

Micro computing

Thomas J. Bergin

©Computer History Museum

American University

Context....

- What was going on in the computer industry in the 1970s?
 - Mainframes and peripherals
 - Minicomputers and peripherals
 - Telecommunications
 - Applications, applications, applications
 - Operating systems and programming languages

And the answer is....

- Everything!!!
 - Mainframes from small to giant
 - Supercomputers (many varieties)
 - Minicomputers, Super Minis, tiny Minis
 - Networks, WANS, LANS, etc.
 - Client Server Architectures
 - 2nd and 3rd generation applications:
 - Executive Information Systems
 - Decision Support Systems, etc.

And into this technologically rich soup of computing, comes the:

- Microprocessor
- Microcomputer
- New Operating Systems
- New Operating Environments
- Economics
- New Users, New Users, New Users, New Users, New Users, New Users, New Users, New Users

Intel

- Robert Noyce, Gordon Moore, and Andrew Grove leave Fairchild and found Intel in 1968
 - focus on random access memory (RAM) chips
- Question: if you can put transistors, capacitors, etc. on a chip, why couldn't you put a **central processor on a chip**?

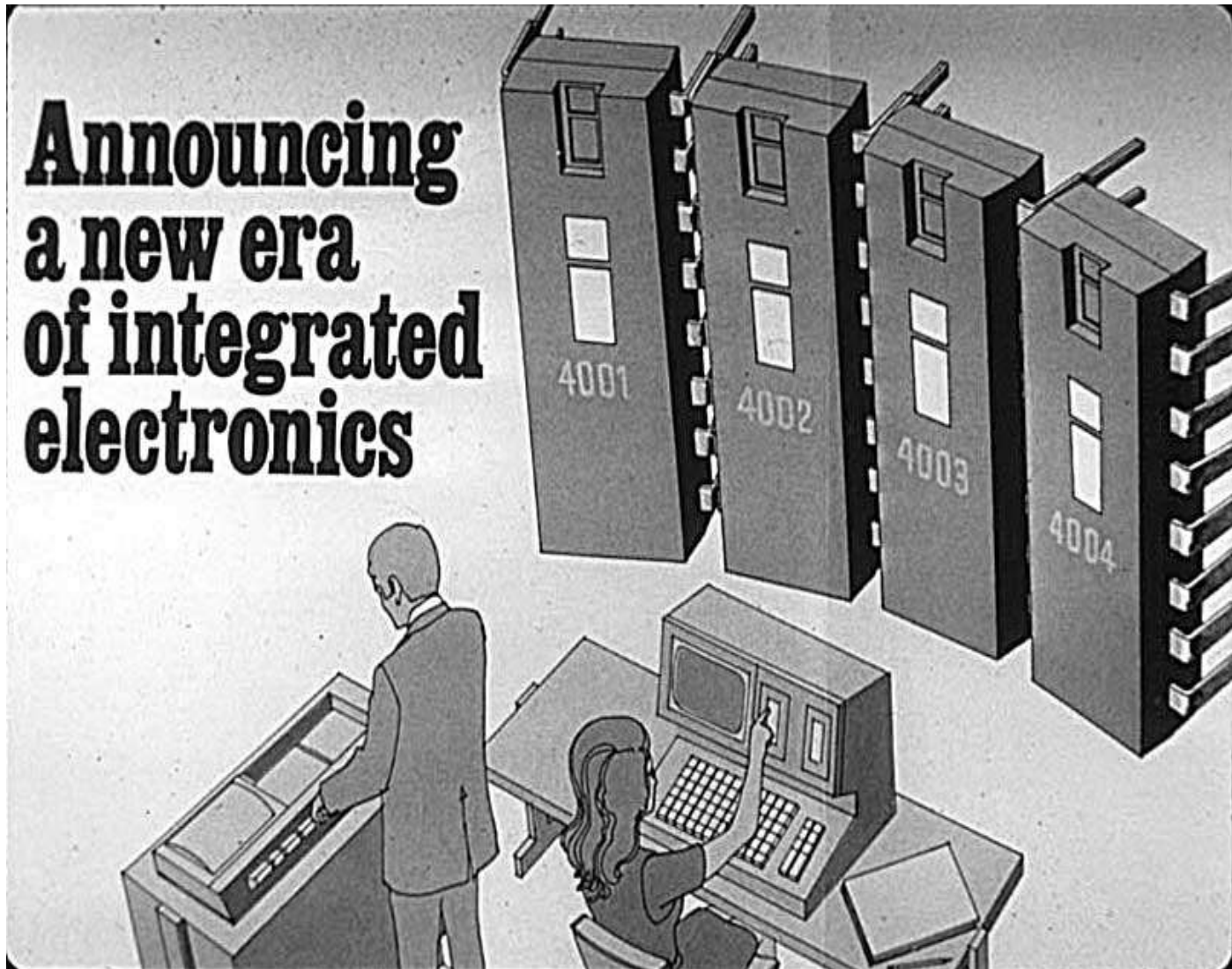
Enter the hero: Ted Hoff

- Ph.D. Stanford University: Electrical Engineering
 - Semiconductor memories; several patents
- Intel's 12th employee: hired to dream up applications for Intel's chips
- Noyce wanted Intel to do memory chips only!
- 1969: ETI, a Japanese calculator company -- wants a chip for a series of calculators

The Microprocessor

- ETI calculator would cost as much as a mini
- "Why build a special purpose device when a general purpose device would be superior?"
- Hoff proposed a new design loosely based on PDP-8: the Japanese weren't interested!
- October 1969, Japanese engineers visit Intel to review the project, and agree to use the I 4004 for their calculator. (first microprocessor.)

Intel 4004



source: Computer Museum

The Second Step (1971)

- Computer Terminal Corporation built technically sophisticated terminals, and needed chips
- Hoff proposed a single integrated circuit.
- I 4004 operated on 4 bits at a time; couldn't handle a single character in one operation!
- Federico Fagin designs the Intel 8008
- CTC pulls out and Intel has no customers
- Texas Instruments produces chips for CTC

