
1140 PRINT "      "
1150 PRINT "SIMULATION OF A COMPETITIVE MARKETPLACE"
1160 REM - OPEN HISTORY FILE AND GET DATA
1170 OPEN "I",1,"GAMEDATA"
1180 INPUT #1,WEEK
1190 WEEK=WEEK+1
1200 PRINT "      "
1210 PRINT "BEGINNING RUN FOR WEEK";WEEK
1220 INPUT #1,NO                   'REM - NUMBER OF COMPANIES
1230 FOR I=1 TO NO
1240 INPUT #1,COS(I)               'REM - COMPANY NAME
1250 INPUT #1,CNS(I)               'REM - CAR NAME
1260 INPUT #1,OWS(I)               'REM - OLD MARKET SHARE
1270 INPUT #1,TP(I)                'REM - TOTAL PROFITS
1280 INPUT #1,TS(I)                'REM - TOTAL SALES
1290 NEXT I
1300 CLOSE #1
1310 OPEN "O",1,"GAMEDATA"   'REM - CHANGE FILE TO OUTPUT
1320 PRINT #1,WEEK
1330 PRINT #1,NO
1340 REM - GET THIS WEEK'S INPUTS
1350 TSP=0
1360 TA=0
1370 TO=0
1380 TSMF=1E-20
1390 PRINT "      "
1400 FOR I=1 TO NO
1410 PRINT "COMPANY #";I
1420 LINE INPUT "NEW COMPANY NAME ?";TRASH$
1430 IF LEN(TRASH$)>1 THEN COS(I)=TRASH$          'REM - COMPANY CHANGE OPTION
1440 LINE INPUT "NEW CAR NAME ?";TRASH$
1450 IF LEN(TRASH$)>1 THEN CNS(I)=TRASH$          'REM - CAR CHANGE OPTION
1460 INPUT "SELLING PRICE ";SP(I)
1470 INPUT "ADVERTISING ";AC(I)
1480 INPUT "IMPROVEMENT ";OC(I)
1490 PRINT " "
1500 TSP=TSP+SP(I)
1510 TA=TA+AC(I)
1520 TO=TO+OC(I)
1530 NEXT I
1540 INPUT "THIS WEEK'S SALES ";S
1550 INPUT "FIXED COSTS ";FC
1560 INPUT "VARIABLE COSTS ";VC
1570 AP=TSP/NO                     'REM - AVERAGE PRICE
1580 REM - WE ENCOUNTER BUYER RESISTANCE WHEN THE AVERAGE PRICE EXCEEDS $10,000
1590 REM - AND SALES FALL OFF FROM THE DESIRED VALUE.
1600 IF AP>10000 THEN S=S*10000/AP
1610 AA=TA/NO                      'REM - AVERAGE ADVERTISING
1620 IF AA=0 THEN AA=1
1630 AO=TO/NO                      'REM - AVERAGE DESIGN IMPROVEMENTS
1640 IF AO=0 THEN AO=1
1650 REM
1660 REM - CALCULATE MARKET SHARE FACTORS
1670 REM
1680 REM   SWF = AP/SP + AC/AA + .5*OC/AO
1690 REM - THIS EQUATION MAY BE MODIFIED TO CHANGE THE WAY THE
1700 REM - 'MARKETPLACE' WORKS.  IT PRESENTLY IS SET TO WEIGH RELATIVE
1710 REM - PRICE AND ADVERTISING EQUALLY.  DESIGN IMPROVEMENTS ARE ONE-HALF
1720 REM - AS EFFECTIVE AS THE OTHER TWO FACTORS.  ALL ARE RATED LINEARLY
1730 REM - RELATIVE TO THE AVERAGE EXPENDITURES OF ALL COMPANIES.  THAT IS,
1740 REM - IF A COMPANY SPENT JUST THE AVERAGE AMOUNT IN EACH AREA, IT'S
1750 REM - MARKET SHARE WOULD NEITHER INCREASE NOR DECREASE.  NOTE ALSO THAT
1760 REM - THE NEW MARKET SHARE IS ALSO A FUNCTION OF THE OLD MARKET SHARE.
1770 REM
1780 REM - THE PRESENT EQUATION ASSUMES THAT NO MATTER HOW HIGH THE PRICE,
1790 REM - THERE WILL ALWAYS BE SOME BUYERS.  IF, ON THE OTHER HAND, YOU FEEL
1800 REM - THAT THERE IS SOME PRICE THAT WILL CHOKE OFF ALL SALES, THEN YOU
1810 REM - MIGHT WISH TO REPLACE THE PRESENT EQUATION WITH:
1820 REM
1830 REM          SWF(I)=AC(I)/AA+.5*OC(I)/AO-SQR(AP/SP(I))
1840 REM          IF SWF(I)<0 THEN SWF(I)=0
1850 REM
1860 FOR I=1 TO NO
```



AIR TRAFFIC CONTROLLER

In **Air Traffic Controller** you assume responsibility for the safe flow of air traffic within a 15x25 mile area up to 5,000 feet in altitude. During your shift as a controller in charge of this airspace, 26 aircraft become active and under your control. Jets and prop planes have to be guided to and from the two airports, navigational beacons and ten entry/exit fixes. The aircraft enter the controller's airspace at various altitudes and headings whether or not you are ready.

Air Traffic Controller retains the basic realism of air traffic control. This program requires the same steady nerves under pressure and the same instant, almost instinctive, analyses of complex emergencies which are demanded of a professional air traffic controller. But "ATC" adds the excitement and well-defined goals of a game. This is just a simulation, and all passengers left in air traffic limbo by a panicked player will live to fly another day.

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CIRCLE 300 ON READER SERVICE CARD

Business, continued...

```
1870 SMF(I)=(AP/SP(I))+(AC(I)/AA)+(.5*QC(I)/AQ)
1880 NMS(I)=OMS(I)*SMF(I)
1890 TSMF=TSMF+NMS(I)
1900 NEXT I
1910 TR=.5            :REM - INCOME TAX RATE
1920 REM - CALCULATE SALES AND PROFITS
1930 SSUM=0
1940 FOR I=1 TO NO
1950 NMS(I)=NMS(I)/TSMF           :REM - NORMALIZE MARKET SHARES TO 100%
1960 CS(I)=INT(S*NMS(I))
1970 SSUM=SSUM+CS(I)              :REM - ADJUST TOTAL SALES FOR ROUNDOFF
1980 TS(I)=TS(I)+SP(I)*CS(I)      :REM - TOTAL SALES TO DATE
1990 WP(I)=CS(I)*SP(I)-FC-AC(I)-QC(I)-VC*CS(I)
2000 IF WP(I)>0 THEN WP(I)=WP(I)*(1-TR)          :REM - DON'T PAY TAXES ON A LOSS
2010 TP(I)=TP(I)+WP(I)            :REM - TOTAL PROFIT TO DATE
2020 REM - REWRITE AND UPDATE THE HISTORY FILE.
2030 PRINT #1,CO$(I)
2040 PRINT #1,CN$(I)
2050 PRINT #1,NMS(I)
2060 NMS(I)=INT(100*NMS(I)+.5)    :REM - ROUND AND CONVERT TO PERCENT
2070 OMS(I)=INT(100*OMS(I)+.5)
2080 PRINT #1,TP(I)
2090 PRINT #1,TS(I)
2100 NEXT I
2110 S=SSUM
2120 CLOSE #1
2130 REM - PAUSE TO POSITION FORM
2140 LINE INPUT " ";TRASH$
2150 REM - PRINT OUT SUMMARY TABLE OF TEAM'S PERFORMANCES
2160 PRINT "      "
2170 PRINT "      "
2180 PRINT "GAME RESULTS FOR WEEK";WEEK
2190 PRINT "      "
2200 PRINT USING "TOTAL SALES WERE ###,### \  \";S,"CARS"
2210 PRINT USING "FIXED COSTS WERE $$###,###,###";FC
2220 PRINT USING "VARIABLE COSTS WERE $$###,### \      \";VC,"PER CAR"
2230 PRINT " "
2240 F2$="\                    \\         \\         \\         \\         \\
 \\        \"
2250 F1$="\                   \ ######### ######### ######### ######### ########
 #########"
2260 PRINT USING F2$;"COMPANY",CO$(1),CO$(2),CO$(3),CO$(4),CO$(5),CO$(6)
2270 PRINT USING F2$;"CAR NAME",CN$(1),CN$(2),CN$(3),CN$(4),CN$(5),CN$(6)
2280 PRINT "      "
2290 PRINT USING F1$;"CAR PRICE",SP(1),SP(2),SP(3),SP(4),SP(5),SP(6)
2300 PRINT "      "
2310 PRINT USING F1$;"ADVERTISING",AC(1),AC(2),AC(3),AC(4),AC(5),AC(6)
2320 PRINT "      "
2330 PRINT USING F1$;"IMPROVEMENTS",QC(1),QC(2),QC(3),QC(4),QC(5),QC(6)
2340 PRINT "      "
2350 PRINT USING F1$;"OLD MARKET SHARE",OMS(1),OMS(2),OMS(3),OMS(4),OMS(5),OMS(6
)
2360 PRINT "      "
2370 PRINT USING F1$;"NEW MARKET SHARE",NMS(1),NMS(2),NMS(3),NMS(4),NMS(5),NMS(6
)
2380 PRINT "      "
2390 PRINT USING F1$;"SALES",CS(1),CS(2),CS(3),CS(4),CS(5),CS(6)
2400 PRINT "      "
2410 PRINT USING F1$;"THIS WEEK'S PROFIT",WP(1),WP(2),WP(3),WP(4),WP(5),WP(6)
2420 PRINT "      "
2430 PRINT USING F1$;"TOTAL PROFIT",TP(1),TP(2),TP(3),TP(4),TP(5),TP(6)
2440 REM
2450 REM - PRINT OUT BALANCE SHEET FOR EACH BUSINESS
2460 REM
2470 FOR I=1 TO NO
2480 REM - PAUSE TO POSITION FORM
2490 LINE INPUT " ";TRASH$
2500 PRINT "      COMPANY NUMBER :";I
2510 PRINT "      COMPANY NAME   : ";CO$(I)
2520 PRINT "      CAR NAME       : ";CN$(I)
2530 PRINT "      "
2540 PRINT USING "      SELLING PRICE...................$$##,###.##";SP(I)
2550 PRINT USING "      ADVERTISING...............$$##,###,###.##";AC(I)
2560 PRINT USING "      IMPROVEMENTS..............$$##,###,###.##";QC(I)
2570 PRINT "      OLD MARKET SHARE................        ";OMS(I);" PERCENT"
2580 PRINT "      NEW MARKET SHARE................        ";NMS(I);" PERCENT"
2590 PRINT "      SALES...........................      ";CS(I);" CARS"
2600 PRINT "      "
2610 PRINT "================================================================"
2620 PRINT "      "
2630 PRINT " YOUR COMPANY'S BALANCE SHEET FOR WEEK";WEEK
2640 PRINT "      "
2650 PRINT "      INCOME"
2660 PRINT "      ------"
2670 PRINT "      "
2680 PRINT USING "            FROM SALE OF CARS........................$$##,###,#
##.##";CS(I)*SP(I)
2690 PRINT "      "
2700 PRINT "      EXPENSES"
2710 PRINT "      --------"
2720 PRINT "      "
```

```
2730 PRINT USING "          COST OF CARS SOLD.....$$##,###,###.##"#CS(I)+VC
2740 PRINT USING "          ADVERTISING..........$$##,###,###.##"#AC(I)
2750 PRINT USING "          IMPROVEMENTS.........$$##,###,###.##"#QC(I)
2760 PRINT USING "          FIXED CUSTS..........$$##,###,###.##"#FC
2770 PRINT "          ----------------------------------"
2780 TAX=0
2790 IF #P(I)>0 THEN TAX=#P(I)*TR/(1-TR)
2800 TE=CS(I)#VC+AC(I)+QC(I)+FC
2810 PRINT USING "               TOTAL.....................$$##,###,#
##.##"#TE                                                  ----------
2820 PRINT "
"
2830 PRINT "     "
2840 PRINT USING "     PROFIT BEFORE TAXES.....................$$##,###,#
##.##"#P(I)+TAX
2850 PRINT "     ----------------"
2860 PRINT "     "
2870 PRINT USING "     INCOME TAXES.....................$$##,###,#
##.##"#TAX                                                 ----------
2880 PRINT "     ----------
"
2890 PRINT "     "
2900 PRINT USING "     THIS WEEK'S PROFITS.....................$$##,###,#
##.##"#P(I)
2910 PRINT "     "
2920 PRINT "     "
2930 PRINT USING " YOUR TOTAL PROFITS SO FAR ARE $$####,###,###.##"#TP(I)
2940 PRINT "     "
2950 PRINT USING " YOUR TOTAL SALES SO FAR ARE   $$####,###,###.##"#TS(I)
2960 PRINT "     "
2970 PRINT USING " YOUR PROFIT MARGIN IS ###.## \     \"#100#P(I)/TS(I),"PERCEN
T"
2980 PRINT "     "
2990 PRINT "=========================================================="
3000 PRINT "     "
3010 NEXT I
3020 PRINT "     "
3030 PRINT "     "
3040 PRINT "     "
3050 PRINT "     "
3060 PRINT "END OF SIMULATION FOR WEEK"#WEEK
3070 PRINT "DATA FILE HAS BEEN UPDATED TO THIS WEEK'S RESULTS."
3080 REM - THAT'S ALL FOLKS !
3090 END
OK
```

How to Solve It— With the Computer

Donald T. Piele

"A problem must involve the student, they must search for the answer. Perhaps they will not reach the goal, but the search itself may prove more important than the goal."

— F. Jacobson

An enjoyable way to develop problem solving skills is to write computer programs. After all, sitting down with a goal in mind and trying to achieve it by fitting together elementary statements is what problem solving is all about. This application of computers is often not familiar to those who have never written programs and only think of them in terms of finished products: an interesting computer game, a business record keeping system, or a scientific program to carry out numerical calculations. But those who write programs know differently. Computer programming can be a very creative exercise which develops logical thinking and problem solving strategies. After all, the output from a computer program is only as logical as the program design. And the development of a program from start to finish exercises the full range of problem solving skills.

Assuming that this is true, what can teachers do with a computer in the classroom that will help develop an appreciation and interest in problem solving? Do the obvious! Give students problems that can be solved by a computer program. This may seem too easy to be true, but in the hands of an experienced teacher, it works.

Problem Solving — A Practical Skill

George Polya, a practitioner and teacher of problem solving skills, taught that learning to solve problems was like learning to swim. You learn by practice and imitation. In swimming you watch what other people do with their hands and feet to keep their head above water and then you try to do the same. In the same way, to learn how to solve problems you must watch and imitate other people and then practice on your own. The teacher must instill an interest in problems in the classroom and give students lots of opportunity for imitation and practice. The teacher must have a good supply of problems and have a genuine interest in working through problem solutions. Unfortunately, both of these conditions are hard to meet. Good problems require careful and complete documentation and an understanding teacher who is interested in providing direction and encouragement. It would be very misleading to think that this approach to teaching problem solving can be implemented by simply moving a computer into the classroom. Like anything of lasting value, it requires a certain amount of dedication. Teachers who are making the effort however, are realizing for the first time the tremendous creativity and determination that students exhibit when writing programs that are uniquely their own. These teachers have found that writing computer programs can be a unique form of expression which rewards original thought yet requires careful planning and logical execution. It is my hope that the problems found in this series will be of use to teachers who are using computers in a problem solving mode.

Donald T. Piele, The University of Wisconsin-Parkside, Kenosha, WI 53141.

Lesson #6 (Beginning Students)
The Setting:

Imagine a situation where a decision is made to separate things into two categories: Boys turn right, girls turn left; heads I win, tails I lose; yes I will, no I won't. The decision to divide objects, events, or actions into two categories is made by evaluating an attribute. In the examples above the attributes are: Sex (boy or girl), coin side (head, tails), response (yes, no).

How can similar decisions be made with a computer? What attributes can be distinguished by a program?

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Primary & Secondary keys maintained automatically—no need to rebuild keys after adding records	YES	
Maximum record size (bytes)	1020	
Maximum number of fields/record	100	
Handles files with more than one diskette of data	YES	
Custom disk operating system (DOS) for faster data retrieval and program chaining	YES	
User-designed screen formats	YES	
Up to 9 screen "pages" per record	YES	
Ten field types, including dollar/cents, phone & social security number, date, etc.	YES	
Automatic data compaction for increased disk storage capacity.	YES	
Wild card, partial string, range and Boolean search capabilities	YES	
Dynamic prompting (tm) - lists all available functions on screen—no need for quick reference card.	YES	
Password file protection	YES	
Four function calculator mode	YES	
Daily update lists for printout of all records added/edited on any day or range of dates	YES	
REPORT GENERATOR:		
Send reports to screen or printer	YES	
Sort on up to 6 fields at a time	YES	
Column subtotals and totals	YES	
Subtotal and page breaks	YES	
Up to 24 computed fields per report	YES	
Up to 9 lines of column titles	YES	
Up to 9 lines for each record	YES	
Maximum number of fields per report	100	
Code fields - store short codes, print long descriptions	YES	
Comment lines and footnotes	YES	
Comment fields for printing labels or headers within each record	YES	
Summary only reports	YES	

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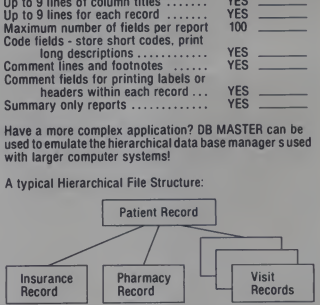

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CIRCLE 213 ON READER SERVICE CARD

Solve it, continued. . .

The Problem:

Write a computer program which uses the IF . . . THEN . . . statement to decide between two courses of action.

The Discussion:

There are many ways to approach this problem. It is intentionally open ended in order to encourage the greatest possible variety of solutions. I can imagine a class where no two programs turn out alike. This would be marvelous.

Here are a few examples to show the class how it might be done. Students can use these examples to gain understanding about the use of IF . . . THEN . . . statements. Then it is up to them to create their own programs.

1. A program that accepts a number from 1 to 10 and prints out whether it is greater than 5, equal to 5, or less than 5.

```
10 INPUT "ENTER A NUMBER FROM 1 TO 10 "!N
20 IF N < 1 OR N > 10 THEN GOTO 10
30 IF N > 5 THEN PRINT "YOUR NUMBER IS GREATER THAN 5."
40 IF N = 5 THEN PRINT "YOUR NUMBER IS EQUAL TO 5."
50 IF N < 5 THEN PRINT "YOUR NUMBER IF LESS THAN 5."
60 END
```

2. A program that generates random numbers between 0 and 1 and prints H (for heads) or T (for tails) depending upon whether the number is less than or equal to .5 or greater than .5.

```
10 PRINT "COIN TOSS"
20 IF RND(1) > .5 THEN PRINT "H"!
30 IF RND(1) < =.5 THEN PRINT "T"!
40 GOTO 20
50 END
```

3. More imaginative solutions use the graphics capabilities of the system. In lesson #4 a program was writen for the Apple II in Applesoft Basic to color the screen a solid color by picking points X,Y at random. With one simple modification we can direct the computer to color certain portions of the screen a specific color. For example, suppose we wanted to color the right half of the screen pink and the left half blue and do it at random. This could be done by setting the color to pink (line 20 below) and changing it to blue if the X coordinate is less than 20 (line 45). Lines 30 and 40 pick a position on the low resolution graphics screen at random.

```
10 GR
20 COLOR = 11
30 X = INT(40*RND(1))
40 Y = INT(40*RND(1))
45 IF X < 20 THEN COLOR = 6
50 PLOT X,Y
60 GOTO 20
70 END
```

4. Instead of coloring the screen at random we could color it a row at a time from top to bottom and turn on a specific color depending upon the position on the screen. Can you tell what will appear when the following program is run?

```
10 GR : BLUE = 6 : PINK = 11
20 FOR Y = 0 TO 39
30    FOR X = 0 TO 39
40       COLOR = PINK
50       IF X > Y THEN COLOR = BLUE
60       PLOT X,Y
70    NEXT X
80 NEXT Y
90 END
```

Points that lie above the diagonal from the upper left corner to the bottom right corner of the screen are colored blue and those below are colored pink. What would be the outcome if the following replacements were made for line 50?

```
(a) 50 IF X + Y > 40 THEN COLOR = BLUE
(b) 50 IF X < 10 OR Y > 30 THEN COLOR =BLUE
(c) 50 IF X < 10 AND Y > 30 THEN COLOR = BLUE
(d) 50 IF ABS(X-Y) > 10 THEN COLOR = BLUE
(e) 50 IF Y/2 = INT(Y/2) THEN COLOR = BLUE
(f) 50 IF X*Y > 100 THEN COLOR = BLUE
```

The Postscript:

These examples are but a few ways to solve the original problem and learn how to write simple programs in the process. Show these to the students and then take it from there. Many of their solutions will be much more elaborate and interesting.

Lesson #6 (Intermediate Students)

The Setting:

"Years ago, when girls were called young ladies and were never permitted more violent exercises than walking, the headmistress of a boarding school wished to arrange matters so that her pupils would derive the maximum amount of companionship in their daily walks without forming boisterous groups. She therefore ordered the young ladies, of whom there were an even number (2N), to walk in pairs, but to form new pairs each day in such a way that no young lady had the same companion a second time before she had walked with every other young lady. This worked well for a day or two, but presently the young ladies began to spend more and more time each day trying to find partners. They would be nearly ready when it was discovered that the last two young ladies had already walked together. Can you help the headmistress?"

This quaint problem appears in *Mathematical Recreations*[1].

The Problem: The Daily Promenade

Write a program which will accept a value for N and prints out the daily pairings for all 2N girls. Make a complete schedule for 2N-1 days in which each girl is paired with every other girl exactly once.

The Discussion:

The hardest part of this problem is finding a suitable procedure which will generate the pairings. I expect that very few students would be able to come up with a procedure on their own. However, I wouldn't discourage anyone from trying. A more modest goal for intermediate students would be to take an established pairing technique and transform it into a computer program.

An often cited method of generating the necessary pairings is called the circle design which will be illustrated here for six

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Solve It, continued...

girls. Number the girls from 1 to 6 and draw a circle as shown in Figure 1. The five evenly spaced points on the circumference are labeled as shown and the center is assigned to number 6. A pairing between the six girls is represented by drawing two vertical lines between points on the upper half and the lower half of the circle. The number 6 at the center of the circle is paired to the point on the left by a horizontal line. This set of lines determines who walks with whom on one particular day. To find the next days pairings, rotate the circle counterclock-

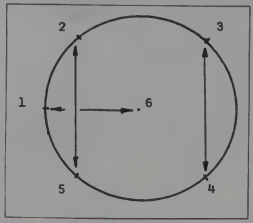

Figure 1. Pairings: 1-6, 2-5, 3-4

wise one number (1/5th of a revolution). Now the same lines can be used for matching up the girls with different partners. This is shown in Figure 2. Continue in this way through all five rotations of the circle by one number. The result will be five different pairings for the five daily promenades. The circle design works just as well for any even number of girls. Some students will have very little difficulty automating the circle design procedure. Others who are unfamiliar with how to represent information in a computer, will need further help.

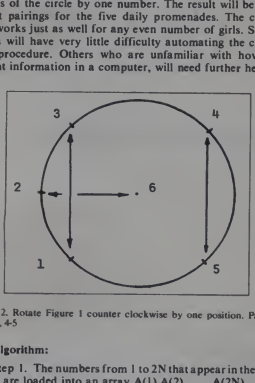

Figure 2. Rotate Figure 1 counter clockwise by one position. Pairings: 2-6, 3-1, 4-5

The Algorithm:

Step 1. The numbers from 1 to 2N that appear in the circle design are loaded into an array A(1),A(2), . . . A(2N).

Step 2. The numbers in the first half of the array are matched with numbers in the last half as follows:

A(1)-A(2N), A(2)-A(2N-1), . . . A(N)-A(2N).

We will call this pairing "the opposing ends."

Step 3. The numbers in the array elements A(1), A(2), . . . A(2N-1) are shifted to the left by one with the exception of A(1) which is cycled back and placed in A(2N-1). This is called a cyclic permutation.

Step 4. If the array has been cyclic permuted 2N-1 times then stop. If not then go back to Step 2.

The Program:

```
10 PRINT "THE DAILY PROMENADE" \ PRINT
20 INPUT "DAILY PAIRINGS FOR 2N GIRLS. N = ";N
30 DIM A(2*N)\PRINT
40 REM **** STEP 1 ****
50    FOR I=1 TO 2*N
60      A(I)=I
70    NEXT I
80 REM **** STEP 2 ****
90    K=K+1
100   PRINT "DAY ";K;" : ";
110     FOR I=1 TO N
120       PRINT A(I);" -";A(2*N+1-I);"    ";
130     NEXT I
140   PRINT
150 REM **** STEP 3 ****
160     IF K=2*N-1 THEN END
170     T=A(1)
180      FOR I=1 TO 2*N-2
190        A(I)=A(I+1)
200      NEXT I
210    A(2*N-1)=T
220 GOTO 80
230 END
READY
RUN
THE DAILY PROMENADE
DAILY PAIRINGS FOR 2N GIRLS. N = 5

DAY  1 :  1 - 10    2 - 9     3 - 8     4 - 7     5 - 6
DAY  2 :  2 - 10    3 - 1     4 - 9     5 - 8     6 - 7
DAY  3 :  3 - 10    4 - 2     5 - 1     6 - 9     7 - 8
DAY  4 :  4 - 10    5 - 3     6 - 2     7 - 1     8 - 9
DAY  5 :  5 - 10    6 - 4     7 - 3     8 - 2     9 - 1
DAY  6 :  6 - 10    7 - 5     8 - 4     9 - 3     1 - 2
DAY  7 :  7 - 10    8 - 6     9 - 5     1 - 4     2 - 3
DAY  8 :  8 - 10    9 - 7     1 - 6     2 - 5     3 - 4
DAY  9 :  9 - 10    1 - 8     2 - 7     3 - 6     4 - 5
READY
```

Lesson #6 (Advanced Students)

The Setting:

The Daily Promenade Algorithm can be used to set up a round robin tournament. A tournament is called round robin if every player plays every other player exactly once. Tournaments ranging from the NCAA Fencing Championships to the summer city tennis league are set up on a round robin basis. Within divisions, the national football, basketball, and baseball leagues are basically round robin tournaments.

The Problem:

Assume that you are responsible for setting up a round robin tournament for the city tennis league. Your job is to write a computer program which will set up the schedule of matches with court assignments for each round of the tournament. The input should be the number of players (P) and the number of available courts (C), and the output should be a list of P-1 rounds so that every player plays every other player exactly once. If P is odd, then one person will of necessity draw a bye in each round. The output should fill out the following table.

