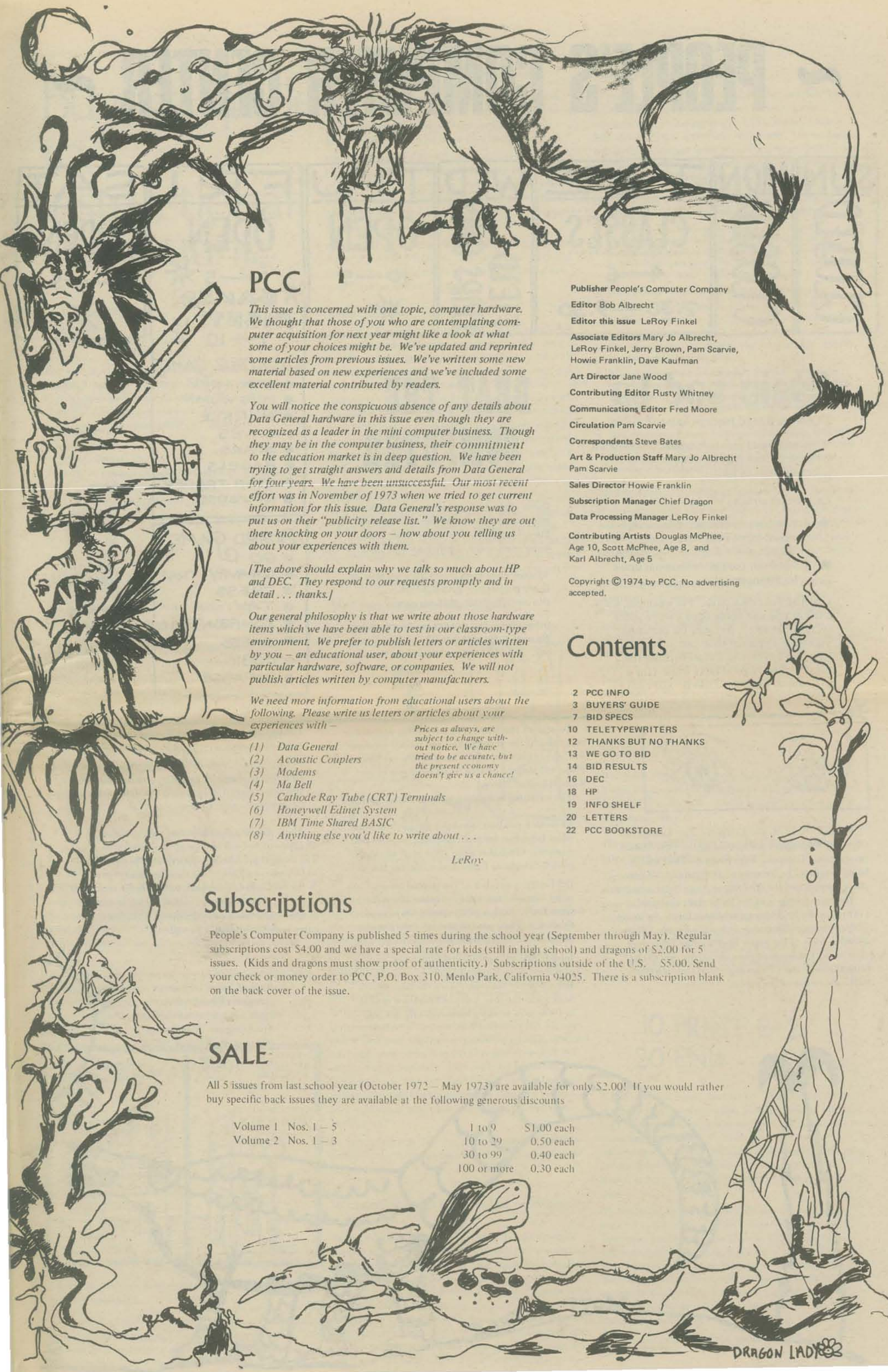

PCC

This issue is concerned with one topic, computer hardware. We thought that those of you who are contemplating computer acquisition for next year might like a look at what some of your choices might be. We've updated and reprinted some articles from previous issues. We've written some new material based on new experiences and we've included some excellent material contributed by readers.

You will notice the conspicuous absence of any details about Data General hardware in this issue even though they are recognized as a leader in the mini computer business. Though they may be in the computer business, their commitment to the education market is in deep question. We have been trying to get straight answers and details from Data General for four years. We have been unsuccessful. Our most recent effort was in November of 1973 when we tried to get current information for this issue. Data General's response was to put us on their "publicity release list." We know they are out there knocking on your doors – how about you telling us about your experiences with them.

[The above should explain why we talk so much about HP and DEC. They respond to our requests promptly and in detail . . . thanks.]

Our general philosophy is that we write about those hardware items which we have been able to test in our classroom-type environment. We prefer to publish letters or articles written by you – an educational user, about your experiences with particular hardware, software, or companies. We will not publish articles written by computer manufacturers.

We need more information from educational users about the following. Please write us letters or articles about your experiences with –

(1) Data General
(2) Acoustic Couplers
(3) Modems
(4) Ma Bell
(5) Cathode Ray Tube (CRT) Terminals
(6) Honeywell Edinet System
(7) IBM Time Shared BASIC
(8) Anything else you'd like to write about . . .

Prices as always, are subject to change without notice. We have tried to be accurate, but the present economy doesn't give us a chance!

LeRoy

Publisher People's Computer Company

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Contents

Subscriptions

People's Computer Company is published 5 times during the school year (September through May). Regular subscriptions cost $4.00 and we have a special rate for kids (still in high school) and dragons of $2.00 for 5 issues. (Kids and dragons must show proof of authenticity.) Subscriptions outside of the U.S. $5.00. Send your check or money order to PCC, P.O. Box 310, Menlo Park, California 94025. There is a subscription blank on the back cover of the issue.

SALE

All 5 issues from last school year (October 1972 – May 1973) are available for only $2.00! If you would rather buy specific back issues they are available at the following generous discounts

Volume 1 Nos. 1 – 5	1 to 9	$1.00 each
Volume 2 Nos. 1 – 3	10 to 29	0.50 each
	30 to 99	0.40 each
	100 or more	0.30 each

DRAGON LADY

~ PEOPLE'S COMPUTER CENTER ~

SUN	MON	TUE	WED	THU	FRI	SAT
CLOSED	CLOSED	CLASSES 4—6 7:30—9:30	FIELD TRIPS ONLY	OPEN 10—5	OPEN 10—5 GAMES NIGHT: 7—10	OPEN 10—5

Basic and Up

LEARN BASIC PROGRAMMING----------

Write computer games to amaze your friends!!! Or solve useless scientific equations in five micro-seconds or less!!!

Each ticket entitles you to:

- 4 two-hour instruction classes with experienced PCC staff on any Tuesday, 4 - 6 or 7:30 - 9:30 pm.
- 4 one-hour computer terminal times by arrangement.

Learn at your own pace. For example, with a ticket you can come once a week, once every other week, or twice on the same Tuesday. Terminal time can be flexible. You don't ever miss a class because the ticket is always good next week (for a two month period). Tickets $20 each.

BEAT THE COMPUTER

Come play math games on our terminals after school: *Hunt the Wumpus, Caves1, Stars, Hurkle, Number, Star Trader, and many many more.* Learn how they work.

10 week class starts March 20, ends May 22. Every Wednesday, 3:45-4:30 pm. (No class April 10). $15 per person, ages 7 - 11.

Other classes like this one can be scheduled. We need a group of 8 to 12. Just give us a call: 323-6117 and we can arrange times.

COMPUTER GAMES
- STAR TREK
- MUGWUMP
- HURKLE
- CAVES
- STARS
- BAGELS
- STAR TRADER
- REVERSE

BOARD GAMES
- GO
- GRAVITY TRAP
- CHESS
- TAU
- CONFRONTATION
- SMESS
- CUBIC
- IMPASSE

Rent Computer TIME

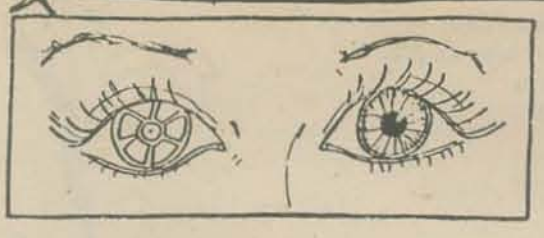
Terminal time cost per hour grows bigger as you grow bigger.

$1/HOUR up through grade 8

$2/HOUR High school

$3/HOUR beyond HS

Give us a quick call before coming by.



March 7–9, 1974, The Evergreen State College in Olympia, Washington will be hosting the First Annual International Computer Film Festival. The event is being sponsored by Evergreen's Department of Computer Services and the Washington State Arts Commission.

The main purposes of the Festival are threefold: (1) to provide the first comprehensive forum for many of the computer films made in the last decade, (2) to assemble some of the major figures in the field, show their work, and suggest future directions, and (3) to bring this important technological/creative interface to the awareness of the public.

To achieve this latter goal, a screening committee composed of the major figures and invited speakers will select two hours of the most significant films. These will then go on tour to art museums in the Western United States.

The screening committee consists of the following

Kenneth Knowlton, developer of the three computer languages for producing film graphics and computer filmmaker since 1964, staff member of Bell Telephone Laboratories, Murray Hill, NJ.

Bill Fetter, a member of the original Boeing Computer Graphics team and computer filmmaker since 1961. Author of *Computer Graphics in Communication*, now Chairman of the Design Department, Southern Illinois University.

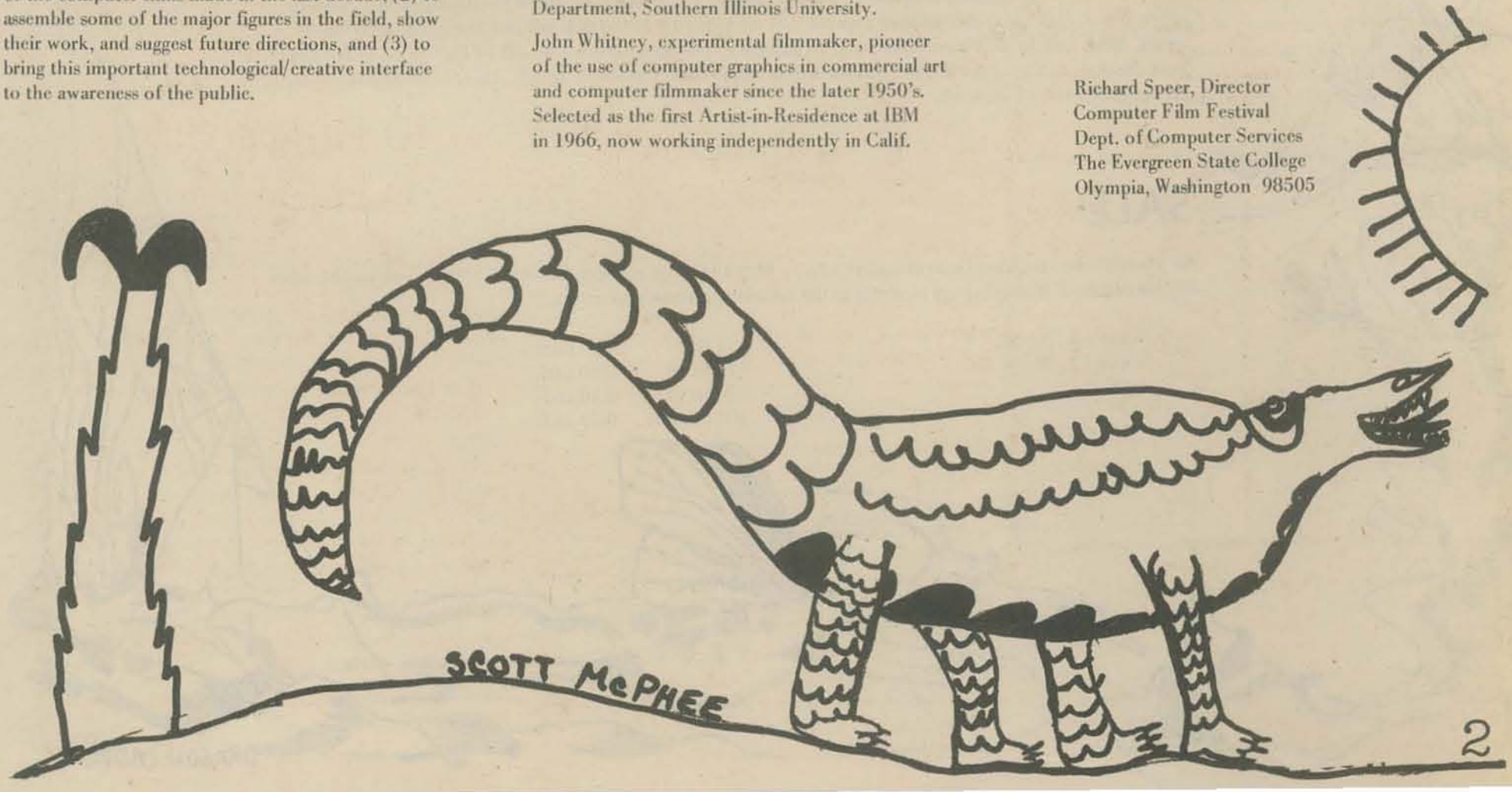
John Whitney, experimental filmmaker, pioneer of the use of computer graphics in commercial art and computer filmmaker since the later 1950's. Selected as the first Artist-in-Residence at IBM in 1966, now working independently in Calif.

Lillian Schwartz, professional artist and computer filmmaker, now Artist-in-Residence at Bell Telephone Laboratories, NJ.

Ron Resch, Master of Fine Arts and computer filmmaker since 1967, now on the staff of the Computing Center, University of Utah.

There will be no pre-screening eliminations – all films entered will be seen by the committee. The Festival provides an opportunity for your film to be shown to some of the most prominent people in the field. And, if selected, to be seen by thousands of people in art museums across America an example of the highest levels of achievement in the field. For entry forms or information, write to:

Richard Speer, Director
Computer Film Festival
Dept. of Computer Services
The Evergreen State College
Olympia, Washington 98505



buyers' guide to instructional computing

What to Look For
What to Avoid
Hints for Dealing with Vendors

Preparation of this Guide is jointly sponsored by the Oregon Council for Computer Education and the Communication-Resource Center of the Oregon Museum of Science and Industry. However, opinions expressed are the responsibility of the author.

Rusty Whitney
Oregon Council for Computer Education
4015 S.W. Canyon Road
Portalnd, Oregon 97221

November 28, 1973

WARNINGS

"If you can't see it, then it doesn't exist." Gunderson's Law

This is the single most important rule. Most grief comes from buying "computer futures" – systems that almost exist. If you know what you want, ask vendors to transport you at their expense to see customers who have current production models in use with the type of applications you expect. Jim Gunderson of the Multnomah County Intermediate Education District used this rule while advising the committee of teachers which helped set up Oregon's first cooperative instructional computing utility.

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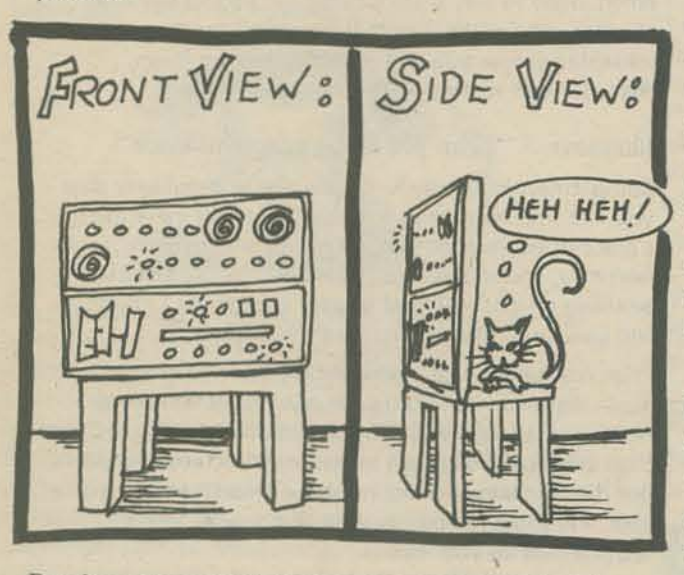
Even if you do see it, it may not exist

Don't settle for a special factory organized dramatic presentation designed for your sole consumption. It's flattering but perhaps misleading. You would not buy a car without testing it under real road conditions; don't buy a computer system without seeing it "under fire."

Remember, they are not doing you a favor –– marketing computer systems can represent a large chunk of the manufacturer's costs and smart vendors expect to spend considerable effort in attracting you to their product.



Previous customers may have a vested interest in their mistakes

When visiting a computing system, try not to be a burden to the system manager but try even harder to get facts both for and against the system rather than just good vibrations. A man who bought a $150,000 lemon may not want to admit his mistake, even to himself.

Comparing Systems: About benchmarks.

Everyone seems to have her own favorite three line program for testing the speed of a system. Such benchmarks will tell you how well the system runs that particular program – no more than that.

Vendors all spend a little time on dirty tricks. A favorite is to amaze a customer with the performance of the system on a particular program knowing that the competition's machine will do poorly. The salesperson for even the puniest system can find features that are not present on other systems.

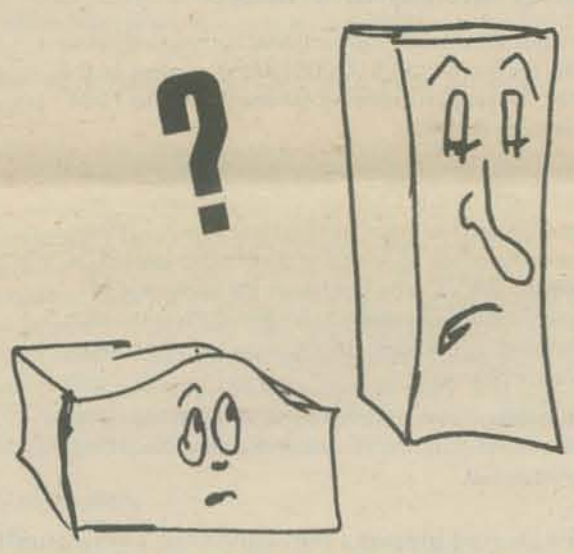
However, if you can define a number of jobs that are for your purposes "typical", you should try to devise methods for making meaningful comparisons of running times on different systems.

About the word "system"

"System" is more than a fad word. In the past, when ninety per cent of a computer center's budget went to purchase a very obvious and rather cranky computing machine maintained by a very small band of specialists, the computer was the system, or at least most of it. But today, the machinery is not only much more powerful and useful but it is physically smaller and often cheaper than other budget items including operators, data clerks, programmers, maintenance staff, and administrators. The computer hardware could be working fine, but if 455 identical parking tickets are issued to one person everyone says "the computer did it." No. The SYSTEM did it.

This is not a trivial semantics game! Most computing catastrophes are not caused by equipment failure. Really! Inanimate computers make splendid scapegoats for bad planning or inept use but if you are to avoid being the victim of your system, start figuring out what you want your system to do.

Are bigger computers always better?