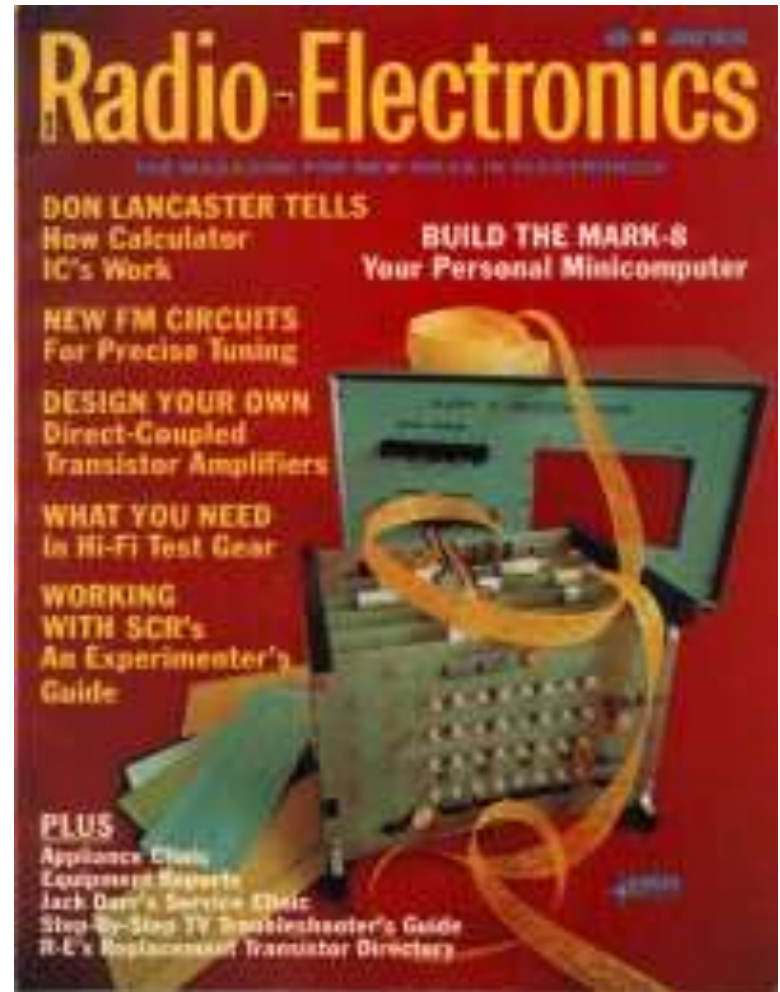
Hindsight/Foresight?

- The microprocessor has brought electronics into a new era. It is altering the structure of our society.
 - Robert Noyce and Marcian Hoff, Jr. "History of Microprocessor Development at Intel", *IEEE Micro*, 1981

Radio Hobbyists



Edmund Berkley's *Simon*
relay based, 1950-51



July 1975

Radio-Electronics

85¢ JULY 1974

THE MAGAZINE FOR NEW IDEAS IN ELECTRONICS

DON LANCASTER TELLS
How Calculator
IC's Work

BUILD THE MARK-8
Your Personal Minicomputer

NEW FM CIRCUITS
For Precise Tuning

DESIGN YOUR OWN
Direct-Coupled
Transistor Amplifiers

WHAT YOU NEED
In Hi-Fi Test Gear

WORKING
WITH SCR's
An Experimenter's
Guide

PLUS
Appliance Clinic
Equipment Reviews
Jack Dwyer's Electronic Clinic
Step-by-Step Troubleshooter's Guide
R-E's Department Transistor Directory



Mark-8

- John Titus was a graduate student in chemistry at VA Tech
- Using PDP 8/L
- Prototype: 1974
- Plans: \$5.00
- Build: \$350.00

<http://www.his.com/~jlewczyk/adavie/mark8design.html>

Kim-1, 1976, MOS 6502, \$245

<http://www.geocities.com/~compcloset/CommodoreKIM-1.htm>





MOS
KIM-1
microcomputer
system

USE THIS FORM TO ORDER YOUR KIM-1 TODAY!

Send to:
MOS TECHNOLOGY, INC.
KIM-1, 950 Rittenhouse Rd.
Norristown, PA 19381

Please allow 4-6 weeks for delivery of a unit at \$245.00 per unit plus \$5.00 for shipping, handling and insurance (U.S. and Canada only). PA residents add 6% sales tax. International sales subject to 11.5% Commodore General Regulations. Add \$30.00 per year for shipping and handling of international orders.