```
Court #      1   2   3   4  ..... C

Round 1:     _   _   _   _        _

Round 2:     _   _   _   _        _

.......

.......

Round P-1    _   _   _   _        _
```

The Discussion:

Two things make this problem different from the Daily Promenade. First the number of players can be odd. This causes

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This original invasion game features superb high resolution graphics, nail biting tension and hilarious antics by the moon creatures. Fifty-five aliens whiz across the screen, quickening their descent, challenging you to come out from behind your blockades and pick them off with your lasers. A self-running "attract mode" makes it easy to learn and demonstrate the game. Game paddles are required.

Space War

Take command in Space War. Select from five game modes, including reverse gravity, and the battle begins. Challenge your opponent with missile fire, force him to collide with the sun or to explode upon re-entry from hyperspace. Be wary. He may circle out of sight and re-appear on the opposite side of the galaxy. (This is the classic MIT game redisigned especially for the Apple.)

3 Adventures

Disk CS-4513 $39.95
Requires 48K Apple II or Apple II Plus

Adventureland (by Scott Adams) You'll encounter wild animals, dwarfs and many other puzzles and perils as you wander through an enchanted world, trying to rescue the 13 lost treasures. Can you rescue the Blue Ox from the quicksand? Or find your way out of the maze of pits? Happy Adventuring!

Pirate Adventure (by Scott Adams)— Yo Ho Ho and a bottle of rum . . . You'll meet up with the pirate and his daffy bird along with many strange sights as you attempt to go from your London flat to Treasure Island. Can you recover Long John Silver's lost treasures? Happy sailing matey.

Mission Impossible Adventure (by Scott Adams)— Good Morning, Your mission is to . . . and so it starts. Will you be able to complete your mission in time? Or is the world's first automated nuclear reactor doomed? This one's well named, its hard, there is no magic but plenty of **suspense**.
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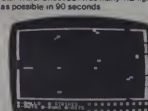

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Solve it, continued. . .

no great difficulty since we just have to add another "dummy" player which makes the number even. Whoever is matched with the "dummy" player draws a bye for the round. The second difference is the court assignments. Usually there are fewer than N courts so that a given round cannot be played simultaneously. This has no effect on the pairing algorithm, but it does cause a change in the way each round is printed out.

The Algorithm:

Step 1. Enter the number of players (P) and the number of courts (C). Let N = INT((P+1)/2). N is the number of matches in each round. If P is odd, then one match must be a bye. Remember whether P is odd or even.

Step 2. Print out a heading for the court numbers.

Step 3. Load the numbers from 1 to 2N in the array A.

Step 4. The numbers in the first half of the array are paired with the numbers in the last half by pairing opposing ends. Matches are assigned courts in a cyclic order 1 through C. If P is odd, then player A(2N) is the dummy and A(1) (who is paired with A(2N)) is given a bye for the round.

Step 5. The elements of A(1), A(2) . . . A(2N-1) undergo a cyclic permutation to the left. If this is the (2N-1)th permutation, then the program ends. If not, then go to Step 4.

The Program:

```
READY
RUN

ROUND ROBIN TOURNAMENT

ENTER THE NUMBER OF PLAYERS  P = 6
ENTER THE NUMBER OF COURTS   C = 3

COURT #          1          2          3

ROUND  1 :   1 - 6      2 - 5      3 - 4
ROUND  2 :   2 - 6      3 - 1      4 - 5
ROUND  3 :   3 - 6      4 - 2      5 - 1
ROUND  4 :   4 - 6      5 - 3      1 - 2
ROUND  5 :   5 - 6      1 - 4      2 - 3

ENTER THE NUMBER OF PLAYERS  P = 7
ENTER THE NUMBER OF COURTS   C = 3

COURT #          1          2          3

ROUND  1 :   2 - 7      3 - 6      4 - 5     1 - BYE
ROUND  2 :   3 - 1      4 - 7      5 - 6     2 - BYE
ROUND  3 :   4 - 2      5 - 1      6 - 7     3 - BYE
ROUND  4 :   5 - 3      6 - 2      7 - 1     4 - BYE
ROUND  5 :   6 - 4      7 - 3      1 - 2     5 - BYE
ROUND  6 :   7 - 5      1 - 4      2 - 3     6 - BYE
ROUND  7 :   1 - 6      2 - 5      3 - 4     7 - BYE

ENTER THE NUMBER OF PLAYERS  P = 8
ENTER THE NUMBER OF COURTS   C = 3

COURT #          1          2          3

ROUND  1 :   1 - 8      2 - 7      3 - 6
             4 - 5
ROUND  2 :   2 - 8      3 - 1      4 - 7
             5 - 6
ROUND  3 :   3 - 8      4 - 2      5 - 1
             6 - 7
ROUND  4 :   4 - 8      5 - 3      6 - 2
             7 - 1
ROUND  5 :   5 - 8      6 - 4      7 - 3
             1 - 2
ROUND  6 :   6 - 8      7 - 5      1 - 4
             2 - 3
ROUND  7 :   7 - 8      1 - 6      2 - 5
             3 - 4

ENTER THE NUMBER OF PLAYERS  P = 5
ENTER THE NUMBER OF COURTS   C = 2

COURT #          1          2

ROUND  1 :   2 - 5      3 - 4      1 - BYE
ROUND  2 :   3 - 1      4 - 5      2 - BYE
ROUND  3 :   4 - 2      5 - 1      3 - BYE
ROUND  4 :   5 - 3      1 - 2      4 - BYE
ROUND  5 :   1 - 4      2 - 3      5 - BYE
```

```
10 PRINT "ROUND ROBIN TOURNAMENT "\ PRINT
20 INPUT "ENTER THE NUMBER OF PLAYERS  P = ";P
30 INPUT "ENTER THE NUMBER OF COURTS   C = ";C
40 N = INT((P+1)/2) \ DIM A(2*N)
50 P1=P-2*INT(P/2)
60 REM **** STEP 2 ****
70 PRINT \ PRINT "COURT # ";
80  FOR I=1 TO C
90    PRINT TAB((4+(I-1)*9),I;
100 NEXT I
110 PRINT\PRINT
120 REM **** STEP 3 ****
130  FOR I= 1 TO 2*N
140    A(I)=I
150  NEXT I
160 REM **** STEP 4 ****
170 R = R + 1
180 PRINT "ROUND ";R;" :",
190 FOR I=1 TO N
200   K=K+1
210     IF I=1 AND P1=1 THEN K = K-1
220     IF K=0 THEN 270
230       J=(K-1) - C*INT((K-1)/C)
240     PRINT TAB(12+J*9),A(I);" -";A(2*N+1-I),
250     IF K/C<>INT(K/C) THEN 270
260       IF I<N THEN PRINT
270  NEXT I
280 IF P1=1 THEN  PRINT TAB(12+(J+1)*9),A(I)," - BYE",
285 K=0 \ PRINT
290 REM **** STEP 5 ****
300   IF R=2*N-1 THEN END
310   T=A(1)
320     FOR I=1 TO 2*N-2
330       A(I)=A(I+1)
340     NEXT I
350   A(2*N-1)=T
360 GOTO 160
```

The Postscript:

The circle design certainly does produce a valid round robin tournament. We can substitute different numbers in the center and around the edges and produce a slightly different tournament. For example, if the number of player P is an even number, we can place P different numbers in the center of the design. The remaining P-1 players may be arranged through the perimeter of the circle in P-2 factorial ways (P-2*P-3*...*2*1). The player in the center may choose to begin in any one of the P-1 players on the circumference of the circle. Thus there are a grand total of P*P-1*P-2! or P! (P factorial) ways of arranging for a round robin tournament for P players. Of course many of these are not significantly different. For example a tournament in which the order of the rounds is the only difference is counted as a different tournament. With this large number of round robin tournaments, can it be shown that all round robin tournaments can be derived for a circle design? Can a computer program be written that will generate all possible round robin tournaments?

All of these questions will be discussed in a future article which deals with back tracking strategies in computer programs. The following matrix is used to illustrate another way to represent a round robin tournament. The top row and left column represent the player's number and the values appearing inside the matrix represent the round number in which the player on the left plays the player at the top. □

```
Player    1   2   3   4   5   6
          ===================
  1     : X : 1 : 2 : 3 : 4 : 5
  2     : 1 : X : 3 : 4 : 5 : 2
  3     : 2 : 3 : X : 5 : 1 : 4
  4     : 3 : 4 : 5 : X : 2 : 1
  5     : 4 : 5 : 1 : 4 : X : 3
  6     : 5 : 2 : 4 : 1 : 3 : X
          ===================
```


References

(1) Kraitchik, Maurice, *Mathematical Recreations*, W.W. Norton & Company, 1942.

(2) Freund, J.E., "Round Robin Mathematics", *The American Mathematical Monthly*, Vol. 63, page 112-114, 1957.

(3) Harary, Frank, & Moser, Leo, "The Theory of Round Robin Tournaments", *The American Mathematical Monthly*, Vol. 73, pages 231-243, 1966.

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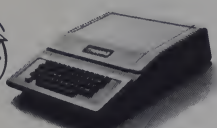

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Reading Level: Determination & Evaluation

Larry Noonan

This program makes use of the principles of phonics to analyze and evaluate the reading level of a given selection.

As a school teacher I was very interested in a program in *Creative Computing* (April 1980) written by Ronald Carlson entitled "Reading Level Difficulty." This program seemed, at first glance, to be the program that I was looking for to help me analyze reading selections.

I soon found out differently. The Basic dialect was not stated in the article and it would not run on my PET as listed. I set about translating the program into PET Basic. Figure 1 is a listing of the PET Basic program and Figure 2 is the resulting printout of a test paragraph.

This program works very well, however, I wanted a program that would help to analyze the selection phonetically and not just give the grade level.

I decided to write my own program that would look into the phonetic make-up of the selection.

Larry Noonan, 787 Strouds Lane, Pickering, Ontario

```
READY.

 10 PRINT"□"
 20 PRINTTAB(9),"    READING LEVEL"
 21 PRINT
 22 PRINTTAB(9),"    DETERMINATION"
 23 PRINT
 24 PRINTTAB(9),"     TRANSLATED
 25 PRINT
 26 PRINTTAB(9),"        BY"
 27 PRINT
 28 PRINTTAB(9),"    L. NOONAN"
 29 REM------------------------------
 30 REM***** ORIGINAL PROGRAM ****
 40 REM******  BY R. CARLSON *****
 41 REM------------------------------
 50 FORQ=1TO2000:NEXT
 60 DIM$(100)
 70 R1=0
 80 N=0
 90 D=0
 95 PRINT"□"
100 PRINTTAB(9),"   DIRECTIONS"
110 PRINT
120 PRINT"PLEASE DELETE ALL PUNCTURATION EXCEPT AT THE END OF A SENTENCE
121 PRINT
130 PRINT"PLEASE TYPE A SPACE BEFORE THIS         PUNCTUATION . "
131 PRINT
140 PRINT"THE ACCURACY WILL BE INCREASED"
141 PRINT"IF YOU CHOOSE SEVERAL PASSAGES"
142 PRINT"THROUGHOUT THE BOOK ."
150 PRINT
170 PRINT"HOW MANY LINES OF TEXT"
171 INPUTA
180 PRINT"TYPE IN THE PASSAGE, ONE LINE"
181 PRINT"AT A TIME."
190 PRINT
200 S=0
210 W=0
220 L=0
230 T=0
240 T1=0
250 V=0
260 FORB=1TOA
270 INPUTA$
280 X=LEN(A$)
290 IF MID$(A$,X,1)="."THEN420
300 IF MID$(A$,X,1)="!"THEN420
310 IF MID$(A$,X,1)="?"THEN420
320 A$=A$+" "
330 REM T  IS NUMBER OF 3 SYLLABLE WORDS
340 REM T1 IS NUMBER OF 3 SYLLABLE WORDS
341 REM    USING VOWELS
350 REM L  IS NUMBER OF LETTERS IN A WORD
360 REM S  IS NUMBER OF SENTENCES
370 REM W  IS NUMBER OF WORDS
380 REM V  IS NUMBER OF VOWELS/WORD
390 REM D  IS AN INDICATOR FOR DIPTHONGS
400 REM N  IS THE NUMBER OF SAMPLES
410 REM R1 IS THE RUNNING TOTAL OF THE          READING LEVELS
420 FORC=1TOLEN(A$)
430 T$=MID$(A$,C,1)
440 IFT$="."THEN600
450 IFT$="!"THEN600
460 IFT$="?"THEN600
470 IFT$=" "THEN620
480 REM TRIPPING THE VARIOUS COUNTERS
490 L=L+1
500 IFT$="A"THEN570
510 IFT$="E"THEN570
520 IFT$="I"THEN570
530 IFT$="O"THEN570
540 IFT$="U"THEN570
550 D=0
560 GOTO680
570 D=D+1
580 IF D=1 THEN V=V+1
590 GOTO680
600 S=S+1
610 GOTO680
620 W=W+1
630 D=0
640 IFL>=3 THEN T=T+1
650 L=0
660 IF V>=3 THEN T1=T1+1
670 V=0
680 NEXT C
690 NEXT B
691 PRINT
692 PRINT
693 PRINT
700 T=INT((T+T1)/2)
710 R=.4*(T+W/S)
720 PRINT
730 PRINT"THE READING LEVEL FOR THIS "
731 PRINT"PASSAGE IS APPROXIMATELY";R
732 PRINT
740 PRINT" ";T;" THREE SYLLABLE WORDS"
750 PRINT" ";W;" WORDS IN THIS PASSAGE"
760 PRINT" ";S;" SENTENCES"
770 PRINT
771 PRINT"DO YOU HAVE ANY MORE MATERIAL?"
772 PRINT"ENTER A 'YES OR 'NO"
773 INPUTB$
780 N=N+1
790 R1=R1+R
800 IF B$="YES" THEN 170
810 PRINT
820 PRINT"THE OVERALL READING LEVEL IS "
821 PRINT" GRADE ";R1/N
830 END
READY.
```

Figure 1. Listing of the Translated Program.

```
                    DIRECTIONS

PLEASE DELETE ALL PUNCTUATION EXCEPT AT THE END OF A SENTENCE .

PLEASE TYPE A SPACE BEFORE THIS PUNCTUATION .

THE ACCURACY WILL BE INCREASED
IF YOU CHOOSE SEVERAL PASSAGES
THROUGHOUT THE BOOK .

HOW MANY LINES OF TEXT
 10
TYPE IN THE PASSAGE, ONE LINE
AT A TIME.

WE FEEL THIS IS MUCH TOO LITTLE COMING MUCH TOO
LATE .IN THAT SENSE WE FEEL HIS PROGRAM IS NOT SUFFICIENTLY
STRONG ENOUGH .WE FEEL HE SHOULD PROPOSE TO CUT DOWN
BY AT LEAST 10 PERCENT IN TWO MONTHS RATHER THAN 50
PERCENT IN 10 YEARS .NOW HE CAN CUT THE DEMAND BY 10
PERCENT IN TWO MONTHS WE FEEL WITH A PROGRAM OF EDUCATING
AMERICANS .WE CALL ON HIM TO ALLOCATE $100 MILLION
FROM THE DEPARTMENT OF ENERGY TO EDUCATE THE AMERICAN
PEOPLE HOW TO CONSERVE ENERGY HOW NOT TO USE
THEIR CARS TAKE ONE MINUTE HOT SHOWERS .



THE READING LEVEL FOR THIS
PASSAGE IS APPROXIMATELY 10.72

  7  THREE SYLLABLE WORDS
 99  WORDS IN THIS PASSAGE
  5  SENTENCES

DO YOU HAVE ANY MORE MATERIAL?
ENTER A YES OR NO
NO

THE OVERALL READING LEVEL IS
 GRADE   10.72

READY.
```

Figure 2. Printout of Translated Program.

Phonics

Throughout the primary and junior grades students are taught to recognize and pronounce letter combinations. Some of these are:

- Blends — two or three distinct letters combined to make one sound.
- Digraphs — two letters which represent a single sound which is unlike the sound of either of the two original letters.
- Dipthongs — two vowels that are in one syllable as the "oy" in boy or a vowel and an "r" as in "ar." This last type is sometimes called a blend.
- Trigraphs — three letters making one sound.

Figure 3 shows examples of the most frequently used letter combinations.

I needed a program to count each of these phonetic letter combinations. In order to take apart each word in a paragraph to look for these vowels, dipthongs, digraphs, blends and trigraphs the function MID$ was used.

The MID$ (string, number over, number of letters) function displays a specified number of letters in the string. The starting letter is specified by the number over from the beginning of the string. The string must be in quotes unless it is a variable like B$. The string and the numbers must be separated by commas.

For example, 50 PRINT MID$ ("DIGRAPHS",3,5) will print out the word GRAPH which starts with the 3rd letter and is 5 letters long.

On the PET MID$ may be written as MID$ (STRING, number). This makes it similar to the RIGHT$ function as all the letters from the specified number to the end will be written.

Using MID$ the words are examined one letter at a time then two letters at a time and then three letters at a time.

The variables that are used are seen in Figure 4.

DIPTHONGS		DIGRAPHS		
REGULAR	MURMUR	CONSONANT	VOWEL	TRIGRAPHS
ou	ar	th	ai	eau
ow	ir	wh	ay	igh
oi	er	ch	ee	
oy	ur	ck	ea	
ew	or	sh	oa	
		kn		
		wr		
		ng		

BLENDS				
r-blends	s-blends	l-blends	other blends	3-letter blends
br	sc	bl	pt	squ
cr	sk	cl	dw	shr
dr	sl	fl	tw	spr
fr	sm	gl	sp	str
gr	sn	pl	pt	thr
pr	sp	sl	ft	spl
tr	st		nk	scr
	sw		nt	

Figure 3. Common Letter Combinations Used In Teaching Phonics.

NUMERIC		STRING	
A,B,C,E,Y	- FOR-NEXT timers	B$,C$,Q$,U$,	- YES/NO
B1	- r-blends	A$	- each line
B2	- s-blends	D$	- each 2 characters in A$
B3	- l-blends		
B4	- other blends	E$	- each 3 characters in A$
B5	- 3 letter blends	G$	- RETURN in order to continue
D	- all dipthongs	L$	- each character in A$
D1	- regular dipthongs		
D2	- murmur dipthongs		
D3	- vowel digraphs		
D4	- consonant digraphs		
I	- number of letters		
N	- number of selections		
R1	- reading level		
R2	- average reading level		
S	- number of sentences		
T	- trigraphs		
V	- number of vowels		
V3	- number of words with three vowels		
W	- number of words		
W9	- number of words with nine or more letters		
X	- number of lines of text		
Z	- length of A$		

Figure 4. Variables.

I needed a program to count each of these phonetic letter combinations.

The Program

Lines 1 and 2 open a file with the number 5.

Lines 20 - 90 print out the titles.

Line 100 is a timer for the titles.

Lines 140 - 295 are the instructions.

Line 300 starts the variable lines.

Line 310 dimensions A$ to 100. A$ represents each line of the selection that will be entered later.

Lines 320-397 initialize some of the variables to zero and explain these variables with REM statements.

Line 400 is a timer for the instructions.

Lines 411 - 420 find out if the user wishes a detailed analysis or just the grade level.

Lines 430 - 435 find out the number of lines of text.

Lines 450 - 460 are further instructions and a space.

Lines 500 - 560 initialize the rest of the variables to zero and use REM statements to explain them.

Lines 640 - 665 input the lines of text from the first line to the Xth line. INPUT A$ inputs the line which is typed on the keyboard and it appears on the video screen. PRINT A$ prints that line on the line printer. INPUT statements are not automatically displayed on the printer.

Lines 750 - 1147 are used for the short analysis. They look at each character in each line and branch to lines that count the vowels and punctuation.

Line 760 sets Z to the length (LEN) of A$.

Lines 770 - 790 look at the last character in a line to see if it is a punctuation mark. If it is execution jumps to line 850.

Line 800 If the selection line does not end with a punctuation mark, a space is added so that the last word will be counted. The number of words is determined by the number of spaces.

Line 850 starts a Y FOR-NEXT loop which starts at one and goes to the new length (LEN) of A$.

Line 860 sets L$ equal to all the characters in A$ one character at a time.

Lines 870 - 890 check to see if L$ is a punctuation mark and if so branch to line 1040 to increment the number of sentences.

```
1 OPEN5,4
2 CMD5
20 PRINT:PRINTTAB(9),"    READING LEVEL"
30 PRINT:PRINTTAB(9),"    DETERMINATION"
40 PRINT:PRINTTAB(9),"         AND"
50 PRINT:PRINTTAB(9),"    EVALUATION"
60 PRINT:PRINTTAB(9),"     WRITTEN BY"
70 PRINT:PRINTTAB(9),"      L. NOONAN"
80 PRINT:PRINTTAB(9),"PICKERING, ONTARIO"
90 PRINT:PRINTTAB(9),"        1980"
100 FOR#=1TO2000:NEXT
140 REM###INSTRUCTIONS###
160 PRINT"DO YOU WANT INSTRUCTIONS YES/NO "
161 INPUTU$
165 PRINTU$
180 IFU$="NO"THEN300
190 PRINT:PRINTTAB(9),"  INSTRUCTIONS"
200 PRINT:PRINT"DELETE ALL PUNCTUATION (;,:) EXCEPT"
210 PRINT"AT THE END OF A SENTENCE ."
220 PRINT"LEAVE A SPACE BETWEEN THE LAST LETTER"
230 PRINT"OF THE LAST WORD OF A SENTENCE AND "
240 PRINT" THE PUNCTUATION ."
250 PRINT"DO NOT LEAVE A SPACE AFTER PERIODS."
260 PRINT"QUESTION MARKS AND EXCLAMATION MARKS ."
265 PRINT
270 PRINT"EXAMPLE: THIS PROGRAM MAY HELP YOU LEARN PHONICS .YES IT WILL !"
280 PRINT:PRINT"NOTICE THE SPACE AFTER THE WORD ";CHR$(34);"PHONICS";CHR$(34)
290 PRINT:PRINT"THERE IS NO SPACE AFTER THE PERIOD ."
295 PRINT:PRINT"WAIT FOR THE QUESTION MARK BEFORE TYPING A LINE ."
300 REM###VARIABLES###
310 DIMA$(100)
320 REM R1 IS READING LEVEL
330 R2=0: REM R2 IS AVERAGE READING LEVEL
340 N=0: REM N IS NO. OF SELECTIONS
345 D=0: REM D IS NO. OF ALL DIPTHONGS
350 D1=0: REM D1 IS NO. OF REGULAR DIPTHONGS
360 D2=0: REM D2 IS NO. OF MURMUR DIPTHONGS
365 D3=0: REM D3 IS NO. OF VOWEL DIGRAPHS
370 D4=0: REM D4 IS NO. OF CONSONANT DIGRAPHS
375 B1=0: REM B1 IS NO. OF R-BLENDS
380 B2=0: REM B2 IS NO. OF S-BLENDS
385 B3=0: REM B3 IS NO. OF L-BLENDS
390 B4=0: REM B4 IS NO. OF OTHER BLENDS
395 B5=0: REM B5 IS NO. OF 3-LETTER BLENDS
397 T=0: REM T IS NO. OF TRIGRAPHS
400 FOR#=1TO2000:NEXT
411 PRINT"DO YOU WISH A DETAILED ANALYSIS? YES/NO"
412 INPUTB$
413 PRINTB$
420 PRINT:PRINT
430 PRINT"HOW MANY LINES OF TEXT"
431 INPUTX
435 PRINTX
450 PRINT"TYPE IN THE LINES ONE AT A TIME."
460 PRINT
500 REM ###REST OF THE VARIABLES ###
510 S=0: REM S IS NO. OF SENTENCES
520 W=0: REM W IS NO. OF WORDS
530 V=0: REM V IS NO. OF VOWELS
540 L=0: REM L IS NO. OF LETTERS
550 W9=0:REM W9 IS NO. OF 9 OR MORE LETTER WORDS
560 V3=0:REM V3 IS NO. OF WORDS WITH 3 VOWELS
640 REM INPUT LINES OF TEXT
650 FOR I= 1 TO X
660 INPUTA$
665 PRINTA$
750 REM EXAMINE LINES LETTER BY LETTER
760 Z=LEN(A$)
770 IF MID$(A$,Z,1)="."THEN850
780 IF MID$(A$,Z,1)="?"THEN850
790 IF MID$(A$,Z,1)="!"THEN850
800 A$=A$+" "
850 FORY=1 TO LEN(A$)
860 L$=MID$(A$,Y,1)
870 IFL$="."THEN1040
880 IFL$="?"THEN1040
890 IFL$="!"THEN1040
900 IFL$=" "THEN1090
950 REM COUNT LETTERS, DIGRAPHS ETC.
960 L=L+1
970 IFL$="A"THEN1060
980 IFL$="E"THEN1060
990 IFL$="I"THEN1060
1000 IFL$="O"THEN1060
1010 IFL$="U"THEN1060
1020 D=0
1030 GOTO1143
1040 S=S+1
1050 GOTO1143
```

Figure 5. Program Listing for Reading Level: Determination and Evaluation.

Strategy Games

Cassette CS-4003 $11.95 4 Programs Requires 16K Apple II or Apple II Plus

Blockade. Build a wall to trap your opponent, but don't hit anything.

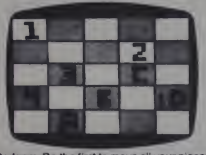
UFO. Use lasers, warheads or guns to destroy an enemy spacecraft.

Skunk. A 2-player strategy game played with dice, skill and luck.

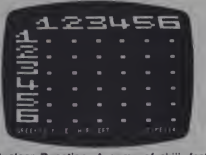
Genius. A fast-moving trivia quiz with scores of questions.

Brain Games

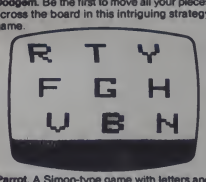
Cassette CS-4004 $11.95 7 programs Requires 16K Apple II or Apple II Plus



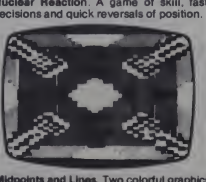
Dodgem. Be the first to move all your pieces across the board in this intriguing strategy game.



Nuclear Reaction. A game of skill, fast decisions and quick reversals of position.



Parrot. A Simon-type game with letters and tones. **Dueling digits** is a version with numbers.



Midpoints and Lines. Two colorful graphics demonstrations. **Tones** lets you make music and sound effects.

Strategy and Brain Games are also available on one 32K Apple disk (CS-4502) for $24.95. Add $2.00 shipping per order. Send to **Creative Computing Software**, P.O. Box 789-M, Morristown, NJ 07960. Or call 800-631-8112.

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SOFTWARE FOR OSI

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VIDEO GAMES 2 $15
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Evaluation, continued...

Figure 5, continued.