Conventional wisdom in the computer industry has long recognized economies of bigness – if you trade in ten small computers for one big one you can fire nine operators, right? Sure, and besides, although the bid computer may cost $1000 per hour to run, it will handle bigger jobs more flexibly. One government financed effort hopes to hook 2000 educational terminals to such a giant giving fifty cent per hour time (exclusive of communications charges).

Unfortunately for conventional wisdom, most big computers have been big flops at providing reliable, economical, responsive computing to the present wants of the educational community. IBM has tried and failed badly; so have others. Not only has the cost per hour of computing been high but big computers require a big support staff which often fails to put instructional computing first.

As computing costs decline, communications costs do not; and they form the base level for cost-per-terminal calculations.

Mix instruction and business data processing at your peril

The mix usually fails; often expensively. Salespeople stress that such systems have succeeded but you should not depend on luck your first time out in the computer world. Instructional computing may depend for its success on how well each teacher uses your system from the other end of a phone line. However, a business data processing "system" includes prompt, reliable data entry and fast turnaround times. If your machine is supposed to print the district's payroll checks, it would mean your job if you fail; such conflicts may lead to instruction taking second place on your system.

Which system should you get?

Of course, you want to purchase the best available for your money. However, if you're just getting into instructional computing, you probably are not confident about what it is that you really need. In that case, you can save yourself some money and much grief by spending some time with people who have already been initiated. Specific actions that you might take include:

1. **Invest a week in traveling to installations in your region and be sure to ask management, operators and users ––**
   a. **What are you trying to do; what is your mission?**
   b. **What would you do differently if you started today?**
   c. **What are your system's biggest strengths? weaknesses?**
   d. **How much does your sytem cost you to do a unit of your kind of work? (A very tough question)**
2. **Form a group of potential users to answer questions:**
   a. **What do we really want to do now? What later?**
   b. **What support will be required (funding, inservice, etc.)?**

Note: The group will probably fail to reach permanent answers to these questions but it is essential that you share responsibility for answering them with the users.

3. **Attend a conference, minicourse or institute dealing with the instructional uses of computing (see people in Appendix A; if you don't know anyone, you may wish to start with Tim Kelley or Dave Moursund or call the author of this guide.)**
4. **Join the Oregon Council for Computer Education (OCCE) or the Association of Educational Data Systems (AEDS) and order a subscription to the People's Computer Company newspaper (see Appendix A – Bob Albrecht).**

Selling Time: Would you rather be the landlord?

If you sell time on your own computer, know that people will want more from your computer than you can probide. You will be accused of being partial to your own needs and empire-building with user fees. This will happen regardless of your performance.

Independent computing utilities must serve paying customers first and can avoid the political thicket. However, should you decide to become 'the landlord', employ a full-time staff to serve users and do not ignore Larry Hunter's Law which states, "If you give something good away, it will be quickly used up and people will complain violently about the shortage." Thus, make fair charges for resources consumed (including staff and overhead) and don't stretch staff or computer time to cover too many users.

SOFTWARE

Most users will not see the pretty flashing lights of the computer console but all will have intimate contact with the software. Give it your closest attention when comparing systems.

Do-it-yourself? "But you can always write your own program to do that"

This remark is made by a salesperson who has a product that does not include some essential feature that your bid requires. The pitch depends on your ego to block out the shortcoming. Reputable vendor don't want naive customers to get in over their heads.

Good, reliable, well-documented computer software costs $10 per instruction in a competitive marketplace . . .

10 PRINT 2+2
20 END

A $20 program, right? Not really. The catch is that programs that handle complex problems and/or interact with novices often require several hundred or several thousand instructions. Further, the art of writing reliable, not to mention efficient or aesthetically pleasing programs isn't practiced widely or well and is harder than it looks to the tyro fresh from his first coding class.

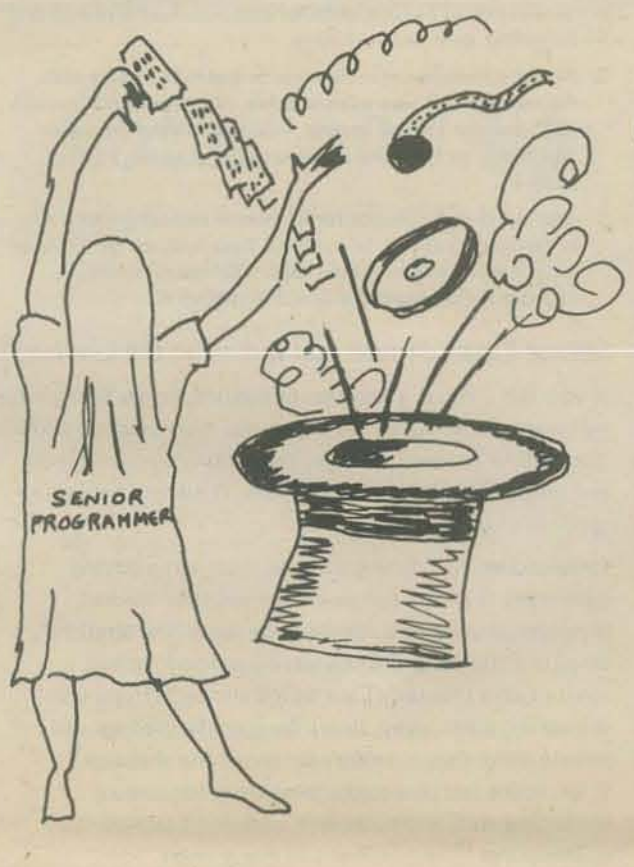
Do not be misled by the ease with which a novice can code his first BASIC program – Beginners All-Purpose Symbolic Instruction Code (B-A-S-I-C). BASIC helps beginners rush into coding, but a lot of experienced programmers prefer other languages – and not because they are snobs. Some complex ideas are harder to express in English than in German; some complex programs are harder to code in BASIC than in ALGOL, PL/1, APL, or COBOL.

A computer system includes hardware AND software – insist on BOTH.

Programmers are nice folks . . . but they cannot tell the truth

"But I can do it in five minutes . . . no kidding!"

Don't you believe it! Books are starting to appear with titles like "The Psychology of Computer Programming." The optimism concerning the smallness of a task and the strength of their art is shared by nearly all programmers. Unfortunately, where reliable software is concerned, wishing does not make it so. But, be gentle in your scorn for the programmers' sins. Sometime in the next several years you are likely to catch yourself looking over your programmer's shoulder and saying "Now that is really easy – move over and let me do that myself."



"The software for this machine has no bugs"

This can only mean that the computer has no software or the salesperson has no integrity. If you think there is more to the product than its ads, talk to someone who purchased one a few years ago.

User Groups: Is free software worth the price?

Probably "yes" if you are careful. The largest vendors have active user groups with offices supported by the company and/or modest fees. At best, user groups offer you and your students a source of free programs for your computer and a vehicle for passing around some of your best work. The personal contacts you will make with others facing problems similar to your own can be of more value than the free programs.

At worst, user groups can be a source of thousands of under-documented programs that "almost" meet your needs. Since developing good software can be more expensive than creating hardware, companies and users can benefit by the availability of programs which nobody has the responsibility to repair, but beware – software breaks, and most good programmers would start from scratch rather than try to patch up an undocumented program.

What besides BASIC?

There are several computer languages more conducive to "structured programming" than BASIC. Writing time for languages is measured in work-years and so expenses have kept most educational vendors from worrying about anything but BASIC. However, some systems offer other languages. If you wish to offer non-BASIC languages, there are alternative at one or more of the following levels:

1. **Translators or interpreters written in BASIC – at worst, these are unreliable "hacks" which offer only a superficial flavor of a language and devour huge amounts of computer time. Few offer more than an introduction, but some may be good instructional tools.**
2. **Limited single-user systems – most general purpose minicomputers will offer a single user FORTRAN subset plus an assembler system.**
3. **A few vendors have minicomputers that permit up to sixteen users to run BASIC while a single user runs FORTRAN, ALGOL, etc., but full implementations of multiple advanced languages under time sharing on sub-$150,000 systems will probably not be delivered until late 1974 or early 1975.**

WARNING: Careless or unscrupulous vendors have cultivated false hopes for true multi-language, multi-user systems on sub $100,000 packages. The few inexpensive systems available are presently of more value in demonstrating different languages than in doing large amounts of computing. Don't plan on using such systems to accomplish the district's business data processing in FORTRAN while the computing classes use it for instruction with BASIC!

"But we have 'advanced' BASIC"

All major vendors of instructional computing systems selling for more than $10,000 offer a version of the BASIC language containing enhancements to 1964 Dartmouth BASIC.

Regrettably, the originators of BASIC, Kemeny and Kurtz, were unable to impose standardization on succeeding versions and at this time every different manufacturer has at least one distinctive variant of Advanced BASIC which inhibits the exchange of program materials requiring advanced features such as alphabetic character strings, data files, and logical or matrix operators.

Fortunately, most government-developed curriculum materials use only the common skeleton BASIC, but watch out.

Manuals cost money (and some aren't very good)

You can buy independent texts to introduce languages but you must depend on your vendor to provide documentation for the operation of your particular system. Some vendors are noted for their expensive and poorly organized manuals – get a full set when you first start shopping.

THROUGHPUT

Users of big computer systems evaluate computers as to how much calculation or data file manipulation they can do reliably per dollar.

They emphasize features that are not felt to be of great value by teachers. This section is not intended to talk you out of your values but to tell you the pros' point of view.

Batch and deferred run

Jobs run under BATCH systems tend to run without human intervention until finished instead of wasting time swapping jobs in and out.

Interactive computing can cost you many times more than BATCH processing. You need interaction for computer-aided instruction but maybe interaction is not needed for teaching problem solving – some people believe that interactive terminals discourage good programming practices in favor of "try something and see if it works" approaches.

Some computer utilities will let users request the "deferred run" of a job. For large computational tasks this can save much money – the computer waits until a slack period, then lets a deferred job take over most of the computer as in BATCH. Sometimes deferred jobs are not done until evening brings a reduced time sharing load.

Scheduling algorithms – responsiveness versus throughput

A simple "round robin" scheduler gives each time sharing user a period of time such as one-tenth of a second in which to do the computing being requested and then turns its attention to the next user until, after at most several seconds, the first user is again serviced.

Such simple schedulers have the advantage of not permitting a large program to hog the computer, thus leaving the other users with an unresponsive terminal. This is probably an advantage in educational environments in which much of the value of the computer is its interaction with users. But, some such systems sacrifice doing "the greatest work for the greatest number" in order to remain always responsive. You should try to simulate your work load before deciding on just which you need.

Saturation – Should you plan to use 100% of your computer's power?

You should definitely not! Yes, it's a trick question. Users will be happiest when they do not experience the impact of big jobs. Time sharing depends on probability to scatter the big jobs through the day. Pity the poor computer system in which all users type RUN on their biggest job of the year at exactly the same time. You should hope that your system will almost always retain enough unused capacity to permit each user the illusion of being alone.

BUYING A SYSTEM

Appendix C lists a number of systems. This section deals with your negotiations with vendors' representatives. Get bids from several!

First, get their attention

To retain much serious interest on the part of a good salesperson, you must be sure it is known that you are authorized to spend money. Salespeople advance according to successful sales, not prospects.

Remember that from your point of view, you are not just "spending money", you are "buying capability." This is not just a slogan!

It is best to define your needs rather than your budget limit – few sales people will quote a price on a system for less than your budget and most will assume you can be raised by twenty per cent.

When asked what your budget is, tell the salesperson that you will be taking bids and then be prepared to provide a detailed specification of your wants – you may change them in later negotiations, but start by asking for what you really want.

The "lowball" – wait 'til you find out what it really costs

Less honest than the "loss leader" pitch used in department store sales, the "lowball" technique brings you in the front door with an astoundingly low price that seems to apply to the package of your dreams. However, "there are a few little extra costs." (!!!) The computer industry has many salesmen new to the business, so honest error is possible but is hard to distinguish from outright intentional deception. If you get a lowball, stop dealing with that salesperson and write company headquarters. You will be doing both yourself and the industry a favor.

"And if you buy this month I'll throw in a green widget"

When urged to buy from a particular vendor because of extra goodies, be sure that you consider them valuable because you will probably pay for them. Also, get it in writing or they may never arrive.

Bargains – "I can get it for you wholesale"

Competition in the market place makes it unlikely that you will find more than a ten per cent cost variation in a piece of equipment that is new, a current model, with warranty, and immediately available. Big price cuts are available on discontinued or used equipment. Price and quality of used systems vary suprisingly.

Price is a function of marketability. Low cost may only mean that everyone wants the new model which has highly touted improvements about which you care little. High value per dollar can be had with such used systems, but the true bargains require some detective work, some care, and some familiarity with that model and its applicability to your needs.

Look for used systems from manufacturers' "used computer lots", from independents who specialize in used computer systems, or from individuals selling an old system that they have replaced. With manufacturers you take the least risk of getting a non-working system and with individuals you should pay the lower price.

buyers' guide ~

If you prefer a maintenance contract on your system, obtain written confirmation of acceptability from your maintenance organization before you write your purchase order and make the order contingent on prompt delivery of a working system – try to get the seller to agree to pay all shipping costs if you have to return it because your maintenance people cannot install it satisfactorily within a certain time or within a set installation budget.

Watch out for bargains that have "trivial differences" from the standard model – they may be part of a special order made for a now defunct customer and the trivial differences may keep you from running standard software.

Who to buy from – Manufacturer or Independent?

Larger manufacturers have full time sales representatives selling nothing but their own products. Experienced salespeople have often developed useful contacts in different parts of their organization and that can be of value to you. They should have good information on maintenance, software, and new products.

Independents purchase large numbers of systems to obtain quantity discounts of from twenty to forty per cent of list price. They can therefore quote you the same list price and make their money from their markup. Some independents are conscientious and will give you a lot of personal attention but there is a hazard – they are often selling only hardware rather than a system. If you buy from them, you may have to pay thousands to buy the system software from the manufacturer. Ask experienced customers.

Beware of the special dangers of mixing vendors. When things go wrong (not "IF they go wrong!"), vendors often point to the alien hardware or software as the culprit. This can cause the most catastrophic of delays – months filled with headaches.

How can you pay for a computing system?

List price is what you'll hear first. Policies vary but many customers will be able to obtain at least a five per cent discount. Discounts go up if the vendor must win you over from a competitor, if the equipment is being discontinued, or if it is the end of the fiscal year (they want to make their annual report look good).

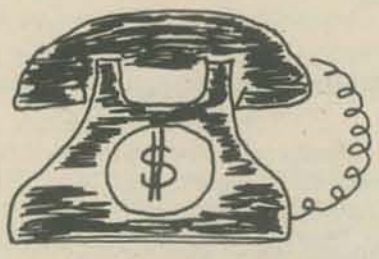
If you lease or get a bank loan, you will pay about 2.2% of the purchase price per month on a five year note. You may be eligible for a total payoff lease with escape privileges – should the voters turn off the money. Otherwise, you may have a 10% payoff option at the end of the lease – if you want to keep the machine, you pay one last payment (10%) and it's yours. Note, bank loan are cheaper.

A maintenance contract will cost you about 0.7 to 1.0% of the list price per month.

Don't forget communications costs

Be sure you get a complete bid that includes all hookups and cables – would you believe that some rather innocent looking cables cost over $50 per foot?

Multiplex devices permitting your computer to talk to many local or over-the-phone users come in many flavors. Some cheap "front ends" can handle a few terminals of the same speed without difficulty, but if you wish to handle different speed devices or more than eight lines you will want more exotic (and more costly) gear. Terminals may be rented from many sources – look for a record of customers who are happy with their maintenance!



You can lose many thousands of dollars if you are not careful about the computer-to-telephone interface and the type of phone service you obtain. Get a bid from both the phone company and a couple terminal leasing companies before you decide on the interface. "Metered call rates" are lower than regular business lines – the phone company tariffs (working rules approved by the Public Utilities Commission) permit such lower rates on phones that have fewer than 90 calls out per month. Your computer is unlikely to place calls, so you might save several hundred dollars per month on a big system. Often such rates must apply to an entire account; so be prepared to show that your computer consortium is a separate entity from your organization or combine all your lines – 32 lines with 90 calls each might add enough to your switchboard pool to save your entire organization considerable money.

VENDOR/SYSTEM PERFORMANCE

"Of course we'll deliver on time, don't you trust us?"

Well . . . no.

Indeed, nice guys get their computer last when they negotiate for a popular item. Even when dealing with the largest, most established firms, your purchase order should specify the latest acceptable date for delivery and USER ACCEPTANCE of the new system. Some vendors slip 60 to 90 days on most of their deliveries. Don't forget this point!

If you have the slightest intuition that they won't deliver, you should plan for the worst case – try to give yourself 120 days padding so that you can replace a no-show with your second best bid.

"What, installation costs extra?!"

You bet. Unless you have specified it, installation may be an extra charge and it could be steep. Proper handling of your order and signing up for a maintenance contract can prevent such extra fees.

Vendor integrity

Some vendors have an industry-wide reputation for integrity – some do not. Most pay salespeople on a commission basis or a partial commission but some do not. You are likely to receive less distorted information from those not paid on a commission basis.

User acceptance – write it into your purchase order

Since you will ultimately select a good computer system that meets your needs at the lowest cost, you can bet others have done the same. If you have violated Gunderson's Law, then you have probably purchased a product that has never been seen in the universe outside of an artist's hand. What might happen is that the salesperson gambled that, this time, the factory would not be nine months late delivering the new product or that you could be persuaded to wait "just another week or two" for delivery of your new computing beast.

The warranty

Be sure you get one and ask for a written description of exclusions. Some vendors' warranties are void if you use another vendor's equipment or supplies (tapes, disks) in their system. If you are caught sinning, you might have to pay the vendor hourly maintenance rates to fix your machine so that it will again be eligible for a maintenance contract.

"Needs no operator, supervision or maintenance"

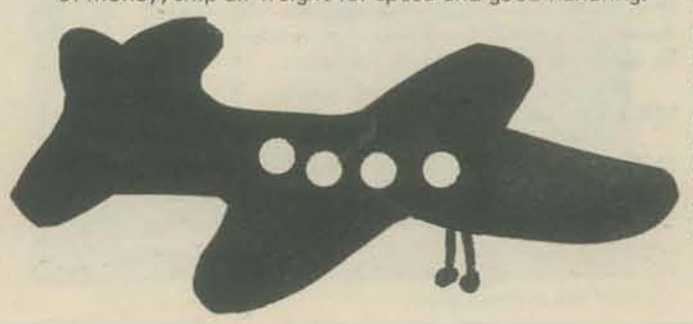
Nonsense! If it moves, it breaks. Especially if it is a terminal, reader, punch, disk, tape drive, or anything else you depend on. It breaks sometimes even if it doesn't move.

To fix things that break will often cost you $35 per hour, plus transportation costs, unless you pay for a maintenance contract, which would typically cost 10% of the purchase price per year. Broken software will be fixed slowly, if at all, by any but the largest and most responsible vendors – only a competent and permanent programming staff can provide such support.