My check or money order is enclosed for \$ _____

Name _____

Address _____

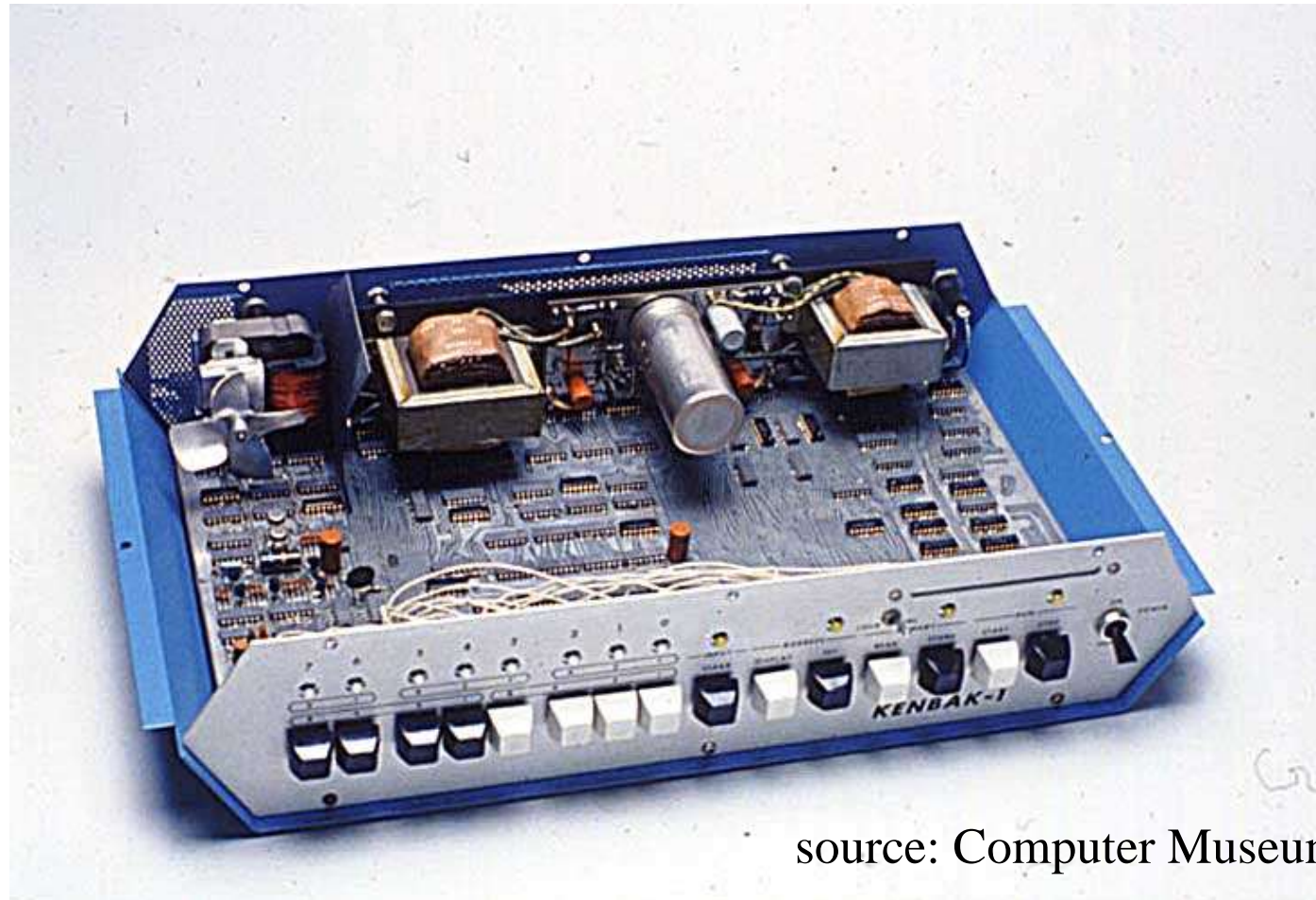
City _____ State _____ Zip _____

- A COMPLETE MICROCOMPUTER
- ONLY \$245
- NOT A KIT!
 - FULLY ASSEMBLED
 - FULLY TESTED
 - FULLY WARRANTED
- OPERATES WITH
 - KEYBOARD & DISPLAY
 - AUDIO CASSETTE
 - TTY
- KIM-1 INCLUDES
 - HARDWARE
 - KIM-1 MODULE WITH
 - 6502 μ P ARRAY
 - 6530 ARRAY (2)
 - 1 K BYTE RAM
 - 15 I/O PINS
 - SOFTWARE
 - MONITOR PROGRAMS (STORED IN 2048 ROM BYTES)
 - FULL DOCUMENTATION
 - KIM-1 USER MANUAL
 - SYSTEM SCHEMATIC
 - 6500 HARDWARE MANUAL
 - 6500 PROGRAMMING MANUAL
 - 6500 PROGRAMMER'S REFERENCE CARD

Kenebak-1 (1971)

John V. Blakenbaker -- **first personal computer**

Scientific American ad: \$750



source: Computer Museum

Micral (1973)

Thi T. Truong founded R2E (French)

earliest non-kit commercial computer

Intel 8008, 500 sold in 6 months at \$1750



source: Computer Museum

Scelbi 8H (March 1974)

first comm. adv. US computer based on a microprocessor

- Intel 8008
- Kit form and assembled
- 4K internal memory
- Cassette tape
- Teletype and oscilloscope interfaces
- Electronic and biological applications
- 1975: 8B version had 16 K of memory



source: Computer Museum

HOW TO "READ" FM TUNER SPECIFICATIONS

Popular Electronics

WORLD'S LARGEST BLIND ELECTRONICS MAGAZINE - ANNUAL SUBS. TOTAL: 100K

PROJECT BREAKTHROUGH!

World's First Minicomputer Kit to Rival Commercial Models...

"ALTAIR 8800" **SAVE OVER \$1000**



ALSO IN THIS ISSUE:

- An Under-\$90 Scientific Calculator Project
- CCD's—TV Camera Tube Successor?
- Thyristor-Controlled Photoflashers



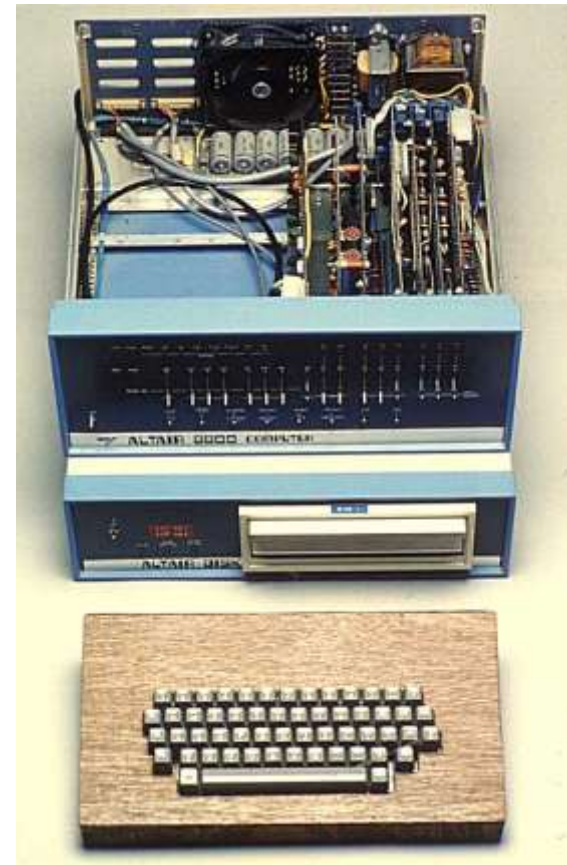
TEST REPORTS:

Technics 200 Speaker System
Plessey RT-1011 Open-Reel Recorder
Twin Diamond-40 CB AM Transceiver
Edmund Scientific "Nirvan" Photo Kit
Hewlett-Packard 5320 Frequency Counter

MIT S Altair (announced January 1975)

First mass-marketed personal computer

- Intel 8080 at 2MHz
- 256 bytes of memory
 - 1024 and 2048 boards
- Paper tape or cassette
- **S-100 backplane**
- Shipped: April 1975
- 500 sold by December
 - **Kit: \$395**
 - Assembled \$650



source: Computer Museum

Microcomputers

- Ed Roberts founds Micro Instrumentation Telemetry Systems (MITS) in 1968
- Roberts coins the term: *personal computer*
- Les Solomon's (Editor of *Popular Electronics*) 12 year old daughter, Lauren, was a lover of *Star Trek*. He asked her about the name of the computer on the *Enterprise*. She said "*computer* but why don't you call it *Altair*, because that is where they are going!
- *Popular Electronics* puts the MITS *Altair* on the cover in January 1975 [nee PE-8, Intel 8080]

Altair 8800 Computer



Tom Carlson

Some Early Microcomputer Vendors

reference: Haddock, A Collector's Guide to Personal Computers

each architecture is unique: operating system, storage formats

- Applied Microtechnology
- Commodore
- Cromemco
- Data General
- DEC
- Electronic Product Assoc.
- HAL Communications
- IMSAI
- Intelligent Systems Corp.
- Osborne Computers
- Ohio Scientific
- PolyMorphic Systems
- Radio Shack
- Sinclair Research
- Southwest Technical Products
- Systems Research
- Vector Graphic