```
1060 D=D+1
1070 IFD=1THENV=V+1
1080 GOTO1143
1090 W=W+1
1100 D=0
1110 IFL>9THEN49=W9+1
1120 L=0
1130 IFV>3THENV3=V3+1
1140 V=0
1143 NEXT Y
1145 IFB$="YES" THEN 1150
1147 GOTO2010
1150 FORC=1 TO LEN(A$)
1160 D$=MID$(A$,C,2)
1170 IFD$="OU"THEN1800
1180 IFD$="OW"THEN1800
1190 IFD$="OI"THEN1800
1200 IFD$="OY"THEN1800
1210 IFD$="EW"THEN1800
1220 IFD$="AR"THEN1820
1230 IFD$="IR"THEN1820
1240 IFD$="ER"THEN1820
1250 IFD$="OR"THEN1820
1260 IFD$="AI"THEN1840
1270 IFD$="AY"THEN1840
1280 IFD$="EE"THEN1840
1290 IFD$="EA"THEN1840
1300 IFD$="OA"THEN1840
1310 IFD$="SH"THEN1860
1320 IFD$="TH"THEN1860
1330 IFD$="WH"THEN1860
1340 IFD$="CH"THEN1860
1350 IFD$="CK"THEN1860
1360 IFD$="KN"THEN1860
1370 IFD$="WR"THEN1860
1380 IFD$="NG"THEN1860
1390 IFD$="QU"THEN1880
1400 IFD$="CR"THEN1880
1410 IFD$="DR"THEN1880
1420 IFD$="FR"THEN1880
1430 IFD$="GR"THEN1880
1440 IFD$="PR"THEN1880
1450 IFD$="TR"THEN1880
1460 IFD$="SC"THEN1900
1470 IFD$="SK"THEN1900
1480 IFD$="SL"THEN1900
1490 IFD$="SM"THEN1900
1500 IFD$="SN"THEN1900
1510 IFD$="SP"THEN1900
1520 IFD$="ST"THEN1900
1530 IFD$="SW"THEN1900
1540 IFD$="BL"THEN1920
1550 IFD$="CL"THEN1920
1560 IFD$="FL"THEN1920
1570 IFD$="GL"THEN1920
1580 IFD$="PL"THEN1920
1590 IFD$="SL"THEN1920
1600 IFD$="PT"THEN1940
1610 IFD$="DW"THEN1940
1620 IFD$="TW"THEN1940
1630 IFD$="MP"THEN1940
1640 IFD$="FT"THEN1940
1650 IFD$="NK"THEN1940
1660 IFD$="NT"THEN1940
1670 NEXT C
1680 FOR E=1 TO LEN(A$)
1690 E$=MID$(A$,E,3)
1700 IFE$="SQU"THEN1960
1710 IFE$="SHR"THEN1960
1720 IFE$="SPR"THEN1960
1730 IFE$="STR"THEN1960
1740 IFE$="THR"THEN1960
1750 IFE$="SPL"THEN1960
1760 IFE$="SCR"THEN1960
1770 IFE$="EAU"THEN1980
1780 IFE$="IGH"THEN1980
1790 NEXTE
1795 GOTO2010
1800 D1=D1+1
1810 GOTO1670
1812 D5=D5+1 GOTO2010
1820 D2=D2+1
1830 GOTO1670
1840 D3=D3+1
1850 GOTO1670
1860 D4=D4+1
1870 GOTO1670
1880 B1=B1+1
1890 GOTO1670
1900 B2=B2+1
1910 GOTO1670
1920 B3=B3+1
1930 GOTO1670
1940 B4=B4+1
1950 GOTO1670
1960 B5=B5+1
1970 GOTO1790
1980 T=T+1
1990 GOTO1790
2010 NEXTB
2030 PRINT:PRINT
2040 PRINTTAB(9);"RESULTS"
2050 PRINT:PRINT
2055 IFB$="NO"THEN2190
2060 PRINT"NO. OF DIPTHONGS ";D1
2070 PRINT"NO. OF MURMUR DIPTHONGS ";D2
2080 PRINT"NO. OF VOWEL DIGRAPHS ";D3
2090 PRINT"NO. OF CONSONANT DIGRAPHS ";D4
2100 PRINT"NO. OF R-BLENDS ";B1
2110 PRINT"NO. OF S-BLENDS ";B2
2120 PRINT"NO. OF L-BLENDS ";B3
2130 PRINT"NO. OF OTHER BLENDS ";B4
2140 PRINT"NO. OF 3-LETTER BLENDS ";B5
2150 PRINT"NO. OF TRIGRAPHS ";T
2160 PRINT:PRINT
2170 PRINT"PRESS RETURN WHEN YOU WISH TO CONTINUE"
2171 INPUT@#
2190 PRINT:PRINT
2200 REM ###CALCULATE GRADE###
2210 W9=INT((W9+V3)/2)
2220 R1=.4*(W9+W/S)
2230 REM .4*(3SYLL + AVER.LEN OF SENTENCES)
2240 PRINT
2250 PRINT"THE READING LEVEL FOR THIS"
2260 PRINT"SELECTION IS APPROX. ";R1
2270 PRINT:PRINTW;" WORDS"
2280 PRINT:PRINTS;" SENTENCES"
2290 PRINT:PRINTW9;"3-SYLLABLE WORDS"
2300 PRINT:PRINT
2310 PRINT"IS THERE ANOTHER SELECTION Y/N"
2311 INPUT0$
2315 PRINT0$
2330 W=W+1
2340 R2=R2+R1
2350 IF0$="Y"THEN430
2360 PRINT:PRINT"THE AVERAGE GRADE LEVEL IS ";R2/N
READY.
```

Line 900 checks L$ to see if it is a space. If L$ is a space then execution jumps to line 1090 where the number of words is incremented by 1.

Line 950 is a remark indicating the start of the counting of letters.

Line 960 increments the numbers of letters.

Lines 970 - 1010 check for vowels which are incremented in line 1060.

Line 1020 sets D to 0.

Lines 1040 - 1090 are incremental lines which have already been explained.

Lines 1100 - 1140 reset variables.

Line 1143 completes the Y FOR-NEXT loop.

Line 1145 checks to see if a complete analysis is required.

Line 1147 branches to 2010 if a complete analysis is not desired.

Line 1150 starts another FOR-NEXT loop from 1 to the length (LEN) of A$.

Line 1160 sets D$ equal to a collection of characters in the selection line in groups of two characters.

Lines 1170 - 1660 check for dipthongs, murmur dipthongs, vowel digraphs, consonant digraphs, r-blends, s-blends, l-blends and other 2 letter blends and branch to counter lines when a particular letter grouping is found.

Line 1670 completes the C FOR-NEXT loop.

Line 1680 starts another FOR-NEXT loop.

Line 1690 sets E$ to a collection of characters in the selection line in groups of 3 characters.

Lines 1700 - 1780 check for three-letter blends and trigraphs and branch to the correct incremental lines.

Line 1790 completes the E FOR-NEXT loop.

Line 1795 branches to line 2010.

Lines 1800 - 1990 are incremental lines for the phonetic letter groupings.

Line 2010 completes the B FOR-NEXT loop which is used for entering the lines of text that are to be analyzed.

Lines 2030 - 2050 print out the title "RESULTS."

Line 2055 checks to see if the complete analysis was done and if not branches execution to line 2190.

Lines 2060 - 2160 prints the results of the detailed analysis.

Lines 2170 - 2171 lets the user look at the detailed analysis and then press RETURN when the rest of the results are wanted.

Lines 2190 - 2230 calculate the grade level by using the formula .4 (3 syllable words + average length of sentences).

Lines 2240 - 2300 print out the rest of the results.

Lines 2310 - 2315 ask if there is another selection from the same book.

Line 2330 increments the number of selections.

Line 2340 sets reading level 2 equal to reading level 2 plus reading level 1. (see variable explanation).

Line 2350 checks to see if there is another selection in which event execution jumps to line 430.

Line 2360 prints the average grade level from all the selections.

If you do not have a printer attached to your computer, then remove lines 1 and 2.

A printout of the test paragraph using the detailed analysis follows the program listing.

How can this program be used? A teacher can determine the grade level of a story or book, but, more importantly, the detailed analysis shows the reason for the grade level by displaying the increased numbers of dipthongs, digraphs, trigraphs and blends.

```
                READING LEVEL
              DETERMINATION
                   AND
               EVALUATION
                WRITTEN BY
                L. NOONAN
            PICKERING, ONTARIO
                  1980
DO YOU WANT INSTRUCTIONS YES/NO
NO
DO YOU WISH A DETAILED ANALYSIS? YES/NO
YES


HOW MANY LINES OF TEXT
 10
TYPE IN THE LINES ONE AT A TIME.

WE FEEL THIS IS MUCH TOO LITTLE COMING MUCH TOO
LATE .IN THAT SENSE WE FEEL HIS PROGRAM IS NOT SUFFICIENTLY
STRONG ENOUGH .WE FEEL HE SHOULD PROPOSE TO CUT DOWN
BY AT LEAST 10 PERCENT IN TWO MONTHS RATHER THAN 50
PERCENT IN 10 YEARS .NOW WE CAN CUT THE DEMAND BY 10
PERCENT IN TWO MONTHS WE FEEL WITH A PROGRAM OF EDUCATING
AMERICANS .WE CALL ON HIM TO ALLOCATE $100 MILLION
FROM THE DEPARTMENT OF ENERGY TO EDUCATE THE AMERICAN
PEOPLE HOW TO CONSERVE ENERGY HOW NOT TO USE
THEIR CARS TAKE ONE MINUTE HOT SHOWERS .

                RESULTS

NO. OF DIPTHONGS  7
NO. OF MURMUR DIPTHONGS  14
NO. OF VOWEL DIGRAPHS  6
NO. OF CONSONANT DIGRAPHS  18
NO. OF R-BLENDS  7
NO. OF S-BLENDS  2
NO. OF L-BLENDS  1
NO. OF OTHER BLENDS  9
NO. OF 3-LETTER BLENDS  1
NO. OF TRIGRAPHS  0

PRESS RETURN WHEN YOU WISH TO CONTINUE


THE READING LEVEL FOR THIS
SELECTION IS APPROX.  10.72

 99  WORDS

 5  SENTENCES

 7 3-SYLLABLE WORDS

IS THERE ANOTHER SELECTION Y/N
N

THE AVERAGE GRADE LEVEL IS  10.72

READY.
```

Figure 6. Test Printout For Detailed Analysis.

```
DO YOU WANT INSTRUCTIONS YES/NO
NO
DO YOU WISH A DETAILED ANALYSIS? YES/NO
YES


HOW MANY LINES OF TEXT
 9
TYPE IN THE LINES ONE AT A TIME.

THE BLACK SQUIRREL WAS SLOWLY DRINKING FROM THE
CLEAR CLEAN WATER .SUDDENLY HE HEARD A NOISE .THE
GLARE OF THE SUN ON THE WATER MADE IT DIFFICULT
TO SEE THE OTHER SIDE OF THE STREAM .HIS MUSCLES
TENSED IN PREPARATION FOR RUNNING WHEN
UNEXPECTEDLY A CLOUD COVERED THE SUN AND A
SMALL BLUE BIRD WAS SEEN DRINKING THE WATER .
THE BLUE BIRD FLEW AWAY .THE BLACK SQUIRREL
RELAXED AND CONTINUED TO DRINK .

                RESULTS

NO. OF DIPTHONGS  4
NO. OF MURMUR DIPTHONGS  14
NO. OF VOWEL DIGRAPHS  7
NO. OF CONSONANT DIGRAPHS  18
NO. OF R-BLENDS  6
NO. OF S-BLENDS  4
NO. OF L-BLENDS  10
NO. OF OTHER BLENDS  4
NO. OF 3-LETTER BLENDS  3
NO. OF TRIGRAPHS  0

PRESS RETURN WHEN YOU WISH TO CONTINUE


THE READING LEVEL FOR THIS
SELECTION IS APPROX.  6.8

 72  WORDS

 6  SENTENCES

 5 3-SYLLABLE WORDS

IS THERE ANOTHER SELECTION Y/N
N

THE AVERAGE GRADE LEVEL IS  6.8

READY.
```

Figure 7.

```
HOW MANY LINES OF TEXT

 11
TYPE IN THE LINES ONE AT A TIME.

NO FURTHER CHANGES ARE EVIDENT ON AIR PHOTOS
UNTIL 1972 WHEN SIX HOUSES SOUTH OF THE SCHOOL ARE
OBSERVED TO BE IN LATE STAGES OF DEMOLITION .
QUESTIONS ARISE .COULD THIS ACTIVITY IN AN AREA ON
THE OTHER SIDE OF PLYMOUTH AVE HAVE ANYTHING TO DO
WITH THE SCHOOL OR IS IT A NEW RESIDENTIAL OR
INDUSTRIAL DEVELOPMENT ?IF THE AREA IS TO BE PART
OF THE SCHOOL HOW IS PLYMOUTH AVE TO BE MADE SAFE
FOR CHILDREN ?THE ANSWER IS THAT PART OF PLYMOUTH
AVE IS NOW PART OF THE SCHOOL GROUND .A PARKING
LOT IS NOW SEEN WHERE THE SIX HOUSES ONCE WERE .

                RESULTS

NO. OF DIPTHONGS  12
NO. OF MURMUR DIPTHONGS  19
NO. OF VOWEL DIGRAPHS  4
NO. OF CONSONANT DIGRAPHS  29
NO. OF R-BLENDS  3
NO. OF S-BLENDS  8
NO. OF L-BLENDS  3
NO. OF OTHER BLENDS  4
NO. OF 3-LETTER BLENDS  1
NO. OF TRIGRAPHS  0

PRESS RETURN WHEN YOU WISH TO CONTINUE


THE READING LEVEL FOR THIS
SELECTION IS APPROX.  9.33333333

 104  WORDS

 6  SENTENCES

 6 3-SYLLABLE WORDS

IS THERE ANOTHER SELECTION Y/N
N

THE AVERAGE GRADE LEVEL IS  9.33333333

READY.
```

Figure 8.

The teacher can make a collection of short stories or paragraphs which are high in the numbers of digraphs or s-blends or all the other phonetic letter combinations. If a child is having difficulty reading or pronouncing words with s-blends, the teacher can give him or her a selection to read from the s-blend collection.

The computer printouts can be used as masters for making duplicating stencils when the teacher finds other students with the same reading difficulty.

Figure 7 shows a paragraph that could be used for practice in murmur dipthongs and digraphs. Also included are examples of paragraphs that can be used in older grade levels to practice consonant digraphs, murmur dipthongs and s-blends (Figure 8), consonant digraphs and r-blends (Figure 9), and all the different types of blends (Figure 10).

I hope that this program will be as useful to you as it has been for me. □


```
DO YOU WANT INSTRUCTIONS YES/NO
NO
DO YOU WISH A DETAILED ANALYSIS? YES/NO
YES


HOW MANY LINES OF TEXT
 10
TYPE IN THE LINES ONE AT A TIME.

NUTRITION IS THE STUDY OF THE WAY
THE BODY TAKES IN FOOD AND HOW THE
FOOD IS USED .IN THE FOOD ARE NUTRIENTS
THAT HELP KEEP THE BODY STRONG AND
HEALTHY .
THE FIVE GROUPS OF NUTRIENTS ARE
PROTEINS MINERALS VITAMINS CARBOHYDRATES
AND FATS .EACH OF THESE ARE NECESSARY
TO KEEP THE BODY RUNNING SMOOTHLY .
NUTRITION IS TAUGHT AS A PART OF THE SUBJECT OF HEALTH .

                RESULTS

NO. OF DIPTHONGS  2
NO. OF MURMUR DIPTHONGS  7
NO. OF VOWEL DIGRAPHS  6
NO. OF CONSONANT DIGRAPHS  17
NO. OF R-BLENDS  8
NO. OF S-BLENDS  3
NO. OF L-BLENDS  0
NO. OF OTHER BLENDS  2
NO. OF 3-LETTER BLENDS  1
NO. OF TRIGRAPHS  0


PRESS RETURN WHEN YOU WISH TO CONTINUE


THE READING LEVEL FOR THIS
SELECTION IS APPROX.  7.6

 65  WORDS

 5  SENTENCES

 6 3-SYLLABLE WORDS


IS THERE ANOTHER SELECTION Y/N
N

THE AVERAGE GRADE LEVEL IS  7.6

READY.
```

Figure 9.

```
DO YOU WANT INSTRUCTIONS YES/NO
NO
DO YOU WISH A DETAILED ANALYSIS? YES/NO
YES


HOW MANY LINES OF TEXT
 8
TYPE IN THE LINES ONE AT A TIME.

PROTOZOANS CAN ONLY BE SEEN WITH A MICROSCOPE .
THEY ARE THE SMALLEST AND SIMPLEST OF ANIMALS .
EACH PROTOZOAN HAS ONE CELL THAT CARRIES OUT
ALL BODY FUNCTIONS .PROTOZOANS FEED ON MICROSCOPIC
PLANTS AND ANIMALS THAT LIVE IN STAGNANT PONDS .
THEY REPRODUCE THROUGH CELL DIVISION SIMPLY BY
SPLITTING IN TWO .THIS TAKES PLACE RAPIDLY UNDER
FAVORABLE CONDITIONS .

                RESULTS

NO. OF DIPTHONGS  2
NO. OF MURMUR DIPTHONGS  4
NO. OF VOWEL DIGRAPHS  6
NO. OF CONSONANT DIGRAPHS  10
NO. OF R-BLENDS  6
NO. OF S-BLENDS  7
NO. OF L-BLENDS  6
NO. OF OTHER BLENDS  5
NO. OF 3-LETTER BLENDS  2
NO. OF TRIGRAPHS  0

PRESS RETURN WHEN YOU WISH TO CONTINUE


THE READING LEVEL FOR THIS
SELECTION IS APPROX.  7.73333334

 56  WORDS

 6  SENTENCES

 10 3-SYLLABLE WORDS

IS THERE ANOTHER SELECTION Y/N
N

THE AVERAGE GRADE LEVEL IS  7.73333334

READY.
```

Figure 10.

TRUCKER

Richard R. Galbraith

The September issue of Creative Computing *carried a challenge to readers to create "an outstanding simulation which focuses on the urban transportation problem faced by many cities today." We also open up a "free-style" category for those interested in simulations on other topics. "Trucker" was the winner in the second category. The version described and listed here was written for 16K TRS-80. A 32K version will soon be available on tape and disk from Sensational Software by Creative Computing.—EBS*

Trucker is a program which simulates the problems facing a long-haul truck driver. Ideally, you can make a good living hauling freight coast-to-coast without exceeding the legal load limit. If all goes well, you can obey the speed limits and stop each night for eight hours sleep and still make the time schedule. On a good trip you will be able to earn well over $1,000. However, even the the best drivers run into occasional streaks of bad luck and may barely break even.

Bad weather, road construction or a flat tire can place you behind schedule and eat up your profits. You may try to increase your profits by skimping on sleep, driving fast, or carrying an overweight load. However, pushing too hard raises the risk of a traffic accident, and you will be fined if you are caught breaking the law.

Your Truck

You are driving an 18-wheel tractor-trailer combination that can hold 50,000 pounds of cargo (10,000 pounds more than the legal limit). You are buying your truck through a bank loan that requires payment of $1,955 per month, or $85 for each working day. This amount includes reserves for taxes and insurance.

Your truck has a 200-gallon fuel tank and gets 4.5 miles per gallon of diesel fuel. Your mileage decreases when you drive faster or slower than 55 miles per hour. Your fuel gauge is accurate to within 5 gallons and your speedometer is accurate to within 3 miles per hour.

Accidents

It is extremely unlikely that you will be involved in a traffic accident in good weather if you drive at a reasonable speed and get enough rest. The danger increases dramatically if you drive at an excessive rate of speed, fail to slow down in fog or a blizzard, or continue driving after you have become fatigued. An exhausted driver speeding through a snow storm is asking for trouble.

There is always the danger of losing time due to a flat tire. This danger can be reduced by purchasing retreads or more expensive tires before you start your trip, and by promptly replacing your spare tire after a flat.

Speeding

The speed limit is 55 miles per hour unless otherwise posted. Generally, Smokey will allow some leeway before pulling you over, but the faster you go the more likely you are to attract his attention. There are also a couple of places along the way where a radar speed trap may be in operation with strict enforcement.

Whenever you get a traffic ticket, you will lose time as you wait to pay your fine at the Justice of the Peace. If you receive more than three traffic tickets, you lose your Interstate Commerce Commission driver's license.

Truck Stops

Every three or four hours you will approach a truck stop. Each stop will take at least one hour while you get coffee, fuel and a spare tire if necessary. The price of diesel fuel and tires will vary unpredictably, but diesel fuel will average about $1.00 per gallon.

Truck stops are also the only places where you can sleep. You may choose when to sleep, but, if you attempt to sleep during the day, you will be disturbed by traffic noise.

Cargo

You can select one of three types of cargo to haul for each trip:

1. U.S. Mail: This contract will pay $.0475 per pound, or $1,900 for a 40,000 pound load upon delivery.
2. Freight Forwarding: This contract pays $.05 per pound, or $2,000 for a load. However, there is a 10% penalty that is subtracted if you are more than 12 hours late in delivering your freight.
3. Oranges: This contract will pay $.065 per pound of good oranges delivered to New York, which amounts to $2,600 for a standard load. You are required to run the air-conditioning unit in your trailer in order to keep the oranges from rotting or freezing. You will burn 7 gallons of diesel fuel per hour while you sleep.

Routes

You can choose one of three routes; the northern route, the middle route or the southern route. Let's look at each route in detail:

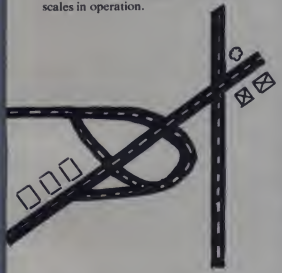
Northern Route

This route is the shortest but also the riskiest. You will leave from Los Angeles on Interstate 15 and drive through Las Vegas and Denver. You then take Interstate 80 through Nebraska, northern Ohio and Pennsylvania. The total mileage is 2,710. You will pay a total of $195 in tolls and have one chance in eight of avoiding weighing stations. The danger of bad weather is high, and the speed limit is vigorously enforced.

Richard R. Galbraith, 2124 E. Fremont Dr., Tempe, AZ 85282.

Middle Route

The middle route follows old Route 66 from Los Angeles through northern Arizona and Oklahoma into St. Louis. Then you cut over to the Pennsylvania Turnpike and follow through to New York. The total distance to New York is 2,850 miles. The toll road portions will cost you $240 in fees. This route has fewer Smokies watching your speed and the weather conditions are much more favorable than the Northern route. However, watch the weight in your trailer since there are usually several truck scales in operation.



Southern Route

This route takes you from Los Angeles on Interstate 10 through Arizona, New Mexico and Texas. You then follow Interstate 20 to Atlanta before heading north to Washington, D.C. The last leg of your journey follows Interstate 95 up the Atlantic coast. The mileage is 3120, much longer than the other routes. However, it is the safest route because you avoid much of the bad weather. Tolls amount to only $95 and you will run into fewer police and fewer truck scales. If you cannot resist the temptation to take on an over-weight cargo or if you have a lead foot, this is the best route for you to take. □

Program begins on page 176.

TRUCKER/16K

```
10    CLS
      :PRINT@220,"TRUCKER"
20    PRINT@336,"by Richard Galbraith, Tempe, AZ"
30    PRINT@404,"Copyright  October  1980"
40    PRINT@534,"All rights reserved"
50    GOSUB5650
      :GOSUB5650
      :RANDOM
      DEFINTC-S
70    :DIMMT(2),MP(2,25),MP$(2,25),MK$(2,25),ZM(2,25),D$(6),NI$(4)
80    DD$="$$#,###.##"
      :DC$="$$#,###.##"
90    NI$(1)="First"
      :NI$(2)="Second"
      :NI$(3)="Third"
      :NI$(4)="Fourth"
92    DS$(0)="Monday"
      :DS$(1)="Tuesday"
      :DS$(2)="Wednesday"
94    DS$(3)="Thursday"
      :DS$(4)="Friday"
      :DS$(5)="Saturday"
      :DS$(6)="Sunday"
1000  CLS
      :XC=190
      :MF=0
      :ML=3
      :MS=7
      :MR=0
      :GOSUB2100
1010  PRINT@128,""
1020  PRINT"You are at the Los Angeles Trucking Terminal"
1030   PRINT"Three types of cargo are available
      :"
1040   PRINTTAB(5)"1--ORANGES  (highest profit IF they don't spoil)"

1050   PRINTTAB(5)"2--FREIGHT FORWARDING   (penalty for late deliver
       y)"
1060   PRINTTAB(5)"3--U.S. MAIL  (lowest rate, but no hurry to arriv
       e)"
1070   PRINT"The cargo is due in New York BY 4 pm on Thursday."
       :INPUT"Which type of cargo do you want";CT
1080   IFCT<1ORCT>3INPUT"PICK A NUMBER
       : 1, 2, OR 3";CT
       :GOTO1080
1090   INPUT"How many pounds will you carry (40000 is the LEGAL limi
       t)";WL
1100   IFWL<25000 PRINT"You can't make a living on half a load."
       :GOTO1090
1110   PRINT
       :PRINTTAB(5)"They are loading your truck now."
1120   RESTORE
1150   FORRT=0TO2
       :READNP,NT(RT)
       :FORI=1TONP
```

```
1170    READMP(RT,I),MP$(RT,I),MK$(RT,I),ZM(RT,I)
        :NEXTI,RT
1190    TC=10
        :WF=190
        :NF=1
        :TS=1
        :SL=55
        :XN=XN+1
1200    IFWL>50000THENWL=50000
        :PRINT"50,000 pounds of cargo has filled your trailer!"
        :GOSUB5650
1220    HR=HR+1
        :CLS
        :GOSUB2100
        :PRINT@128,""
1225    PRINT"You paid $ 190 for a nearly full tank of Diesel."
        :PRINT
1230    INPUT"Two of your tires are worn.  Do you want replacements";
        Z$
1240    IFLEFT$(Z$,1)="N"ORLEFT$(Z$,1)="n"THENI350
1250    PRINT"A NEW tire costs $200.   A RETREAD costs $100."
        :PRINTTAB(5)$
1260    INPUT"Which type do you want";Z$
        :PRINTTAB(5)$  ,
        :Z$=LEFT$(Z$,1)
1270    INPUT"How many";I
1280    IFI=3IFZ$="N"ORZ$="n"THENI5=2
        :I=2
        :XC=XC+200
1290    IFI<0ORI>2THENI330
1300    IFI=0THENI350
1310    IFZ$="R"ORZ$="r"THENIL=IL-3*I
        :XC=XC+100*I
        :GOTO1350
1320    IFZ$="N"ORZ$="n"THENIC=IC+4*I
        :XC=XC+200*I
        :GOTO1350
1330    PRINT"I did not understand your answers."
        :PRINT"Let's try again
        :"
        :PRINTTAB(5)$
        :GOTO1230
1350    PRINT
        :PRINT"You may choose the Northern, Middle or Southern route."