Operation and supervision vary. Conservative systems, such as the Hewlett-Packard 2000 series, might run relatively unattended for time measured in months, from the moment they are uncrated. Sophisticated or flexible systems may need a full time operator.

Delivery method – use air frieght

Shop for the best route; but, unless you can save a lot of money, ship air freight for speed and good handling.



ALTERNATIVES

Most secondary teachers entering the field of instructional computing in recent years have done so with a model 33 Teletype terminal (Teletype is a trademark of Teletype Corporation, Skokie, IL). The terminal is usually connected to a school owned minicomputer or a commercial service selling cheap time. This generally produces $3 to $5 per hour computing instead of the $6 to $15 per hour time sold on large commercial time shared computers. Even $3 to $5 per hour leads to about $4000 per classroom per year. However, there are alternatives to buying your own minicomputer and terminal:

Presenting computing concepts and simple programming without hardware

Computers and terminals can and do motivate a great deal of student and teacher activity. Such activity sometimes gives little benefit beyond fun and group status. In the best situations, such fun and status give rise to educational program that do use the computer to teach problem solving and to help motivate and assist other learning. However, the novelty will wear thin, and you will be able to see if there is enough depth of commitment to sustain a valid educational program.

If your budget does not permit giving you and your students direct access to computers, you may wish to present a "familiarization" class in which the students become acquainted with techniques for logically attacking problems and with some of the jargon used in the computing biz. "Computer Literacy" or "Computing Readiness" may be offered without machines.

If some cheap device is needed, several cardboard or plastic computers are available – Bell Labs' CARDIAC has been popular with some students.

Calculator versus computer

"Calculator" no longer means "small". If a calculator will meet your needs, it will do so for less money than a general purpose computer. Calculators usually have special purpose buttons and a fixed programming language, while computers usually use only regular typewriter keyboard characters. For numerical applications, multi-user programmable calculators will be cheaper than multi-user computers.

The smallest hand-held calculators sell for about $50 – you might prefer to spend $4000 per year on calculators that can be used by all students at once rather than a single computer terminal; or perhaps a $4000 one-time-only expense for a powerful desk-top programmable calculator – some of them even speak BASIC

Card readers: Every student can run a program every day

When language coding is being taught,not more than five students can use one terminal to run and debug short programs. If you add extra terminals for punching up program tapes off-line, you may get a ratio of up to eight or ten to one with good typists.

Optical mark-sense card readers offer an alternative that can give a several fold increase to the number of programs run. Many teachers disdain cards because the computer then loses its immediacy or magic. Nonetheless, this approach is probably the cheapest way to provide real coding experience to a lot of people. Where motivation is very important (with non-science or non-math students), use terminals.

Buying Time: Central support without capital investment or big staff

A few commercial vendors sell cheap time. Careful use of the Oregon State University network will approach $3 to $4 per hour. Joining one of the other educational users' cooperatives mentioned in Appendix B-2 may also make such low cost time available to you.

Buying time from a computer utility has the advantage of giving you access to a central trained staff which can give classes to your staff and offer some limited programming advice, plus a shared central library of application programs.

Some commercial users will sell surplus time to educators at very low cost. Buying time rather than equipment can have the advantage of fixed cost and no risk plus no extra staff. However, administrators and boards of directors remain impressed by ownership and fail to realize that the computer box is only a token representing the "system" purchased. In addition, some people have observed that if the district signs a five year contract, it tends to give a five year commitment to the instructional program as well. However, most people do not use the flexibility available through owning their own machine.

Buyers' Guide

PEOPLE

These are only a few of the people who might be of help to novices:

Bob Albrecht, People's Computer Company, P.O. Box 310, Menlo Park, Ca. 94025; games, the computer as a social tool, Bob publishes the best (and wildest) educational computing newspaper ($4/year).

Howard Bailey, Eastern Or Col, La Grande, Or. 97850; teacher training, info dissemination, uses OSU computing services

JoAnnBaughman, OSU, Comp Center, Corvallis, Or 97331; program libraries, info dissemination, teacher training

Jim Cline, Elkton HS, Elkton, Or. 97436; teacher training, helping teachers new to computing

Michael Clock, Pacific U, Forest Grove, Or 97116; conducts teacher inservice training, interested in non-math applications

Mike Dunlap, U of O, Eugene, Or 97403; curriculum development in computer science, structured programming, teacher training

Keith Garrett, Ashland HS, Ashland, OR 97520; one of the first teachers in Oregon to use computers, helped found the Rogue Valley educational computing cooperative

Tony Jongejan, Everett HS, 24th & Colby, Everett, Wa. 98270, has his own classroom minicomputer for BASIC plus other languages including assembly

Tim Kelley, Southern Oreg Col, Ashland, Or 97520; Chairperson of Or Council for Comp Ed., computer graphics & simulations, helps teachers just getting involved in instructional computing

Mary Kurtz, West Sylvan Elementary Schoo, 8111 S.W. West Slope Dr, Portland, Or 97225; new to use of computers in the classroom but an experiences elementary teacher

Dave Moursund, U of O, Dept. of Comp Sci, Eugene, Or 97403; sponsors largest teacher inservice in computing in state, has a strong interest in all aspects of instructional use of computers

Mike Neill, Lane C.I.E.D., 748 Pearl St. Eugene, Or, 97401; ex-junior hgih teacher, administrative workshops, teacher training, curriculum development, non-math applications, politics, edits good newsletter

Earl Philips, Reynolds HS, Gresham, Or 97030; state curriculum standards, teacher training, curriculum, info dissemination, marks sense cards

Kathy Reed, Rockwood Schook, 17800 S.E. Stark, Portland, Or, 97223; has written text for jr. high computing, teacher training, curriculum

Jack Riley, 2039 SE Yamhill, Portland, Or 97214; high school and college engineering education, good source of weird ideas

Wally Rogelstad, 2697 SE Walnut St. Milwaukie, 97222; Colorado Project, computer math, teacher training, a high school teacher himself

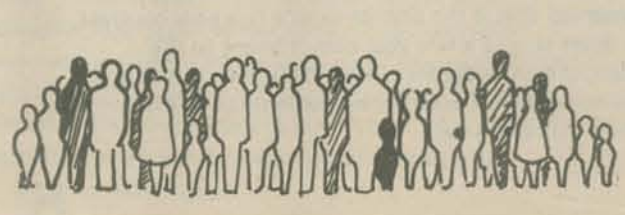
Jack Slingerland, Multnomah County I.E.D., P.O. Box 16657, Portland, Or 97216; instructional computing specialist for Mult. County, a high school teacher, evaluation, teacher training, curriculum

Wally Waldman, Blue Mountain Com. Col., Pendleton, Or, 97801; teacher training, helping teachers get started

Marshall Watkins, Clackamas County I.E.D., Oregon City, Or. 97045; teacher training, computing in Clackamas County, curriculum

Rusty Whitney, OMSI, 4015 SW Canyon, Portland, Or 97221; taught secondary physical sciences, set up OMSI research center, computer games, non-BASIC languages, hardware comparisons, data bases

Peter Womut, Multnomah County I.E.D., P.O. Box 16657, Portland, Or 97216; evaluation, measurement, goals.



VENDORS

This very limited list of vendors excludes those who do not have a manufacturers representative in Oregon or have sold relatively few educational systems. IBM, and particularly Honeywell and Burroughs, might deserve more mention but they are not selling many low-priced smaller systems in the tricky educational market.

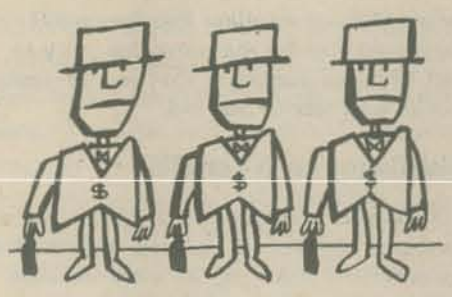
CALCULATORS: ←

Pocket or desk-top calculators are compared in the June 1973 *Consumer Reports* and the Texas Instruments Datamath TI2500 rated highest. It costs $100, but useful calculators were tested in the $60 range. Prices are dropping fast.

WANG LABS – Wang has a lot of experience using calculators in the classroom. They have a new BASIC speaking calculator which does not yet have much software, designed for use in the schools.

TEKTRONIX, INC. TEK is not experienced in marketing to high schools, but their new line of programmable calculators is inexpensive and offers many advanced features. TEK products are noted for their exceptional reliability.

HEWLETT-PACKARD – HP makes the world's most sophisticated pocket calculator and a wide range of desk-top calculator systems including the HP9830 BASIC language speaking calculator/computer. HP equipment is reliable and their sales and support staff is very familiar with the education market.



COMPUTERS ←

HEWLETT-PACKARD – Reliability, quick terminal response on small jobs when fully loaded with the normal mix of educational users, conservative development, and a large public BASIC library are the hallmarks of the HP2000 series time shared BASIC systems. HP offers the single-user BASIC calculator mentioned above, plus 8, 16 and 32 user time shared BASIC systems. HP has sold a lot of HP2000 systems and has not shown much interest in varying their offerings. HP's most painful language restriction is their failure to permit one or two dimensional string arrays. HP BASIC has only 6 digit precision and won't execute data files. Whatever its limitations, HP BASIC is probably used by more students than any other, and their sales people are well tuned in to desires of secondary school teachers. The HP user group is well organized.

DATA GENERAL – DG makes essentially only one computer, the NOVA, which was the first widely used sixteen bit machine. It comes in several versions from 4K and one terminal to a large 16 user system. Their computer systems tendto be a little heaper than DEC or HP. Their Extended BASIC is available on some very small systems and is similar in power to HP BASIC. NOVA 840 systems are the first priced under $100,000 to offer a powerful 16 user BASIC withsimultaneous batch that can handle a very nice ALGOL and an excellent FORTRAN IV . Performance on single CPU systems with over 16 users should be evaluated very carefully. DG claims they can expand in 16 user increments by adding a new CPU and swapping disk ($25,000 per increment); make them show you one in operation. DG does not have a well developed users group.

DIGITAL EQUIPMENT CORPORATION – DEC offers a bewilderingly large assortment of educational packages from small to gigantic. Their systems are more flexible than HP's at most levels, because they are often purchased by business, engineering, scientific, and industrial customers in addition to their educational sales. At most levels, "more flexible" means that the operators often need to be more expert than on the same size HP system. A number of non-BASIC languages are available for DEC PDP8 and PDP 1 1 minicomputers for single user mode; the same is true for HP and DG. DEC's 2–24 user time shared PDP8 is the only multi user multi language system under $60,000 and boast BASIC, FORTRAN, ALGOL, FOCAL and assembly language, although its BASIC does not compete in string and file handling with advanced BASICs of HP, DG and DEC's PDP11. DEC's PDP11 RSTS BASIC-Plus is the most powerful mini computer BASIC available, although its cheaper hardware configurations can be overloaded by a relatively small number of complex jobs. The Digital Equipment Corporation Users Society (DECUS) is well developed end well run; however, its educational group has not been its strongest section.

COMMUNICATIONS EQUIPMENT ←

SIDEREAL CORPORATION – Sidereal leases computer terminals and communications equipment. Call Sidereal, Western Union and your phone company business office for quotes on communications equipment.

USED COMPUTERS ←

AMERICAN USED COMPUTER CORPORATION
15 School Street, Boston, Ma 02108 – AUC sells all sorts of used or discontinued stock. Sometimes it's a bargain and sometimes not. Send in your name to get on their mailing list. Make sure to get some sort of return privilege before you send in a purchase order.

BASIC

Some BASIC Language and Other System Features to Examine

When comparing "features" between different systems, this list might help draw your attention to points of difference between competitors.

10 PRINT

(1) Is machine binary, octal, hex?
(2) What is its word length?
(3) What operating systems available?
(4) What non-BASIC languages?
(5) Well organized users group?
(6) How much can system grow?
(7) How much is extra memory?
(8) BASIC compiler or interpreter?
(9) What peripherals available?
(10) Does vendor discourage flexibility?
(11) Mean Time between failures?
(12) Are data files compatible?
(13) Are data files executable?
(14) How many digits of precision?
(15) Are numeric variables dimensioned?
(16) How about string variables?
(17) Maximum string length?
(18) Midstringing (substringing)?
(19) Program length limits?
(20) CHAINing permitted?
(21) Data file limits?
(22) String functions?
(23) String concatenation?
(24) User defined functions?
(25) CALL external subroutines?
(26) Maximum number of data fields?
(27) Sequential files?
(28) Record-oriented files?
(29) Random access files (how?)?
(30) Virtual arrays on disk?
(31) PRINT USING (output formatting)?
(32) Maximum number of users?
(33) Batch permitted?
(34) Response time?
(35) Hardware floating point?
(36) Support high speed terminals?
(37) List price of system?
(38) Is software bundled?
(39) Matrix operators?
(40) Boolean operators?
(41) Availability of good maintenance?
(42) How much attention required by operator?
(43) File security arrangements?
(44) Cost per word for extra disk space?
(45) Execution time for benchmarks typical of your job mix? (Be sure system is "typically loaded" during test)
(46) How easy is it to crack user ID codes?
(47) What sore of accounting/billing info is generated?
(48) What is it that you really want to do that needs a computer?

AFTERWARD

Thousands of teachers now purchase computing power to help them in the classroom – most currently use the BASIC language on a mini computer. The most important parts of the "system" include students, trained teachers, instructional goals, and the computing machines and the programs that tell the machines what to do. This Guide is intended to help novices in their encounters with vendors of computer hardware and the computer program (software) most commonly used in schools.

Please forward corrections and suggestions to the author in care of O.C.C.E. so that you can help benefit readers of future editions.

"TRUTH IN MARKETING" POTENTIAL BIASES

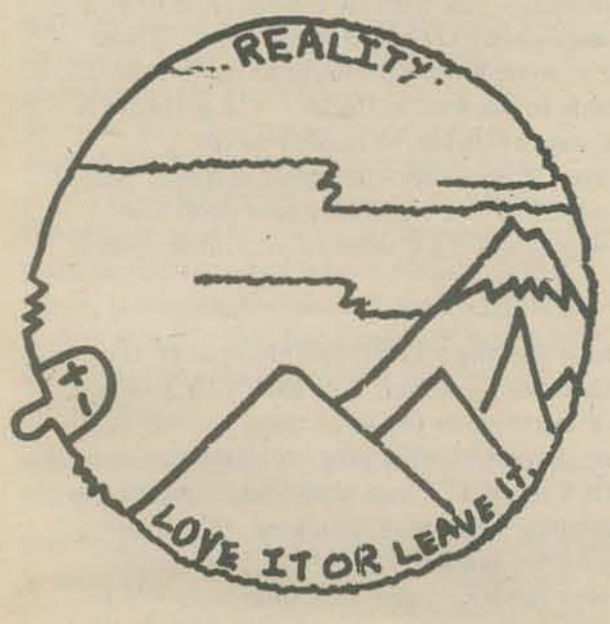
Income from software sales supports many of OMSI's computing projects. Over the last five years, OMSI has made heavy use of General Electric time sharing, HP 2000 BASIC systems, and Digital Equipment Corporations PDP8 and PDP11 mini computers. OMSI'S computing activities have been partially supported by grants and other assistance from the Hill Family Foundation, National Science Foundation, Tektronix Incorporated, Digital Equipment Corp., General Electric Company, Electro Scientific Industries, and Berkeley Bio-Engineering.

Rusty Whitney

WRITING BID SPECS

The True Scam On That Delicate Process Known As "GOING TO BID"

If you are shopping for a mini computer system for your school or whatever, you can choose from some 150 mini manufacturers. Nearly ALL of them can provide you with *hardware*. SOME of them can provide you with BASIC language *software*. A FEW can provide *maintenance* within a reasonable period of time and with reasonable efficiency. About TWO can give you the kind of *support* that we think is essential for school installations.



Depending on WHO you are, WHAT experience you have, the RESOURCES you have available and how much pure, raw COURAGE you possess, you may look to any of these mini manufacturers or you may limit yourself to the two who will "hold your hand" while you breakin your system. If all you need is hardware (you feel you can get software and maintenance from other sources) than you can write wide open bid specs and buy from the cheapest source. For the rest of us the job is not so easy. We have to look at everything that is available to meet our needs (keeping GROWTH in mind), narrow our choice down to one or two systems, and then write a set of specs that will encourage more than two bidders but at the same time not stick us with some hoky system from Fly-By-Nite Manufacturing. What you really want is 5 or 6 legitimate bidders and the ability to choose the one YOU want (that's where the pure, raw courage comes in!). We've seen more than one situation where the school had their heart set on one system and have the bids produce a strong competitor with a new system. Courage prevailed and the school took the new system. In the same light we've seen the "preferred" system lose to a low bid competitor and everyone ends up unhappy.

All bids must have some general provisions regarding bid bonds and all that stuff. A few extras you should throw in are:

1. No bidder may withdraw his bid for 90 days after the opening of the bids – *this gives you protection against any price increases (decreases they should give you). Also gives you plenty of time to make up your mind.*

2. The bid should include all freight charges, taxes, installation charges, etc. – *everything to make the thing go!*

3. Include a solid delivery date – *delivery defined as up and running, not just on your doorstep (be reasonable). Allow the vendor to state alternatives if he cannot meet your delivery date.*

4. Liquidated damages – *if the contract is not completed (delivery) within the time required in the contract then an amount ($50 to $100 per day) shall be deducted from the contract total. What a club this gives you if things go awry or delivery is delayed (and it will be!).*

Fig. 14 Jackknife positioning for relief of acute back strain.

5. Manufacturer's name and model number must be shown under each item bid. *(Require all new equipment if you wish.) The prime contractor should be responsible for the quality and the compatibility of all the equipment he bids.*

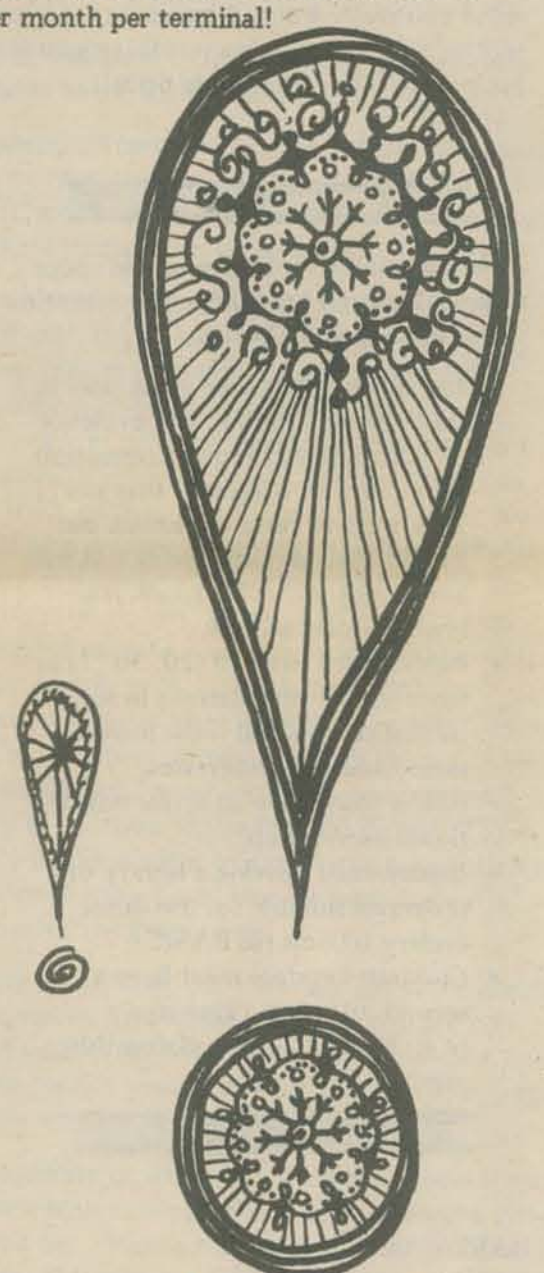
6. Bidders will present alternative purchase, lease-purchase and lease arrangements – *we discovered a wide range of variations between vendors in this area. HP offers a full payout 4 year lease at some ridiculously low interest rate.*

7. Certificate of non-discrimination – *the bidder must submit with his bid a certification that his firm does not discriminate in employment with regard to race, religion, creed or national origin . . . in your heart you know this is right.*

And then there is a whole array of other things you can add before you even get into the specifics of your hardware and software.