IMSAI (IMS Associates, Inc

Altair clone (Intel 8080A) 1976

- 4K memory exp: 64K
- **Input: toggle switches**
- S-100 with 22 exp. slots
- Floppy drive and 50 M hard drive available
 - 2 floppies: + \$1,095
- Production Dec. **1975**
- Kit: \$439
- \$931 assembled with 1 k of RAM



Shown with dumb terminal: Computer Museum

Radio Shack

- TRS-80 (1977)
- Z80 (Zilog)
- \$599.95 bought:
 - 4K memory
 - BASIC
 - Cassette storage
 - Readable manuals
 - Plan: 300/year
- Sold 10,000 1st month
- TRS-80 homepage:
<http://www.kjsl.com/trs80/>



source: Computer Museum

Monitor and Printer were extra

A New Techno-culture

Radio Shack

MICROCOMPUTER

NEWSLETTER

MAY, 1979

Radio Shack One Tandy Center Lane Dallas, Texas 75212

Computer Services

HOTLINE

1-800-433-1679

This information may be the most valuable you'll find in this Newsletter. We suggest you read it carefully and file it for future reference.

Radio Shack is dedicated to the idea that our responsibility to you doesn't end when we sell you a computer. For that reason, we've established a Computer Services Group to help you with hardware and software questions.

Of course, one of the first things you can do to insure best performance from your equipment is to read your manuals carefully. Often, the solution to a problem can be found in the manuals. But if not, Radio Shack Computer Services has a toll-free HOTLINE you can call for assistance. It's shown in big type above and again on the next page.

The Computer Services Group has recently been reorganized and is now under the direction of John Snodgrass. On John's staff are a number of computer analysts you can call to get answers to your questions.

To get the most efficient service, think through your problem completely and develop as clear a statement as possible about your difficulty. (For vague aches and pains, we can't give you aspirin.) Please DO NOT call us for help in writing or debugging your applications programs... we are not set up for custom software work.

Radio Shack is a 50-year-old company. We value your business and our reputation. So here's how you can help us preserve both:

For routine questions, call our Computer Services Group and speak with one of our analysts. The toll-free number is:

1-800-433-1679 (or 1000)

If you believe the problem is not routine, it appears to be chronic, and has resisted repeated attempts at solution, call and ask specifically for Paul Franco. Think of Paul as a "central communications point" at Radio Shack who knows where to get the answers you need.

In the case of a detailed problem, it may be easier and more convenient for you to write. But always include a telephone number to call to Hotline, next page.



SALE!

\$200 OFF TRS-80TM SCREEN PRINTER

If you've been needing an economical way to get a printed copy of programs and data, your wait is over! Our fast Screen Printer is now on sale for \$399. (Regular price, \$599.)

This printer will produce a copy of whatever is on your video screen—including graphics—in only 2 seconds! It will operate on a Level-I or Level-II TRS-80, with or without the Expansion Interface. BUT—if you presently have an Expansion Interface with a buffered cable, you will have to order a special buffered cable, discussed below.

The Screen Printer uses special aluminumized paper which can be ordered at your Radio Shack store or our National Parts Dept. Copies will not fade and are not affected by heat or light.

Don't miss this outstanding buy. Save \$200!

Screen Printer, Cat. No. 26-1151 Sale \$399.00

Paper, item No. ACP-0031 Pkg. of 3 rolls, \$14.95

SCREEN PRINTER BUFFERED E/I CABLE

If you are operating an Expansion Interface that already has a Buffered Cable, you will need this special Buffered Cable for use with the Screen Printer.

Just ask your store to order part number AW-2340 from Radio Shack National Parts Dept. in Fort Worth.

When the new cable arrives, you can exchange your existing buffered cable for the new cable at no charge.

Part No. AW-2340 No Charge with Exchange.

Ft. Worth Scene...

"Good grief, Virginia! It's a newsletter from Radio Shack! Now I know there's a Santa Claus!"

We know how you feel. We've received numerous inquiries about the "monthly" Microcomputer Newsletter. Please bear with us a little longer. We are in the process of "beefing up" our Newsletter staff so it will indeed be the monthly publication we've been promising. Meanwhile, we've tried to do some catching up by making this an extra-long issue. Look it over carefully—there should be something of interest for almost everyone.

To start with, many of you will be pleased to know that TRSDOS 2.2 is in the works. It will contain some corrections and enhancements. Again, bear with us... it'll be worth the wait! The exact release date for TRSDOS 2.2 is not certain, but when it is released, those of you who already have TRSDOS 2.1 can get the new version at no charge.

All you'll have to do is go to the Radio Shack store or Computer Center where you purchased your original system and pick up a diskette with the new system and revised manual pages.

TRS-80 User's Groups are forming all over the country. We have received reports from groups in Oregon and California, and West Virginia. If there are more of you out there, we would very much like to hear from you! Write to:

Microcomputer Newsletter
700 One Tandy Center
Fort Worth, Texas 76102

Let us know that you exist and what you're doing. If you have any programming tips or especially useful programs you'd like to share, send them in so we can publish them in future editions of the Newsletter.

Mailing List Info
— See last page —

Disk Owners
... See Page 5

Radio Shack

TRS-80TM

Microcomputer NEWS

P.O. Box 2510, Fort Worth, Texas 76101

THE MICROCOMPUTER NEWSLETTER PUBLISHED FOR TRS-80 OWNERS

Volume 3, Issue 4

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RADIO SHACK ANNOUNCES AGRICULTURE'S FIRST ELECTRONICS MARKETING INFORMATION SERVICE

Tandy Corporation/Radio Shack, in a joint announcement with Professional Farmers of America, in Chicago recently revealed plans for agriculture's first electronic marketing information service.

Called Instant Update, the service provides farmers and agribusinessmen immediate access to the market-making events that affect commodity prices, crop yields and other data important to improving farmers' business activities.

Instant Update information will be transmitted via telephone lines to VIDEO-TEX terminals specially made by Tandy Corporation/Radio Shack for the Professional Farmers of America program.

"The Radio Shack VIDEO-TEX system was selected because of its technology and cost effectiveness," stated Charles Phillips, senior vice president of Special Markets for Radio Shack. This Radio Shack terminal utilizes standard telephone lines and a standard television set.