1360    INPUT"   Which route do you choose";Z$
        :Z$=LEFT$(Z$,1)
1365    IFZ$="N"ORZ$="n"THENKT=1
        :RH=4
        :GOTO 1600
1370    IFZ$="M"ORZ$="m"THENKT=0
        :RH=2
        :GOTO 1600
1375    IFZ$="S"ORZ$="s"THENKT=2
        :RH=1
        :GOTO 1600
```

CALIFORNIA

Advance Data Concepts—2280 Diamond Blvd., Concord, 94520; (415) 671-9016. 9-5 Mon-Fri. Vector-Graphic, CP/M Software Headquarters-User's Group.

D.E.S. Data Equipment Supply—8315 Firestone, Downey 90241. (213) 923-9361. 7 days. Commodore PET specialists. Hardware Software, Books, Mags, Supplies, In House Maintenance.

Rainbow Computing, Inc.—9719 Reseda Blvd., Northridge 91324; (213) 349-5560. 10-7 Tues-Fri, 10-5 Sat, 12-5 Sun. Apple, DEC, and Atari. Authorized Sales and Service.

CONNECTICUT

Computerworks—1439 Post Rd., East Westport 06880; (203) 255-9096. 12-6 Tues-Fri, 12-9 Thu, 10-5 Sat.

FLORIDA

AMF Electronics—11158 N. 30th St, Tampa 33612; (813) 971-4072. 10-6 Mon-Sat. Apple Computer Sales & Service; TRS-80, Apple Software & Peripherals; S-100 boards, computer parts & books.

GEORGIA

Atlanta Computer Mart—5091 Buford Hwy, Atlanta 30340; (404) 455-0647. 10-6 Mon-Sat

ILLINOIS

Computer Junction—543 S. York Rd., Elmhurst 60126; (312) 530-1125. Mon & Thu 9:30-8:30 pm; Tues-Sat 9:30-5:30; Sun 12-4:30.

ComputerLand/Downers Grove—136 Ogden Ave, Downers Plaza 60515; (312) 964-7762. 10-6 Mon-Sat, 10-8 Tue, Thu.

Data Domain of Schaumburg—1612 E. Algonquin Rd., Schaumburg 60195; (312) 897-8700. 12-9 Tues-Fri, 11-5 Sat. Apple, Alpha Micro, Hewlett-Packard Calculators. Largest book and magazine selection.

Farnsworth Computer Center—1891 N. Farnsworth Ave, Aurora 60505; (312) 851-3888. M-F 10-8, Sat. 10-5 Apple, Hewlett-Packard, Corvus, HP Calculators, IDS-440G printers.

Lillipute Computer Mart, Inc.—4446 Oakton, Skokie 60076; (312) 674-1383. M-F 10:30-8 pm, Sat 10-6. We sell Cromemco, Cimix, Bell & Howell, NorthStar and others. Starting our fifth year in business.

Video Etc.—465 Lake Cook Plaza, Deerfield 60015; (312) 498-9669; Open Everyday. Strong software support for Apple, Atari.

MASSACHUSETTS

Neeco—679 Highland Ave, Needham 02194; (617) 449-1760. 9-5:30 Mon-Fri. Commodore, Apple, Superbrain, TI 99/4.

MICHIGAN

Upstate Computer Shop—629 French Rd., Campus Plaza, New Hartford 13413; (315) 733-9139; Mon—Fri 10—6, Sat 11—5. Apple—Commodore—Data General.

NEVADA

Home Computers—1775 E. Tropicana #6, Las Vegas 89109 (702) 798-1022. 10-7 Mon-Sat. Apple, Commodore, Atari, AIM 65, (Books) Sales & Service.

NEW JERSEY

Computermook—Rt. 46, Pine Brook Plaza, Pine Brook 07058; (201) 575-9468. 10-6:30 MTWS, 10-8 Thurs., Fri. Apple/Commodore Authorized dealer.

Silent Partner—2050 Center Ave., Fort Lee 07024; (201) 947-9400; Mon-Sat 10-6. Apple/Atari/Commodore/Vector/Malibu.

Stonehenge Computer Shop—89 Summit Avenue, Summit 07901; (201) 277-1020. 10 am - 6:30 pm Mon-Sat. Apple/Bell & Howell/Commodore Authorized Dealer, Sales and Service.

Software City—111 Grand Ave., Riveredge 07661; (201) 342-8788. Ed/Rec/Home Programs for TRS-80, Atari, Apple and PET. 10-25% off list.

NEW YORK

Computer Center—28251 Ford Rd. Garden City (313) 425-2470 Books, Magazines, Hardware and Software for Apple, Northstar, TRS80, & Pet.

OHIO

Abacus II—1417 Bernath Pkwy., Toledo 43615; (419) 865-1009.

The Basic Computer Shop—2671 W. Market St, Akron 44313; (216) 867-0808. 10-6 Mon-Sat.

Micro Mini Computer World—74 Robinwood Ave., Columbus 43213; (614) 235-5813/6058. 11-7 Tues-Sat. Authorized Apple/Commodore dealer. Sales, Service, Business Software.

PENNSYLVANIA

Personal Computer Corp.—24-26 W. Lancaster Ave, Paoli 19301; (215)647-8463. 10-6 Mon-Fri, 10-8 Wed, 10-5 Sat.


```
1380    PRINT"Please, answer
       : NORTH, MIDDLE, or SOUTH !"
1385    GOTO1360
1400    AF=SP↑2*CD*CR
1420    IFAF>RND(0)*1E7GOTO4000
1430    AF= SQR(MF+100)*TC
1440    IFAF>RH*25000*RND(0)GOSUB2600
1450    IFSP>SL·RH+10GOSUB2300
1460    HR= HR+1
       :HL=HL+1
1470    IFSL<40THENSL=55
1480    T=ABS(55-SP)
       :IFT>12THENT=12.5
1490    T1= SP/(4.5 -0.2*I)
1500    WF=WF-T1
       :IFWF<0GOSUB2500
1510    MF= MF+SP
1520    IFMF>MT(RT)THEN5000
1530    GOSUB5650
1550    CLS
       :GOSUB 2100
1560    PRINT@64,"Approximate FUEL
       :";INT(WF-5)+RND(10);TAB(36)"SPEED
       :";SP
1570    PRINTTAB(8)"Odometer
       :";MF;TAB(30)"Miles to go
       :";MT(RT)-MF
1580    PRINT
1600    IFMP(RT,NP)<=MFGOTO3100ELSEPRINT"Cruising on ";MR$(RT,NP)
1610    GOSUB 3000
       :PRINT"You are feeling ";LD$
1620    GOSUB 2800
       :PRINT"Current weather
       : ";CR$
1630    NS=NS+1
       :IFNS>3GOSUB1700
1640    INPUT"How fast do you wish to go";SP
1650    IFSP<20PRINT"YOU HAVE TO GO AT LEAST 20 -- ";
       :GOTO1640
1660    IFSP>INT(1.5*SL)THENSP=INT(1.5*SL)
       :PRINT"You can only get the old rig to go";SP;"mph on this roa
        d."
1670    GOTO 1400
1700 REM
1710    INPUT"TRUCK STOP AHEAD.   Do you want to stop";Z$
1720    IFLEFT$(Z$,1)="N"ORLEFT$(Z$,1)="n"THENNS=1
       :HL=HL+1
       :RETURN
1730    IFLEFT$(Z$,1)<>"Y"ANDLEFT$(Z$,1)<>"y"INPUT"MAKE UP YOUR MIND.
            YES or NO";Z$
       :GOTO1720
1740    T= 85 +INT(35*RND(0))
1750    PRINT"Diesel fuel costs";T;"cents a gallon."
1760    INPUT"    How many gallons do you want";I1
1770    IF T1>0 PRINT"PAY";
       :PRINTUSING"$$$$$.##";T*T1/100
       :XC=XC+T*T1/100
       :WF=WF+T1
1780    PRINT"So far, you have spent ";
       :PRINTUSING DC$;XC
1790    IF WF> 201 PRINT"Your tank only holds 200 gallons --";INT(WF-
        200);"gallons spilled !!"
       :WF=200
1800    IFTS>0THEN1900
1810    T=200+INT(50*RND(0))
       :T1=100 +INT(70*RND(0))
1820    PRINT"A NEW tire costs $";T;"    a RETREAD costs $";T1
1830    INPUT"    Do you want to buy a tire";Z$
1840    IFLEFT$(Z$,1)="N"ORLEFT$(Z$,1)="n"THEN1900
1850    INPUT"    Choose
       :  New or Retread";Z$
1860    IFLEFT$(Z$,1)="N"ORLEFT$(Z$,1)="n"THENXC=XC+T
       :TS=2
       :GOTO1900
1870    IFLEFT$(Z$,1)="R"ORLEFT$(Z$,1)="r"THENXC=XC+T1
       :TS=1
       :GOTO1900
1880    PRINT"I DID NOT UNDERSTAND YOUR ANSWERS."
       :GOTO1830
1900    HR= HR+1
       :NS=0
1910    INPUT"Do you want to get some sleep";Z$
1920    IFLEFT$(Z$,1)="N"ORLEFT$(Z$,1)="n"GOSUB2100
       :RETURN
1930    INPUT"    How many hours of rest";I
1940    IFT<1RETURN
1950    DH= HR -24*INT(HR/24)
1960    HR=HR+1
       :GOSUB5650
       :GOSUB5650
       :IFCT=1THENWF=WF-7*I
       :IFWF<0THENWF=0
       :GOSUB2570
1970    IF DH>21 OR DH<12 THEN I=INT(I/2+.6)
       :PRINT"Thanks to the daytime noise, you got only";I;"hours rea
        l sleep."
1980    HS=HS+1
1990    IFT>3THENHL=0ELSEHL=HL/2
2000    GOSUB5600
2010    GOSUB2100
       :PRINT"Time to hit the road again."
2015    IFCT=1PRINT"You now have ";
       :PRINTUSING"###";WF;
       :PRINT" gallons of fuel"
       :INPUT"Do you want to buy more";Z$
       :IFLEFT$(Z$,1)="Y"ORLEFT$(Z$,1)="y"THEN1740
2020    RETURN
2100    DH=HR+8
2120    DT=INT(DH/24)
       :DH=DH -24*DT
2130    IFDT>6THENDT=DT-7
       :GOTO2130
2140    DM$="am"
2150    IF DH=12 THEN DM$="noon"
       :GOTO 2200
```

```
2160    IF DH>12 THEN DH=DH-12
       :DM$="pm"
2170    IF DH=0 THEN DH=12
       :DM$="midnight"
2200    T=PEEK(16416)
       :T1=PEEK(16417)
2210    PRINT@13,"Day
       : ";DS$(DT);TAB(37)"Time
       :";DH;DM$;"        ";
2220    POKE16416,T
       :POKE16417,T1
2230    RETURN
2300 REM
2310    IF(SP-SL+2*RH-5)↑2<900*RND(0) RETURN
2320    PRINT"SMOKEY is behind you with his lights on.   PULL OVER!"
2340    GOSUB5650
2350    NT=NT+1
       :PRINT"See the JUSTICE of the PEACE for your ";NT$(NT);" offen
        se"
2360    PRINT"    Wait";NT;"hours for your hearing"
2370    HR=HR+NT
       :HL=HL+NT
2380    IF NT>3 THEN 2430
2390    T=NT*RND(5)
       :T1= 5*(RT+NT*RND(4))
2400    PRINT"    FINE is ";
       :PRINTUSING"$###";T1;
       :PRINT" plus $";T;"for each MPH over the limit."
2410    PRINT"    PAY ";
       :PRINTUSING DD$;T1+T*(SP-SL)
       :XC=XC+T1+T*(SP-SL)
2420    GOSUB5650
       :GOSUB5650
       :RETURN
2430    PRINT"  You are sentenced to 30 Days in Jail for reckless dri
        ving."
2440    GOSUB5650
2450    PRINT"Your I.C.C. Driver's License is revoked !"
2460    GOTO5500
2500    T1=T1+WF
       :WF=0
       :SP=0
2520    T=(4.5 -0.2*T)*T1
       :MF=MF+T
2530    PRINT"After";T;"more miles, you ran out of fuel  (DUMMY !!)"
2540    PRINT"    It cost $ 200 to get a barrel of diesel delivered."
2550    WF=55
       :T1=RND(5)
       :HR=HR+T1
       :XC=XC+200
       :HL=HL+T1
2560    PRINTTAB(5)"    You also wasted";T1;"hours by your carelessne
        ss."
2570    IF CT=1 THEN CX=CX+RND(3)
       :PRINT"    Sitting with the refer unit off is damaging the ora
        nges."
2580    FOR I=1 TO 500
       :NEXTI
2590    RETURN
2600    GOSUB5600
2620    PRINT"You just blew a tire !!"
2630    IF TS=0 THEN 2710
2640    TC=TC -2*TS
       :TS=0
2650    T=RND(2)
       :IF T=1 THEN T$="outside" ELSE T$="inside"
2660    PRINT"    It took";T;"hours to change the ";T$;" tire."
       :HR=HR+T
       :HL=HL+T+1
2670    GOSUB5650
       :RETURN
2710    PRINT"Since your spare has already been used, you have to cal
        l a tow  truck from town to deliver a new tire to you."
2720    PRINT"    This service cost $ 400 and took 4 hours."
2730    HR=HR+4
       :HL=HL+4
       :XC=XC+400
2740    GOSUB5650
       :RETURN
2800 REM
2810    AF=(3000 + MF)*RND(0)
       :ON (RT+1) GOTO 2870,2820,2910
2820    IF AF<3300 AND CR<>50 THEN 2960
2830    IF AF>4800 THEN 2965
2840    IF AF>4600 THEN 2970
2850    IF AF>3800 THEN 2975
2860    GOTO2985
2870    IF AF<3400 AND CR<>50 THEN 2960
2880    IF AF>4900 THEN 2965
2890    IF AF>4700 THEN 2970
2900    IF AF>4200 IF RND(3)=1 THEN 2975 ELSE 2980
2905    GOTO2985
2910    IF AF<4000 AND CR<>50 THEN 2960
2920    IF AF>5700 THEN 2965
2930    IF AF>5500 THEN 2970
2940    IF AF>4400 THEN 2980
2950    GOTO2985
2960    CK=1
       :CK$="CLEAR & DRY"
       :RETURN
2965    CK=50
       :CK$="B-L-I-Z-Z-A-R-D  !!"
       :RETURN
2970    CK=10
       :CK$="FOG -- Limited visibility"
       :RETURN
2975    CK=5
       :CK$="LIGHT SNOW"
       :RETURN
2980    CK=5
       :CK$="RAIN"
       :RETURN
```

```
2985    CK=3
        :CK$="CLEAR, but roadway is wet"
        :RETURN
3000 REM&#
3010    IF HL>19 OR HK/HS>4 THEN CU=100
        :CU$="..E.X.H.A.U.S.T.E.D.."
        :RETURN
3020    IF HL<4 AND CSNG(HK/HS)<2.3 THEN CU=1
        :CU$="RESTED & READING TO GO."
        :RETURN
3030    IF HL<8 AND CSNG(HK/HS)<2.5 THEN CU=2
        :CU$="FINE"
        :RETURN
3040    IF HL<12 AND HK/HS<=3 THEN CU=4
        :CU$="  B U R E D"
        :RETURN
3050    IF HL<16 AND HK/HS<=3 THEN CU=8
        :CU$="  T I R E D  !!"
        :RETURN
3060    CU=25
        :CU$="FATIGUED...You're getting sleepy"
        :RETURN
3100 REM
3110    PRINT"You have just passed "$MP$(K1,MP)
3120    ZH=ZM(K1,MP)
        :SL=55
3130    ON INT(ZH) GOSUB 3210,3310,3360,3410,3500,3710,3860
3140    MP=MP+1
        :IF INT(ZH)=8 THEN 5000 ELSE 1600
3210    PRINT"Time Zone changes -- Set clock ahead one hour"
3220    HK=HK+1
        :GOSUB 2100
3230    RETURN
3310    T=1000*(ZH-INT(ZH))
3320    PRINT"$TOP!    PAY TOLL OF "$
        :PRINTUSING"$$$.$$"!!
3330    XC=XC+1
3340    RETURN
3360    IF KND(0)< ZH -INT(ZH) RETURN
3370    PRINT"CONSTRUCTION AHEAD !!"
        :FOR I=1 TO 500
        :NEXT
3380    PRINT"SLOW DOWN -- SPEED LIMIT 35 mph"
        :SL=35
3390    RETURN
3410    IF KND(0)< ZH -INT(ZH) RETURN
3420    T=SP *KND(5) -2
3430    PRINT"You were just clocked by KAVAK at"!!"mph"
3440    IF T> SL+3 GOSUB 2320 ELSE PRINT"    No ticket this time."
3450    RETURN
3500    IF ZH=INT(ZH) IF KND(0)<.5 THEN 3520 ELSE RETURN
3510    IF KND(0)< ZH -INT(ZH) RETURN
3520    PRINT"WEIGHING STATION OPEN --  TRUCKS MUST STOP"
        :GOSUB5650
3530    PRINT"Scale weighs truck with cargo, fuel & driver
        : "!
```

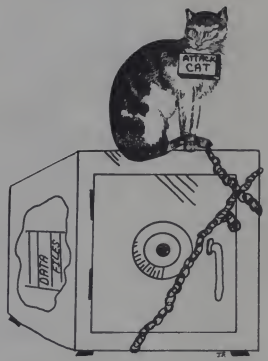

```
3540    T=19000 +WL +7*WF +25*KND(10)
3550    PRINTUSING"$$,$$$"!!
        :PRINT" POUNDS."
3560    T=INT(T-60000)
3570    IF T<1 PRINT"      You're O.K."
        :RETURN
3580    IF ZH=5.00 THEN 3630
3590    T1=KND(4)*2
        :PRINT"    Overweight fine is $ 200 plus"!!"cents/Pound"
3600    XC=XC+200*(T*11)/100
3610    PRINT"Pay fine of"$
        :PRINTUSING DC$;200*(T*11)/100
3620    RETURN
3630 REM
3640    PRINT"You are not allowed to enter Louisiana with that load."
3650    PRINT"    Take a 200 mile detour through Arkansas with 45 mph
        limit."
3660    SL=45
        :MK$(K1,MP)="Arkansas County Roads"
3670    FOR I=12 TO 25
        :MP(K1,I)=MP(K1,I)+200
        :NEXT
3680    M1(K1)=M1(K1)+200
3690    RETURN
3710    IF KND(0)< ZH -INT(ZH) RETURN
3720    T=KND(6)
3730    PRINT"A ROCK SLIDE has blocked the Alleghany tunnel entrance"

3740    PRINT"    The highway Department will have it cleared in"!!"
        hours"
3750    HK=HK+1
        :GOSUB5650
        :IF CT=1 THEN WF=WF-7*1
        :IF WF<=1 GOSUB3820
3760    IF T>1 THEN T1=INT(T/2 +.5) ELSE T1=0
3770    IF T1>3 THEN HL=0 ELSE IF T1>0 HL=HL/2
3780    HS=HS+11
3790    PRINT"    While waiting, you sat"!!"hours of sleep"
3800    GOSUB 2100
        :RETURN
3820    PRINT"    You ran out of gas while waiting"
        :T=0
        :GOSUB2540
3830    RETURN
3860    IF CT>1 RETURN
3870    IF KND(0)< ZH - INT(ZH) RETURN
3880    PRINT"The trailer refrigeration unit has failed endangering t
        he cargo"
3890    PRINT"    Repairs take 2 hours and cost $ 100"
3900    CX=CX +KND(4)
        :HK=HK+2
        :HL=HL+2
        :XC=XC+100
        GOSUB2100
        :GOSUB5650
3920    RETURN
```

```
4000    GOSUB5600
4020    FOR I=1TO6
4030    CLS
        :FOR J=1 TO 60
        :NEXTJ
4040    PRINT@400,CHR$(23);"C R A S H  !!"
4050    FOR J=1 TO 60
        :NEXTJ:I
4060    PRINT
4070    IF CD=100 OR (CD=25 AND SP<65) PRINT"You fell asleep at the w
        heel"
        :GOTO4130
4080    IF CR=50 PRINT"You drove off the road into       a snow fille
        d ditch"
        :GOTO 4130
4090    IF CR=10 PRINT"You rear-ended a Pick-up with no tail lights"
        :GOTO 4130
4100    IF SP>65 PRINTTAB(8)"SPEED KILLS !"
        :GOTO4130
4110    IF CR>2 PRINT"You hit a slick spot"
        :PRINT"  and skidded off the road."
        :GOTO 4130
4120    PRINT"A drunk driver rammed your rig"
        :PRINTTAB(8)"TOUGH LUCK !"
4130    PRINT
        :GOSUB5650
4140    PRINT"You lose your truck & profits"
        :PRINT
        PRINT
4150    :INPUT"Do you want to start over";Z$
4160    IF LEFT$(Z$,1)="N" OR LEFT$(Z$,1)="n" THEN CLS
        :END
4170    XP=0
        :CLS
        :GOTO 1000
5000    FOR I=1TO5
5020     CLS
        :FOR J=1 TO 60
        :NEXTJ
5030    PRINT@152,CHR$(23);"WELCOME"
        :PRINT@286,"TO"
        :PRINT@408,"NEW YORK"
5040    FOR J=1 TO 60
        :NEXTJ:I
5050    FOR I=1 TO 250
        :NEXTI
        :CLS
5100    GOSUB2100
        :PRINT@64,""
        T=HR -INT(HR/24)
5110    IF T<10 OR T>21 THEN 5140
5120    PRINT"The warehouse is closed for the night.  Come back tomor
        row."
5130    T=24-I
        :HR=HR+T
        :GOSUB5650
        :GOSUB2100
```

```
5140    PRINT
        :T=INT(HR/24)
        :T1=HR -24*T
5150     PRINT"You completed the trip in";T;"days";
5160    IF T1>1 PRINT" &";T1;"hours." ELSE PRINT
5170    PRINT"    Trip expenses totaled ";
        :PRINTUSING DL$;FX
5180    T1=85*T +85
        :PRINT"   Truck payments, insurance & taxes cost ";
        :PRINT USING DD$;T1
5190    XE=XE+T1
        :PRINT
5200     ON C1 GOTO 5220,5310,5360
5220     T1=(C1-4)*RND(3)
        :IF T1>0 THEN CX=CX+T1
5230    IF CX>6 PRINT"Your oranges have spoiled.  Haul them to the d
        ump!"
        :XT=-50
        :GOTO5400
5240    PRINT"Collect six-and-a-half cents per pound for 8000 oranges
        ."
5250     XT=.065*WL
        :PRINT"    Total for the load
        : ";
        :PRINTUSING DC$;XT
5260    IF CX<1 THEN 5400
5270    PRINT"    Part of the load is damaged.  Subtract ";
        :PRINTUSING"##";5*CX;
        :PRINT"%."
        XT=XT -XT*CX/20
        :PRINT"    Net Payment is ";
        :PRINTUSING DC$;XT
5290    GOTO5400
5310    XT=.05*WL
        :PRINT"Collect five cents a pound for freight."
5320    PRINT"    Total for load = ";
        :PRINTUSING DC$;XT
5330    IF HR<95 THEN 5400
5340    CX=2
        :PRINT"    You're late!!  Subtract ten percent penalty."
        :GOTO5290
5360    PRINT"Postmaster pays 4.75 cents per pound on deliverys."
        :XT=.04/5*WL
        :CX=0
        :GOTO 5290
5400    PRINT
        :XT=XT-XL
        :XP=XP+XT
        :IF XT<0 THEN 5470
5410    PRINT"Your Net Profit this trip was ";
        :PRINTUSING DC$;XT
5420    IF XT>1000 PRINT"   G O O D    W O R K  !!"
5430    IF XN>1 PRINT"    Your Average Profit has been";
        :PRINTUSING DC$;XP/XN
5440    IF XT<200 OR XP/XN<250 PRINT"    You'd make more money washin
        g dishes !"
```