The most significant section in any bid spec should be worded along the following lines: *The system must be demonstrated on demand with all requirements before the bid shall be accepted.* This one section may save you more grief than all the rest of the specs. With all due respect for my friends who sell computers, you can't always believe what the salesman TELLS you. MAKE HIM SHOW it to you (and if you're smart, you'll bring along someone to this demonstration who is capable enough to verify that you *really* are seeing what they say you are seeing). A salesman's promise that "it will be available by the time your system is delivered ... we're working on it" is usually just so much salesman's talk. When the time comes for delivery of your system, he'll pop-up with "it's not ready yet but it will be an easy job for one of your hotshot students to do." And there you are, up the proverbial creek without a paddle! By the way, you'll probably get a good system anyway. It's just that most of us are in the habit of getting what we asked for and plan accordingly. The loss of some special system capability may very well be harmful to the planned instructional program. This one clause (and your diligent enforcement of it) should keep out shaky bidders.

To assure yourself a computer or computer time until delivery of your system you can insert a clause stating that *the vendor shall provide you with time on a computer similar to the bid item from date of contract to date of delivery.* You should specify hours of the day, number of terminals, disk space requirements and so on. If the interim system is a timesharing system, available over phone lines, be sure to specify that the telephone calls *must be* a LOCAL call from your location (or else the vendor must pay all phone charges). This section should be included as a biddable item, the vendor can charge you for the service. In two bids locally, HP bid no charge while other vendors were going to charge as much as $600 per month per terminal!



To cover yourself and assure you sole discretion in the ultimate choice you can add the following clause: *The contract will be awarded to the responsible bidder(s) who in the judgement of the district make(s) the most cost effective proposal(s). The district reserves the right to reject any or all bids and to sit and act as sole judge on the merit and quality of the material, or equipment, or service offered and on the responsibility of the bidder and may accept whatever bid or combination of bids is deemed to be in the best interest of the district.* This essentially allows you to reject or accept any bidder for nearly any reason. This clause takes away the sanctity of "low bid" and places the bid process into the category of an information gathering procedure that allows the district to choose from what the vendors offer, without regard to price. We have seen an entire set of bids rejected under this clause and in another case, saw Data General low bid a 12K, 5 terminal Nova system for $17300 and lose to an 8K, 5 terminal DEC Edusystem 20 bid in at $17990 (explain that one!).

WRITING BID SPECS:

Here are the specifics for hardware and software. You should be aware from the start that your *software* requirements may be every bit as important as your *hardware* needs and specs should be written accordingly. Secondly, the more specific you are, the more information will be provided to you by bidders, (i.e., if you list all your requirements, it is incumbent upon the bidder to list any *exceptions* to those requirements). If you *don't* list your needs, he may not tell you all about his system and you will have to search out this information on your own.

Both hardware and software sections can and should be written with a *required* section and a *preference will be shown if you can provide this* section. This gives you wiggle room in your selection and lets your bidders know exactly what your minimum needs are and what you really want. Chances are, no one will be able to give you everything you want (at least not at a reasonable price!).

Here are some more general bid specs that have been brought to our attention Use them in good health.

- **The bidder must have gross sales in excess of $50 million and evidence of a profitable computer operation. [Wonder who suggested that one?] This line will certainly knock out Fly-By-Nite Manufacturing but will also knock out other small, legitimate bidders as well.**
- **Bidder must have 10 (20, 30 ??) or more similar installations in similar institutions and must provide their names and addresses.**
- **Bidder must have an *active* educational users group.**
- **Bidder must provide a library of programs suitable for use in secondary schools (in BASIC).**
- **Computer system must have a second *instructive* language (e.g., FOCAL – who claims this one?).**

HARDWARE

You can take three different approaches in writing specs for hardware. You can be SUPER-SPECIFIC. For instance, you could specify an 8K, DEC Edusystem 20 with 4 terminals (ASR 33). Unless you added "or the equivalent," this kind of spec would get you one single bidder, DEC. If you add "or the equivalent" it would be like opening Pandora's box. Everyone would bid claiming they were "equivalent" or *better* than an Edusystem 20 and you might have a real hassle proving otherwise. Unless your mind is completely closed, we don't recommend this approach.

Another approach is to spec your hardware completely around your software specs – "the hardware provided will be capable of operating the software described elsewhere in this document." This seems like an awfully gutsy thing to do and requires that your software specs be exhaustive and exacting. This approach probably makes the most sense but I'm not convinced it's practical unless you really have some sharp spec writers around your shop.

Always seeking a compromise, the obvious way to spec your system is to list those minimum hardware requirements that you think you might have plus your preferences, require that the hardware be capable of operating all the software specs and write yourself a neat set of software specs.

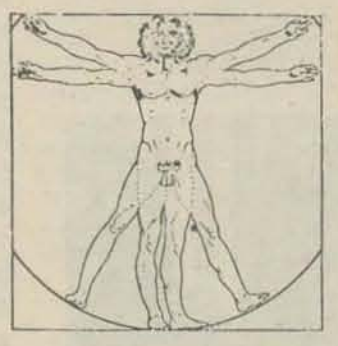
Now for the specific hardware items –

Central or Basic Computer System

Don't spec a Central Processor (CPU) per se, rather spec a total system. Require that it be new equipment (unless you want a used one) and define that it be of latest generation design (today that's third generation or is it fourth or 3½[?]). If you're gutsy don't identify your core storage requirements in terms of *x* number of words or bytes. Instead, specify your needs in *x* amount of USER SPACE or user space per terminal, while operating in time shared BASIC. (We felt 5000 words was adequate if the system could CHAIN programs.) And, if your're messing with FORTRAN and the like, then define your needs in terms of user space for each language. User space is really what you're concerned about isn't it? You will find wide variations in user space from system to system– so beware. This tactic puts the pressure on the vendor to specify space in your terms, not his. To save you dollar$ later, you should specify that the delivered system be *expandable* to *x* amount of core without the need to replace the CPU or the addition of an expansion chassis (we said 32K). It's cheaper to get the bigger chassis now and less aggravation later. If you have a preference for a 12 bit word system, say so. If you want a 16 bitter spec it that way. You may as well get what you want!

More Storage

In this day and age you have an unbelievable choice if you want more storage capability on your system. For the complete system you can choose fixed-head disks, cartridge disks, magnetic tape, DECtape, cassette tape, and a plethora of floppy disks and other assorted paraphenalia, or any combination thereof. You should examine *your* needs as *you* see them and then make your decision. We're not convinced that a fixed head disk is needed for any reason other than speed and to run up the price. If speed is not your concern, save yourself some money and don't require a fixed head disk. That doesn't mean you won't get one. Some systems only work with such a disk for reasons that have never been adequately explained.



"I'd like a computer that's about this high and this wide..."

Here are some cost savers – Most large systems are sold with magnetic tape to be used to load the "system" in case of a malfunction. This tape unit ($10,000 worth) has no other use since time sharing users *cannot* use it. You can eliminate this costly extra by using a *cartridge* disk as your time share storage unit. In case of malfunction you use this same device to reload the system.

If you're considering a DEC Edusystem, some combination of DECTAPE and cartridge disk is probably the most flexible, least cost way to go. Remember, DECTAPE is more like a random access device than it is like magnetic tape, or so they say.

Whatever you do, be sure to specify that the storage you want be available to *all* users in time shared BASIC. That seems obvious but you should know that hardware people sometimes sell you things that don't work the way you expect them to.

We're a little gun-shy about floppy disks and cassette units as of now. We haven't seen major vendors providing software to drive these units. Is that clear? Just because it's *attached* to your hardware does NOT mean it will work. There must be some linking software to make the "it" available to the user in BASIC. The software is not always available, so buyer beware . . . . However, if you have some good software people around, these two items may be a good low-cost way to adding storage to your little system.

I/O Capability

If you're specing a Teletype-only system, there is little to worry about. For each TTY you need a TTY interface or for all of them get one multiplexor into which they plug. Multiplexors usually handle 8 to 16 TTY and work out to be cheaper than buying individual interfaces. If you are going to communicate via phone lines with modems beware. Some TTY interfaces WILL run either direct TTY or modems – some WON'T. Specify your needs. No matter how many TTY's you want now, you'll want more soon. Be sure to require that your system I/O is expandable.

With changing technology you should be able to get multi-speed interfaces and multiplexors so you will be prepared to run those sweet new CRT's at rates of 30 CPS or faster. Your standard TTY interface will *not* run at 30 CPS. Specify variable speed interfaces or multiplexors to meet this need.

If you want card readers, printers, and all those other high speed peripherals be very cautious. These items don't just plug into the multiplexor– EACH needs a controller (like an interface). Do you want these peripherals available for time share users? You had better say so! Some BASIC systems will run these peripherals in time share, other will not. The HP 2000E, the low cost model, will not drive high-speed peripherals in time share . . . the 2000F will. (Another of life's unexplained mysteries.) Some DEC systems will drive these peripherals IF you buy more core.

Another frustrating item is the high-speed paper tape reader you must buy on larger systems for $3500 or so. It is *only* used to ENTER system software. No user can use it to enter BASIC programs (don't ask me why!).

Cost savers – Mark sense card readers – we have friends who swear by them and other who swear at them. Check mark sense readers out carefully before you decide. You may find a punch card reader will better meet your needs and save you money. Line printers are expensive as hell. A good $aving can be made if you buy the 80 column printer instead of the full blown 132 column model. Do you really need all that printing?

more memoes on GOING TO BID

Miscellaneous

Somewhere in your bid spec you should require that all interconnecting cables and hardware be included. Cables can run $35 to $50 each. It's nice to have them included in the price. (I realize these things sound obvious but unfortunately we know of schools that have been $-screwed by these little things.)

Most bids we've seen have specified that the system will operate without special environmental requirements such as air conditioning. You might even specify the low-high temperatures you require. That's what's neat about a mini . . . no air conditioning, no special raised floors and all those other expensive things.

Powerfail/restart capability is a hardware *and* software item. This goody costs about $500. In case of power failure or fluctuation, it guarantees you won't lose everthing that's going on and then restarts your system automatically. As a hardware item, it's pretty straightforward. Be sure to mention the requirement that there be software to make it operate when you're running BASIC. Again, it sounds obvious, but we did use a system recently that had powerfail hardware but when the plug was kicked out, we lost everything???!

Want your computer in a cabinet? Better say so, you may not get it that way.

Maintenance – the stickywicket of this business. It costs dearly but buy a yearly maintenance contract on your system and high speed peripherals. It's worth it. We don't recommend maintenance contracts on TTY's. Service them with on-call service. Be confident that you will get 12 to 24 hour service from the computer manufacturer – service by employees of the firm. I'd be very leery if maintenance is only available from a "local mechanic with whom we contract." Those of you in the boonies will encounter this problem. Beware.

We've said . . . don't buy TTY's from the computer supplier. It'll cost you a fortune. The computer supplier may require that you buy a consol TTY from them (usually an ASR 35 for $3500 or so). You're stuck buying it from them but don't accept the ASR 35 – tell them you want an ASR 33. It will do the same job at half the price.

When you specify TTY's from another source be sure to include the requirement that the TTY be modified for your system. TTY's connected to DEC, Data General and other computers, require a modification kit installed in the TTY to make it run compatibly with the computer (cost is about $100 each). Remote TTY's (via phone lines) don't require these modifications.

Leasing – Nobody buys computers these days, they lease them. Someone out there should write us an article about leasing – pros, cons, prices etc. We do know that interest rates vary from firm to firm as do all other fine print items. Let Truth-In-Lending work for you – REQUIRE the vendor to specify the interest rate used in calculating your lease.

SOFTWARE

We're only going to worry about BASIC here. If you need other language specs, you'll have to find another reference. Let me repeat the comment that this section of your specs may be more important than your hardware requirements.

BASIC was developed at Dartmouth College and there is considerable literature to explain what is called Dartmouth BASIC. Trouble is, the authors of the language have come out with several revisions and improvements to the language which have blurred the original definition. We're going to reinstate what we think is the original Dartmouth BASIC.

Dartmouth BASIC includes the following statements: LET, PRINT, READ, DATA, GOTO, IF-THEN, FOR, NEXT, GOSUB, RETURN, INPUT, REMARK, END, DEF, DIM, STOP, RESTORE, RND, SGN, SIN, COS, TAN, ATN, SQR, LOG, EXP, INT, ABS, and a full mix of MATRIX commands.

You may not need the MATRIX commands. All the rest represent the *absolute* minimum BASIC language requirements. You might place the MATRIX commands in a "desirable" software category. (MATRIX commands take up an awfully large amount of user space on core-based minis. Be sure to require the ability to delete the MATRIX commands at *your* will to gain user space when MAT isn't used. Then you only have to load the MAT commands when you need them.)

To this standard BASIC you should add the requirement of a TAB command which will help formatting output and the MULTI-BRANCH GOTO (ON x GOTO 100, 200, 300) which you will find invaluable.

If you're really getting into it, you'll want STRING VARIABLE capability on your system. String variable commands allow you to manipulate alphabetic data. Some systems will only allow strings of lengths from 6 to 18 characters, depending on the system. This is *almost* like no strings at all. HP allows strings of 72 characters (one full TTY line) on the 2000 series. DEC's BASIC PLUS language will handle strings as large as 255 characters. In addition to having strings you should specify the ability to use relational operators (<, =, >) with strings so you can do such things as compare strings and arrange them in alphabetic order. To round out your string variable capability you should require the ability to concatenate strings and separate strings using substring commands.

In the category of "preferred and awfully nice" (but not necessary) we place the ability to store strings in arrays or string array capability. This feature is now available one some of the newer, super BASIC systems that are coming out.

Next in order of preference, we see the need to CHAIN programs, that is to link two or more programs together for continuous operation. With CHAIN you must have a COMMON statement which allows carrying a variable forward from one program to another. Some systems offer CHAIN but not COMMON, caveat emptor.

The following BASIC features are not in any meaningful order but we suggest you evaluate each on its' merits and use them in your specs as you see fit, . . . as required, . . . preferred, . . . not necessary.

PRINT USING or picture formatting as a BASIC command. This gives you the ability to control output format with more precision and without some fancy programming shenanigans. Especially useful for business applications.

Multiple statements per line – DEC has a neat user space saving feature that permits you to put multiple statements on one line.

```
10 FOR X=1 TO 10\PRINT X\NEXT X
```

If you're looking at a core based mini this is almost a necessity.

Immediate or calculator mode – allows you to execute unnumbered statements without writing a complete program and without having to scratch the existing program. The statement may be any legit BASIC statement, even including a looping one.

ENTER permits limiting the time a user has to input a value. Absolutely essential for CAI and nice to have for simulations and games.

File capability – the ability to store data in sequential and random access files. You should specify how many files can be accessed at one time (4 to 10), how much data each file should be able to handle. These figures will vary wildly from system to system.

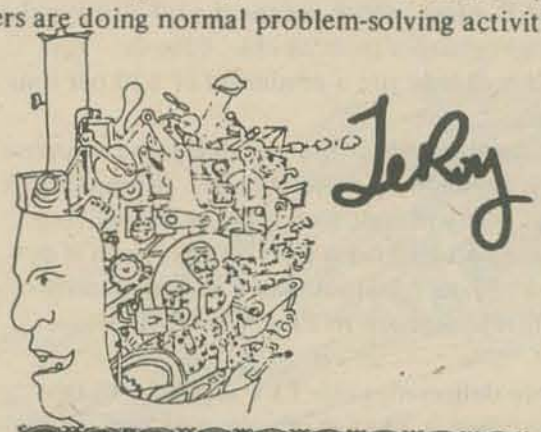
Logical operators – AND, OR, NOT operators available to use on all data.

Peripheral drivers – if you are buying card readers etc., we repeat again, specify (REQUIRE) that the BASIC software include the ability to effectively use these items by terminal users.

There must be other BASIC features but we're out of gas! If you're seeking a large disk time sharing system than you must require a full compliment of system accounting features including *x* number of assignable user numbers, file protection for each user, and the ability to keep track of time and space for each user. You should also *require* that the system have a Public Library capability which allows all users to access the programs in this library, AND require that the vendor provide you with at least 200 programs for this library each of which be suited for educational use at your level. HP (maybe DEC too has a nice feature called a GROUP library. Users with similar user numbers have access to this library in addition to the Public Library. This feature is appropriate in a consortium installation where each school may like its own library in addition to the Public one.

We hate to say this, but these are the recommended requirements for *one* language. If you are concerned with other languages you should take some time to specify your needs for that or those languages as well.

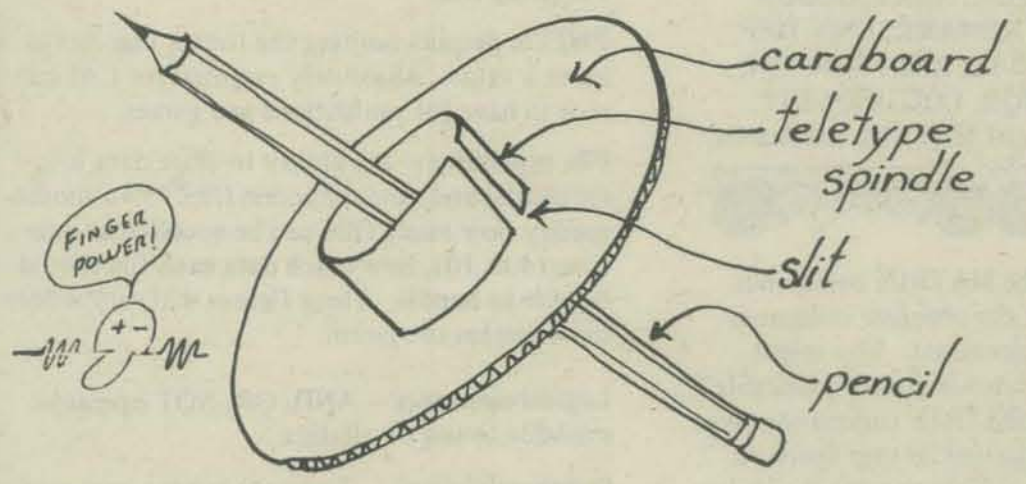
Is it hardware or software? Someplace you should require a reasonable response time when the system is in full use. What's reasonable??? How about 5 seconds after pressing RETURN when all 16 (or 32 users are doing normal problem-solving activities.