(Continued on Page 20)

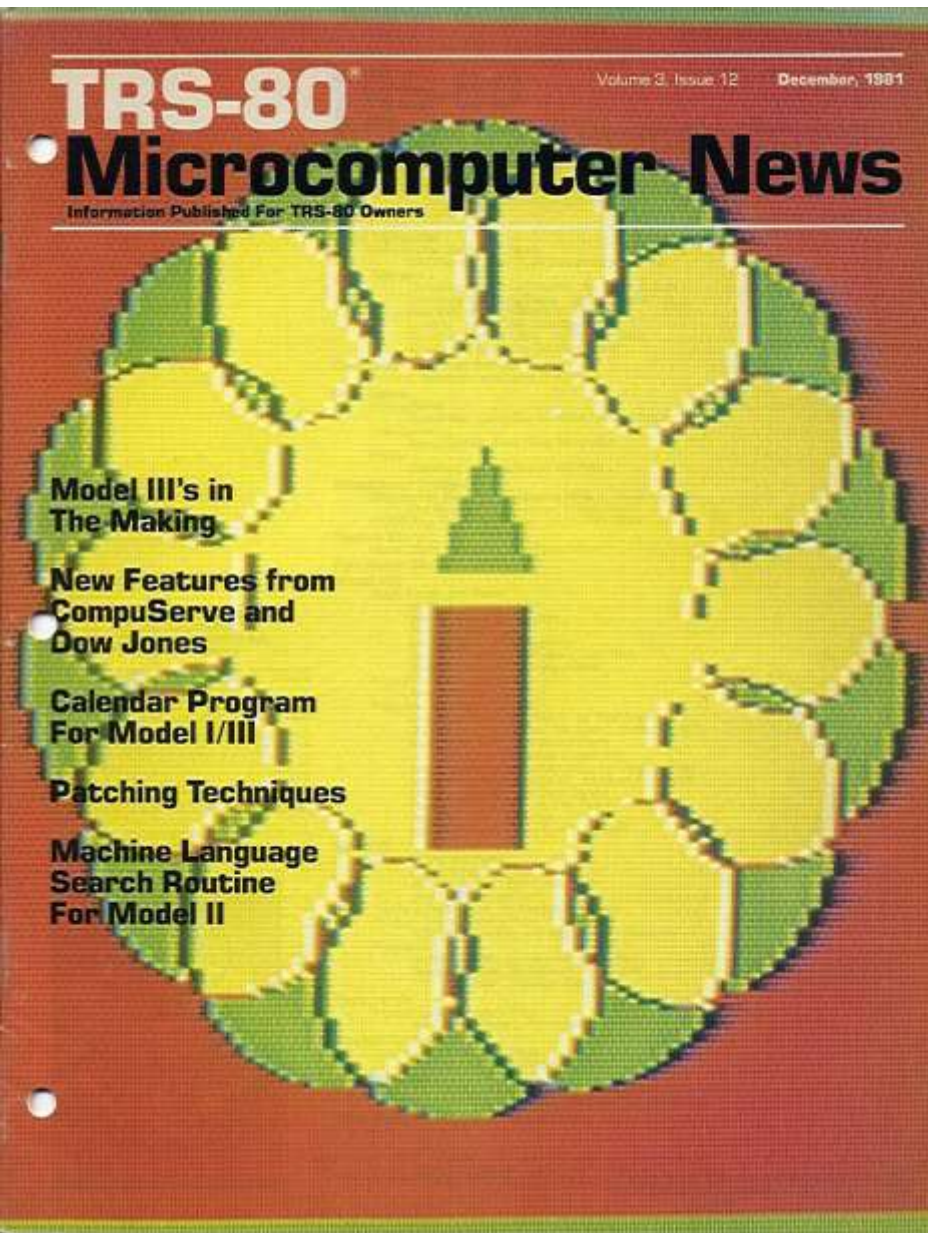
Computer Club

Southern Maine TRS-80 Group
15 Mountain View Road
Cape Elizabeth, ME 04107
207/767-2351 or 207/797-4896

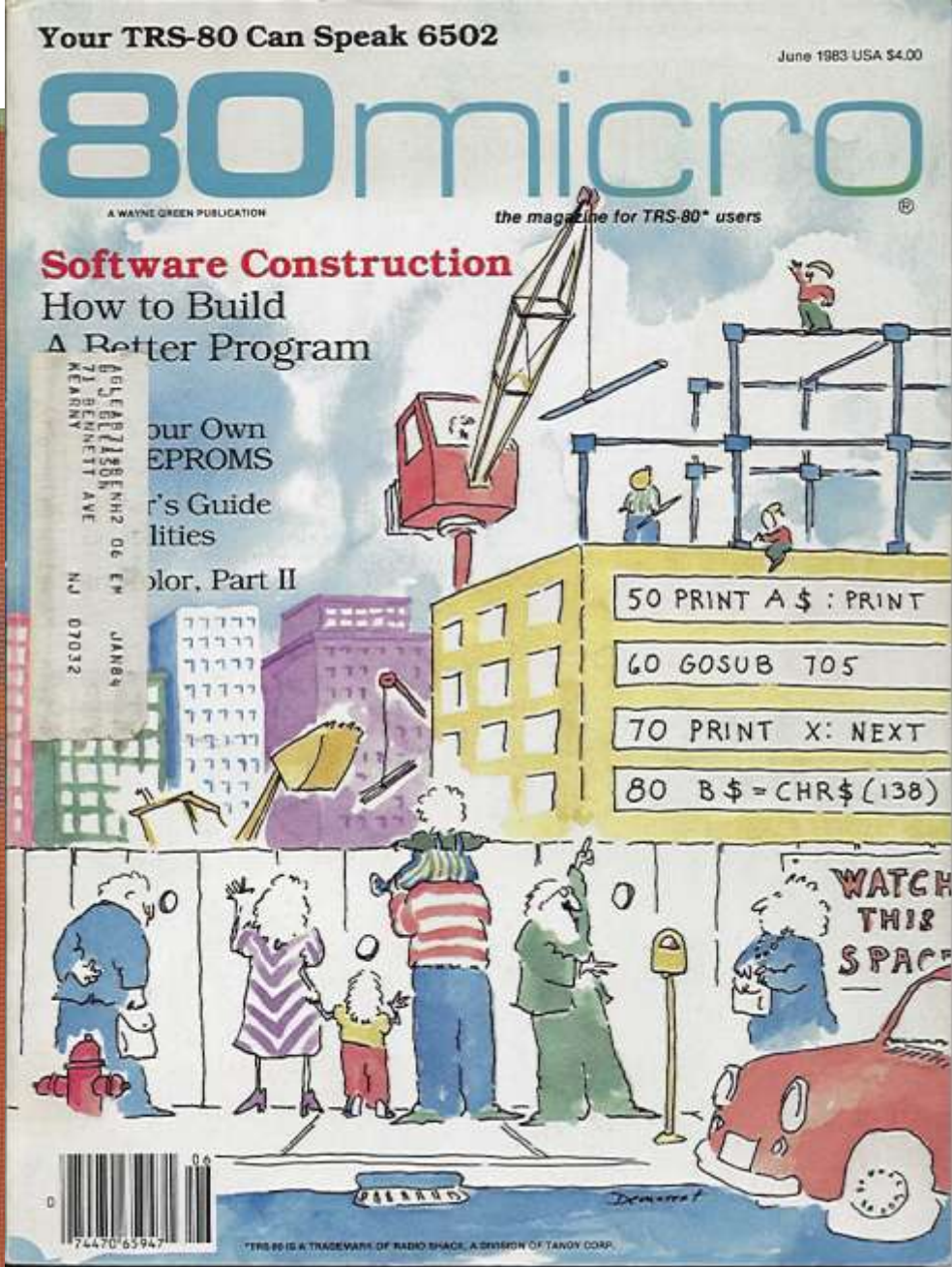
Read prices in this newsletter may vary at individual stores and dealers. The company cannot be held for printed and typographical inaccuracies.