```
5450   PRINT
       :PRINT
       :INPUT"Do you want to make another trip"$Z$
5460   IF LEF$(Z$,1)<>"N" AND LEF$(Z$,1)<>"n" THEN 1000 ELSE CLS
5470   END
       PRINT"BAD TRIP. . . You lost"!
       :PRINTUSING DL$;ABS(XT)
5480   IF XP>0 GOTO 5430
5490   PRINT"     You are BANKRUPT !!!"
5500   GOSUB5650
       :GOSUB5650
5520   PRINT
       :PRINT"Your car has been repossessed."
5530   PRINT
       :END
5600   FOR1=1TO12
       :POKE14308,1
       :FOKJ=1TO3
       :POKE14308,2
       :FOKJ=1TO3
       :NEXTJ,I
       :RETURN
5650   FOR1=1TO800
       :NEXTI
       :RETURN
9030   DATA 21,2650
9040   DATA 90,BAKSTOW,1-15 in California,7.80
9050   DATA225,NELMLES,1-40 in California,1
9060   DATA 440,FLAGSTAFF,1-40 in Arizona,3.65
9070   DATA 620,GALLUP,1-40 in Arizona,5.5
9080   DATA 760,ALBUQUERQUE,1-40 in New Mexico,3.35
9090   DATA 930,TUCUMCARI,1-40 in New Mexico,1
9100   DATA 1040,AMARILLO,1-40 in Texas,7.80
9110   DATA 1155,OKLAHOMA Border,1-40 in Texas,5.5
9120   DATA 1305,OKLAHOMA CITY,1-40 in Oklahoma,2.65
9130   DATA 1530,MISSOURI Border-OKlahoma Turnpike,2.40
9140   DATA 1815,ST. LOUIS,I-44 in Missouri,0
9150   DATA 1980,TERRE HAUTE,I-70 in Illinois,5.5
9160   DATA 2050,INDIANAPOLIS,I-70 in Indiana,0
9170   DATA 2115,OHIO Border,I-70 in Indiana,1
9180   DATA 2220,COLUMBUS,I-70 in Ohio,5.5
9190   DATA 2350,WHEELING West Virginia,I-70 in Ohio,4.25
9200   DATA 2410,NEW STANTON,I-70 in Pennsylvania,6.75
9210   DATA 2570,HARRISBURG,Pennsylvania Turnpike,3.75
9220   DATA 2760,NEW JERSEY Border,Pennsylvania Turnpike,2.95
9230   DATA 2840,HOLLAND TUNNEL,I-70 in New Jersey,2.40
9240   DATA 9999,NEW YORK,New York Streets,0
9250   DATA 10,2710
9260   DATA 90,BAKSTOW,I-15 in California,7.80
9270   DATA 245,LAS VEGAS,I 15 in California,1
9280   DATA 365,UTAH Border,I-15 in Arizona,0
9290   DATA 500,end of Interstate,I 15 in Utah,3.20
9300   DATA 550,SALINA,US-89 in Utah,4.50
9310   DATA 760,GRAND JUNCTION,I-70 in Utah,5.40
9320   DATA 1010,DENVER,I-70 in Colorado,3.75
9330   DATA 1190,NEBRASKA Border,I-76 in Colorado,1
9340   DATA 1450,OMAHA,I-80 in Nebraska,5.50
9350   DATA 1590,DEMOINES,I-80 in Iowa,4.75
9360   DATA 1750,ILLINOIS Border,I-80 in Iowa,5.6
9370   DATA 1910,GARY,I-80 in Illinois,2.50
9380   DATA 2050,OHIO Border,Indiana Turnpike,2.45
9390   DATA 2215,CLEVELAND,Ohio Turnpike,2.80
9400   DATA 2280,PENSYLVANIA Border,I-80 in Ohio,4.16
9410   DATA 2615,EAST STROUDSBURG,I-80 in Pennsylvania,3.55
9420   DATA 2675,WASHINGTON BRIDGE,I-80 in New Jersey,2.20
9430   DATA 9999,NEW YORK,City Streets,0
9450   DATA 25,3120
9460   DATA 75,PALM SPRINGS,I-10 in California,0
9470   DATA 225,BLYTHE,I-10 in California,1
9480   DATA 375,PHOENIX,I-10 in Arizona,0
9490   DATA 495,TUCSON,I-10 in Arizona,7.9
9500   DATA 650,LORDSBURG,I-10 in Arizona,5.75
9510   DATA 795,EL PASO,I-10 in New Mexico,0
9520   DATA 965,PECOS,I-10 in Texas,1
9530   DATA 1080,ODESSA,I-20 in Texas,0
9540   DATA 1250,ABILENE,I-20 in Texas,3.80
9550   DATA 1439,DALLAS,I-20 in Texas,0
9560   DATA 1610,LOUISIANA Border,I-20 in Texas,5.00
9570   DATA 1785,VICKSBURG,I-20 in Louisiana,0
9580   DATA 1965,ALABAMA Border,I-20 in Mississippi,1
9590   DATA 2100,BIRMINGHAM,I-20 in Alabama,4.25
9600   DATA 2200,GEORGIA Border,I-20 in Alabama,0
9610   DATA 2255,ATLANTA,I-20 in Georgia,0
9620   DATA 2329,CAROLINA Border,I-85 in Georgia,5.75
9630   DATA 2545,CHARLOTTE,I-85 in North Carolina,3.80
9640   DATA 2680,VIRGINIA Border,I-85 in North Carolina,7.85
9650   DATA 2775,RICHMOND,I-85 in Virginia,0
9660   DATA 2880,WASHINGTON D.C.,I-95 in Virginia,0
9670   DATA 2920,BALTIMORE,I-95 in Maryland,2.40
9680   DATA 2990,NEW JERSEY Border,I-95 in Delaware,2.25
9690   DATA 3110,HOLLAND TUNNEL,New Jersey Turnpike,2.40
9700   DATA 9999,NEW YORK,City Streets,0
```



Protect Those Data Files!

Charles W. Noah

I was first introduced to computers in an electronics technology course at St. Augustine Technical Center in St. Augustine, Florida. The school had purchased a Heath H8 computer in kit form, which had been assembled by several senior students some two years before I joined the class. It was sitting in a corner of the special projects lab gathering dust because, quite frankly, it didn't work. It had never worked, I was told, and probably never would. Intrigued with this challenge, a fellow classmate and I repaired the damage (a multitude of minor construction errors) and began learning what made it tick.

Basic appeared easier than assembly langauge programming to learn, so I started there. As my programming proficiency (and my software library) grew, I began to see some interest on the part of the school administration in expanding the 16K cassette-based system, as well as developing a computer-science curriculum. The instructors and I put together our list of wants and needs. Nine long and frustrating months later, we had 32K RAM, one disk drive and a printer.

If key substitutions were tried at a rate of one per second, it would take 35,000 years to try them all.

In exchange for the system expansion, I agreed to implement a data management program for the school to use in maintaining student records. It was to be an interactive, on-line system, fast and easy to use. I worked on it for quite some time, and finally it was ready for fine tuning for field use (I thought).

"What about security?" the instructor asked. "Student records are protected by the Privacy Act, you know."

I was stumped. It was relatively easy to keep an inexperienced operator from accessing protected data files, but what about other programmers? By this time, quite a few students had become interested in computers, and some were showing a great deal of promise as programmers. How in the world could I guarantee that the system was secure against them?

The solution to this problem involved several levels. First, the data base management program itself (prepared in Microsoft Basic-80,[1] Rel 5.0) was written to disk in the "P", or protected mode.

Listing 1. Encode Routines Using XOR Command.

```
  KEY INPUT ROUTINE
100 REM  FILE TO BE ENCODED IS A$(1) - A$(N)
110 REM  FIELDS ARE VARIABLE LENGTH - 'L'
120 REM  ERROR TRAPPING IS ELIMINATED FOR CLARITY
130 REM
140 FOR A=1 TO 5                              ! KEY VALUES SHOULD BE BETWEEN 0 AND 255
150 PRINT "TYPE KEY # "; A ;                  ! MUST BE BETWEEN 0 AND 255
          "(3) DIGITS -->"
160 K$(A) = INPUT$(3)                         ! ACCEPTS KEY VALUES, NOT ECHOED TO CRT
170 K(A) = VAL(K$(A))                         ! CONVERTS INPUT KEY TO NUMERIC
180 NEXT A                                    ! INCREMENTS KEY INPUT COUNTER

  TEXT ENCODE ROUTINE
200 FOR X = 1 TO N                            ! ARRAY COUNTER
210 L = LEN(A$(X)): A1 = 0                    ! SETS ARRAY MEMBER LENGTH; KEY CNT TO 0
220 FOR A = 1 TO L                            ! STEPS THRU ARRAY MEMBER CHAR BY CHAR
230 A1 = A1 + 1                               ! INCREMENTS KEY COUNTER
240 MID$(A$,A,1) =                            ! ENCODES CHARACTER 'A'
          MID$(A$,A,1) XOR K(A1)
250 IF A1 = 5 THEN A1 = 0                     ! RESETS KEY COUNTER IF EQUAL TO 5
260 NEXT A                                    ! INCREMENTS MEMBER CHARACTER COUNTER
270 NEXT X                                    ! INCREMENTS ARRAY MEMBER COUNTER
280 FOR X = 1 TO 5
290 K$(X) = "": K(X) = 0                      ! CLEARS KEY VALUES
300 NEXT X
310 REM FILE IS NOW ENCODED, AND CAN BE WRITTEN TO DISK
```

1) Basic-80 is available compatible with CPM, ISIS-II and TEKDOS operating systems.

Charles W. Noah, P.O. Box 492, Pomona Park, FL 32081.

A New Type of Game

Welcome to an astonishing new experience! **ADVENTURE** is one of the most challenging and innovative games available for your personal computer. This is not the average computer game in which you shoot at, chase, or get chased by something, master the game within an hour, and then lose interest. In fact, it may take you more than an hour to score at all, and will probably take days or weeks of playing to get a good score. (There is a provision for saving a game in progress).

The original computer version of Adventure was written by Willie Crowther and Don Woods in Fortran on a PDP-10 at MIT. In this version the player starts near a small wellhouse. Upon entering the house, he finds food, water, a set of keys and a lamp. Armed with only these items, he must set out to explore the countryside in search of treasure and other objects of play. He must also confront dwarfs, snakes, trolls, bears, dragons, birds, and other creatures during his quest. The game accepts one-or two-word commands such as GET LAMP* SOUTH* or KILL DWARF. Of course, if you don't have the proper tool to carry out an action, or if you do something foolish, you may find yourself in big trouble.

In playing the game you wander thru various 'rooms' (locations), manipulating the objects there to try to find 'treasures'. You may have to defeat an exotic wild animal to get one treasure, or figure out how to get another treasure out of a quicksand bog. You communicate thru two-word commands such as 'go west', 'climb tree', 'throw axe', 'look around'.

Adventure

For Apple, TRS-80, Sorcerer, PET, CP/M

ORIGINAL ADVENTURE (by Crowther, Woods, Manning and Roiche!) - Somewhere nearby is a collosal cave where others have found fortunes in treasures and gold, but some who have entered have never been seen again. You start at a small brick building which is the wellhouse for a large spring. You must try to find your way into the underground caverns where you'll meet a giant clam, nasty little dwarves, and much more. **This Adventure is Bi-Lingual —you may play in either English or French—a language learning tool beyond comparison.** Runs in 32K CP/M system (48K required for **SAVE GAME** feature). Even includes SAM76 language in which to run the game. The troll says "Good Luck."

PIRATE ADVENTURE (by Scott Adams) - "Yo Ho Ho and a bottle of rum..." You'll meet up with the pirate and his daffy bird along with many strange sights as you attempt to go from your London flat to Treasure Island. Can you recover LONG JOHN SILVER's lost treasures? Happy sailing matey.....

MISSION IMPOSSIBLE ADVENTURE (by Scott Adams) - Good Morning, Your mission is to... and so it starts. Will you be able to complete your mission in time? Or is the world's first automated nuclear reactor doomed? This one's well named, its hard, there is no magic but plenty of **suspense**. Good luck.....

THE COUNT (by Scott Adams) - You wake up in a large brass bed in a castle somewhere in Transylvania. Who are you, what are you doing here, and WHY did the postman deliver a bottle of blood? You'll love this Adventure, in fact, you might say it's LOVE AT FIRST BITE.....

ADVENTURELAND (by Scott Adams) - You wander through an enchanted world trying to recover the 13 lost treasures. You'll encounter WILD ANIMALS, MAGICAL BEINGS, and many other perils and puzzles. Can you rescue the BLUE OX from the quicksand? Or find your way out of the maze of pits? Happy Adventuring.....

VOODOO CASTLE (by Scott Adams) - Count Cristo has had a fiendish curse put on him by his enemies. There he lies, with you his only hope. Will you be able to rescue him or is he forever doomed? Beware the Voodoo Man.....

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Apple II Disk (48K) Menu-driven machine language disks for only $39.95 each
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CS-4514 Voodoo Castle, The Count and Ghost Town
CS-4504 Haunted House and 4 Outdoor Games (only $24.95)

Pet (24K) Basic cassette
CS-1009 Adventureland and Pirate Adventure, only $19.95

Sorcerer (16K) Machine language cassettes for only $14.95 each
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CS-5004 Pirate Adventure
CS-5005 Mission Impossible
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CP/M 8" Disk (48K) for only $24.95 each
CS-9003 Adventureland and Pirate Adventure (requires MBasic)
CS-9004 Original Adventure, bi-lingual with SAM76 language system.

Order directly from Creative Computing Software Dept. AFGG, P.O. Box 789-M, Morristown, NJ 07960. To Order use hand order form in the back of the magazine. For faster service call in your bank card order to (800) 631-8112. In NJ call (201) 540-0445.

CIRCLE 300 ON READER SERVICE CARD

The "P" mode inhibits listing or altering a protected program by writing it to disk in an encoded binary format. Once saved in this way, a program cannot be reconverted to ASCII. This is a fairly new feature Microsoft has added to their disk Basic interpreter, and may not be available for all personal systems.

Second, data files created by the DBM are passed through an encoding routine before being written to disk (see Listing 1). Each data byte is exclusive OR'd (XOR command) against one of a series of key bytes (five in this example).[2] When read back from disk, each byte is again XOR'd against the same key bytes by the encode routine, and returned to a readable format. Any but the correct key bytes will yield nothing but garbage. The same routine is used to decode as well as to encode.

Referring to Listing 1, notice that the key bytes must be input by the operator, are not echoed to the CRT, and do not appear anywhere in the program itself. Since the program cannot be listed, the key structure is easily concealed.

XORing the data against a series of five key bytes assures an almost impossible-to-decode format, even if the data file could be printed out and examined. Since there are 256 (over 1 trillion) possible key combinations, trial and error key substitutions, even by computer, would not work. If key substitutions were tried at a rate of one per second it would take 35,000 years to try them all.

For those systems whose Basic does not offer the XOR feature, a somewhat slower, but equally effective substitute is shown in Listing 2.

Lastly, as if the above were not enough, the operator is required to input a password (not echoed to the CRT; see Listing 3) to use the program. By the use of further passwords, access to specific routines can be restricted. This allows look-up access to the files without danger of unauthorized changes.

While there may be a way for some sharp hacker to breach the security methods described here, it's going to be mighty hard to do. Certainly, these methods will be sufficient for the security requirements of the average small system owner.

CHALLENGE

At the end of this article is a message encoded using XOR substitution. I challenge any reader to decode the message and publish the results. The message is shown here in ASCII (base 10) because, after coding, much of it consists of non-printing characters. (Hint: There could be more or less than five keys!) □

2) Exclusive OR is a digital logic term which means that if either of two binary bits, but not both, are logic 1, the result is 1. If both bits are logic 1 or both are logic 0, the resultant is 0. See Chart 1 for a demonstration of the XOR function.

```
  KEY INPUT ROUTINE
100 DIM K$(6), K(6), B(9), B1(6,9), C(9) ! INITIALIZE ARRAYS
110 FOR A = 1 TO 5
120 PRINT "TYPE KEY #"; A;                ! MUST BE BETWEEN 0 AND 255
                      "(3 DIGITS) -->"
130 K$(A) = INPUT$(3)                     ! ACCEPTS KEY VALUES 1 - 5
140 K(A) = VAL(K$(A))                     ! CONVERTS INPUT KEY TO ASCII VALUE
150 RESTORE
160 FOR B = 1 TO 8: B1(A,B) = 0
170 READ V1
180 IF K(A) >= V1 THEN B1(A,B) = 1:       ! CONVERTS KEY TO BINARY
                    K(A) = K(A) - V1
190 NEXT B: NEXT A

  TEXT ENCODE ROUTINE
200 FOR X = 1 TO N                        ! ARRAY COUNTER
210 L = LEN(A$(X)): A1 = 0                ! SETS ARRAY MEMBER LENGTH; KEY CNT TO 0
220 FOR A = 1 TO L                        ! STEPS THRU ARRAY MEMBER CHAR BY CHAR
230 A1 = A1 + 1                           ! INCREMENTS KEY COUNTER
240 V$ = MID$(A$(X),A,1)                  ! CONVERTS CHARACTER TO ASCII VALUE
250 V = ASC(V$)
260 RESTORE
270 FOR B = 1 TO 8: B(B) = 0
280 READ V1
290 IF V >= V1 THEN B(B) = 1:             ! CONVERTS ASCII CHAR VALUE TO BINARY
                    V = V - V1
300 NEXT B
310 FOR B = 1 TO 8: C(B) = 0
320 IF B(B) <> B1(A1,B) THEN C(B) = 1     ! XOR'S CHAR AGAINST KEY, BIT BY BIT
330 NEXT B                                ! BUILDS BINARY VALUE OF CODED CHARACTER
340 RESTORE
350 C = 0
360 FOR B = 1 TO 8
370 READ V1
380 C = C + (C(B)*V1)                     ! CONVERTS BINARY VALUE OF CODE TO ASCII
390 MID$(A$(X),A,1) = CHR$(C)             ! REPLACES TEXT CHAR WITH CODED CHAR
400 NEXT A: NEXT X
410 FOR A = 1 TO 5
420 K$(A) = "": K(A) = 0                  ! CLEARS KEY VALUES
430 FOR B = 1 TO 8
440 B1(A,B) = 0
450 NEXT B: NEXT A
500 DATA 128, 64, 32, 16, 8, 4, 2, 1      ! BINARY PLACE VALUES
```

Listing 2. Encode Routines Without XOR Command.

TEXT CHARACTER	"L"
BINARY VALUE	01001100
XOR WITH KEY CHARACTER "A"	01000001
RESULTANT	00001101 <- ENCODED
XOR WITH KEY CHARACTER "A"	01000001
ORIGINAL CHARACTER RETURNED	01001100 <- DECODED

Chart 1. Demonstration of XOR.

```
100 REM SECURITY PASSWORD IS 'PASSWORD'
110 A$ = INPUT$(8)                        ! ACCEPTS 8 CHARACTERS FROM KEYBOARD
                                          ! NO RETURN KEY IS NEEDED AND CHARACTERS
                                          ! ARE NOT ECHOED TO THE CRT
130 IF A$ = "PASSWORD" THEN 200
140 GOTO 130
200 REM END OF PASSWORD ROUTINE