At the present time there is a Standards Committee meeting to establish standards for the BASIC language and all its improvements. This article has completely disregarded the existence of these standards. When they become available, we will print them so you can require the established standards on your system.

TELETYPES

Cheap Tape Winder



How Many terminals to you need?

Grades 9–12 Enrollment	Starting Program[1]	Intermediate Usage[2]	Total Program[3]
Under 500	1	3	4
501 – 1000	2	4	5
1001 – 2000	3	5	7
2001 – 3000	4	8	11
3001 – 4000	5	11	15
4001 – 5000	6	14	19
Over 5000	8	18	24

(1) Elective course in computer literacy or supplemental use in one year of mathematics. (10-15% of students will use computer regularly; 5% occasionally.)

(2) Elective course in computer literacy and supplemental use in one or two years of mathematics and use of simulations in physics, biology, or social studies. (20-25% of students will use computer regularly; 10-15% occasionally.)

(3) Elective courses in computer literacy and computer science and supplemental use in three years of math and use of simulations in two or more subject areas. (30-35% of students will use computer regularly; 25-30% occasionally.)

Compliments of Dave Ahl, DEC.

WI$E?

Is it wise to buy a Teletype from Teletype Corp?

In the interest of saving money we checked out the possibility of buying teletypewriters from Teletype Corporation directly, rather than buying through a local dealer (which is what we previously recommended).

We found Teletype Corp. to be most cooperative. They suggested that interested readers contact their Los Angeles sales office at (213)724-6040 or their central number (312)982-2500, or write directly to the plant:

Teletype Corporation
Sales Department
5555 West Touhy Ave.
Skokie, Ill. 60076

You should note the purchase of a Teletype is a cash operation, payment is due in total in 30 days. If you want to lease a TTY, you'll have to deal with RCA, Western Union or a local dealer. You should also note that prices are F.O.B. plant, which means the buyer pays the freight charges from Skokie, Illinois – this will probably run a minimum of $20 per unit.

We were unable to get any definitive response to a question on delivery dates. Rumor has it that you will wait 6–8 months for delivery when you buy from the factory. Even if delivery is only 4 months (we've been wrong before) you have to PLAN AHEAD.

Once delivered, your TTY will have to be "installed." Though it's checked out at the factory, 1000 miles in a truck may beat it up. Installation (final test and adjustment) by Teletype will cost you $75/unit plus mileage if you're more than 25 miles from an office. Our friends at Data Terminals will only charge about $35/unit if you have the machine shipped to their office in San Jose – then they will deliver it to you. Data Terminals claims that unless you have an experienced man at your school to check out your new TTY, you could possible find yourself in *real* trouble a few weeks later.

Well, is it worth it? We priced out the following unit which is perfect for a T/S terminal. ASR 33 Data Terminal with paper tape reader/punch, friction feed paper, automatic reader control (X-on, X-off), ME type wheel (give a slashed zero), pedestal mount including chad box and copy holder.

Model 3320/5JC	Price	$970
To which we add	Transportation	20
	Installation	50 (happy medium)
	TOTAL	$1040 (coupler is not included)

The same unit from our friends at Data Terminals is only $1100 and they can deliver quickly and will assume all responsibility for bad units etc.

Is it worth it? We don't think so. Not if you're buying onesy, twosy units. The $60/unit profit you give to your local dealer will save you more than that in aggravation and risk. BUT, if you're buying lotsa terminals, it might well be worth the risk to buy all your units direct from Teletype and have them installed by your local men.

Other words of wisdom –

You can buy a builtin modem from Teletype also. The modem runs an additional $200 or so. It must be hard wired to a telephone Data Access Arrangement (DAA). You cannot use a builtin acoustic coupler with the 3320/5JC for some strange reason. You have to to use a separate coupler sitting on the floor or nearby.

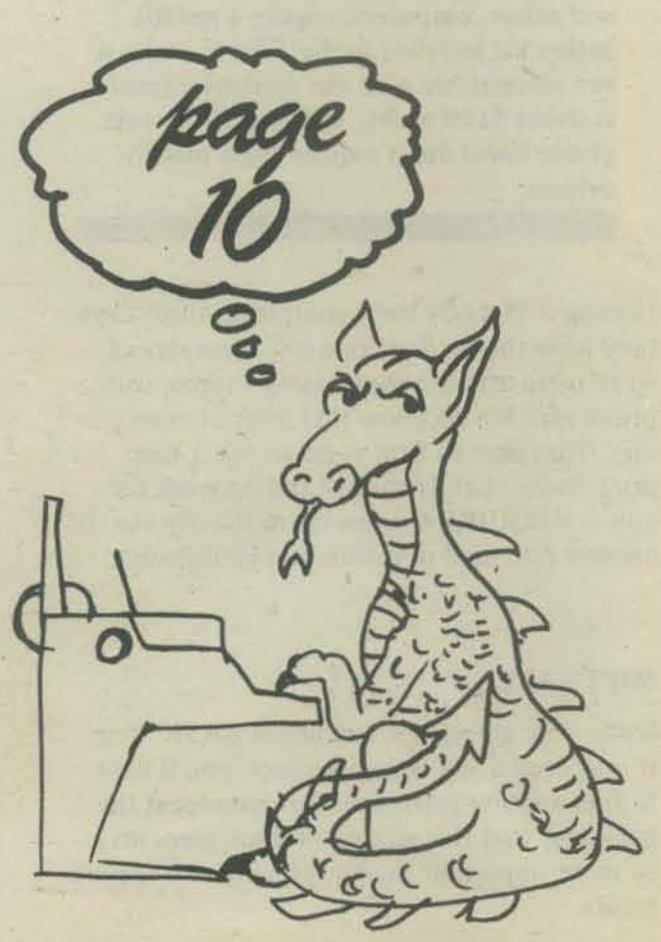
Teletype recommends maintenance every 750 hours or 6 months. How do you keep track? For $15 more, they will equip your TTY with an elapsed timer that records the "motor-on" time to the nearest hour. We think it's a worthwhile investment! Model SOP 188660.

There are a zillion other options available when you're buying a TTY. The unit and information described above is basic, but will meet your needs adequately.

REMEMBER – If you plan to hardwire your TTY to a DEC or Data General computer, you need a modification kit which may run you more than $100 installed.

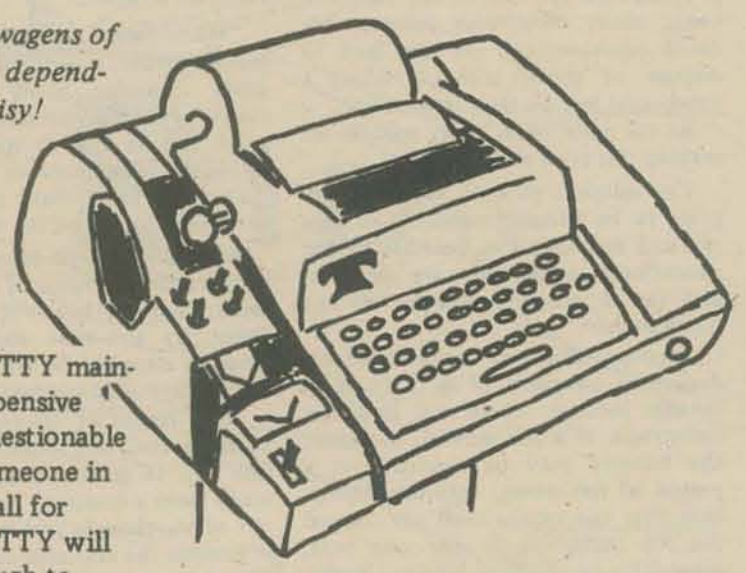
Paper

Earlier we recommended PERFECTION brand paper (stock number 6210) which we were buying as cheap as $0.73 per roll. We haven't been able to beat that price but we found another good paper you might check out. We buy it from Blake Moffitt & Towne paper company in San Francisco. We buy the 4½" diameter roll, white, model 40-18303 for $0.82 per roll if you buy 60 rolls, $0.77 per roll if you buy 120 rolls. Higher quality bond paper, model 41-18303, will run you $1.15 per roll in 60 roll lots and $1.08 in lots of 120.



TTY

Teletypewriters are the Volkswagens of computer terminals ... rugged, dependable, inexpensive, ugly and noisy!



TTY COST SAVING TIPS

Definition: *ASR 33, is a Model 33 TTY with paper tape reader/punch*

KSR 33, same but without paper tape.

Nothing can beat an ASR 33 TTY for price, performance and reliability, but buying them is a gas. One way to save lots of dollars is to buy your TTY from a different supplier than your computer vendor (DEC and HP now encourage this). This requires that your school business office prepare two bid forms, one for the computer and one for the TTY.

The reason for this is simple. TTY bought from Teletype Corporation only cost about $800 (though you may have to wait 6 to 8 months for delivery). From a computer supplier, the same TTY may run as high as $1600. In most metropolitan areas you can find 3 or 4 independent sources of TTY that will sell you a new ASR 33 for $1200 or less. They'll make any modifications necessary to make your computer and TTY compatible. Rebuilt like new models are selling today for less than $900 from these same sources. You can lease a TTY for $50 to $60 per month, including maintenance if you'd care to go that route.

Think twice before you buy KSR models. They'll save you a few dollars but at some point you'll discover you need the paper tape capability.

Maintenance Experience ~
I've had 4 ASR's running 4-6 hours daily for 2 full school years. We've had regular preventative maintenance on all 4, plus a few bigger problems on 2. Altogether we've spent about $150 in 2 years.

LF

MAINTENANCE CONTRACTS. TTY maintenance contracts are absurdly expensive ($20 to $25 per month) and of questionable necessity. There's bound to be someone in your area who will come out on call for around $10 per hour or so. Your TTY will take a big beating but not big enough to justify the charge by vendors for monthly maintenance contracts.

TTY PAPER. By the roll, your local office supply dealer charges as much as $2.00 for average quality TTY paper. At that price the poor house beckons for you! Buy in case lot quantities and save a fortune. Our recent experience dropped the price to $0.98/roll for a case of 12 rolls. When we bought 6 cases (72 rolls), the price dropped to $0.73 per roll. The paper is not fancy but more than adequate for classroom use. This experience was with the brand PERFECTION, stock number 6210. Have your district office supply store order this brand for you.

PUNCH PAPER TAPE. Ditto with paper tape. $1.25 was the going price until we bought a case of 28 rolls. That brought the price down to $0.52/roll or $12.88 for the case. Brand: PERFECTION again, stock number 8219.

TTY RIBBONS. Ribbons cost about $1.00 each and constantly need replacement. One way to save money is to simply flip your used ribbon over (the print mechanism only uses the top half of the ribbon). That will double the life of the ribbon. To save BIG money go to your school business education department and ask them for any old (unused) ribbons they still have in stock for machines they no longer have. We found some Underwood ribbons that had been around for years. We had to respool them onto teletype spools (a pain) but it saved us money.

If you're buying terminals with acoustic couplers, I suggest you do NOT buy the built in couplers. Rather, buy a separate coupler that you will have to locate on the floor. The built-in couplers are too easy for some smarty to disconnect accidentally or on purpose. Separate couplers are also accessible for repair, etc.

If you have some hints for cost savings or if you can recommend a TTY supplier in your area, let us know and we'll include it in future issues.

In the San Francisco Bay Area, a source for TTY purchase, lease and/or maintenance is:

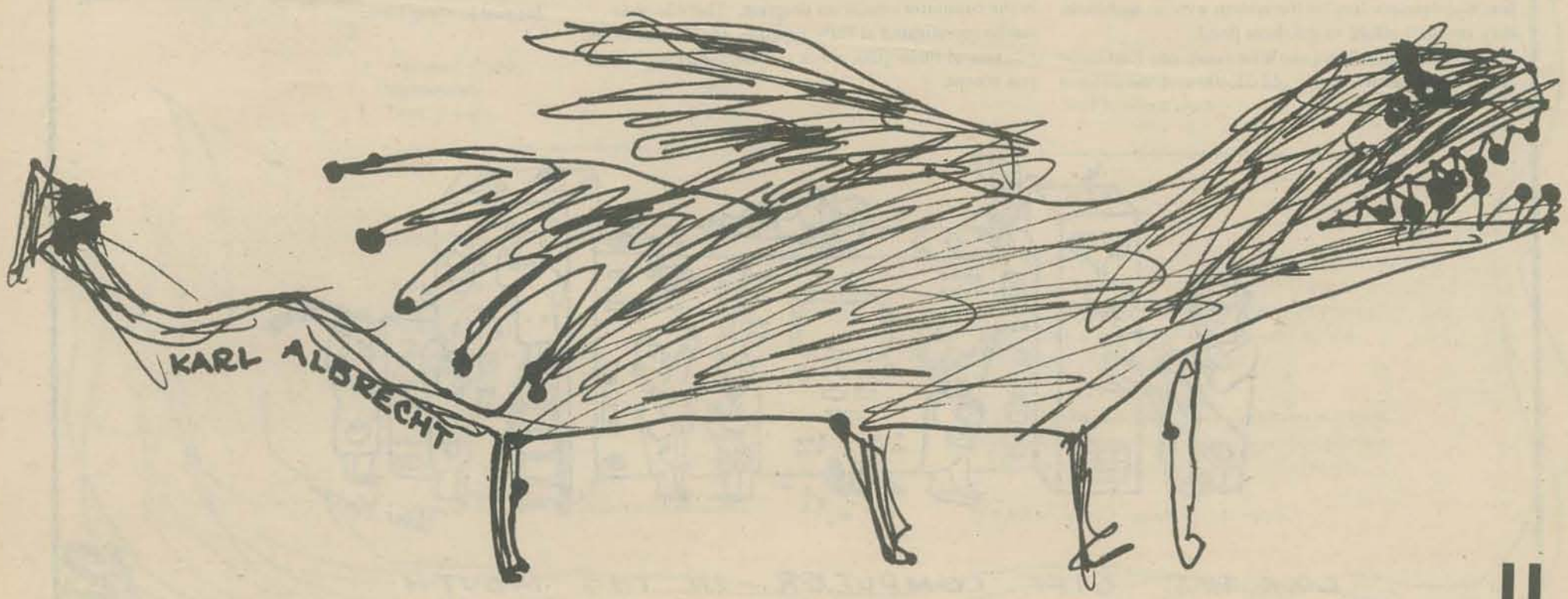
Data Terminals & Communications
P.O. Box 5583
San Jose, California 95150

Current price list tells us:

ASR 33	$52/mo. year lease	$1150 purchase
Acoustic Coupler	$14/mo.	250 purchase

They also have used and rebuilt materials at considerable savings and an excellent, cheap acoustical enclosure (an acoustical closure cuts the volume of sound down to something less than a rock band). We've had excellent experience with these people.

For those of you out there in the big, wide, wonderful world, you can always lease TTY from Western Union. Call their toll free number (800-631-7050) for more information. Model 33 ASR with acoustic coupler is $65/month.



The Joy of Donating a Computer — All Benefit

By Toni Wiseman
Of the CW Staff

BOSTON – With the rapid advances in computer systems in the past few years, many companies possess outdated machines and no idea how to dispose of them, without risking a substantial loss on their investment.

At the same time, many schools are seeking this type of equipment.

The solution to both problems appears to be a logical matching of supply and demand. The benefits to the educational institution are obvious, and the donating company also has much to gain.

A corporation may make charitable donations, annually, of up to 5% of its taxable income. There are, however, carryovers. If a gift exceeds the limit, the balance may be carried over a period of five years, with the stipulation that the excess shall not exceed the 5% limitation in any one year, according to Boston lawyer Nestor Nicholas.

Carryovers are also available if the company is acquired by another corporation, Nicholas said. Thus, they are considered assets in the same manner as unused losses.

Legally, Nicholas said, computers are considered tangible personal property. This means a donation can only be written off if the charity uses the gift directly in its charitable enterprise. In the case of schools, education is considered a charitable enterprise, Nicholas affirmed.

"When faced with the decision to sell or donate, a company should seriously consider going the charity route," Nicholas stressed. "There is a good chance that it will be able to establish a fair market value higher than what they could actually get if they were to sell on the open market."

An added benefit to consider is the public relations value of a donation. A small financial loss will certainly be offset by the time and aggravation saved in escaping the hassles of a sale, and by favorable publicity.

John Haller of Modular Computer Systems, Inc., sees donations as a bona fide way to get equipment (which in many cases a company can't get rid of) out of warehouses and into operation.

Besides the financial considerations, Haller is concerned with the future. "It's sort of like training in the Little Leagues," he said. "If we can get the kids acquainted with the equipment now, later on when they get into industry, they're going to have a feel for the type of gear they need."

Most universities and colleges and many high schools already have their own data processing equipment. And some, such as Daytona Beach Community College (DBCC), would not be interested in "dated" equipment except for electronics courses where the students would simply tear them apart and learn to reassemble them, according to DBCC computer science professor Harry Muntz. But even this, he said, would be a worthwhile use.

Though there are still colleges which do not own CPUs, the preponderance of "worthy causes" falls in the junior high school, vocational school and community college categories.

Derwood Huneycutt, superintendent of the Thomasville, N.C., Board of Education, said he may have to drop the current DP program because of financial considerations. Over 125 students were enrolled in the computer course last year, he said, and that number is always increasing.

"We're mostly interested in letting them learn the languages and seeing what a computer can do, so an outdated computer wouldn't hurt us at all. And certainly it'll be worlds better than no computer at all," Huneycutt said.

The James J. Reynolds Jr. High School in Brooklyn, N.Y., started a program this year on a ninth grade level using programmable calculators.

"We found that as a motivational tool computers really turn the kids on," Stephen Storman of the mathematics department said. "One kid started working on Einstein's theory of relativity and took the negative view of it," Storman said, "and he could be working at Princeton right now, because they think he's right."

Storman, like many other educators surveyed, would like to see the industry get involved in the education process now because "it's to their (industry's) advantage too. Not only will some of those kids become the programmers and analysts of the future, but if they should go into business they'll have a background in DP which will make everyone's job easier."

Belknap College in New Hampshire would "definitely be interested in having a computer donated to them," according to a math professor there. Belknap, he said, will probably have to tie into the Dartmouth Time-Sharing System for financial reasons, "but an on-line computer would certainly be preferable for teaching anything," he said.

Storman summed up the general feeling by saying, "We're not asking a company to give us $1 million worth of equipment; all we're saying is that if there are IBM 1401s or other machines around, we'd love to have them. We're not worried about having to wait a few minutes for an answer, we're worried about teaching these kids Fortran, Cobol and real tangible skills."

Thanks, But No Thanks

By LeRoy Finkel

MENLO PARK – The preceding article was first published in Computerworld, January 9, 1974. As much as we normally like this newspaper we felt we had to respond to this ridiculous article before you all were "blessed" with gifts from readers of the article. Our reaction has also been sent to the editors of Computerworld.