May 1979, 8 pages

April 1981, 20 pages



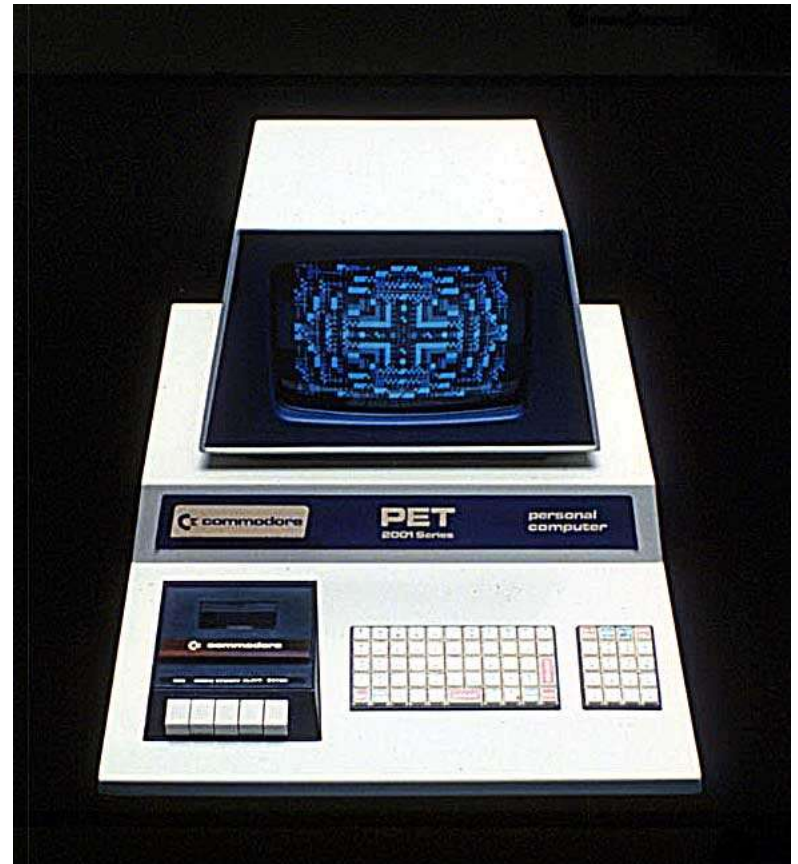
December 1981, 46 pages with color cover



June 1983, 370 pages with color advertising

Commodore Pet 2001 (June 1977)

- 6502 at 1 MHz
- 4K or 8K memory
- 2 built-in cassettes
- Membrane keyboard
- Keypad
- Instruction book
- Widely adopted for elementary schools



source: Computer Museum

Retail Computer Stores!

- Dick Heiser: The Computer Store, LA, 1975
- Paul Terrell: Byte Shop, Mountain View, 1975
- ComputerLand incorporates, 1976
- ComputerLand Franchise, Morristown, NJ, 1977
- Radio Shack manufactures and sells TRS-80

Other Infrastructure

- Southern California Computer Society, 1975
- *Byte Magazine*, 1975
- *Dr. Dobbs*, 1976
- World Altair Computer Conference, 1976
- Gary Kildall: Intergalactic Digital Research, 1976
- Trenton (New Jersey) Computer Festival, 1976
- Personal Computing Festival, Atlantic City, 1976
- Midwest Area Computer Club Conference, 1976
- Jonathan Rotenberg: Boston Computer Society, 1977
- David Bunnell: *Personal Computing*, 1977
- West Coast Computer Faire, 1977

Sinclair Research: ZX80 (1980)

- \$199.00
- Zilog 80A
- 1K RAM
- Membrane keyboard
- Std television
- Cassette tape
- Timex Sinclair 1000:
\$99: 2K (Feb 1982)



source: Computer Museum

July/August 1982

Volume 2, Number 4

\$2.95 (USA)
£1.50 (UK)

The magazine for Sinclair users

SYN

Use the DEFine function
To Construct 3-D Plots

Sinclair ZX Spectrum:
An In-depth Review

"To Explore New frontiers..."
Six Games of Outer Space

Hardware: More Memory,
Power Filtering, Ear Input



SYN02/01/198407032
B GLEASON
71 BENNETT AVE
KEARNY

NJ 07032

Osborne I (April 1981)

- Zilog Z-80A **\$1,795**
- 1st 'portable" (23.5 pounds)
- 3.55 by 2.6 inches mono screen (24 by 52 chars)
- Dual 5 1/4 drives: 91 K each
- **Control Program for Microcomputers (CP/M)**
- **Wordstar, SuperCalc, Mailmerge, BASIC**
(compiler and interpreter)
- Sales went from \$0 to \$100 M in 2 years
- Bankrupt on September 13, 1983

Portable Computers in 1981



Osborne I



Kaypro

<http://www.obsoletecomputermuseum.org/osborne.html>

Pat R...

kugram

FEBRUARY, 1983 VOL. 1 NO. 2

Official Newsletter of the KAYPRO USERS' GROUP

KUG BULLETIN BOARD GOES "ON LINE" MARCH FIRST

As of March first, you will be able to get all sorts of information transferred to your Kaypro by just calling the KUG number in Chicago.

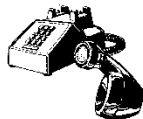
Of course you will need a modem and some communication software, but, this promises to be the start of some great co-operative efforts on the part of all our members.

You will be able to leave messages, get messages, "down-load" programs called in by members, learn what's happening with our library, and get answers to some of your annoying problems.

To understand a little more about modems and communication software, let's discuss their use with the Kaypro II.