ENCODED MESSAGE - PREPARED IN ASCII, BASE 10

000 253 200 115 214 025 235 216 121 213 027 229 207 122 195 012 235 203 024 201
026 255 195 108 217 027 227 209 107 211 006 228 213 112 217 027 239 192 107 203
031 239 194 112 207 025 255 213 118 212 014 236 206 109 206 001 239 199 118 200
026 254 201 122 200 026 229 206 107 213 014 175 194 112 222 012 174 201 118 201
004 239 210 108 219 014 239
```

Listing 3. Security Password Routine.

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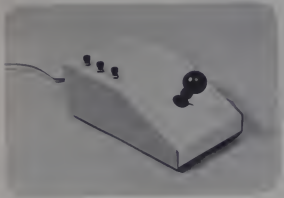

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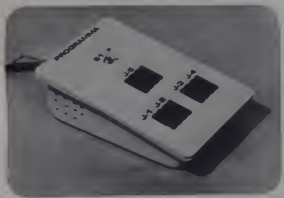

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The PROGRAMMA EXPANDA-PORT is a multi-port expander for the game I/O port of any APPLE II Computer System. In addition to allowing expansion for up to six devices, the EXPANDA-PORT contains a built-in speaker that replaces the function of the Apple II's speaker. The switch on the EXPANDA-PORT allow for the selection of the specific device desired and for the switching of that device. No unplugging of any device connected to the EXPANDA-PORT is required. The PROGRAMMA EXPANDA PORT comes completely assembled and tested.

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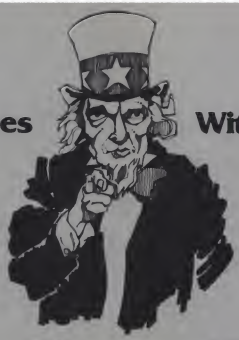
CIRCLE 231 ON READER SERVICE CARD

Save Taxes With Schedule G



Edward Osborne and Allan Harris

Many U.S. taxpayers could save taxes by using income averaging (1040 - Schedule G) but they either don't know about it or they believe that the form is too difficult to fill out. This computer program, written in Basic for the TRS-80, is designed to do all computations on the Schedule G and give you a line-by-line list of amounts that you can then copy onto the Schedule G form. It should change an agonizing two-hour task of reading directions and doing computations into a pleasant five minutes.

A Historical Perspective

The intent of income averaging when it was first written into the U.S. tax law by Congress was to provide tax relief to authors, inventors and the like. These taxpayers often worked several years on a project, then earned income in a lump sum when the copyright or patent was sold. This "lump sum" earnings pattern put them in a high tax bracket when the earnings was received. If earnings had been spread over the years, the same amount of income would have been taxed at a much lower rate. In the interest of fairness, Congress allowed these taxpayers to "spread" a certain portion of current income into the prior four years.

In the late 1960's the income averaging rules were liberalized by Congress. The definition of a "significant increase" in income was changed and certain income that was previously excluded from the computation (capital gains for example) was allowed to be included. These changes made income averaging available to many taxpayers who did not originally qualify. You no longer need to be an author or inventor, sometimes a raise in pay or the sale of some stock will meet the requirements.

Edward H. Osborne, Associate Professor of Accounting, Marietta College, Marietta, Ohio.

SCHEDULE G (Form 1040)
Department of the Treasury
Internal Revenue Service

Income Averaging
▶See instructions on back.
▶ Attach to Form 1040.

1980
21

Name(s) as shown on Form 1040 — Your social security number

Base Period Income and Adjustments	(a) 1st preceding base period year 1979	(b) 2nd preceding base period year 1978	(c) 3rd preceding base period year 1977	(d) 4th preceding base period year 1976
1 Enter amount from: Form 1040 (1977, 1978, and 1979)—line 34 / Form 1040A (1977 and 1978)—line 10 / Form 1040A (1979)—line 11	22,000	20,000	18,000	
2 a Multiply $750 by your total number of exemptions in 1977 and 1978		2,250	2,250	
b Multiply $1,000 by your total number of exemptions in 1979	3,000			
3 Taxable income (subtract line 2a or 2b from line 1). If less than zero, enter zero	19,000	17,750	15,750	15,000
4 Income earned outside of the United States or within U.S. possessions and excluded under sections 911 and 931				3,200
5 On your 1980 Form 1040, if you checked box (2 or 5 enter $2,200; if 1 or 4 enter $2,200; if 3 enter $1,600)	▶ column (a)			
6 Base period income (add lines 3, 4 and 5)	19,000	17,750	15,750	18,200

Computation of Averageable Income			
7 Taxable income for 1980 from Schedule TC (Form 1040), Part I, line 3	7	36,000	
8 Certain amounts received by owner-employees subject to a penalty under section 72(m)(5)	8		
9 Subtract line 8 from line 7	9	36,000	
10 Excess community income	10		
11 Adjusted taxable income (subtract line 10 from line 9). If less than zero, enter zero	11	36,000	
12 Add columns (a) through (d), line 6, and enter here	12	70,700	
13 Enter 30% of line 12	13	21,210	
14 Averageable income (subtract line 13 from line 11)	14	14,790	

If line 14 is $3,000 or less, do not complete the rest of this form. You do not qualify for income averaging. G

Computation of Tax			
15 Amount from line 13	15	21,210	
16 20% of line 14	16	2,958	
17 Total (add lines 15 and 16)	17	24,168	
18 Excess community income from line 10	18		
19 Total (add lines 17 and 18)	19	24,168	
20 Tax on amount on line 19 (see caution below)	20	4,334	
21 Tax on amount on line 17 (see caution below)	21	4,334	
22 Tax on amount on line 15 (see caution below)	22	2,526	
23 Subtract line 22 from line 21	23	1808	
24 Multiply the amount on line 23 by 4. Note: If no entry was made on line 8 above, skip lines 25 through 27 and go to line 28.	24	3,312	
25 Tax on amount on line 7 (see caution below)	25		
26 Tax on amount on line 9 (see caution below)	26		
27 Subtract line 26 from line 25	27		
28 Tax (add lines 20, 24, and 27). Enter here and on Schedule TC (Form 1040), Part I, line 4 and check Schedule G box	28	7,646	

Caution: Use Tax Rate Schedule X, Y or Z from the Form 1040 instructions to figure your tax on lines 20, 21, 22, 25 and 26. Do not use the tax tables.

Figure 3.

Do You Qualify?

There are a few things that you need to do before running the program and filling out the Schedule G form. The first is a quick computation to see if you meet the "significant increase in income" test. The test is done in three steps:

1. Estimate your total income in the current year (or use actual income if you have finished this year's return).[1]

2. Estimate income for each of the past four years (1976 through 1979). Add these numbers together and multiply the total by 30%.

3. Subtract the amount in step 2 from the amount in step 1. If the result is more than $3,000, you might benefit from income averaging.

This is *not* the way that the increase is computed on Schedule G, but it will give you an idea of whether it is worth pursuing. If you are married and filing a joint return in 1980 but were not married during all of the base years (1976 - 1979), you must add husband and wife income together in those years that you filed separate returns. If you are divorced in 1980 but married during one or more of the base years, you need professional help.

As an example of this three-step process, assume that the following pattern of income applies to a taxpayer:

1980 . . . $39,000
1979 . . . 22,000
1978 . . . 20,000
1977 . . . 18,000
1976 . . . 15,000

The increase in 1980 may have been caused by a previously non-employed spouse entering the job market.

The three steps would be computed:

Step 1.
Current income $39,000

Step 2.
30% of the total of base year income:
$22,000
20,000
18,000
15,000

$75,000 × 30% 22,500

Step 3.
Difference between
Step 1 and Step 2 . . . . $16,500

Since Step 3 is considerably more than $3,000, the taxpayer in this example is a prime candidate for income averaging.

Some events that might generate a "significant increase" in income are:

- Inheriting income producing property.
- A non-employed spouse joining the ranks of the employed for the first time (used in the example above).
- A significant capital gain from the sale of property.
- A significant bonus or other raise in pay (which may also result from a job change).
- Low base year income if you were in college, the military or Peace Corps (but you *must* meet the self-support test discussed later).
- A change from part-time to full-time employment.
- Winning a lottery or other cash prize.
- Large itemized deductions in the base period.

These are just a few examples. There are many events that can cause a substantial increase in taxable income.

The next step in the process is to determine that you meet other requirements. These requirements are:

- **Citizenship or Resident Test:**

You must have been either a citizen or resident of the U.S. throughout your computation year (1980) and the base period (1976-1979). If you were married to a nonresident alien during any part of the averaging period, you cannot use income averaging if you file a joint return.

The Internal Revenue Service does little to inform taxpayers about the advantages of averaging.

- Support Test:

You must have furnished at least one-half of your own support in all four base period years. Both you and your spouse

SCHEDULE TC
(Form 1040)
Department of the Treasury
Internal Revenue Service

Tax Computation Schedule — ▶ Attach to Form 1040. — **1980**

Name(s) as shown on Form 1040 | Your social security number

Part I — Computation of Tax for Taxpayers Who Cannot Use the Tax Tables

Use this part to figure your tax if:

- Your income on Form 1040, line 34, is more than $20,000 and you checked Filing Status Box 1, 3, or 4 on Form 1040.
- Your income on Form 1040, line 34, is more than $40,000 and you checked Filing Status Box 2 or 5 on Form 1040.
- You had more exemptions than were shown in the Tax Table for your filing status.
- You figure your tax using Schedule G (Income Averaging) or Form 4726 (Maximum Tax on Personal Service Income).

1 Enter the amount from Form 1040, line 34	1	39,000
2 Multiply $1,000 by the total number of exemptions claimed on Form 1040, line 7	2	3,000
3 Taxable income. Subtract line 2 from line 1. (Figure your tax on this amount by using the Tax Rate Schedules or one of the other methods listed on line 4.)	3	36,000
4 Income tax. Enter tax and check if from: ☐ Tax Rate Schedule X, Y, or Z, ☐ Schedule G, or ☐ Form 4726. Also enter on Form 1040, line 35	4	7696

Part II — Computation for Certain Taxpayers Who MUST Itemize Deductions

If you are included in one of the groups below, you MUST itemize. If you must itemize and the amount on Schedule A (Form 1040), line 40, is more than your itemized deductions on Schedule A, line 39, you must complete Part II before figuring your tax.

You MUST itemize your deductions if:

A. You can be claimed as a dependent on your parents' return and had interest, dividends, or other unearned income of $1,000 or more and had earned income of less than $2,300 if single (less than $1,700 if married filing a separate return).

Note: *If your earned income is more than your itemized deductions, you don't have to fill in Schedule A. Just enter your earned income in Part II, line 3, of this schedule, unless you are married filing a separate return and your spouse itemizes deductions. Generally, your earned income is the total of any amounts on Form 1040, lines 8, 13, and 19. See page 11 of the instructions for Form 1040 for more details.*

B. You are married filing a separate return and your spouse itemizes deductions. (There is an exception to this rule. You don't have to itemize if your spouse must itemize only because he or she is described in A and enters earned income instead of itemized deductions on Part II, line 3, of this schedule. If this is the case, don't complete Part II. Go back to Form 1040, line 33, and enter $0. Then go to Form 1040, line 34.)

C. You file Form 4563 to exclude income from sources in U.S. possessions. (Please see Form 4563, and Publication 570, Tax Guide for U.S. Citizens Employed in U.S. Possessions, for more details.)

D. You had dual status as a nonresident alien for part of 1980, and during the rest of the year you were either a resident alien or a U.S. citizen. However, you don't have to itemize it at the end of 1980, you were a nonresident alien married to a U.S. resident or citizen and file a joint return reporting your combined worldwide income.

1 Enter the amount from Form 1040, line 31			1	
2 If you checked Form 1040, Filing Status Box: {2 or 5, enter $3,400; 1 or 4, enter $2,300; 3, enter $1,700}	2			
3 Enter the amount from Schedule A, line 39	3			
Caution: *If you can be claimed as a dependent on your parents' return, see the **Note above**. Be sure you check the box below line 33 of Form 1040.*				
4 Subtract line 3 from line 2			4	
5 Add lines 1 and 4. Enter here and on Form 1040, line 34. (Leave Form 1040, line 33 blank. Disregard the instruction to subtract line 33 from line 32. Follow the rest of the instructions for Form 1040, line 34.)			5	

TC

The example below may help you to complete Part II.

Example—Walter Green, a single individual, is claimed as a dependent on his parents' return. Walter's adjusted gross income, Form 1040, line 31, is $4,000. Of this amount, $1,500 was earned income from a summer job and $2,500 was unearned income that he received as a beneficiary of a trust. Because Walter is being claimed as a dependent on his parents' return and has unearned income of $1,000 or more and earned income of less than $2,300, he must use Part II of Schedule TC. Walter knows that his total itemized deductions are only $500. Since this is less than his earned income ($1,500), he does not have to complete Schedule A. Walter enters $2,300, the zero bracket amount for a single individual, on line 2 of Part II and his earned income on line 3. He completes Part II as shown below and enters the total of $4,800 on Form 1040, line 34. He then figures his tax using the Tax Tables as explained in the instructions for lines 34 and 35 on page 12.

1 Adjusted gross income		$4,000
2 Zero bracket amount for a single individual	$2,300	
3 Earned income	1,500	
4 Subtract line 3 from line 2		800
5 Add lines 1 and 4. Enter here and on Form 1040, line 34		$4,800

Note: *If Walter's itemized deductions are more than his earned income, he must complete Schedule A first.*

Figure 4.

FOOTNOTE

[1]The only income that is not allowable in the averaging computation is either premature or excessive payouts from self-employed retirement plans or accumulation distributions from trusts. Both of these exceptions are rare and are subject to other tax "spreading" benefits.

must meet the support test if you file a joint return. However, there are three exceptions:

a. You are at least 25 in the current year and you were not a full-time student (5 months or more a year) for at least 4 years after age 21.

b. You received more than half of your current year's taxable income for work done in 2 or more base years.

c. Your income is not more than 25% of the total adjusted gross income reported on a joint return.

Taxpayers do not usually have difficulty meeting these tests *except for* those who were full-time students during the base period. The Congressional intent was to exclude students who are obtaining their first full-time job after graduation. I should stress, however, that students who have provided more than one-half of their own support while in school *still qualify* for averaging. This may apply to many graduate students who are not supported by their families during graduate school (scholarships, fellowships and grants are included in determining support even though they may not be taxable income).

The third step in the process is getting forms (Schedule G and TC) from your local Internal Revenue Service office and locating your federal income tax returns for the past four years. Locating returns is often the most challenging part of the process. If you can't find all four years, the IRS will provide copies (for a modest fee). Call your local IRS office and they will be happy to tell you how to obtain these copies. Since the fee is charged per page, you should only request pages 1 and 2 of the missing returns.

Many taxpayers are surprised at how much money they save.

Running the Program

After you have determined that you qualify for averaging and have obtained copies of IRS forms and prior year returns, you are ready to run the program. Make sure that, if you are married in the current year, you have base period returns for both husband and wife. Income amounts must be added together in the base period if separate returns were filed.

All dollar amounts should be rounded to the nearest whole dollar and should be entered without commas, decimal points or dollar signs. For ease of locating amounts, each amount is tied to a line number on the tax return. If you have all returns in front of you, data entry should only take a few minutes. Filing status is requested by the program for the current year. The filing status is on the front of your 1040 form. Filing status may be:

1. Single
2. Married filing a joint return
3. Married filing a separate return
4. Head of household
5. Qualifying widow(er) with dependent child.

Data output is grouped in the same format as the Schedule G. Lines 1 through 6 are displayed first, then 7 through 14, then 15 through 28. Pauses are programmed after each block of data so that the information can be copied onto the Schedule G form. In order to use averaging, your "averageable income" must exceed $3,000. The program will abort at line 14 if this test is not met and a message will explain why you cannot continue.

After all information for the Schedule G form is completed, you will need to fill out the Tax Computation form (1040 — Schedule TC). The final segment of the program provides information for filling out this form.

You should also compute the amount of tax savings realized from averaging. Occasionally there is no tax savings (although the tax is *never* higher under averaging), thus you are better off scrapping Schedule G and filing a normal return. The savings, if any, is computed by looking up the tax on the regular tax table and subtracting the averaging amount from the table figure. Many taxpayers are surprised at how much money they save.

As an example, I will use the amounts stated earlier when we made the initial increase in income test. I will also assume that the taxpayer is filing a joint return and claims three exemptions (taxpayer, spouse and one child) in the current year and all base period years. Data input and output are shown in Figures 1 and 2. The completed Schedule G and Schedule TC are shown in Figures 3 and 4. The Schedule G tax is $7,696. According to the 1980 tax tables, tax on $39,000 for a married couple filing a joint return with three exemptions is $8,495. The tax savings is $799!!

```
                1980 -- SCHEDULE G
                ------------------
          BASE PERIOD INCOME AND ADJUSTMENTS

LINE          1979          1978          1977          1976
---------------------------------------------------------------
  1         22,000        20,000        18,000      ////////
 2A      ////////         2,250         2,250      ////////
 2B         3,000      ////////      ////////      ////////
  3        19,000        17,750        15,750        15,000
  4             0             0             0             0
  5      ////////      ////////      ////////         3,200
  6        19,000        17,750        15,750        18,200
---------------------------------------------------------------
   FOR A DISPLAY OF THE NEXT 8 LINES, PRESS <ENTER>?
          COMPUTATION OF AVERAGEABLE INCOME
                LINE          AMOUNTS
                  7            36,000
                  8                 0
                  9            36,000
                 10                 0
                 11                        36,000
                 12            78,700
                 13                        21,218
                 14                        14,798
---------------------------------------------------------------
   TO DISPLAY THE NEXT 14 LINES, PRESS <ENTER>?
                COMPUTATION OF TAX
                 15                        21,218
                 16                         2,958
                 17                        24,168
                 18                             0
                 19                        24,168
                 20                         4,384
                 21            4,384
                 22            3,556
                 23              828
                 24                         3,312 (SKIP LINES 25-27)
                 28                         7,696
---------------------------------------------------------------
TO SEE AMOUNTS TO BE ENTERED ON SCHEDULE TC, PRESS <ENTER>?

                1980 SCHEDULE TC
                ----------------
                LINE          AMOUNTS
                  1            39,000
                  2             3,000
                  3            36,000
                  4             7,696

---------------------------------------------------------------

   DO YOU WANT TO RUN THIS PROGRAM AGAIN (Y OR N)? N
```

Figure 1. An example of data input.

```
          ( F O R M   1 0 4 0 )
1 9 8 0  --  S C H E D U L E  G
-------------------------------

THIS PROGRAM PROVIDES A LINE-BY-LINE LIST OF AMOUNTS
TO BE ENTERED ON YOUR 1980 INCOME TAX AVERAGING FORM-
1040, SCHEDULE G. ALL DOLLAR AMOUNTS MUST BE ENTERED
IN WHOLE DOLLARS WITHOUT COMMAS OR DECIMAL POINTS.
IF YOU DIDN'T FILE A TAX RETURN IN A PARTICULAR YEAR,
ENTER A 0 FOR ALL AMOUNTS REQUESTED IN THAT YEAR.

          PRESS <ENTER> TO BEGIN?
-----------------------------------------------------------
          ENTER THE FOLLOWING AMOUNTS FROM YOUR
            1980 INCOME TAX RETURN (FORM 1040):

.....TAXABLE INCOME, LINE 34? 39000
.....NUMBER OF EXEMPTIONS CLAIMED? 3
.....FILING STATUS (ENTER 1, 2, 3, 4 OR 5)? 2
-----------------------------------------------------------
          ENTER THE FOLLOWING AMOUNTS FROM YOUR
            1979 INCOME TAX RETURN:

.....TAXABLE INCOME (1040, LINE 34 OR 1040A, LINE 11)? 22000
.....NUMBER OF EXEMPTIONS CLAIMED? 3
-----------------------------------------------------------
          ENTER THE FOLLOWING AMOUNTS FROM YOUR
            1978 INCOME TAX RETURN:

.....TAXABLE INCOME (1040, LINE 34 OR 1040A, LINE 10)? 20000
.....NUMBER OF EXEMPTIONS CLAIMED? 3
-----------------------------------------------------------
          ENTER THE FOLLOWING AMOUNTS FROM YOUR
            1977 INCOME TAX RETURN:

.....TAXABLE INCOME (1040, LINE 34 OR 1040A, LINE 10)? 18000
.....NUMBER OF EXEMPTIONS CLAIMED? 3
-----------------------------------------------------------
          ENTER THE FOLLOWING AMOUNTS FROM YOUR
            1976 INCOME TAX RETURN:

.....TAXABLE INCOME (1040, LINE 47 OR 1040A, LINE 15)? 15000
-----------------------------------------------------------
```

Figure 2. An example of data output.

Limitations of the Program

You cannot use this program if you have:

- Income earned outside the United States or within U.S. possessions that is excluded under Internal Revenue Code sections 911 or 931.
- Premature pension distributions received by owner-employees subject to a penalty tax under Internal Revenue Code section 72(m)(5).
- Excess community income

Since so few taxpayers are subject to these obscure rules, they have been excluded from the program. Including these items would unnecessarily complicate the program while accommodating only a few taxpayers.

If you are divorced or are a surviving spouse, and if you were married filing a joint return in any base year, you have special problems of determining the amount of income to be included as base period income. Under these circumstances it is best to consult a professional tax advisor.

Conclusion

Income averaging is not used nearly as much as it should be. The Internal Revenue Service does little to inform taxpayers about the advantages of averaging, and even if the advantages are known, the Schedule G form can be intimidating. This program should make income averaging at least bearable, if not downright fun (especially after you have determined your tax savings).

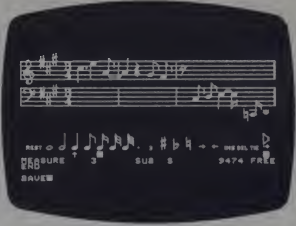
If you find that you should have averaged last year, there is still time. You have up to three years to amend a prior year return (file form 1040X along with the Schedule G that applies to the appropriate year). You will not be able to use this computer program since the method of computation has changed over the years, but you can either modify the program or prepare the form by hand. You are permitted to use averaging year-after-year as long as you qualify.

Program begins on page 192.

Program Listing

```
1000 REM
1010 REM          * * * * * * * * * * * * * * * * * * * *
1020 REM          *     SAVE TAXES WITH SCHEDULE G       *
1030 REM          *               BY                     *
1040 REM          *    EDWARD H OSBORNE MBA, CPA         *
1050 REM          * ASSOCIATE PROFESSOR OF ACCOUNTING    *
1060 REM          *        MARIETTA COLLEGE              *
1070 REM          *         MARIETTA, OHIO               *
1080 REM          *                                      *
1090 REM          *    MODIFIED FOR THE TRS-80 BY        *
1100 REM          *        ALLAN L HARRIS                *
1110 REM          * * * * * * * * * * * * * * * * * * * *
1120 CLEAR200
1130 D$=STRING$(63,140):Z$="      ####,###":G$="      ////////"
1140 CLS:PRINTTAB(22)"( F O R M   1 0 4 0 )
1150 PRINTTAB(17)"1 9 8 0  --  S C H E D U L E   G
1160 PRINTTAB(17)STRING$(32,131)
1170 PRINT:PRINT
1180 PRINTTAB(7)"THIS PROGRAM PROVIDES A LINE-BY-LINE LIST OF AMOUNTS
1190 PRINTTAB(7)"TO BE ENTERED ON YOUR 1980 INCOME TAX AVERAGING FORM-
1200 PRINTTAB(7)"1040, SCHEDULE G.  ALL DOLLAR AMOUNTS MUST BE ENTERED
1210 PRINTTAB(7)"IN WHOLE DOLLARS WITHOUT COMMAS OR DECIMAL POINTS.
1220 PRINTTAB(7)"IF YOU DIDN'T FILE A TAX RETURN IN A PARTICULAR YEAR,
1230 PRINTTAB(7)"ENTER A 0 FOR ALL AMOUNTS REQUESTED IN THAT YEAR.
1240 PRINT:PRINT
1250 INPUT"                    PRESS <ENTER> TO BEGIN";C$
1260 CLS:PRINTD$
1270 PRINTTAB(13)"ENTER THE FOLLOWING AMOUNTS FROM YOUR
1280 PRINTTAB(14)"1980 INCOME TAX RETURN (FORM 1040):
1290 PRINT:INPUT".....TAXABLE INCOME, LINE 34";A
1300 INPUT".....NUMBER OF EXEMPTIONS CLAIMED";B
1310 INPUT".....FILING STATUS (ENTER 1, 2, 3, 4 OR 5)";X
1320 IFX<1ORX>5GOTO1310
1330 PRINT:PRINTD$
1340 PRINTTAB(13)"ENTER THE FOLLOWING AMOUNTS FROM YOUR
1350 PRINTTAB(20)"1979 INCOME TAX RETURN:
1360 PRINT
1370 INPUT".....TAXABLE INCOME (1040, LINE 34 OR 1040A, LINE 11)";C
1380 INPUT".....NUMBER OF EXEMPTIONS CLAIMED";D
1390 PRINT:PRINTD$
1400 PRINTTAB(13)"ENTER THE FOLLOWING AMOUNTS FROM YOUR
1410 PRINTTAB(20)"1978 INCOME TAX RETURN:
1420 PRINT
1430 INPUT".....TAXABLE INCOME (1040, LINE 34 OR 1040A, LINE10)";E
1440 INPUT".....NUMBER OF EXEMPTIONS CLAIMED";F
1450 PRINT:PRINTD$
1460 PRINTTAB(13)"ENTER THE FOLLOWING AMOUNTS FROM YOUR
1470 PRINTTAB(20)"1977 INCOME TAX RETURN:
1480 PRINT
1490 INPUT".....TAXABLE INCOME (1040, LINE 34 OR 1040A, LINE 10)";G
1500 INPUT".....NUMBER OF EXEMPTIONS CLAIMED";H
1510 PRINT:PRINTD$
1520 PRINTTAB(13)"ENTER THE FOLLOWING AMOUNTS FROM YOUR
1530 PRINTTAB(20)"1976 INCOME TAX RETURN:
1540 PRINT
1550 INPUT".....TAXABLE INCOME (1040, LINE 47 OR 104A, LINE 15)";I
1560 CLS
1570 PRINTTAB(17)"1 9 8 0  --  S C H E D U L E   G
1580 PRINTTAB(17)STRING$(32,131)
1590 PRINTTAB(16)"BASE PERIOD INCOME AND ADJUSTMENTS
1600 PRINT
1610 PRINT"   LINE        1979          1978          1977          1976
1620 PRINT
1630 PRINT"    1 ";USINGZ$+Z$+Z$+G$;C;E;G
1640 D1=D*1000
1650 F1=F*750
1660 H1=H*750
1670 PRINT"    2A";USINGG$+Z$+Z$+G$;F1;H1
1680 PRINT"    2B";USINGZ$+G$+G$+G$;D1
1690 T9=C-D1
1700 T8=E-F1
1710 T7=G-H1
1720 IFT8<0THENT8=0
1730 IFT9<0THENT9=0
1740 IFT7<0THENT7=0
1750 PRINT"    3 ";USINGZ$+Z$+Z$+Z$;T9;T8;T7;I
1760 PRINT"    4 ";USINGZ$+Z$+Z$+Z$;0;0;0;0
1770 IFX=2ORX=5THENE9=3200
1780 IFX=1ORX=4THENE9=2200
1790 IFX=3THENE9=1600
1800 B6=I+E9
1810 PRINT"    5 ";USINGG$+G$+G$+Z$;E9
1820 PRINT"    6 ";USINGZ$+Z$+Z$+Z$;T9;T8;T7;B6
1830 PRINTD$
1840 INPUT"       FOR A DISPLAY OF THE NEXT 8 LINES, PRESS <ENTER>";C$
1850 PRINT@128,CHR$(31)TAB(16)"COMPUTATION OF AVERAGEABLE INCOME
1860 E0=B*1000
1870 T0=A-E0:IFT0<0THENT0=0
1880 PRINTTAB(18)"LINE              AMOUNTS
1890 PRINTTAB(19)7;USINGZ$;T0
1900 PRINTTAB(19)8;USINGZ$;0
1910 PRINTTAB(19)9;USINGZ$;T0
1920 PRINTTAB(18)10;USINGZ$;0
1930 PRINTTAB(18)11;TAB(32)USINGZ$;T0
1940 T1=T9+T8+T7+B6
            1950 PRINTTAB(18)12;USINGZ$;T1
1960 T2=.3*T1
1970 PRINTTAB(18)13;TAB(32)USINGZ$;T2
1980 A1=T0-T2
1990 IFA1<0THENA1=0
2000 PRINTTAB(18)14;TAB(32)USINGZ$;A1
2010 PRINTD$
2020 IFA1<3001GOTO2240
2030 INPUT"          TO DISPLAY THE NEXT 14 LINES, PRESS <ENTER>";C$
2040 PRINT@128,CHR$(31)TAB(23)"COMPUTATION OF TAX
2050 PRINTTAB(18)15;TAB(30)USINGZ$;T2
2060 A2=A1*.2
2070 PRINTTAB(18)16;TAB(30)USINGZ$;A2
2080 A3=A2+T2
2090 PRINTTAB(18)17;TAB(30)USINGZ$;A3
2100 PRINTTAB(18)18;TAB(30)USINGZ$;0
2110 PRINTTAB(18)19;TAB(30)USINGZ$;A3
2120 Q=A3:GOSUB2410
2130 PRINTTAB(18)20;TAB(30)USINGZ$;Q1
2140 PRINTTAB(18)21;USINGZ$;Q1
2150 Q2=Q1:Q=T2:GOSUB2410
2160 PRINTTAB(18)22;USINGZ$;Q1
2170 Q3=Q2-Q1
2180 PRINTTAB(18)23;USINGZ$;Q3
2190 Q4=Q3*4
2200 PRINTTAB(18)24;TAB(30)USINGZ$;Q4;:PRINT" (SKIP LINES 25-27)
2210 Q5=Q2+Q4
2220 PRINTTAB(18)28;TAB(30)USINGZ$;Q5
2230 GOTO2270
2240 PRINTTAB(12)"***** LINE 14 IS LESS THAN  $3001 *****
2250 PRINTTAB(6)"***** YOU DO NOT QUALIFY FOR INCOME AVERAGING *****
2260 PRINTD$:GOTO2350
2270 PRINTD$:INPUT"TO SEE AMOUNTS TO BE ENTERED ON SCHEDULE TC, PRESS <EN
     TER>";C$
2280 CLS:PRINT
2290 PRINTTAB(16)"1 9 8 0   S C H E D U L E   T C
2300 PRINTTAB(16)STRING$(31,131)
2310 PRINTTAB(21)"LINE       AMOUNTS
2320 PRINT
2330 PRINTTAB(21)1;USINGZ$;A
2340 PRINTTAB(21)2;USINGZ$;E0
```

ALF/Apple Music Synthesizer



With the ALF software, entry of music is easy, fast and accurate.

The ALF Apple Music Synthesizer (AMS) is an easy to use peripheral which allows you to program music into an Apple II computer using standard musical notation. The ALF kit includes the synthesizer board (plugs into any peripheral slot), exceptional quality software, and an extensive user manual.

Sophisticated Music Entry Program

Sheet music is easily entered using the Apple game paddles. The high-resolution ENTRY program features the familiar music staff with a "menu" of musical items listed beneath it (note lengths, rests, edit commands, accidentals, etc.). One game paddle moves a cursor up and down the music staff and is used to select the note pitch; the second paddle chooses from the menu items (note length, etc.) With the ALF hi-res ENTRY program, you won't have to use cryptic codes to select note parameters.

As you program sheet music with ENTRY, measure bars are inserted automatically (and note values are tied over the bar where necessary). Key signatures are also automatic—you don't have to keep writing in every sharp or flat!

Three monophonic, individual parts can be programmed with each ALF Music Synthesizer. Two boards are required for stereo. A total of three synthesizers can be used simultaneously for a maximum of nine voices. By controling the envelope (or shape) of each voice, many different instrumental sounds can be simulated.

Eight-octave Range

The ALF Music Synthesizer has a pitch range of eight octaves—a wider range than a grand piano. The ALF can also play semitones—"blues notes" or the pitches in between the keyboard notes of a piano. (The pitch range is from 27.5 to 55,000 Hertz, well beyond the limits of human hearing.) Tuning accuracy is virtually perfect within two cents of pitch value.

Every parameter of the ENTRY program can be changed again and again during a musical piece. For example, you can make changes in key, time signature, volume, and timbre (envelope). Parts can be edited at any time, also. Notes can be added or deleted, note length can be changed, as well as pitch, volume, etc.

You can save songs on either cassette or disk, and play them back using either ENTRY or PLAY. The playback speed is adjusted with one of the game paddles, and can be varied during the playback, if you wish to change the overall tempo.

Colorful Playback Display

The ALF Music Synthesizer features a 16-color low-res graphic display during song playback. Each musical part is represented on a stylized piano "keyboard"—the intensity of the note determines the color, and the pitch is shown in relation to "middle C".

The ALF Music Synthesizer requires the use of an external audio amplifier. Stereo programming is possible with the use of two or three synthesizer boards.

The ALF software includes the ENTRY and PLAY programs, sample songs, an introduction to "envelope shaping", and demonstrations of advanced uses of the synthesizer.

Nine Voices for only $198

The new ALF "AM-II" music synthesizer offers an unbeatable value for the Apple owner who is a music hobbyist. With nine voices on a single music board for $198.00, the AM-II is the most economical device for creating music with the Apple.

The AM-ii uses the same excellent ENTRY and PLAY programs as the more sophisticated ALF Music Synthesizer (AMS); the same hi-res graphic display from which notes are selected with the Apple game paddles (not typed with cryptic codes). All of the convenience of the ENTRY program apply—easy editing, playback with low-res display, ability to save songs on cassette or disk, etc.

The AM-II has **stereo output** (3 voices in left, 3 voices in the middle, 3 voices in the right).

How can the AM-II offer so much for only $198.00? The two basic differences between the AM-II and the ALF Apple Music Synthesizer (AMS) are pitch accuracy and dynamic range. The AM-II has an accurate pitch range of about six octaves. Pitch values above the treble staff become increasingly inaccurate. Also, the AM-II has a dynamic range of 28db, with 16 different volume levels, (the AMS has a dynamic range of 78db).

The AM-II is manufactured with the same high quality standards as other products from the ALF Corporation. No sacrifice has been made in reliability; the new AM-II is simply a great bargain.

Professional musicians will still want to use the original Apple Music Synthesizer (AMS) for its extended range and volume controls (the AMS has a range of 8 octaves). But for the Apple owner who is interested in music as a hobby, the AM-II is the best music peripheral value available today.

Requires: 16K Apple ii or Apple Ii Plus, cassette or Disk ii, and an external audio amplifier (all necessary patch cords are included).

AM-ii ALF/Apple Synthesizer	$198.00
AMS ALF/Apple Synthesizer	268.00

To order, send payment plus $3.00 shipping and handling to Peripherals Plus, 119 Maple Ave., Morristown, NJ 07960. Credit card customers should include card number and expiration date of Visa, MasterCard or American Express. Credit card customers may also order toll-free:

800-631-8112

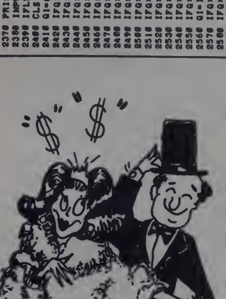
(in NJ call 201-540-0445)

Peripherals Plus

119 Maple Ave., Morristown, NJ 07960

Schedule G, continued...