When I first read this article I wished 5 years bad luck to the author. Having read it through many times since, I now wish the author 10 years of machine language programming on ENIAC I (or go directly to that part of hell where people wire old 407 control panels). It is articles such as this that can set the progress of computer education back a full decade.

I can't refute the tax advantages to the benevolent corporation. There is no doubt about that. But what about the recipient school? What happens to us? Here are a few horror stories from days past.

In its infinite generosity, IBM offered a model 1620 to schools for $525/month. This was a typewriter I/O system. For most schools typewriter I/O was too restrictive so they leased a card reader/punch, card punch machines, etc. By the time they were done, the school was paying $1000 – $1200/month for an antiquated single terminal system at a time when DEC was already offering multi-terminal PDP8 systems for less money.

CDC sold the old G-15 computer to schools for a song. A few short years later the same schools found that maintenance fees on the system were so high they couldn't afford to get them fixed.

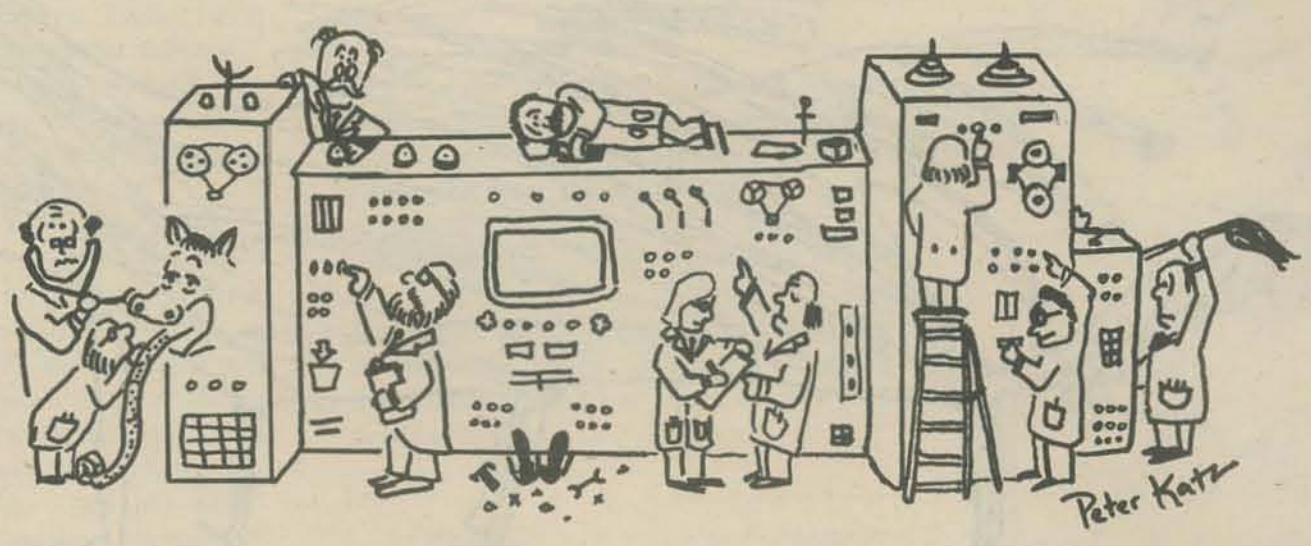
Two school districts (one West coast, one East coast) are presently leasing old GE400 systems at a great educational discount. One problem . . . no one supports the software anymore so either they hire a software staff or "work around" the gliches that exist in the software (kids won't cooperate in working around gliches!)

SCM blessed the San Francisco Bay Area Schools with a $1 million tax write off in the form of old clunking accounting machines which they called computers. Schools gladly accepted them and then the roof fell in. Most of them didn't work! Finding someone to fix them was another story. Those that were working used some obscure language for which there was little or no documentation and teachers set about to write instructional materials at some expense but little came of that effort when it was discovered how difficult the language was to learn. What happened? Well, the electric typewriter and desk were cannibalized by enterprizing teachers. The computer guts were sent down to the electronics shop where the whole mess should have started. But the really bad thing that resulted from all of this was that when the teachers approached their school boards for decent equipment the boards responded with . . . "but what did you do with the computers those nice people from S-C-M gave us?" How do you convince a school board they were SHAFTED by their friends in industry?

Now let's tell the whole story about gifts of outdated equipment. If the computer is truly outdated then its greatest value is in the electronics class, not in the computer education program. There its guts can be investigated at little expense. If someone offers you one of those gifts, check out the following before you accept.

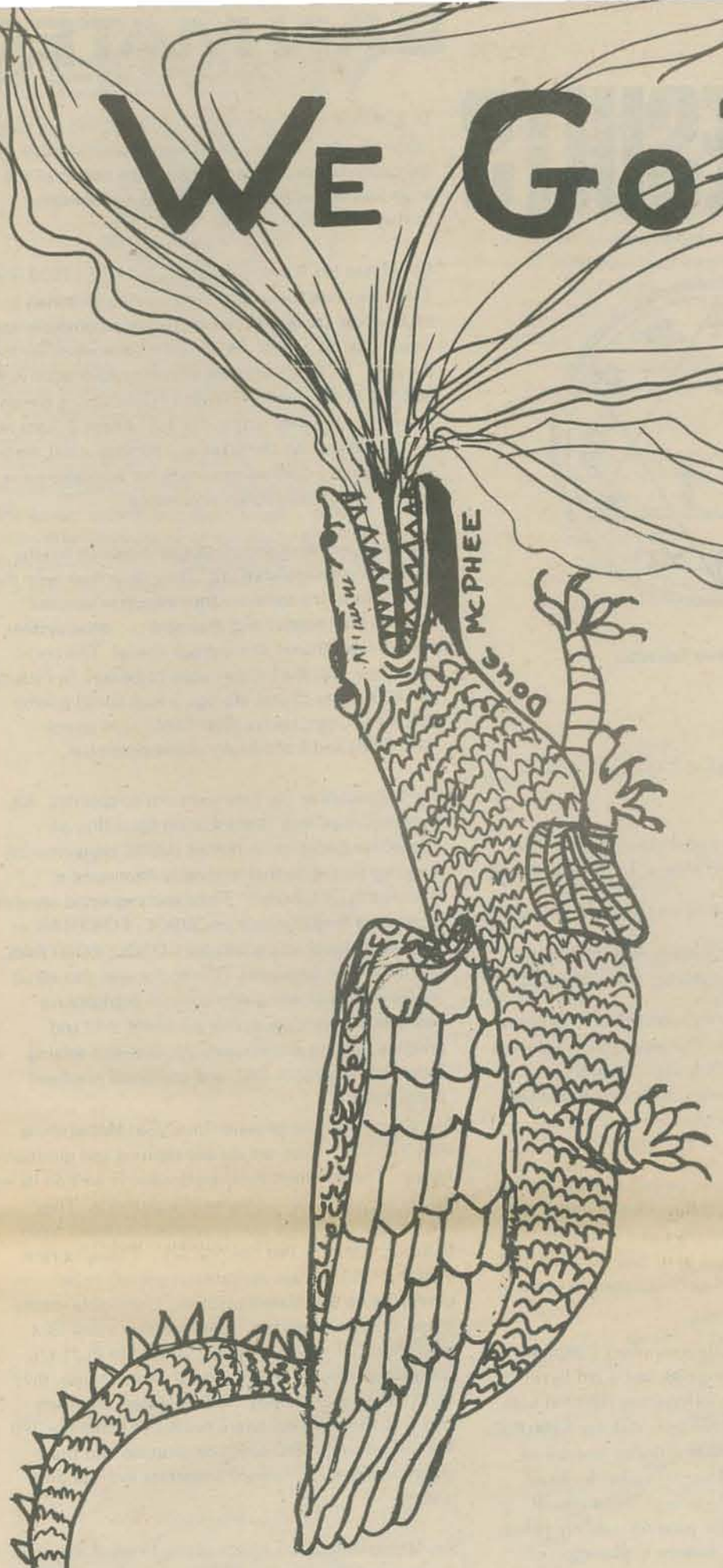
1. Is a maintenance contract available? How much is it? Will the company commit itself to a 3 year contract?
2. What is the status of the software? Is it still supported by the manufacturer? Are the software systems available compatible with your needs and the offered configuration? Are there classroom oriented materials available?
3. How much electricity does the beast need? (We just turned down a system that consumed $200-$300 per month in electricity AFTER a rewiring job.)
4. Do you need air conditioning? Chances are you do and that costs big bucks.
5. Can you run the system in a classroom or does it need its own facility . . . and can you get one?
6. Who will pay for moving the machine to your site?
7. Most important – is this a good system to help you meet your teaching objectives (you do have objectives don't you?).

It is our feeling that by the time you add up all the costs to install and maintain the gift system you would be better off buying a new third generation system designed for educational applications. As a matter of fact, you should evaluate all gift computers in the same manner you would evaluate new systems as described in this issue. (If someone offers you an old PDP8 or HP2114 or any old NOVA . . . take it and ask questions later. We're sure we can get these running for you.)



LOOK THAT GIFT COMPUTER IN THE MOUTH

We Go To Bid



To give you more finite details, we decided to go to bid ourselves. We decided we wanted a system that would –

- ★ run 8 terminals either local or remote
- ★ have a cartridge disk with at least 2.5M bytes
- ★ run in a fairly decent version of BASIC
- ★ be expandable to 16 terminals

We asked for and received –

- cash purchase price
- lease purchase price per month
- maintenance price per month
- hardware cost to upgrade to 16 terminals
- 5 year dollar payout starting with 8 TTY system

Because we were so vague in our specs, we recieved two responses from DEC and one from HP. There is a tramatic difference in the BASIC software in these three systems and you should keep that in mind as you read the results. These prices include ONE consol terminal ONLY. TTY terminals will be added at your expense.

DEC EDU80 (See page 16 for full description). This is a mini RSTS-11.

■ Purchase price	$46100
■ Lease per month †	959
■ Maintenance (7%)	305
■ Upgrade including swapping disk and 8 TTY interfaces but excluding field installation charges	20100
■ Hardware - 5 year	$59845
Maintenance	18300
Total - 5 years	$78145

HP2000E (See page 18). An off-the-shelf 2000E.

□ Purchase price	$34950
□ Lease purchase ††	905
□ Maintenance †††	283
□ Upgrade - already a complete 16 TTY system	0
□ Hardware (42 months)	$38010
Maintenance (60 months)	16980
Total	$54990

DEC EDU25 (See page 16 for full description). Includes 1.6M word disk and all interfaces.

◆ Purchase price	$26970
◆ Lease per month †	593
◆ Maintenance per month (from price list)	278
◆ Upgrade to EDU50 including all interfaces but excluding field installation	31180
◆ Hardware	$36928
Maintenance	16680
Total System 5 years	$53608

† DECs lease is a 60 month lease with a 5% balloon payment at the end. Monthly payments are 2.2% per month subject to variation in the prime rate. Maintenance is calculated at .7%/month unless we were given a more solid figure.

†† HP lease is a special 42 month full payout lease. Public schools pay roughly 2.6%/month, while non-public schools pay approximately 2.8%/month.

††† HP requires a maintenance contract

BID RESULTS

PALO ALTO

Bruce Keepes, Director of Educational Technology in Palo Alto says that we should tell you to remind bidders by phone 24 hours in advance of the bid deadline that the bids are due. Vendors don't always remember or pay attention to deadlines!!!

In the spring and summer of 1972, Palo Alto Unified School District put together a beautiful set of bid specs (we used them as a model for the Bid Spec article in this issue) calling for a 16 terminal system with extended BASIC that might be expandable as the instructional needs of the district grow. It would be redundant to repeat the specs here. By virtue of circumstance, Palo Alto threw out all the first round bids and reassigned priorities, this time asking for 32 terminal capability. Things got hairy and vendors complained but the bidding proceded. Palo Alto hired three knowledgeable outsiders to help them evaluate the offers made by the various companies.

To make a long story short, Hewlett Packard bid the HP3000 unit with a 12 month delivery date but agreed to lease an HP2000F as an interim system with all 2000 rent going towards the ultimate purchase of the HP3000 (in other words a free computer until delivery). This past summer (1973) HP was unable to provide the 3000 as bid, and made an offer the Palo Alto people could not refuse . . . HP would *give* the district a 2000F *and* the 3000 for the price of the HP3000 . . . $310,000 worth of hardware for $203,000. WOW! After considerable hassle with the school board, etc., Palo Alto agreed to this offer. One of the primary reasons for their acceptance was that their needs had already gone beyond 32 terminals and this deal guaranteed 47 terminals (now) AND the multi-language capability on the 3000 in interactive mode was rated as highly desireable by the teachers in the district.

It should be noted that as a result of problems with the 3000, HP has reverted to what used to be a long standing policy – until you see it running, you don't talk about it. We do not sell promises, we sell products (that's my paraphrasing).

Here are the results of both rounds of bidding. Remember, these prices are at least 12 months old as are some of the systems.

Round 1. 16 terminal extended BASIC system required. Card reader and line printer were specified but we show them as separate items. These are cash prices. Lease and maintenance variations are so wild that I wish one of you would write an entire huge article on each. None of these prices include anything but a consol teletype and no communications equipment.

The Sacred Eye

Basic Timeshare Corp. A small OEM distributor in Mountain View, Ca. bid their BTS3000 which uses a 24K, HP2100 CPU plus 1.5M bytes worth of Diablo disk units. Price $55,310 plus card reader ($4000) and line printer ($11,500).

Control Data CDC had a model 1704 in the district at the time of the bid. We doubt that you could ever get a repeat of their offer to make it timeshare in BASIC for $75,406 including the price of the reader and printer.

Data General DG bid a standard Seminar 5 with 24K, 128K word swapping disk, and a 2.5M byte storage disk. Price $51,621 plus card reader, $5000 . . . and line printer $11,500.

Digital Equipment Corp. Bid offered two versions of its RSTS system. One, a PDP 11/20 with 24K and a 256K swapping disk and 1.2M byte storage disk for $71,600. The other was an 11/45 with 32K and the same disks for $86,850. We gather the 11/45 was the "expandable to 32 terminal" configuration. Card reader was $4900, and line printer was $12,000.

HP and Decisions were late to the bid opening and their specs were unopened in Round 1.

Makes Business Successful

Round 2. 32 terminal extended BASIC system with card reader and line printer.

Basic Timeshare Corp. Two matching systems of the BTS 3000 described briefly in Round 1. Price $106,000.

Control Data 32K now required on the 1704. $120,000.

Data General A different Seminar 5 with 24K and the swapping disk plus a 5M byte storage disk. $56,972.

Decisions Inc. A small Berkeley outfit that repackages Data General NOVA systems. Decisions bid a Decisions model 31 which is a 32K NOVA with 6M bytes of Diablo disks using Decisions own software (developed with Lawrence Hall of Science but we hear it's no longer available). Low price of $52,436.

Digital Equipment Corp. Again, two configurations – PDP 11/40 with 56K and a 512K word disk and 2.4M byte storage disk for $121,895, OR an 11/45 with 56K plus 512 K word disk and 2.4M byte disk for $135,150. (32 terminal capability would be 9–12 months coming . . . right about now).

Hewlett Packard HP bid the then standard 2000F with 32K plus the 1M byte swapping disk and 4.8M byte disk for $110,074. They also offered the HP3000 with 64K plus 1M byte disk and 4.8M byte disk for $166,865. (12 months delivery on the 3000 with the free use of an F as an interim system). We're reluctant to detail exactly what an HP3000 really is since it changes all the time. When they define the product publicly (when it runs) we'll give you a clear, concise explanation of what they say.

Systems Engineering Labs Who? A blind bid . . . they hardly contacted the district before offering the bid. It turned out to be a 16K system with a 262K word swapping disk and a 2.4M byte disk for $73,080. It did not have extended BASIC and no one had ever seen the system.

Look these over carefully. There is a $50,000 PLUS price spread for what the bidders all claim will do the same thing. What would you have done???

Amulet for Protection

SAN MATEO

In an effort to show you that some schools are buying one computer to be used for both administrative and instructional use, we present here the results of the bids from San Mateo HS District that were submitted in August, 1972.

San Mateo has 7 schools with an ADA of 11600 or so. Their plan was to install 2 time sharing terminals in each school (to start) and connect to a computer that would also do all of the administrative work for the district. In phase one, the administrative work would be done in the evening in batch mode leaving the entire system for the kids during the day. Phase 2 plans hope to run the kids on terminals and provide a full, on-line management information system for administrators and do the administrative processing.

The bid specs were complete and thorough for the administrative applications. They described fully their applications, the software they expected and the support they needed and then said . . . what system do you recommend to meet our needs? The only clues they gave the bidders were to be sure to include 20–40M bytes of disk storage, a high speed printer (600 LPM), card reader (800 CPM), card punch (200 CPM) and a communications controller.

For instructional use they were not so specific. All they requested was "time sharing capability of interactive BASIC or extended BASIC programming language similar to that originally developed at Dartmouth University." They also requested another interactive language such as COBOL, FORTRAN or PL/1 AND batch compilers for COBOL, FORTRAN and assembler language. The vendor was also asked to give details of what software was available for vocational education, career guidance, drill and practice, gaming and simulations, problem solving subroutines, tutorial CAI, and computer managed instruction.

More details would be superflous. San Mateo chose IBM 370/125. They are up and running and questionably happy. The administrative application is well on its way. The teachers . . . well they're in a quandry. They started the year using user supported software from BOCES in Westchester County, NY. Though a nice version of BASIC was available, it proved to be unreliable on San Mateo's system. Unreliable means it had all sorts of gliches. They are now using IBM supported ITF which is BASIC written in PL/1 (?). It's greatest value is that it works! Nonetheless, they don't sound that "happy" in San Mateo. We were told that the extra hardware needed to make the 370 run time share BASIC could be dropped and those dollars could easily finance a separate instructional system.

San Mateo is in limbo now, waiting to see if they can improve on what they've got. In April they will decide if they should stay with the dual-use concept and that will depend on them getting *better* BASIC software than they now have, or get a separate instructional system. We'll keep you posted.

Here are the results of their bid. We've severely edited out all the finite details.

HEWLETT PACKARD. HP 3000 for delivery in second year. First year they would only provide an instructional for $44,166.60 (a 2000F?). Year 2 lease was quoted at $83,322.96.

NCR. Century 200, $95,524 on a one year lease – $315,958 for outright purchase. [There is some question about NCR's ability to provide interactive BASIC.]

IBM. Winning bid was a 370/125 at $130,000 for a one year lease or $600,000 (approximately) purchase price.

BURROUGHS. B3500, $170,544 on a one year lease. $788,726 purchase price. Burroughs did not really have student use capability.

DEC. PDP10, $182,808 on a one year lease. $788,726 purchase.

HONEYWELL. H2040 for administrative plus a H1644 for instruction. $197,784 on a one year lease, $603,774 outright purchase.

Boy do administrative systems cost a lot! What would you do?