The type of modem you use should be rated at 300 baud (300/1200 is O.K. too). That means the amount of characters being transferred is about 30 per second. At 1200 baud the count would be 120 characters per second. The type of modem could be either direct (uses the same connectors as the Kaypro keyboard or telephone jack) or acoustic (the telephone hand-set fits into two openings for sending and receiving).

You will need an RS232 cable to fit into the back of the Kaypro and to the modem. The modem usually comes with the cable to be connected to the telephone (if it is direct connect).



(312) 397-0360

About the software, you already have a communication program on your CP/M disk. It is called TERM.COM. This program will allow you to communicate with the bulletin board but you cannot save any of the information on disk. There are other programs available such as "Move-it" or Modem 7 that will allow you to store from memory. We will have a modem package available to members that will let you do just that.

The procedure is as follows:

Place your CP/M disk in drive A and type TERM <return>. The screen will tell you that the Kaypro is a "dumb" terminal and it will ask you for a <return> to start communicating. DON'T HIT <return> YET!

Using the instructions that came with your modem call the KUG Bulletin Board in Chicago by dialing 312-397-0360. NOW, HIT <return> a couple of times. The KUG Bulletin Board Menu will appear. Just follow the instructions and enjoy it.

At first, the bulletin board will be available to anyone who calls, but eventually you will be asked for your KUG ID Number so that you can have access to privileged information.

The baud rate for now will be 300. Later on you will have a choice of either 300 or 1200 baud.

We here at KUG look forward to working with you through this new medium and would like to hear from you regarding its use for a mutual benefit.

\$3.50

PROFILES

The Magazine for Kaypro Users
September 1984

Educational Computing

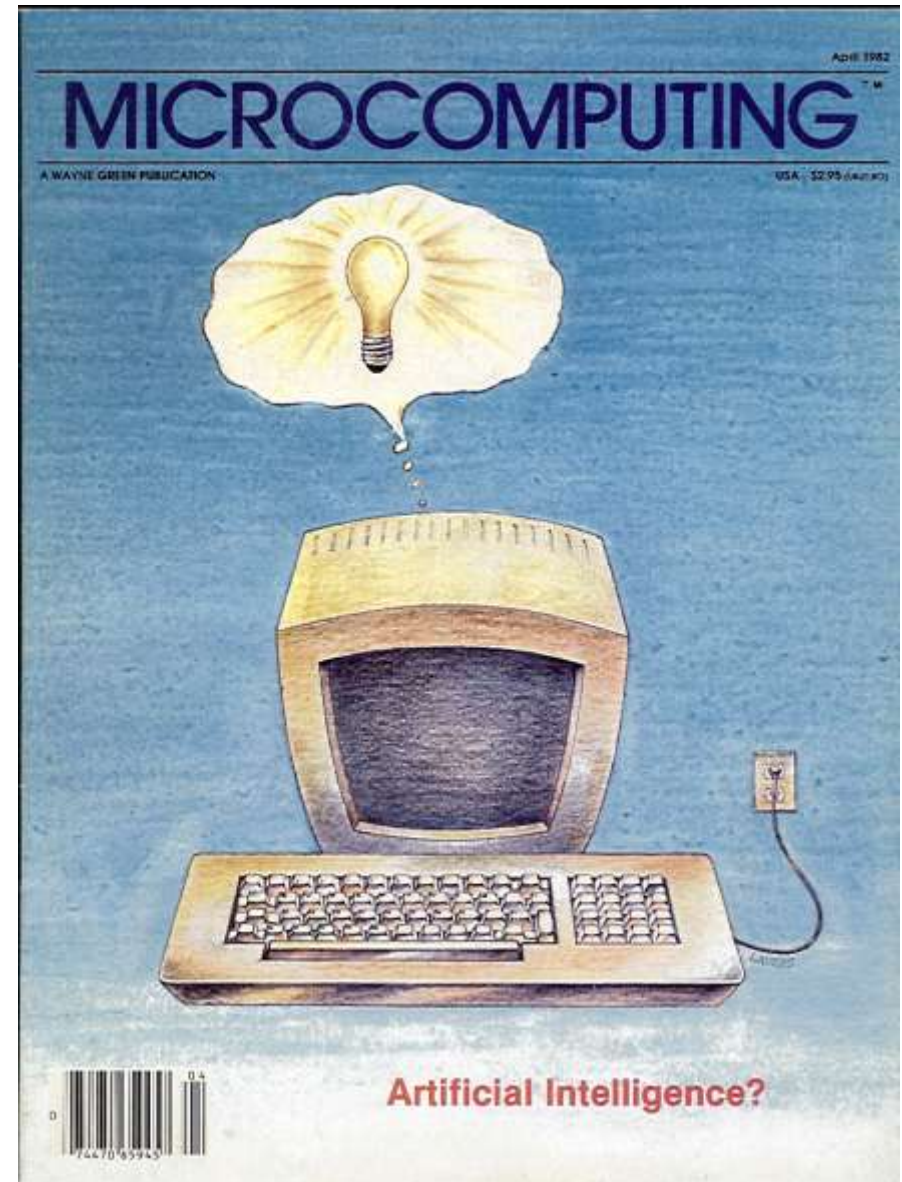
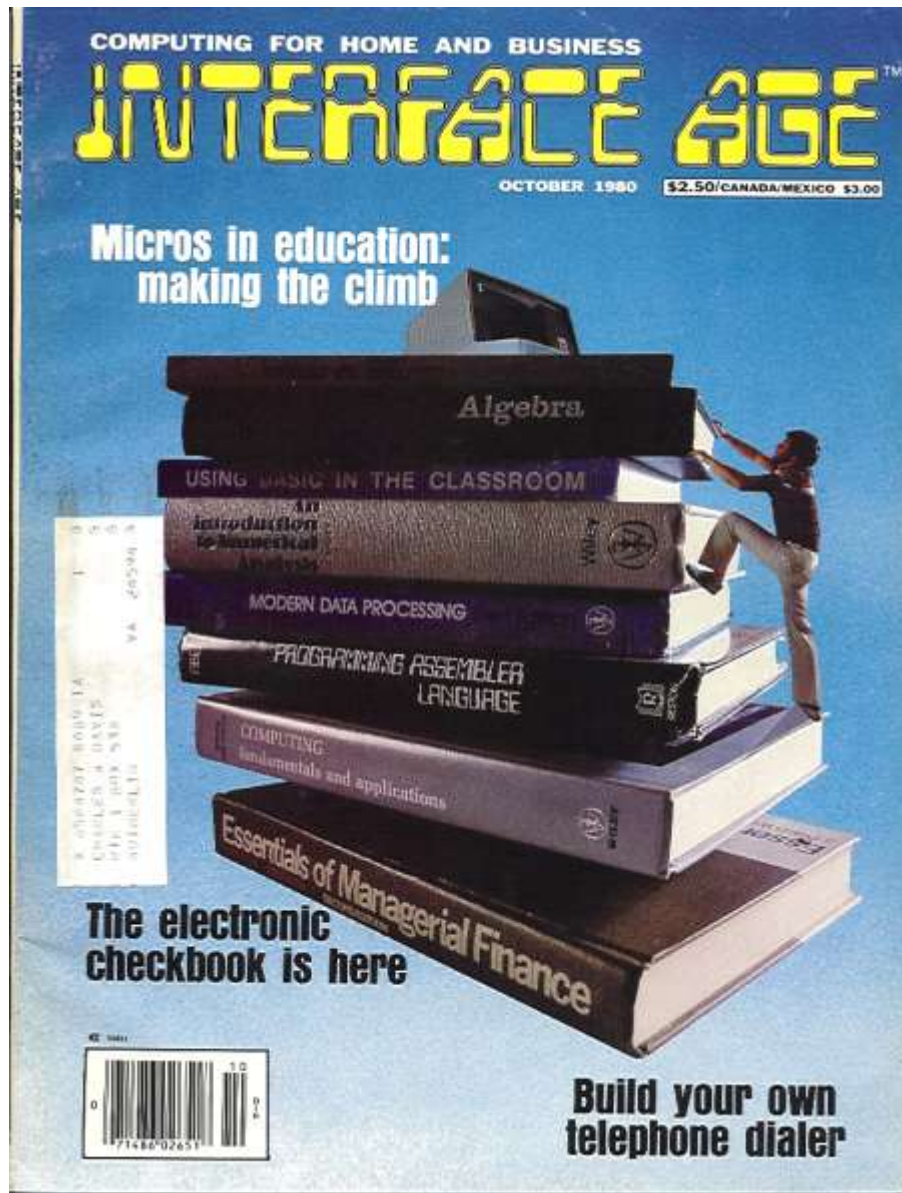
Logo and PILOT for the Kaypro