```
2350 PRINTTAB(21)3;USINGZ$;T0
2360 PRINTTAB(21);4;USINGZ$;Q5
2370 PRINT:PRINTD$:PRINT
2380 INPUT"        DO YOU WANT TO RUN THIS PROGRAM AGAIN (Y OR N)";C$
2390 IFLEFT$(C$,1)="Y"RUN
2400 CLS:END
2410 Q1=0:ONXGOTO2420,2570,2730,2890,2570
2420 IFQ>2300THENQ1=Q*.14
2430 IFQ>3400THENQ1=154+((Q-3400)*.16)
2440 IFQ>4400THENQ1=314+((Q-4400)*.18)
2450 IFQ>6500THENQ1=692+((Q-6500)*.19)
2460 IFQ>8500THENQ1=1072+((Q-8500)*.21)
2470 IFQ>10800THENQ1=1555+((Q-10800)*.24)
2480 IFQ>12900THENQ1=2059+((Q-12900)*.26)
2490 IFQ>15000THENQ1=2605+((Q-15000)*.3)
2500 IFQ>18200THENQ1=3565+((Q-18200)*.34)
2510 IFQ>23500THENQ1=5367+((Q-23500)*.39)
2520 IFQ>28800THENQ1=7434+((Q-28800)*.44)
2530 IFQ>34100THENQ1=9766+((Q-34100)*.49)
2540 IFQ>41500THENQ1=13392+((Q-41500)*.55)
2550 IFQ>55300THENQ1=20982+((Q-55300)*.63)
2560 Q1=INT(Q1+.5):RETURN
2570 IFQ>3400THENQ1=Q*.14
2580 IFQ>5500THENQ1=294+((Q-5500)*.16)
2590 IFQ>7600THENQ1=630+((Q-7600)*.18)
2600 IFQ>11900THENQ1=1404+((Q-11900)*.21)
2610 IFQ>16000THENQ1=2265+((Q-16000)*.34)
2620 IFQ>20200THENQ1=3273+((Q-20200)*.28)
2630 IFQ>24600THENQ1=4505+((Q-24600)*.32)
2640 IFQ>29900THENQ1=6201+((Q-29900)*.37)
2650 IFQ>35200THENQ1=8162+((Q-35200)*.37)
2660 IFQ>45800THENQ1=12720+((Q-45800)*.43)
2670 IFQ>60000THENQ1=19678+((Q-60000)*.49)
2680 IFQ>85600THENQ1=33502+((Q-85600)*.54)
2690 IFQ>109400THENQ1=47544+((Q-109400)*.59)
2700 IFQ>162400THENQ1=81464+((Q-162400)*.64)
2710 IFQ>215400THENQ1=117504+((Q-215400)*.7)
2720 Q1=INT(Q1+.5):RETURN
2730 IFQ>1700THENQ1=Q*.14
2740 IFQ>2750THENQ1=294+((Q-2750)*.16)
2750 IFQ>3800THENQ1=315+((Q-3800)*.18)
2760 IFQ>5950THENQ1=702+((Q-5950)*.21)
2770 IFQ>8000THENQ1=1132.5+((Q-8000)*.24)
2780 IFQ>10100THENQ1=1636.5+((Q-10100)*.28)
2790 IFQ>12300THENQ1=2252.5+((Q-12300)*.32)
2800 IFQ>14950THENQ1=3100.5+((Q-14950)*.37)
2810 IFQ>17600THENQ1=4081+((Q-17600)*.43)
2820 IFQ>22900THENQ1=6360+((Q-22900)*.49)
2830 IFQ>30000THENQ1=9839+((Q-30000)*.54)
2840 IFQ>42800THENQ1=16751+((Q-42800)*.59)
2850 IFQ>54700THENQ1=23772+((Q-54700)*.64)
2860 IFQ>81200THENQ1=40732+((Q-81200)*.68)
2870 IFQ>107700THENQ1=58752+((Q-107700)*.7)
2880 Q1=INT(Q1+.5):RETURN
2890 IFQ>2300THENQ1=Q*.14
2900 IFQ>4400THENQ1=294+((Q-4400)*.16)
2910 IFQ>6500THENQ1=630+((Q-6500)*.18)
2920 IFQ>8700THENQ1=1026+((Q-8700)*.22)
2930 IFQ>11800THENQ1=1708+((Q-11800)*.24)
2940 IFQ>15000THENQ1=2476+((Q-15000)*.26)
2950 IFQ>18200THENQ1=3308+((Q-18200)*.31)
2960 IFQ>23500THENQ1=4951+((Q-23500)*.36)
2970 IFQ>28800THENQ1=6859+((Q-28800)*.42)
2980 IFQ>34100THENQ1=9085+((Q-34100)*.46)
2990 IFQ>44700THENQ1=13961+((Q-44700)*.54)
3000 IFQ>60600THENQ1=22547+((Q-60600)*.59)
3010 IFQ>81800THENQ1=35055+((Q-81800)*.63)
3020 IFQ>108300THENQ1=51750+((Q-108300)*.68)
3030 IFQ>161300THENQ1=87790+((Q-161300)*.7)
3040 Q1=INT(Q1+.5)RETURN
```



Track Meet

Clinton Morey

"Track Meet" is a program designed to simplify the task of keeping score at a track meet.—EBS

A track meet is an exciting activity. Athletes competing in many different events, brightly colored uniforms, men and women striving to improve their performances to achieve victory.

A track meet is exciting—it is also a highly organized activity (at least it should be). The spectators and athletes concerned only with the event of the moment usually pay little attention to the organizational aspects of a meet. Recording winners of events, distributing ribbons or medals, keeping track of team scores, are just a few of the many details that go into a successful track meet. And that's where the computer can help. With its willingness to aid the inexperienced and its ability to perform calculations quickly and accurately, the computer is a friend and helper of the often overworked (and seldom noticed) people who sit at the official scorer's table.

Clinton Morey, Box 534, Peerless, MT 59253.

The Program

The program "Track Meet," was written to meet the needs of a small rural school in Northeastern Montana but modifications will make it suitable for any athletic department. "Track Meet" allows individuals with little experience in track (typing would be helpful) to serve as scorers at a track meet. The program is designed for use on a TRS-80, Level II, 16K machine and a Centronics 730 (Line Printer II). It is easily adapted to other Basics.

At the prompting of the computer, the operator enters identifying information about the track meet (meet title, date, etc.). The only other keyboard entry required is to enter the results from the various events when the information is received (usually in barely legible scribblings by the official at the event).

With the the data in the computer the operator may:

1) Display or print the results of a particular event. (Five points are awarded for first place, four for second place and so on.) Any scorer who has tried to record results while athletes and coaches are asking about events that took place 30 minutes earlier will appreciate the benefits of this part of the program.

2) Maintain a running total of team points. This allows scores to be posted and maintains a good level of interest in the team aspect of a track meet.

3) Print results of the entire meet. Hardcopy printouts can be provided to the coaches almost immediately after the meet. The results can also be sent to the local newspaper or the PR people.

Modifications

Several modifications could be made to this program to meet specific needs of individual schools. If ribbons are awarded at the meet an option could be added which would print self-adhesive labels to save someone the trouble of doing the work by hand. Someone would have to stick the labels on the backs of the ribbons, but that is a whole lot easier than writing them.

The events in this program are geared for a small rural school with limited track facilities. Events like the pole vault are usually not available to our athletes. To add or delete events merely change the READ-DATA statements. If the number of events is changed lines 40, 740, 1100, 1140, and 1320 will have to be adjusted to show the proper number of events. □

Starting Line

```
10 REM--TRACK MEET BY MOREY
20 CLS:POKE 16553,255:CLEAR 5000
30 DIM E$(5,3,22):DIM N$(3)
40 FOR X=1TO22:READ E$(0,0,X):NEXT X
45 FOR X=1TO3:READ N$(X):NEXTX
50 CLS
55 PRINT@340,"TRACK MEET":FORX=1TO1000:NEXTX:CLS
60 INPUT"WHAT IS THE TITLE OF TODAY'S MEET";MN$
70 INPUT"WHAT IS TODAY'S DATE";MO$
80 INPUT"HOW MANY TEAMS ARE ENTERED";T
90 DIM T$(T)
100 CLS:PRINT"ENTER THE NAME OF EACH TEAM.":
110 FOR X=1TOT:PRINT"TEAM NO.";X;:INPUT T$(X):NEXT X
120 CLS:PRINTTAB(20)MN$:PRINTTAB(20)MO$:PRINT:PRINT
130 PRINTTAB(20)"TEAMS PARTICIPATING"
140 FOR X=1TOT:PRINTTAB(25) T$(X):NEXT X:PRINT
150 GOTO 1000
160 CLS
170 PRINTTAB(30)"MENU"
180 PRINTTAB(20)"1. ENTER EVENT RESULTS"
190 PRINTTAB(20)"2. DISPLAY EVENT RESULTS"
200 PRINTTAB(20)"3. CORRECT EVENT RESULTS"
210 PRINT"          ----------------------------------------------"
220 PRINTTAB(20)"4. DISPLAY TEAM SCORES"
230 PRINTTAB(20)"5. PRINT MEET STATS"
240 PRINT:PRINT
250 INPUT"WHICH DO YOU WISH TO USE (ENTER NUMBER)";Z
260 ON Z GOTO 300, 400, 500, 600, 700
270 IF Z>5 OR Z<1 GOTO 250
300 REM--ENTER EVENT RESULTS
310 GOSUB 1100
320 CLS:PRINTTAB(20) E$(0,0,M)
330 P=5
340 FOR A=1TO5
    PRINT"PLACE:";A;
    FOR B=1TO3
        PRINT N$(B);":";     ";
        INPUT E$(A,B,M)
    NEXT B
    FOR Y=1TOT
        IF T$(Y)=E$(A,3,M) THEN TP(Y)=TP(Y)+P:GOTO 358
    NEXT Y
    P=P-1
NEXT A
370 GOSUB 1200
380 GOTO 1000
400 REM--DISPLAY EVENT RESULTS
410 GOSUB 1100
420 GOSUB 1200
430 INPUT"DO YOU WANT A PRINT OUT (YES/NO)";Y$
440 IF LEFT$(Y$,1)="Y"THEN GOTO 460
450 GOSUB 1000
460 PRINT"PRESS ENTER WHEN THE PRINTER IS READY.":INPUTZ
465 LPRINTTAB(20) E$(0,0,M):LPRINT"PLACE";:LPRINTTAB(9) N$(1);:LPRINTTAB(30) N$(
2);:LPRINTTAB(50) N$(3):FOR A=1TO5:LPRINTA;:LPRINTTAB(9)E$(A,1,M));:LPRINTTAB(30)
E$(A,2,M);:LPRINTTAB(50)E$(A,3,M):NEXTA
470 GOTO 1000
500 REM--CORRECT EVENT RESULTS
510 GOSUB 1100
540 PRINT"TO MAKE CORRECTIONS FOR THIS EVENT YOU WILL BE ASKED EACH ENTRY QUESTI
ON AGAIN.  IF THE INFORMATION IS CORRECT, MERELY PRESS <ENTER>."
545 PRINT"   IF YOU WISH TO CHANGE ANY INFORMATION, TYPE IN THE NEW DATA WHEN RE
QUESTED THEN PRESS <ENTER>."
547 INPUT"PRESS <ENTER> TO CONTINUE";X:GOSUB 1200
549 PRINT"ENTER NEW DATA...."
550 P=5:FORA=1TO5:FORY=1TOT:IFT$(Y)=E$(A,3,M)THENTP(Y)=TP(Y)-P:GOTO554
552 NEXTY
554 PRINT"PLACE:";A;:FOR B=1TO3:PRINTN$(B);":     ";:INPUTE$(A,B,M):NEXTB
556 FORY=1TO:IFT$(Y)=E$(A,3,M)THENTP(Y)=TP(Y)+P:GOTO5A0
558 NEXT Y
560 P=P-1
565 NEXTA
570 GOSUB1200
580 GOTO1000
600 REM--DISPLAY TEAM SCORES
630 CLS:PRINTTAB(20) MN$:PRINTTAB(20) MO$:PRINT:PRINT:PRINTTAB(5)"TEAM";:PRINTTA
B(40)"POINTS"
640 FOR X=1TO:PRINT T$(X);:PRINTTAB(42) TP(X):NEXT X
650 GOTO 1000
700 CLS:PRINT"PREPARE PRINTER.  PRESS <ENTER> WHEN READY.";:INPUTX
705 INPUT"HOW MANY COPIES DO YOU WANT PRINTED";K
707 FOR W=1 TO K
710 LPRINTTAB(20) MN$
720 LPRINTTAB(20) MO$
730 FOR X=1TO4:LPRINT" ":NEXTX
732 GOSUB 1300
735 LPRINTTAB(5)"TEAM";:LPRINTTAB(40)"POINTS"
737 FOR X=1 TO T:LPRINT T$(X);:LPRINTTAB(42) TP(X):NEXTX
738 FORX=1TO4:LPRINT" ":NEXTX
740 FOR M=1 TO 22
750   LPRINTTAB(20) E$(0,0,M)
760   LPRINT"PLACE";:LPRINTTAB(9) N$(1);:LPRINTTAB(30) N$(2);:LPRINTTAB(50) N$(3)
```