KENNEDY

Uncertainty

After a couple of foul experiences in years past, Kennedy wnet to bid for a 16K, core based time sharing system. They neglected to follow our advice on writing specs and wrote what I consider to be a wide-open set of specs (shown below). They got responses from four vendors and tossed them all out due to errors(no bid bond, submitted on Xerox copy(?) late arrival and other idiotic things). Again to bid with Data General getting the bid with a NOVA 1220. Both bid results are shown here for your enjoyment. These are September 1973 results.

A. HARDWARE

1. Computer with 16K of 16 bit word core memory, capable of expansion to:

   32K core memory
   Disc operating system
   Cassette operating system
   Card Reader
   Line Printer
   Plotter and CRT's
   Plotter and CRT's
   sharing to 16 terminals
2. Communications multiplexor for up to 16 TTY's
3. High-speed paper tape reader (minimum 300 char/sec) for system and user's programs
4. Interface for High-speed paper tape reader
5. Interface for 4-ASR33 TTY's
6. Equipment cabinet

B. SOFTWARE

1. Time sharing BASIC with string character I/O expandable to EXTENDED BASIC
2. FORTRAN IV
3. ONE or more of the following languages:
   a. FOCAL
   b. ALGOL
   c. ASSEMBLY
4. Edit Routines
5. Diagnostic Routines
6. 15 programming language manuals for each compiler supplied

C. INCLUDE WITH BID

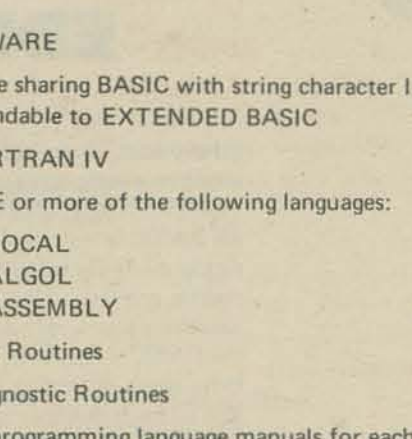
1. Purchase Price Quotation
2. Lease Price Quotation for 3 years and right to cancel for non-authorization of funds at yearly anniversary date
3. Installation and Shipping charges

Bid Specs. *Note: The specs include TTY interfaces but no TTY's.*

Round 1.

Digital Computer Controls. Offered a model D116 at a 22% educational discount.

1. 16K CPU with all items specified	$8264
2. High speed paper tape reader/with controller	2463
3. Software	350
TOTAL	$11,077



Hewlett Packard. HP2100A

1. 16K CPU with all other items	$13750
2. High speed paper tape reader	2100
3. Teletype interfaces	750
4. Cabinet	1050
TOTAL	$18,400

HP also offered a reconditioned CPU with a standard 90 day guarantee for $14720 total.

Digital Equipment Corp. Model PDP8E, Edusystem 20

1. 16K CPU plus all the other goodies	$10400
2. Paper tape reader	2400
3. Cabinet	650
4. Software	250
TOTAL	$13,760

NOTE: The PDP8E is a 12 bit machine not a 16 bit as the bid called for.

Data General Corp. Model 1220 NOVA at 10% educational discount.

1. 16K CPU plus other things	$11592
2. Paper tape reader	1800
3. Cabinet	950
4. Software	400
TOTAL	$14,742

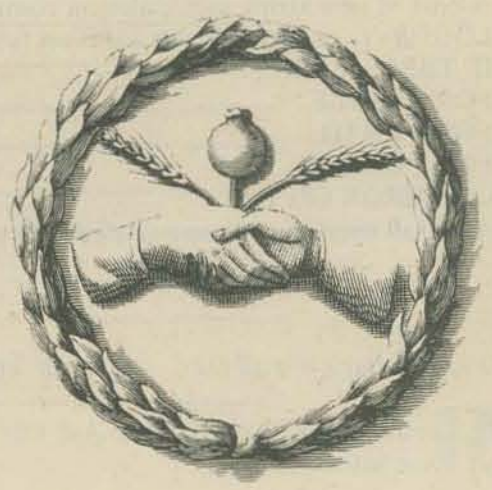
NOVA 2 offered as an alternative for $11882.

Round 2.

DEC made the same offer as in Round 1. $13760.

Data General realligned their price down to $13600 because of a newly announced price breakthrough in their 16K core planes. They were awarded the bid!

For the record, DCC wrote a letter of complaint after Round 1 objecting to the bid rejections and stating categorically that their system did meet all spec requirements and that their price was considerably cheaper than even the NOVA 2. DCC did not bid in Round 2, though they would have again been low bidder.



EDU 10

EduSystem 10 is DEC's starter system, a 4K single terminal mini that talks in BASIC, FOCAL, FORTRAN (barely) and PAL III assembler. DEC's 4K BASIC is really quite powerful. It includes nearly all of Dartmouth BASIC except TAB and, of course, matrices. You can pick and choose which functions you want to keep operable when you load the BASIC interpreter. The fewer you choose, the more space remaining for your programs. You can also scrunch multiple statements on one line, thereby saving space as in this example:

10 FOR N = 1 TO 100\PRINT N, SQR(N)\NEXT N

We guess that user space is about equal to 900 words on other systems. With a little programming imagination you'd be amazed at what can be done in those 900 words.

You can buy a 4K EduSystem 10 complete with teletype for $7000.

We understand DEC announced a 16 channel multiplexor for $3400 which might replace the individual TTY interfaces for $500. And, we understand that some of these other prices have changed downward. The system prices you see on this page are probably still fairly accurate (± $1000).

These systems use the PDP 11 computer, a 16 bit machine. For each local Teletype add $430 for an interface, $500 for a remote terminal interface.

We have little or no experience on these systems. This merely serves as a description for systems that we know some of you out there have or are considering. Write us and tell us and our readers what these systems are *really* like.

EDU 70

A starting BASIC system in the PDP 11 series. It's a core-resident system like EDU 20 that will handle 1–8 users depending on core size. A new BASIC is coming which will be a nifty subset of BASIC-PLUS. Cost: A 16K (core is cheaper this way so you might as well . . .), PDP 11/40 with high speed paper tape and one Decwriter terminal is $22510. Add $430 for terminal interfaces. [The only reason you might want this system is if you plan to upgrade to EDU 80 or 90, otherwise you may as well get an EDU 20 and Save.]

RSTS

DEC has a new BASIC language called RSTS BASIC PLUS. It's a superset of most known BASICs and is easily the most powerful BASIC language around on a computer this size. The language will permit you to do almost anything you'd like. It's a sure thing that FORTRAN and ALGOL types who have hasseled you about BASIC will be much easier to deal with once you show them BASIC PLUS. It should also be noted that IF we ever get standards in BASIC, DEC's BASIC PLUS will probably come closer to the standard than other BASICs we have seen.

From a practical standpoint, the bells and whistles found in BASIC PLUS are certainly not a *necessity* for those of you in schools. But, wow, what you can do if you have it. To summarize the entire language here would be impossible (especially since we have limited experience with it). But . . . take a small standard BASIC, add to it all the bells that HP has put on the HP2000F and then add these statements or features –

Immediate mode - one line programs
Character strings of unlimited length
Character string arrays and matrices
A host of new string manipulation commands
LOG10(x) - common log in addition to natural log
IF THEN_ ELSE
FOR_ WHILE
FOR_ UNTIL
FOR_ UNLESS
ON ERROR GO TO
AND, all users have access to all peripherals . . . printer, punch, reader, etc.

[I know that's not all DEC – you tell 'em about the rest.]

This system looks fantabulous. Ask DEC for the REST/E publicity blurb to get more information.

BASIC PLUS

This runs on the RSTS-11 (EDU 80) and RSTS/E (EDU 90). What's the difference? RSTS-11 software places only one user in core at a time, while RSTS/E, with more core memory, works on 3 or 4 users at a time. (That speeds things up considerably.) We're not convinced that the EDU 80 is even worth considering for the reasons that follow, but we'll explain it anyway and let you decide.

DEC has at least 3 current models of the PDP 11. The PDP 11/20 appears to be obsolete already. The PDP 11/40 will do anything an 11/45 will do except the 11/45will handle a 16K MOS memory which makes the 11/45 twice as fast as the 11/40 and probably the best buy in the final analysis.

EDU 80

THESE PRICES INCLUDE THE PRICE OF CONSOL TELETYPES ONLY – TTY TERMINALS ARE XTRA.

EDU 80 uses the PDP 11/40 in many configurations but now requires a minimum of 28K. Since 16K core planes just dropped in price you may as well get 2, 16K core planes for a 32K system. Add dual 2.4M byte cartridge disks, high speed paper tape, DECwriter and interface and 7 local TTY interfaces and a software charge of $2500 and you now have what can be called a mini RSTS that will run 8 terminals in BASIC PLUS . . . yours for about $46,000

If you want 16 terminals on this system you need to add a 256K word swapping disk for $16500, plus 8 TTY interfaces ($500 each) and you'll have a full 16 terminal system at a total cost of approximately $66,100. *[See EDU 90 and ask yourself why should I buy a 16 terminal EDU 80???]*

EDU 90

DEC now offers RSTS&E software (remember that's multiple users in core for speed) on a PDP 11/40 with 48K, dual 2.4M byte cartridge disks, and 16 TTY interfaces for around $65000. This system does not include a swapping disk since it's value is questionable. They hope to offer this system for $55000 or thereabouts, soon! You can upgrade this system to 32 users simply by adding 16K memory for $ 5600, 16 TTY interfaces for $7000 or so and a swapping disk for $16500. This gives you a 32 terminal system for $94100 (more or less).

However, if you went to DEC and asked them for a 32 terminal system they would try very hard to talk you out of $120,000 and into a neat system consisting of a PDP 11/45 with 16K MOS, 64K core, dual 2.4M byte disks, a 256K swapping disk, magnetic tape or DECtape and 32 interfaces. This system *should* be twice as fast as the same setup on an 11/40.

[This may appear confusing to you (it is to me) but you must understand DEC. Their RSTS "system" is not as clearly defined as you might hope. Much of what goes into your system will be tailor designed depending on your type of usage, peripherals, etc., etc.)

DIGITAL EQUIPMENT CORP.

DEC is the IBM of the mini-computer manufacturers. Their bread and butter mini, the PDP8, has sold over 15,000 units. DEC easily has more mini-computers in schools than any two of their competitors combined. They claim over 1,000,000 kids will use DEC computers this year. This is due, in part, to the companies past strong interest and pioneering effort in education which is being perpetuated today in the form of an aggressive, creative, educational marketing team. In what is becoming a highly competitive marketplace, it's nice to find people who are still sensitive to the needs of educators.

DEC's primary educational product is the EduSystem series of mini's, each designed to meet the needs of education. They are off-the-shelf system configurations that come complete, ready to plug in and use.

A nice thing about DEC is the unbelievable amount of software support material they provide or have available. Here are brief descriptions of a few.

BASIC APPLICATION PROGRAMS, Sets 1-6 about $1 ea. Each set contains small demonstration programs that you can use to promote computers. If you have a system, you can use these programs in your classroom. Written for math, science, business and social science by teachers and kids throughout the country.

BASIC SIMULATION PROGRAMS, Vol. I – VI. Reprints of the Huntington project programs reviewed elsewhere in this issue. Six volumes for $10.

EDU MAGAZINE, $2.00 Contemporary educational newsletter published 5 times a year (just like us). EDU includes a lot of tidbits, some letters to EduMan and some sales-type information from DEC. You should get it to keep informed.

1,000,000 STUDENTS, free. A booklet from DEC that lists hundreds of educational users of DEC hardware in the country. Find out which of your neighbors have DEC computers.

DECUS. DEC users groups now have an educational subsection that provides a means for educators to exchange ideas and attend a conference with sessions just for educational users. (DECUS is free to DEC users but is open to "outsiders.")

BOOKS

Huntington II Simulations

(1) Huntington II Simulations (see PCC Vol. 1, No. 1, and No. 1). DEC is the exclusive distributor of these outstanding computer simulation packages. Each program comes complete with a resource handbook, teacher support material and student lab guide. Programs are written in a very standard form of BASIC. Send to DEC for more information.

(2) *Advanced Problems for Computer Mathematics* is a 75 page collage-like set of mathematics problems designed by Bob Albrecht of Dymax. Published one year ago by DEC, this volume has been greeted with exceptional success! We dare to say that it stands alone as the most outstanding collection of mine-boggling, brain-dazzling problems for computer solution available. If you're looking for some ideas to keep those advanced students busy this school year, *Advanced Problems for Computer Mathematics* is just what you need! Recommended for senior high, junior and community colleges. $2.00 each.

(3) *Computer Problems for Business.* A series of three books in press at this writing, written by yours truly, Bob Albrecht and Peter Sessions. One book concentrates on consumer-oriented business applications that should be fun to do while challenging the mind. Another on payroll and salary type problems. The third developes beginning data processing techniques featuring DEC's EDUCRUNCH BASIC. Each booklet has a solution set as well. Price . . . unsure.

(4) *EDUSYSTEM Handbook.* For $5 you get a BASIC primer plus a detailed hardware and software analysis of the EduSystems 10–50. PLUS how to write FOCAL and FORTRAN programs and a whole bunch of other stuff. Chapters are actually a complete users guide or reference manual for each EduSystem. If you're shopping for a DEC system or you have one, you need this book. Other people will have little use for it.

(5) *BASIC Computer Games.* An assortment of 101 computer games collected by Dave Ahl from contributors throughout the country. All are fixed to work on DEC systems, many for DEC RSTS BASIC which you will have to "fix" if you don't have a RSTS system. Price $5.00 from DEC.

BASIC LANGUAGE ANALYSIS

	EduSystems										Hewlett-Packard	
DARTMOUTH BASIC	10	15	20	25	30	40	50	70	80	90	2000E	2000F
LET, PRINT, READ, DATA GO TO, IF-THEN, FOR-NEXT GOSUB, RETURN, INPUT, REM, END, DEF, DIM, STOP, RESTORE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
RND, SGN, SIN, COS, TAN, ATN, SQR, LOG, EXP, INT, ABS	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ON...GO TO		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
TAB, CHAIN, COMMON		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓
MATRIX									✓	✓	✓	✓
STRING VARIABLES			✓	✓	✓	✓	✓		✓	✓	✓	✓
FILES				✓		✓	✓		✓	✓	✓	✓
PRINT USING									✓	✓		✓
ENTER									✓	✓		✓
PLUS LOTS MORE STRING ARRAYS									✓	✓		

HEWLETT PACKARD

HP is another Big One in the ed biz. While DEC's s emphasis has been in small system installations, HP's strength has been in 8, 16 and 32 user timesharing systems. The HP 2000 series timesharing systems start at $35K and zoom to $120K before you know it. They offer reliability and have a great track record in education. The 2000 series has been around since 1968. In our experience the HP 2000 hardware and software combination has been the most reliable timesharing system we've ever used. A number of small timesharing services in our area sell time on HP 2000's for under $5 per hour. We have had nothing but excellent experience dealing with these sources over regular telephone lines, using acoustically coupled terminals. If you use telephone communications you know how messy it can be. We've had excellent luck with HP. Some of these little businesses leave their systems unattended as they're so confident of their reliability.

The latest central processor from HP is the 2100A. The older model for the 2000 series is the 2116 which you can pick up used at reasonable prices, but if you plant to expand, buy the 2100.

HP's BASIC includes matrix operations, logical operators (AND, OR, NOT) and string functions and operations. HP has also added a few goodie features to their software which make it awfully nice. The software has been around for years and is essentially bug free. The 2000 also runs batch FORTRAN IV, ALGOL and assembler. [Some new BASIC's put IP's to shame. Hopefully they'll come out with some new improvements shortly.]

For some years HP has been selling CAI drill and practice software for their large timesharing system. Only recently have they put any real dollars and sanse into the problem-solving market. Primarily, this effort is represented by the HP Educational User's Group, their newsletter and a semi-annual journal. The users group has an executive board of educators who represent all types of users and are dispersed geographically. They are mostly HP users, as you might suspect. Admission to the users group is free to HP users and $16 per year for "outsiders."

The HP Educational Users Group Newsletter is GOOD and is worth every penny of the $ 6 you might have to pay for it. The newsletter includes articles contributed by users on the order of ... this is about what we are doing ... project information ... what others are doing as described by the editor ... descriptions of computer education organizations .., workbook and textbook reviews ... where to get-types of info (tidbits) ... and of course, the inevitable sales pitch. for new HP educational products. This is a quality newsletter that meets the needs of the classroom computer education teacher, that we have seen. It's success is largely due to the effort that is made to provide good, factual information for classroom teachers without trying to kill 10 other birds with the same stone. (Now that we've said it, let's hope they keep it up!)

HP also has a fantastic program library of BASIC application programs for every possible application. Most are contributed by users. The educational user group has their own education program library available to members of the Educational Users Group.

HP2000E & F

HP 2000E. The E is HP's new starter system that will run 16 terminals at speeds of 10–30 CPS. The system includes a 16K CPU plus 4.8M byte disk unit that gives you one removable platter and one fixed platter. This gives you the easy option to save your entire system on a back-up disk for security reasons, just in case you system crashes (they do, you know). You can add one more of these disk units for another $10,000 if you feel the need. We use a fully loaded 16 terminal system in a classroom environment and have found it to be fast and smooth. User space is only 4180 words but you can CHAIN programs. Price $34,950 excluding teletypes.

HP 2000F. This is the 16–32 terminal "big system" from HP. It now comes in four models. All models include a 32K and an 8K CPU plus mag tape plus ASR35 teletype for consol.

2000F option 200. 16 terminal system featuring the HP7900 disk unit described with the E. You can add multiple disk units. Price is $67,950. Add $2500 for 32 terminal capability.

2000F option 205. 16 terminals featuring a huge 23.5M byte disk. Absolutely essential if you're thinking of doing CAI. Add $18,000 for each additional disk drive. Price is $86,550. Add $2500 for 32 terminal capability.

2000F option 210. Uses a fixed head 1M byte disk plus the 4.8M byte disk described before. Supposedly the fixed head disk speeds up the system but insiders don't think this disk is necessary. Price $104,320. Add $2500 for 32 terminals.

2000F option 215. Price $121,750. It's a 210 with the 23.5M byte disk drive instead of the 7900 unit. Add $2500 for 32 terminal capability.

You've probably heard about the HP2000 A, B and C. These are earlier versions of the E and F. We didn't bother to describe them since the E and F are the only systems now available from HP.

Software

We recently received a letter from an HP sales-type explaining the differences between the E and the F. Read on for a summary.

1. The F user space is 10,240 words versus 4180 words in the E.
2. The F will run 32 terminals.
3. The F user library is greater and includes HP supported IMF, IDF, and math drill and practice packages.
4. The F will access an unlimited number of files. The E is limited to 4.
5. The F provides output formatting capability with the PRINT USING command.
6. The F file size is 128 record maximum, the E is 48 records.
7. The F has the timed input statement, ENTER.
8. The F will make a line printer available to terminal users.

Books

HP has recently gone into the workbook publishing business. They've hired teachers from throughout the country to write computer-related classroom materials and they really look good. Here's the list of currently available materials. If you've used them, let us know what you think of them.