SOFTWARE REPORT CARD

	A	B	A
Word Processing			
Spreadsheet			
Analysis			
Data Base Management			
Recreational Computing			
Telecommunications			

BLANK RATE
U.S. POSTAGE
PAID
Bensenville, IL

Applications, applications, applications....



Special Section: Can You Protect Your Software?

MICROCOMPUTING[®]

A WAYNE GREEN PUBLICATION

July 1982
USA \$2.95 (UK £1.80)
Number 67

Dateline: Afghanistan



ASTANJES
37 MECHANIC ST
HAVERHILL

MA 01830
OCT 82

OSBORNE
UNDER
FIRE

Plus Apple, Commodore, Heath, IBM . . .





Osborne— Behind Guerrilla Lines

This free-lance journalist reported on the Afghan rebels' resistance to the Soviet-backed regime in their country and filed his stories back to the U.S. using an Osborne computer.

By David Kline

Kunar Province, Afghanistan—The incoming mortar round whistled dully through the night sky, slamming with a loud crack into the side of the hill. Desperately looking around for cover, a dozen Islamic guerrillas in turbans fired their rifles and machine guns ineffectively at the pro-Russian militia position on the ridgeline above. Then another mortar round crashed into the trees 50 yards away, temporarily drowning out the staccato sounds of automatic rifle fire all around us.

Me, I lay flat on my back, trying to calculate the odds of the mortar crew above us lobbing one directly into my lap. It occurred to me that I wasn't being paid nearly enough for this assignment.

Seeing as how I had no other option but to at least try to act like a reporter, I pulled out my notebook and started to record my observations of the battle. I also began making plans for how I was going to file the story. I faced a three day walk over the mountains before I could get back to civilization—the dusty little frontier town of Peshawar, Pakistan, just 20 miles from the legendary Khyber Pass on the Afghan-Pakistan border. But even once I arrived, I still didn't know if I'd be able to file. For I intended to employ equipment never

before used from this part of the world: a portable computer and telephone modem.

Oh well, first things first, I told myself. And the first thing I had to do that night was to find a rock to crawl under.

The experiment, for that's what it was, first took shape in late 1981. I had already decided to purchase a portable Osborne computer for word-processing, mail list and business applications in my free-lance writing agency. Then, when I was asked by CBS News, the *Chicago Sun-Times* and the *Los Angeles Times* to go back on assignment to Afghanistan (it would be my fourth trip in three years), an idea began bubbling in my head. Could I take the Osborne with me to the war zone, or at least close to it, and use the machine to both write and file my stories?

The advantages of using a computer as a reporter's tool in a situation like this would be significant. First and foremost, any articles I would write using a word-processing computer—with its quick and easy ability to edit and re-edit copy—would naturally be superior to what I could either write longhand or what I could hack out on a clackety manual typewriter. But also, if I could use a telephone modem or some other transmittal system to get my copy back to the newspapers, I could avoid the costly and often unreliable public telex offices in Pakistan.

Ordinarily, free-lance journalists like myself not based in a telex-

equipped overseas office must go to a public telex office and present handwritten or typewritten copy to an often-bored and always insufferable bureaucrat-of-an-operator. He may or may not send your message that day, may or may not send it as written, and may or may not send it at all if it happens to offend his government (most telephone and telex systems outside the United States are government-owned and operated).

The implications of the experi-



David Kline is director of Impact Features (2329 N. Sawyer Ave., Chicago, IL 60647), an agency for free-lance journalists. He reported from behind Afghanistan's rebel lines—his fourth trip in three years—on assignment for CBS-TV, the *Los Angeles Times* and the *Chicago Sun-Times*.

References

- Bunch and Hellemans, *The Timetables of Technology*, Simon and Schuster, 1993
- Lee, *Computer Pioneers*, IEEE Press, 1995
- Freiburger and Swaine, *Fire in the Valley: The Making of the Personal Computer*, Osborne/McGraw-Hill, 1984

References

- Thomas F. Haddock, *A Collector's Guide to Personal Computers and Pocket Calculators*, Florence, AL, Books Americana, Inc. (1993)
- Stan Veit, *Stan Veit's History of the Personal Computer*, copyright Stan Veit (1993)
- The Computer Museum: slide sets 13-17
- *Intel at 20, The Revolution Continues*, 240447-001
- *Defining Intel: 25 Years/ 25 Events* , 241730

Show and Tell

- Early manuals from Apple, Radio Shack
- Periodicals
- Processor Technology SOL
- Osborne I with documentation
- Apple IIc
- Timex Sinclair system
- Floppies: 8", 5 1/4", 3 1/2"