```
770   FOR A=1 TO 5:LPRINT A1;LPRINTTAB(9) E$(A,1,M);:LPRINTTAB(30) E$(A,2,M);:LP
RINTTAB(50) E$(A,3,M):NEXT A
780   LPRINT" "
790 NEXT M
800 NEXT V
1000 PRINT"PRESS <ENTER> TO SEE THE MENU.";
1010 INPUT Z
1020 GOTO 160
1100 CLS:FORX=1TO22:PRINTX;"    ";E$(0,0,X);:X=X+1:PRINTTAB(30)X;"    ";E$(0,0,X
);:NEXT X
1110 FOR X=1TO60:PRINT"-";:NEXTX
1120 PRINT:PRINT
1130 INPUT"WHICH EVENT (ENTER NUMBER)";M
1140 IF M>22 GOTO 1130
1150 RETURN
1200 CLS:PRINTAR(20) E$(0,0,M)
1210 PRINT"PLACE";:PRINTTAB(9) N$(1);:PRINTTAB(30) N$(2);:PRINTTAB(50) N$(3)
1220 FOR A=1TO5:PRINT A1;PRINTTAB(9) E$(A,1,M);:PRINTTAB(30) E$(A,2,M);:PRINTTAB
(50) E$(A,3,M):NEXT A
1230 RETURN
1300 CLS
1310 FORX=1TOT:F(X)=0:NEXTX:L=0
1320 FORM=1TO22
1340   FORA=1TO5:FORN=5TO1 STEP-1:FORX=1TOT:IF E$(A,3,M)=T$(X) THEN F(X)=F(X)+N:
NEXTX:NEXTN:NEXTA:NEXTM
1350 RETURN
2000 DATA 100 METERS--BOYS,100 METERS--GIRLS
2010 DATA 200 METERS--BOYS,200 METERS--GIRLS
2020 DATA 800 METERS--BOYS,800 METERS--GIRLS
2030 DATAMILE RUN--BOYS,MILE RUN--GIRLS
2040 DATA MILE RELAY--BOYS,MILE RELAY--GIRLS
2050 DATA JAVELIN--BOYS,JAVELIN--GIRLS
2060 DATA LONG JUMP--BOYS,LONG JUMP--GIRLS
2070 DATA HIGH JUMP--BOYS,HIGH JUMP--GIRLS
2080 DATA SHOT PUT--BOYS,SHOT PUT--GIRLS
2090 DATA DISCUS--BOYS,DISCUS--GIRLS
2100 DATA3000 METER RUN--BOYS,3000 METER RUN--GIRLS
2110 DATA NAME,TIME/DISTANCE,SCHOOL
3000 END
```

MOREY'S MARVELOUS MEET
APRIL 23 1981

TEAM	POINTS
PEERLESS	19
SCOBEY	15
OUTLOOK	8

100 METERS--BOYS

PLACE	NAME	TIME/DISTANCE	SCHOOL
1	BILL BAILEY	10.0	PEERLESS
2	RON RUNNER	10.2	OUTLOOK
3	FRED FAST	10.5	SCOBEY
4	SAM SLOW	12.8	PEERLESS
5	TOM TANK	15.1	OUTLOOK

100 METERS--GIRLS

PLACE	NAME	TIME/DISTANCE	SCHOOL
1	RONDA RUNNER	10.8	SCOBEY
2	SALLY SWIFT	11.3	PEERLESS
3	JOAN JALOPY	12.2	PEERLESS
4			
5			

200 METERS--BOYS

PLACE	NAME	TIME/DISTANCE	SCHOOL
1	TOM TERRIFIC	24.8	SCOBEY
2	BILL BAILEY	25.4	PEERLESS
3	TOM TANK	26.0	OUTLOOK
4	FRED FAST	28.1	SCOBEY
5	SAM SLOW	34.9	PEERLESS

200 METERS--GIRLS

PLACE	NAME	TIME/DISTANCE	SCHOOL
1			
2			
3			
4			
5			

800 METERS--BOYS

PLACE	NAME	TIME/DISTANCE	SCHOOL
1			
2			
3			
4			
5			

800 METERS--GIRLS

PLACE	NAME	TIME/DISTANCE	SCHOOL
1			
2			
3			
4			
5			

MILE RUN--BOYS

ium...compendium...co

IBM Proofreader for Blind Typists

Blind typists will now be better eble to edit end revise documents with e new typing unit thet "speeks" typed information.

The IBM Audio Typing Unit enebles blind typists to produce error-free copy without the essistance of e sighted person. Linde Webb, e blind typist employed by IBM, operetes the unit.

When ettached to any of four IBM megnetic medie typewriters, the IBM Audio Typing Unit ellows e blind typist to review end proofread meteriel by hearing whet hes been typed or stored on the megnetic medie.

In eddition to pronouncing end spelling typed cherecters, words or lines of text, the IBM Audio Typing Unit elso verbelizes punctuetion and capitelization, provides audio prompts to guide the operetor in the use of the host typewriter end gives eudible indications of typing position on the page.

Audio responses ere created by combining e stored set of basic speech sounds, called phonemes, in eccordence with preprogrammed pronunciation rules stored in electronic memory circuits.

The use of phonemes end the pronunciation rules developed for the IBM Audio Typing Unit provide an unlimited vocebulery. Rether then pley back e limited number of specific words, the IBM Audio Typing Unit's programmed instructions meke possible the synthesis of sounds in eny combination.

The eudio responses ere generated by e voice synthesizer unit, which produces and blends the phoneme sounds to form continuous speech.

"Human" Computer Helps Handicapped

Amid fearful cries thet the computer dehumenizes people is e creative man involved thoroughly with decomputerizing computers in order to eid humenity.

"A generel feature of society is that it doesn't invest much in those who ere poor or heve communicetion hendicaps," seid John Eulenberg, essociete professor of linguistics and computer science et Michigen Stete University.

As director of the Artificiel Language Leboretory in the Computer Science Department, Eulenberg end his student research team heve created computerized devices enebling the handicepped to communicate. One of Eulenberg's innovetions hes been the telking computer.

In October of 1975, Vicki Caruso spoke her neme for the first time in her seventeen year struggle with cerebrel palsy. With the use of the telking computers — e modified keyboard conteining e metrix of phrases end vetical end horizontel lights — the young computerist formed the messege by selecting words from e display boerd. Vie telephone hook-up, the messege wes trensmitted to e computer on campus, which relayed the signel beck to the vocel synthesizer, where it wes then converted into words.

Eulenberg cleims the computer is often used es e scepegoet. Through his work he hes shown the computer copeble of bringing the humenity out of people. Technology hes helped the hendicepped rise from being the most politically week group on eerth to people with e voice, Eulenberg seid.

"Of course, I missed the unicorns. How can I keep track of everybody without a damned computer?" ©Creative Computing

Touch-Screen Terminal

Do people feel more comfortable being interviewed by e computer then by another humen being? A recent survey conducted for the Bumsville Current and the Apple Valley/Lekeville Countryside, two Minnesote newspapers, seems to indicate this is so.

In fact, four of five participents in the survey seid they liked the computer method of surveying, while one in twenty-five disliked it (the rest hed no opinion).

The success is ettributed to e recent computer innovetion — the touchsensitive-screen terminel.

The touch-screen terminel ellows more then 95 percent of the U.S. population to converse with e computer without eny prior trainIng. All one does is sit down (or stend up) in front of the terminel, touch the screen with e finger tip, and the computer "telks" by printing words on the screen.

"Nearly ell the people who particiPated in the survey enjoyed doing so. Meny remerked thet they felt much less intimidated end were, therefore, more honest because the computer, unlike e humen interviewer, has no opinion of them.

Meny of the results from the survey reflect e generel openness among the particiPents. for example, close to 95 percent of the particiPents felt free to answer questions dealing with personel annuel income. The openness emong survey particiPents adds to the velidity of the computer survey es e sound method for gathering marketing dete.

Information Systems, Inc. of Bloomington, Minnesote conducted the merketing survey for the two pepers.

©Creative Computing

"These are the figures of the first three months..."

ium...compendium...co

Professor + Computer = Aztec Culture

A Virginia Tech professor, teamed with a computer, is trying to make it easier for English speaking people to better understand the secrets of the Aztec empire.

Franke Neumann, associate professor of religion in Tech's department of philosophy and religion, is using a computer as he translates the Aztec language — Nahuatl — into English for inclusion in a dictionary. Neumann feels this project should encourage the study of the language and literature of the cultura. He specializes in the study of pre-Hispanic Mexico.

"There are dictionaries that translate classical Nahuatl into German, French and Spanish, but no English," he said. "I was annoyed with this, since it's hard enough to translate any language directly, without having to go through an intermediary language."

So he started to compile his own dictionary, using words from many sources as a basis for his work. He soon enlisted the aid of a computer and a computer expert to increase the project's scope.

"I wanted to be able to enter words in English and draw out words in Nahuatl, and vice versa," Neumann said. "The computer makes this possible." Thanks to Harlan Miller, a computer aficionado and an associate of Neumann, the computer prints out all the related Nahuatl words and examples of their use in context, once an English word has been punched in.

Naumann has encountered two roadblocks during the seven years he has been working on the dictionary. One is lack of support; the second is a lack of time.

"Most publishers I approach say the project is a good idea, but that it's not salable," said Neumann.

Consequently, there has been little financial support. Others question the need for this type of dictionary, since Nahuatl already has been translated into Spanish, French and German.

"There is a certain mystique surrounding the Aztec language. Only those who can handle these other languages can read Nahuatl and understand the importance of translating it into English," he said.

Time is an important factor. According to the professor, he is not close to finishing the dictionary.

"I used to enter 10 words each day. Right now, I have 1,500 entries, and I'm not through with the A's," he said.

Working with a computer can be advantageous, but also time consuming, Neumann has discovered. "I have to find the information, code it, have it punched into the computer, run tests and corrections and file data. The task is so large, one person can't do it."

"But it's a good project," he added, "though I won't see its conclusion in my lifetime." □

A one-hour LP record of eight synthesizers may change your views about computer music forever

Binary Beatles

by David Ahl

Computer music. Who needs it? It's mostly boring beep, beep, beeps or wildly modern stuff. It's certainly nothing you'd want to listen to more than once. That's what I thought about computer music and most of my friends agreed.

In 1978 I entered Yankee Doodle Dandy into my Software Technology system just to be different. Dick Moberg heard of it and asked me to perform in the Philadelphia Computer Music Festival. I agreed expecting to be the only one with something out of the ordinary. I was wrong.

Computer Accompanist

Nine individuals and groups performed in the festival. There were the usual Bach pieces but even they were different. Goeltzen van der Wal performed the last movement of the 2nd Bach Suite in a unique way. He played the flute solo while using the computer as accompaniment.

Then Dorothy Siegel did the same thing, playing the clarinet solo part of Wanhal's Sonata in b flat. The audience went wild.

Hal Chamberlin played Bach's Tocatta and Fugue in d minor. But also with a difference. He used a large computer before hand to "compute" the waveform of every instrument playing every note. It took one hour of computation time for each two minutes of playback time. The result could hardly be distinguished from the organ in the Hapsburg Cathedral.

Don Schertz had a home brewed synthesizer truly mounted on a breadboard that allowed him to control 25 parameters of each note. It produced spectacular sounds in his arrangement of Red Wing.

Singing Computer

In 1962, D.H. Van Lenten at Bell Laboratories produced the first talking computer. Bell engineers taught it to recite the soliloquy from Hamlet. Then they went one step further and taught it to sing Daisy both alone and accompanied by another computer. This was also performed at the festival.

Yes, the Beatles were represented. Andrew Molda played Hey Jude on his COSMAC VIP system with a program called PIN-8 (Play it Now).

Superb Quality Recording

All these pieces and twelve others were recorded with broadcast quality equipment. Because of audience noise, eight were re-recorded later in a studio. We then took these tapes to Tru-Tone, a top recording studio and cut a lacquer master. It was a long session since the recording engineers insisted upon analyzing the sound from every source and setting up the equilization curves accordingly. It took over 12 hours to produce a one-hour lacquer master.

Finished recordings were then pressed on top-quality vinyl and inserted into liners and record jackets. These were then shrink wrapped in plastic for maximum protection. We guaranteee that every LP record is free from defects or we will replace it free of charge.

The extensive descriptions of each of the eight synthesizers and the festival would not all fit on the jacket so we've included an extra sheet with each record. This entire package is mailed in a protective corrugated package to insure that it reaches you in mint condition. The cost is a modest $6.00 postpaid in the U.S. and $7.00 foreign. Send order with payment or Visa, MasterCard or American Express number to Creative Computing, Morris Plains, NJ 07950.

This LP record contains one hour of eight computer music synthesizers that you'll listen to over and over again. Send in your order today at no risk whatsoever.

creative computing

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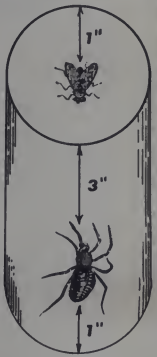
puzzles & problems

The Spider and the Fly

Our first puzzle is a humdinger. In the figure at the right we have a picture of a glass cylinder 4 inches high and 6 inches in circumference. On the outside of the cylinder is a spider 1 inch from the bottom. Exactly opposite from the spider is a fly on the inside of the cylinder 1 inch from the top. The spider, on seeing the fly, takes the shortest possible route over the cylinder and pounces on the fly. What was the route that the spider traveled and how many inches did he walk? (This puzzle is from "Merlin's Puzzler".)



The Word Square

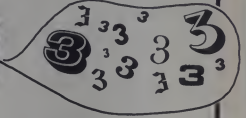
NESTLES
E R T
S A E
TRAITOR
L T N
E O E
STERNER

Here's a change-of-pace problem to stir things up a bit. Mathematical Magic squares have always been popular, so why not build a Word-Square? In our example we have a half-completed word-square. Your job, should you care to accept the assignment, is to fill in the missing letters. If you do this correctly you will have ended up with a word-square made up of the same seven words both horizontally and vertically. Since this magazine will self-destruct in about 70 years, you should have an adequate amount of time in which to complete the square. (From "Merlin's Puzzler 3.")

The Rhino's Riddle

Merlin's pet, Rupert The Rhino, is back with a math stumper for his friends.

He challenges you to arrange thirteen threes in such a way that they total up to exactly 100. I hope that this will not be an unlucky puzzle for you.



A Star Problem

Here's an interesting problem from one of our readers, Mr. James G. Cina of San Mateo, California. Refering to the diagram at the left Mr. Cina wants to know how many different squares are there with a dot at each corner which enclose the central star? This should keep you all busy for the next half hour. (Mr. Cina, Merlin is sending you a copy of "Merlin's Puzzler 2". Thanks for your contribution.)

A Square Deal

Can you divide this square into 6 perfect squares? You can do it by adding just 4 straight lines to the drawing.

Pearls of India

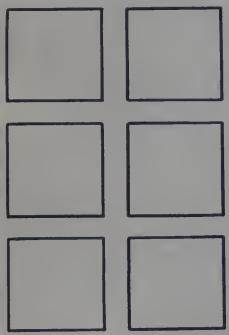
From a reader in far off India, Mr. Ravi Mehta, we have two contributions to Puzzles and Problems. The first will be presented by that famous Indian fakir, Prince Riz Aloft.

"It is written that on the road to Bombay two fathers and two sons found 3 rupees (3 silver coins). Without delay they shared out the coins, each receiving one coin. How was this possible?

Our second puzzle from Mr. Mehta deals with a math problem using Roman numerals. Below is an equation which is *not* true. Can you shift one stick around so that the equation becomes true? (Our thanks go out to Mr. Mehta. A copy of "Merlin's Puzzler" is on the way.)

$$\frac{XXIII}{VII} = II$$

A Constabulary Problem



Merlin showed me this problem the other day. He says that many years ago a policeman, by the name of Olaf Anderson, came to him in a quandary. The policeman was newly assigned to a beat in the city which covered six square blocks. Being a conscientious man officer Anderson wished to find the shortest possible route he could take that would enable him to circle each block during one complete trip around his beat. Merlin, who is very good at this type of puzzle, came up with a solution. Officer Anderson went away happy, and, so will you if you can "beat" this puzzle. Who knows, you may even find a shorter route than Merlin. If so, write to the old boy and let him know. Even Merlin's not too old (he's only 900 or so) to learn something new.

The Professor's Puzzle

Now, let's see, it says; "Take away my first letter and I remain unchanged; take away my second letter and I remain unchanged; take away my third letter and I remain unchanged; take away all my letters and still I remain exactly the same". My, my, what could that word be?"

A Money Puzzle

Here's a quick problem to wind-up our column. Can you change a dollar bill into 50 coins. Five minutes time is all you get!

Answers on page 208

That's it for this month, folks. Remember, if you have any puzzles that you would like to see printed in this column send them along to Merlin. If he uses your puzzle he will send you one of his famous books. So long until next month.

Your editor,

Charles Barry Townsend

Reviews

Steve Gray

Word Processing and Text Editing, by John Zarrella. Microcomputer Applications, Box E, Suisun City, CA 94585. 152 pages, paperback $7.95. 1980.

This is one of the first three self-published books, all by Zarella, in a projected nine-volume Microprocessor Software Engineering Concepts Series. The other two available at this writing are on Operating Systems and System Architecture.

The flier describes this book as "for anyone wishing to acquire a broad background in word processing or text editing," and as providing business or office managers with "a firm basis for understanding word processing terminology and for comparing systems," and, for software or hardware design engineers, is said to "describe the fundamental and advanced features necessary in the design of a word processing or text editing system."

The basics are covered in ten chapters: Introduction, System Configuration Overview, Documents and Files, Formatting and Layout, Advanced Features, Editing, Printing, Programming, Office of the Future, and Data Structures. Two appendixes provide a 37-page glossary of terms and a list of five reference works.

The writing is workmanlike and gives enough detail to satisfy a reader interested in the ABCs of the subject, although a design engineer would want to know more than provided in this slim volume, which does quite well in only 100 small pages of text.

Owning Your Home Computer, by Robert L. Perry. Everest House, 1133 Ave. of the Americas, New York, NY 10036. 224 pages, hardcover $15.00, paperback $10.95. 1980.

This is one of the better guides to personal computers, with a well written text that gets into enough detail to be interesting, but not into so much that it's boring.

After introductory chapters, there's How to Buy a Home Computer (questions to ask yourself, points to consider), The Newest Home Computers (Sinclair ZX80, APF Imagination Machine, Interact One, Mattel Intellivision, TI 99/4, HP-85), The Handiest Home Computers (Radio Shack TRS-80, Commodore PET, Apple II and III, Ohio Scientific Challenger, Compucolor II, Exidy Sorcerer, Atari 400 and 800), Networking, Future Products.

The third part of the book has six chapters on applications, from learning programs to help for the handicapped. An 11-page appendix lists 1,050 programs, by vendor, machine and category, mainly for the Apple, Atari, PET, Compucolor, and TRS-80.

Despite some confusing oversimplifications such as "the calculator 'prints' instuctions on magnetic cards with a magnetic footprint," a few unfortunately overthusiastic predictions such as TI, with its 99/4, promising to "quickly become—and remain—one of the two or three most important home computer companies," and several very poor free-hand block diagrams, this book is well worth the price, as a guide to those looking for a path throught the maze of home-computer hardware, plus a careful look at adjacent areas of interest.

Musical Applications of Microprocessors, by Hal Chamberlin. Hayden Book Co. Inc., Rochelle Park, NJ 671 pages, hardcover $24.95. 1980.

Hal Chamberlin's name has been synonymous with musical applications of computers for years, and he's finally put a great deal of his knowledge and experience into a book.

According to the blurb, "Here's a truly comprehensive book that covers digital microprocessor sound and music synthesis, and features heretofore unpublished techniques that are practical only with microprocessors."

The two-inch-thick book is divided into three sections: Background (analog music synthesis principles, sound modification voltage control, direct computer synthesis, microprocessors), Computer-controlled Analog Synthesis (analog modules, DA and AD converters, signal routing, organ keyboard interface, control sequence display and editing), and Digital Synthesis and Sound Modification (DA and AD conversion of audio, digital tone generation, digital filtering, percussive sound generation, source-signal analysis, digital hardware, music synthesis software).

One of the appendixes lists 12 books, indicating seven "that would be most valuable for further study." The three listed books on computer music were copyrighted in 1969 and 1975, making Hal's book the latest by far.

Hal writes very clearly and in enough detail to satisfy anybody, from beginner to engineer. A great many waveforms, schematics, and block diagrams are used, along with flowcharts and programs in assembler and Basic.

If you have more than a casual interest in computer music, get this book. It may tell you more than you want to know, but it will tell you all you need to know.

An Introduction to Computer Science: An Algorithmic Approach, by Jean-Paul Tremblay and Richard B. Bunt. McGraw-Hill Book Co., NY. 654 pages, hardcover $14.50. 1979.

This is another in McGraw-Hill's Computer Science Series, for which Tremblay, in conjunction with other authors, has written books on mathematical structures and data structures.

Intended as a text for a first course in computer science, this book focuses on problem-solving by being language-independent and de-emphasizing flowcharts.

So that the student "not become mired in programming language detail," the authors introduce an algorithmic language. The book is based "on the premise that a student should learn to program *into* a programming language rather than *in* one. The translation of the algorithms developed in this book into most programming languages ought to be a straightforward exercise."

The eleven chapters deal with Computer History, Computers and Solving problems, Decision Structures, Vectors and Arrays, Strings and Things, Subalgorithms, Programming, Linear Data Structures and Their Applications, and Trees.

Every chapter (except the first) contains dozens of exercises.

This is one of the better language-independent textbooks, written in semi-conversational style, full of worked-out examples, and progressing slowly and carefully from basic principles toward the more comple areas.

The algorithmic language resembles a simplified Basic with some of the symbols changed.

Basic Computer Programs For Business: Volume 1, by Charles D. Sternberg. Hayden Book Company Inc., Rochelle Park, NJ. 269 pages, paperback $9.95. 1980.

Sternberg, who wrote a Hayden book on *Basic Computer Programs For The Home*, with 75 programs, has turned his attention to business, with over 35 programs covering budgets, depreciation, cash flow, property comparisons, accounts payable, order entry, warehouse locations, inventory turnover analysis, job routing, resource allocation, production scheduling, etc.

The book has eight chapters: an Introduction, Simple Bookkeepping System, Accounts Receivable Systems, Financial Programs (General), Perpetual Inventory System, Periodic Inventory System, Inventory Programs (General), and Production programs (General).

The introduction is very brief, less than three pages. The bookkeeping chapter leads the reader through a simple system, detailing the reports required, and providing Flowcharts, program listings in Basic, symbol tables, sample data, and samples of all the reports.

Everything is explained in enough detail so that any businessman or entrepreneur with a knowledge of business fundamentals can follow the text with a minimum of difficulty.

According to the Appendix, which outlines the language features used, the programs were developed and run on an Altair 8800b operating under Altair's Revision 4.1 of their Disk Entended Basic. This is Microsoft's older disk Basic (the current version is 5.X), so on there should be little if any trouble using these programs on any of the many computers that use Microsoft Basic.

The Information Age, by William S. Davis and Allison McCormack. Addison-Wesley Publishing Co., Reading MA. 445 pages, hardcover $14.95. 1979.

The Information Age: Instructor's Manual. 105 pages, paper cover, $2.95. 1979.

Designed for an overview course in computers, this textbook is language-independent, and covers the hardware/software technology of computers in the first half and the social implications of computers in the second half.

The 21 chapters are divided into five parts: The Computer Impact, The Basic Technology, How Computers Are Used, Problems (computers and employment, computers and crime, the misuse of power, etc.), and Two Views of The Future (optimistic and pessimistic).

Hardware discussions are not at the circuit level, but at a higher level disigned to provide a basic understanding of the computer. On this basis it can be read with profit by anybody wanting a not-too-technical explanation of what computers are all about.

Each chapter ends with a summary, list of keywords, and nine or ten exercises. The book ends with a glossary.

The instructor's manual, designed to aid classroom lectures based on the text, contains for each chapter a statement of the objectives of the chapter, a discussion of how the chapter fits into the overall text organization, a list of key ideas covered in the chapter, specific lecture suggestions with occasional brief anecdotes, additional references, solutions to textbook exercises, additional exercises, suggestions for out-of-class projects, and examination questions with answers.

Introduction to TI Basic, by Don Inman, Ramon Zamora and Bob Albrecht. Hayden Book Co. Inc., Rochelle Park, NJ. 314 pages, paper back $9.95. 1980.

This is one of several books on Basic for the Texas Instruments Home Computer, written before the TI 99/4 made such a poor showing on the market. As a clear, well-written test on Basic, it's quite good, but not many copies will be sold.

The authors are old hands at Basic books, and know how to take the neophyte by the hand and lead him slowly through the mysteries of the computer, building up his confidence with short programs explained in full detail. Later chapters get into larger programs, for animation, color graphics, sound and music.

The 14 chapters are on an introduction, sound and color graphics, simple programs, loops, simulation, control statements, data files, arrays, anamation, strings, editing, and subroutines. The five appendixes cover musical notes and frequencies, character codes, color codes, mathematical operations (decimals, floating point, scientific notation), and error messages.

The book is very nicely produced, with all program lines in boldface, and many drawings of how the screen looks while entering a program or RUNning it.

Each chapter ends with review questions, followed by the answers. Now that the 99/4 is heavily discounted, one sentence in the preface should be pointed out: "For those persons who are 'thinking' about getting a TI 99/4, this book is an excellent resource in helping them make that decision."

Structured Microprocessor Programming, by Morris Krieger, Charles Popper, Robert Radcliffe & David Ripps. Yourdon Press, NY. 239 pages, paperback $18. 1979.

This book is about three things: structured programming; instructions for 8080/8085 microprocessors; and SMAL/80, a structured macro-assembly language for 8080 and 8085, which the publisher says "combines the advantages of traditional assemblers with the power of high-level languages such as Pascal or C."

The publisher also says the book is "valuable to hardware experts having no programming experience, as well as to data-processing students familiar with higher-level languages but who desire an introduction to assembly language for small computers and an increased understanding of the link between computer programs and the hardware that executes them."

The four authors are partners in a microprocessor software firm, whose name is made up of the first letters of their given names, Chromod Associates, whose primary product is the SMAL/80 package: compiler, macro-assembler, and translator program.

The 15 chapters cover an introduction to SMAL/80; structured programming; computer basics; binary numbers; Boolean logic; decision-making with IF/THEN/ELSE; decision-making with LOOP/REPEAT; symbolic addressing; BREAK and NEXT; subroutines and the stack; files, counters and markers; storage and retrieval; writing modular programs; I/O programming; and the SMAL/80 macro-processor.

Four appendixes provide 8080/8085 condition flags, a description of the macro-processor, and instructions for the 8080/8085, Z-80 and SMAL/80, sorted both numerically and alphabetically.

The writing is clear and relatively simple, and the text is about as simple as possible, so that anybody with a little computer background should be able to get through this book with a minimum of difficulty. There's a great deal to learn here, and the authors have made it as easy as possible.

Economic and Ecology Simulations

The Ecology Simulations series are a unique educational tool. They are based on "simulation models" developed by the Huntington Two Computer Project at the State University of New York at Stony Brook under the direction of Dr. Ludwig Braun. The programs and accompanying documentation are written for self-teaching or classroom use and include background material, sample exercises and study guides. Graphic displays were specially developed by Jo Ann Comito at SUNY and Ann

Corrigan at Creative Computing. The Ecology Simulations packages are a remarkable educational application of micro-computers

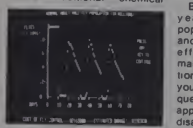
Ecology Simulations-1, CS-3201 (16K)

1. Pop

The POP series of models examines three different methods of population projection, including exponential, S-shaped or logistical, and logistical with low density effects. At the same time the programs introduce the concept of successive refinement of a model, since each POP model adds more details than the previous one

2. Steri

STERL allows you to investigate the effectiveness of two different methods of pest control—the use of pesticides and the release of sterile males into the fly population. The concept of a more environmentally sound approach versus traditional chemical methods is introduced. In addition, STERL demonstrates the effectiveness of an integrated approach over either alternative by itself.



3. Tag

TAG simulates the tagging and recovery method that is used by scientists to estimate animal populations. You attempt to estimate the bass population in a warm-water, bass-bluegill farm pond. Tagged fish are released in the pond and samples are recovered at timed intervals. By presenting a detailed simulation of real sampling by "tagging and recovery," TAG helps you to understand this process.

4. Buffalo

BUFFALO simulates the yearly cycle of buffalo population growth and decline, and allows you to investigate the effects of different herd management policies. Simulations such as BUFFALO allow you to explore "What if" questions and experiment with approaches that might be disastrous in real life.

Ordering Information

The series is designed for the 16K TRS-80 Level II and is attractively packaged in a vinyl binder with a complete study guide. *Ecology Simulations-I:* disk CS-3501, cassette 3201. *Ecology Simulations-II:* disk CS-3502, cassette CS-3202. *Social and Economic Simulations:* disk CS-3508, cassette CS-3204. At a modest $24.95 each, the series is an affordable necessity.

To order, send payment plus $2.00 for one, $3.00 for two or more for shipping and handling to Creative Computing Software, Dept. ACGG, P.O. Box 789-M, Morristown, NJ 07960. For Faster Service, call in your order toll-free to our order hotline 800-631-8112. In NJ call 201-540-0445.

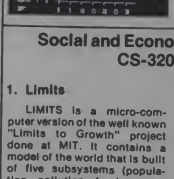
Ecology Simulations-2, CS-3202 (16K)

1. Pollute

POLLUTE focuses on one part of the water pollution problem, the accumulation of certain waste materials in waterways and their effect on dissolved oxygen levels in the water. You can use the computer to investigate the effects of different variables such as the body of water, temperature, and the rate of dumping waste material. Various types of primary and secondary waste treatment, as well as the impact of scientific and economic decisions can be examined.

2. Rats

In RATS, you play the role of a Health Department official devising an effective, practical plant to control rats. The plan may combine the use of sanitation and slow kill and quick kill poisons to eliminate a rat population. It is also possible to change the initial population size, growth rate, and whether the simulation will take place in an apartment building or an entire city



3. Malaria

With MALARIA, you are a Health Official trying to control a malaria epidemic while taking into account financial considerations in setting up a program. The budgeted use of field hospitals, drugs for the ill, three types of pesticides, and preventative medication, must be properly combined for an effective control program.

4. Diet

DIET is designed to explore the effect of four basic substances, protein, lipids, calories and carbohydrates, on your diet. You enter a list of the types and amounts of food eaten in a typical day, as well as your age, weight, sex, health and a physical activity factor. DIET is particularly valuable in indicating how a diet can be changed to raise or lower body weights and provide proper nutrition

Social and Economic Simulations CS-3204 (16K)

1. Limits

LIMITS is a micro-computer version of the well known "Limits to Growth" project done at MIT. It contains a model of the world that is built of five subsystems (population, pollution, food supply, industrial output, and resource usage) linked together by six variables: birth rate, death rate, pollution generation, resource usage rate, industrial output growth rate, and food production rate.

2. Market

Market allows two or more people to play the roles of companies who are competing for the market for a particular product: in this case, bicycles.

Each player makes marketing decisions quarterly including the production level, the advertising budget, and the unit price of the product for his/her company.

3. USPop

USPOP allows the user to study many aspects of the United States' human demography (population change) including population growth, age and sex distribution. USPOP makes population projections and investigates the consequences of many different demographic changes.

Creative Computing-- Albert Einstein in black on a red denim-look shirt with red neckband and cuffs.

Creative's own outrageous **Bionic Toad** in dark blue on a light blue shirt for kids and adults.

Plotter display of **Pi to 1362 Places** in dark brown on a tan shirt.

I'd rather be playing spacewar-- black with white spaceships and lettering.

Give your tie a rest!

All T-shirts are available in adult sizes S,M,L,XL. Bionic Toad, Program Bug and Spacewar also available in children's sizes S (6-8), M (10-12) and L (14-16). Made in USA. $6.00 each postpaid.

Specify design and size and send $6.00 for each shirt to Creative Computing, P.O. Box 789-M, Morristown, NJ 07960. Orders for two or more shirts may be charged to Visa, MasterCard or American Express. Save time and call toll-free **800-631-8112** (in NJ 201-540-0445).

Computer Bum-- black design by cartoonist Monte Wolverton on gray denim-look skirt with black neckband and cuffs.

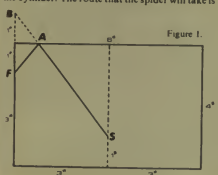
The **Program Bug** that terrorized Cybernia in Katie and the Computer is back on this beige t-shirt with purple design. You can share the little monster with your favorite kid.

Roll down the block with this little black **Robot Rabbit** (on a bright orange t-shirt) on your back and you can intimidate every carrot, radish or cuke in your way.

CIRCLE 300 ON READER SERVICE CARD

Puzzle Answers

The Spider and the Fly — To illustrate the solution to this problem we must first cut the cylinder and open it out flat (see Fig. 1). We will mark the location of the fly with an "F" and the location of the spider with an "S." Now extend the line of the left side upwards one inch to point B. If we draw a line from B to S we will cut the top edge of the drawing at point A, this is the point at which the spider will go over the edge of the cylinder. The route that the spider will take is the hypotenuse of a right-sided triangle with a base 4" long and a high side 3" long. The hypotenuse is then 5" long, the shortest route that the spider could have taken.

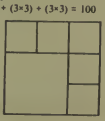


THE WORD SQUARE:

N	E	S	T	L	E	S
E	N	T	R	A	N	T
S	T	R	A	N	G	E
T	R	A	I	T	O	R
L	A	N	T	E	R	N
E	N	G	O	R	G	E
S	T	E	R	N	E	R

The Rhino's Riddle:
$(3/3)^3 + (3)^3 + (3)^3 + (3)^3 + (3*3) + (3*3) = 100$

A Star Problem: 18.



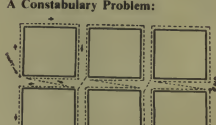
A Square Deal:

Pearls of India: The answer to the first puzzle is that there were only three people — a grandfather, a father and a son.

The answer to the second puzzle is:

$$\frac{XXII}{VII} = \pi\left(\frac{22}{7}\right) = \pi \quad \text{or } 3.14$$

A Constabulary Problem:



The Professor's Puzzle: It's no word. The answer is a person, a "Postman".

A Money Puzzle: 45 pennies, 1 quarter, 2 dimes, 2 nickels.

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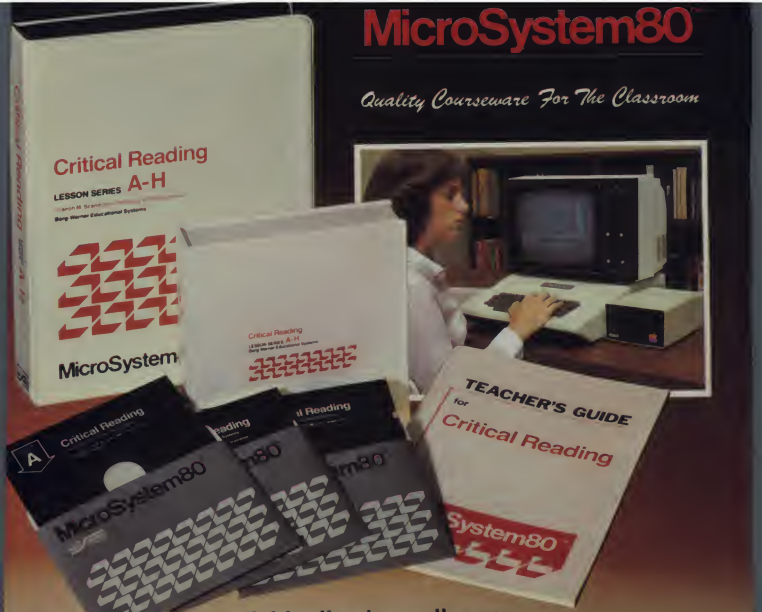

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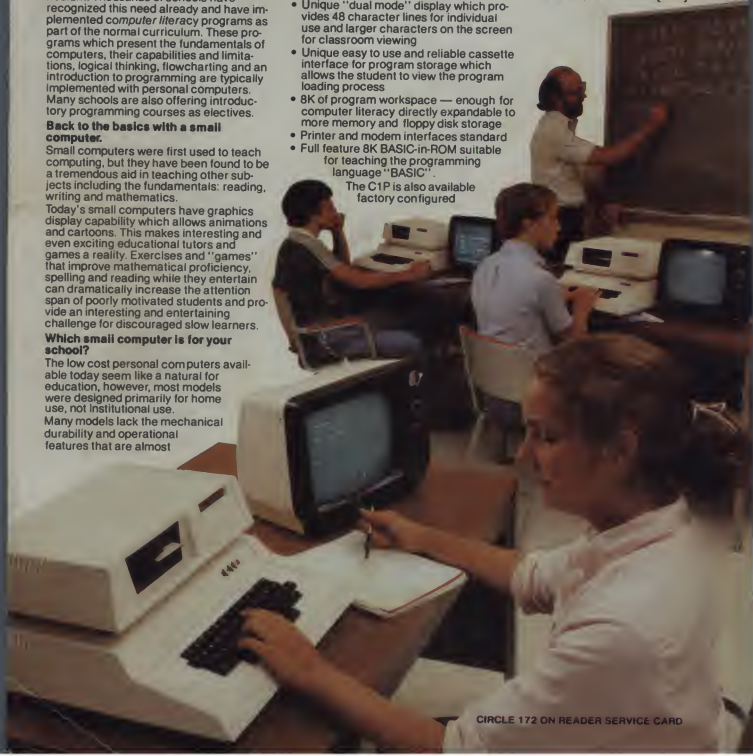

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