Secondary School Series

Attacking Non-Linear Equations – $2.50
Number Sets – $1.00
Mathematical Systems – $1.00
Functions – $1.00
Linear Equations & Systems – $1.00
Graze Ecology Simulation – $3.50
Air Pollution – $1.00
Cases in Computer & Model Assisted Marketing – $5.00

[Most of these also have teachers guides for additional $]

The SOLO materials are also available from the PCC Bookstore, P.O. Box 310, Menlo Park, California 94025.

Project SOLO – edited and reproduced from the original material produced at University of Pittsburgh [Project SOLO was NSF funded.]

Trigonometry – $3.50
Mathematics – $3.50
Calculus – $3.95
Matrix Mathematics – $3.50
Physics – $3.50

Also available . . . paper tapes and teachers guides.

School or College Series

Geometrical Optics – $1.00
Mechanics – $1.00
Waves – $1.00
Electricity & Magnetism – $3.50

Send your orders to HEWLETT PACKARD
Computer Curriculum Project
333 Logue Avenue
Mt. View, Ca. 94040

INFO SHELF

Hi mortals. Here are some of the things I peruse each month for information, inspiration and entertainment.

PROJECTS and STUFF

Here is a bunch of stuff from people who are doing things.

Computers and Teaching (CAT)
Northwestern University
2003 Sheridan Road
Evanston, IL 60201

Free to people who will share and participate.

Comp Randomly
Computer Oriented Math Club
3052 Warrington Road
Cleveland, OH 44120

Published intermittently. $0.10 plus postage per issue. Donations greatly appreciated.

EduHelp
DECUS
Digital Equipment Corp.
Maynard, MA. 01754

Written by Chase Ambler, The Asheville school, Asheville, NC. 28806 for users of DEC Edu-systems. Write to Chase for Vol. 1, No. 1 or to DECUS for additional info – it's good. Get it if you can.

Huntington II Newsletter
College of Engineering
State University of New York
at Stony Brook
Stony Brook, NY 11790

In my opinion, H2 is one of the only two super-good computer projects the NSF ever supported. The other is Project SOLO.

SOLOWORKS
Project SOLO
University of Pittsburgh
Pittsburgh, PA 15280

If you want to know what's possible in the near future, get SOLO WORKS.

Ties Timely Topics
TIES
1925 W. County Rd. B2
St. Paul MN 55113

30,000 students in 30 school districts are using TIES. TTT is the "inhouse" newsletter – but maybe you can get on the mailing list.

KEEPING UP and KEEPING YOUR HEAD STRAIGHT

Computerworld is a weekly newspaper. I read it to find out what's happening. Computers and People is a magazine with a conscience. I read it to stretch my mind. Especially recommended for people who care how computers will be used.

COMPUTERS AND PEOPLE
(Formerly Computers and Automation)
Berkeley Enterprises
815 Washington St.
Newtonville, MA 02160

$11.50/year

COMPUTERWORLD
797 Washington St.
Newton, MA 02160

$0.50 a copy / $12 a year

TRADE MAGAZINES

are FREE to "qualified individuals" who work with computers. To find out if you qualify for a free subscription, write the publisher – if you don't qualify, he will probably offer you a paid subscription.

COMPUTER DECISIONS
Hayden Publishing Company
50 Essex St.
Rochelle Park, NJ 07662

DATAMATION
Technical Publishing Co.
35 Mason Street
Greenwich, CT 06830

INFOSYSTEMS
Hitchcock Publishing Co.
Hitchcock Bldg.
Wheaton, IL 60187

MODERN DATA
3 Lockland Ave.
Framingham, MA 01701

UNUSUAL

Here are two very unusual publications for you hardware phreaks.

Electronotes
B.A. Hutchins
60 Sheraton Drive
Ithaca, NY 14850

Jan–Jun 1974 (8 issues) $4.25
All of 1974 (16 issues) $8.00

If you are interested in computer and/or electronic music – performance or technology – then DO, DO, DO find out about Electronotes.

Logic Newsletter
P.O. Box 252
Waldwick, NJ 07463

Somebody borrowed all my Logic Newsletters. Write them for subscription info. They say "Logic for the truly interested."

INSPIRATION

If you like games or simulations or math recreations or . . . try the following.

Flying Buffalo's Favorite Magazine
P.O. Box 1467
Scottsdale, AZ. 85252

6 times a year for $4
single copy $0.75

Games and Puzzles Magazine
Box 1176
Palo Alto, Ca. 94302

12 times a year for $9
Sample copy $1

Journal of Recreational Mathematics
Baywood Publishing Company
43 Central Drive
Farmingdale, NY 11735

Individuals: $10/yr, 4 wonderful issues
Institutions, et al: $15/yr (same wonderful issues)

Simulation/Gaming/News
Box 3039, University Station
Moscow, ID. 83843

$4 for 5 issues during the school year. [If PCC has a sister publication, its got to be S/G/N. Support our friends, subscribe to S/G/N.]

FROM YOUR FRIENDLY COMPUTER VENDOR

If you like computers and kids, subscribe to these.

EDU
Digital Equipment Corp.
Maynard, MA 01754

$2 for 4 issues

HP Educational Newsletter
Hewlett Packard
11000 Wolfe Road
Cupertino, Ca. 95014

Free to HP Ed. Users
$6 for 9 issues to others

Are there other publications like this from computer companies? Send samples to Chief Dragon at PCC.

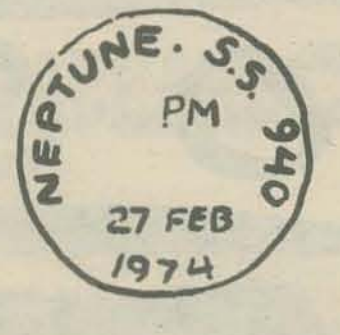
ENGLAND anyone?

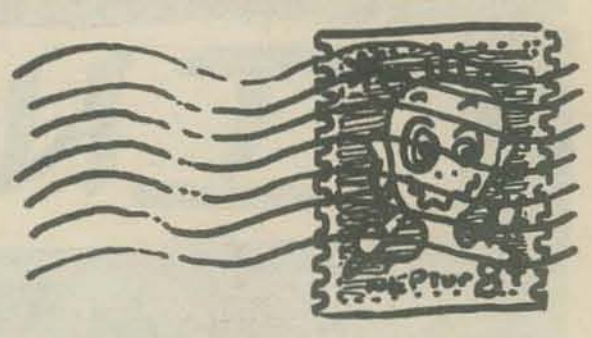
For info about
Computer Education
Computer Education News

write

J.J. Turnbull
Sr. Consultant, Ed. Sector
NCC
Quay House, Quay Street
Manchester M3 3HU

LETTERS:





HEWLETT hp PACKARD

DATA SYSTEMS • 11000 Wolfe Road, Cupertino, California 95014, Telephone 408-257-7000, TWX 910-338-0221

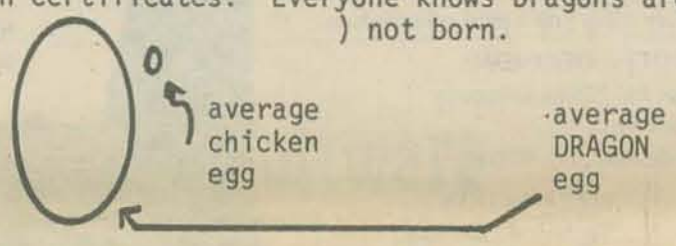
Hatched?

January 17, 1974

People's Computer Company
P.O. Box 310
Menlo Park, CA. 94025

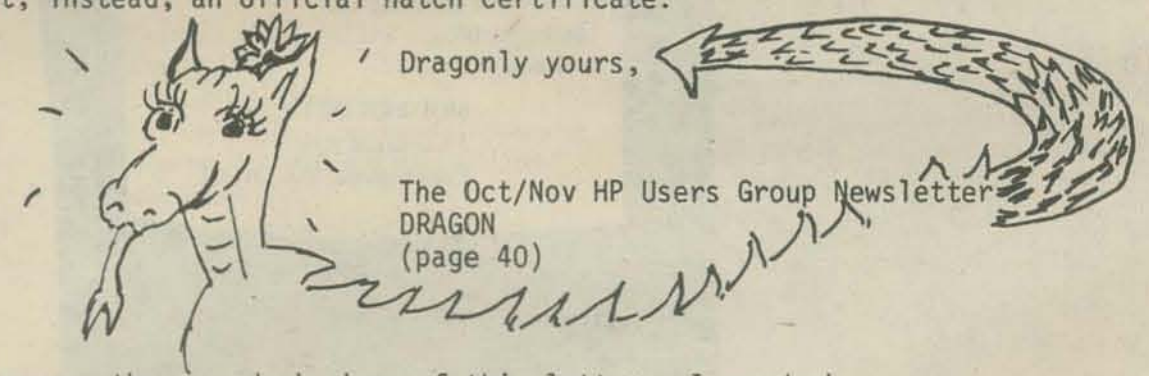
Dear Dragon Lovers:

What! A special Dragon subscription rate for Dragons with birth certificates. Everyone knows Dragons are hatched (out of enormous eggs) not born.



Did you ever see a Dragon with a belly-button?

Any Dragon sporting a birth certificate must be a phony. You should request, instead, an official hatch certificate.



Dragonly yours,

The Oct/Nov HP Users Group Newsletter
DRAGON
(page 40)

P.S. Please excuse the scorched edges of this letter. I coughed while typing it!!

P.P.S This is what you might call a scorching letter!

Carol ... it's OK to reprint this letter!!

Dear Dave,

Thank you very much for the extra copies of the PCC in which you printed my letters. Thank you also for printing them; perhaps some other 30-owners or users will have some games to exchange with me.

According to fairly concrete plans, I will be in San Francisco and the immediate area next Tuesday. I shall probably be there for two to three weeks, so I certainly hope to spend at least a day at PCCenter. I am getting out of school for a few weeks, to accompany my father on a business trip to your area, and to get out of Pecos for a while. I look forward to seeing you, and hope this reaches you before I do.

Our 30 is here, but there has been some trouble getting the typewriter connected so we are trying to function solely on DISP statements. I rewrote -- actually, edited is a better word -- your CAVES1 game with DISP and WAIT instead of PRINT, and the friends I have had over to see the 30 enjoyed your game most of all. I had a couple boys over one day who could not believe that you need to make a map to get out: they spent over half an hour trying to find their way out of one series of caverns. My sister was in playing it until after 11:00 one night.

Again, thanks for the publicity and the free papers. I look forward to seeing you next week: I shall call when the following day's plans seem to leave me time and transportation to see you.

Stephen Bates
1915 Jefferson Street
Pecos, TX 79772

[It was great having you here Steve – come again soon]

Space War

I believe we agree that the Space War Game should not be supplied on an HP system, even as a contributed program, without some modification to bring out the depersonalization aspects. Here are some suggestions as to how this might be done:

(1) Integrate a "promotion" to something like an admiral as a result of a successful battle. This can be used to build guilt feelings once the nature of the conflict has been exposed.

(2) After a successful battle, bring out the real nature of the battle by providing battle statistics. The nature of the statistics should escalate. For instance;

- (a) First the overall numbers of killed, wounded, etc. on both sides.
- (b) Then, "details" of the casualties on our side such as blinded, etc.
- (c) Personalization of the loss by condolences to you for your (father, brother, etc.) killed in the battle.
- (d) Congratulations to you on skillful use of the new laser beams which kill by boiling the body fluids of the spaceship crew. It's very effective physiological warfare when the enemy attempts to reclaim his ship and has to clean it up, "ha ha".

(3) Provide a surprize ending such as:

"Congratulations for exterminating those 100,000 vermin. We must stop the mongrelization of space beings by these inferior creatures called Klingons (or, more accurately, Homo sapiens). You were wise in attacking as they made their final attempt at emigration from the dying planet Earth. This way you have boiled away the females and infants as well and have carried out the final solution."

(4) You might throw in a bit of military jargon to build the association with other events. Some possibilities are:

- (a) measured reaction
- (b) neutralize the area
- (c) regrettable, but unavoidable, accidents
- (d) saturation attack
- (e) zapped the freak Klingons
- (f) etc.

(5) Bring in ecology via comments like:

"Headquarters has declared the regions within 1000 light years of the battle area to be avoided by all space travelers because of hyperon contamination. Estimated half life for natural clean-up to occur is 106.35 eons."

(6) A message to you as follows:

"Congratulations on a fine job, well done. Your concentration on the technical task at hand has demonstrated your capacity for enlarged command responsibility. You have avoided the irrelevant and irrational emotional distractions which made the removal of your predecessor necessary.

Machine Uber Alles!!"

Bill Ansley
Hewlett Packard Company
11000 Wolfe Road
Cupertino, California 95014

Chi

Dear Mr. Albrecht:

Chi Corporation "in real life" offers computing time and services to scientific, business and engineering clients. The majority of our clients are in the Cleveland/Columbus area but we have clients throughout the United States and on the Atlantic, Pacific and Gulf coasts.

Chi is for-profit and wholly owned by Case Western Reserve University and CWRU does its academic and administrative computing at Chi. As a result, Chi has an interest in "educational life" and Chi provides computing services to over thirty schools which include elementary, junior and senior high schools, vocational schools, junior colleges, colleges and universities.

We have a Univac 1108 which we run in an open shop environment with high speed remote job entry and a Honeywell G-430 time sharing system. Elementary and secondary clients use time sharing and post secondary schools use ALGOL or FORTRAN on the 1108 as well as time sharing.

We have found that our clients appreciate hearing about new educational materials and we always encourage our elementary and secondary clients to be PCC subscribers. I find that the articles I benefit most from are the book reviews. Most of the things I have read at your recommendation have given me good ideas. However, I'm beginning to find that many people are in accord in describing the kinds of things that could be done; it is actual classroom usage that lags behind. More descriptions of actual classroom units would be very helpful to teachers.

Dorothy K. Deringer, Ph.D.
Director
Educational Systems Services
Chi Corporation
11000 Cedar Avenue
Cleveland, Ohio 44106

APL

Dear Bob:

I enjoyed talking with you at the O.C.M.A. Converence on Computers.

In reference to the letter in your last issue of PCC from Carter DePaul Jr., among many languages the UCI Computing Facility has APL available on the XDS SIGMA 7 and can be accessed by most standard terminals (2741-types, TTY's, CRT's, etc.) at several speeds. In particular, he can use the U.C. Tie Line from Santa Cruz for cost of a local call.

Our version is generally a superset of APL/360, APL/PLUS, and DREV/APL and includes several enhancements most appropriate for educational use. For a student programmer, the ")OBSERVE" command is most amazing. It allows "super-trace" observation of values of all variables and results of all operations and functions used in a program statement, together with the original source code. The "side-tracking" option is most useful for CAI work, enabling a master program to intercept and maintain control of all breaks and syntax errors caused by students. Additionally for CAI, all commands can now be program executed, and upon loading a workspace a "driver" program can be designated to begin immediate execution. This is most helpful, for example, for inexperienced students who need direction. To my knowledge, the above features are available only on UTS/APL Version B00 for which our institution was the test site. For those lucky enough to own Tektronix 4013 Graphics terminals, the version also incorporates the DREV Graphics developed by Dr. Alfred Bork.

For beginners in APL who wish to program tutorial type material, we maintain a workspace called CALAPL (Computer Assisted Learning). Since CAL is written in APL the user is not constrained to CAL and can enhance his program as he sees fit.

The most active local APL users for CAI type educative use is Coast Community College District. I would suggest that Mr. DePaul contact John Clark or Dick Mercer for a demo.

On another matter, I suggest that you consider using PCC as a vehicle of communication regarding the X3J2 Committee for formulating standardization of BASIC. In my view there are numerous features in SIGMA 7, PDP-11, and HP BASIC, for example, which really need to be incorporated into a standard language for effective educational use. While the simplified "pure" original Dartmouth BASIC is great for introduction, students rapidly become constrained, and with the advent of powerful versions of BASIC and APL on small mini computers and calculators, I think it is fair to expect all vendors to maintain such quality software.

Finally, regarding our Computing Fair, March 28 and 29, we would again appreciate sample copies of PCC to be included in our handout packets. Last year, we attracted over 1200 students, teachers, and administrators from Orange, Los Angeles, and San Diego Counties.

Michael J. Cox
Liaison with Schools
UC Irvine
Irvine, CA. 92664

Editor

Dear Bob:

I would appreciate it if you would put the following letter in your "Letters to the Editor" column in the next issue.

We are looking for somebody to be a guest editor of a new section on Computer Simulations and Games. The guest editor will prepare a chapter for the Guide to Simulations and Games for Education and Training, which is the "Consumers Report" of the games and simulations field.

We believe that this new section on Computer Simulations and Games will substantially increase the usefulness of our Guide to educators.

So, if there is anybody out there who wants to be guest editor, please write me.

Robert E. Horn
Guide Editor
Information Resources, Inc.
P.O. Box 417
Lexington, Massachusetts 02173

PCC BOOKSTORE

FREE LISTINGS FOR SUBSCRIBERS

Due to almost too much popular demand, we find we are making too many trips to the printer. So we are going to limit the number of free listings to a choice of four.

Select four from this list: NUMBER, LETTER, STARS, TRAP, HURKLE, SNARK, MUGWUMP, BAGELS, BAGEL2 (Beyond Bagels), REVERSE.

Please send one stamped self-addressed long envelope for your four program listings.

Basic BASIC *by James S. Coan*

from: Hayden Book Company, Inc.
116 West Fourteenth Street
New York, NY 10011

or

PCC Bookstore

$5.95
1970; 256 pages

Beginners can learn BASIC from this book but we like it best for its excellent chapters on applications of the BASIC language. The book is full of sample programs and problems. Here's what it looks like –

BASIC *by Albrecht, Finkel and Brown*

from: John Wiley & Sons, Inc.
605 Third Avenue
New York, NY 10026

or

PCC Bookstore

$3.95
1973; 325 pages

The following is an excerpt from EduHelp, September, 1973 . . . "The book is similar (in style only) to Albrecht's popular Teach Yourself BASIC, but it is much more thorough and better organized. It is designed as a self-teaching text. The self-tests at the end of each chapter are excellent and easily permit the user to review the text on any missed sections, as the answers refer back to the frame number in the chapter. The text is very suitable for any grade level, as the examples are not solely based on math, but are taken from business, social science, humanities and simple statistics. This reviewer believes it will be THE text used in the majority of schools. Get a copy and see for yourself."

See Review, PCC Vol. 1, No. 4

My Computer Likes Me *by Dymax*

from: Dymax

from: PCC
P.O. Box 310
Menlo Park, Calif. 94025

$1.49
1972; 64 pages

In an easy going, conversational style, this 64 page workbook introduces BASIC to young or old. Designed to be used with frequent access to a timeshare terminal (learn by doing!), we use this large format book in our introductory workshops for people with no previous computer experience or knowledge of programming. The teaching examples are oriented around population problems and demographic data. Over 20,000 of this popular book now in use.

ANNOUNCING

P C C GAMES (Program Listings)

$2.00 *from: PCC Bookstore*
1974; 40 pages

Bare program listings of the computer games presented in back issues of PCC. They are written in a standard form of BASIC. When strings are used they are standard Hewlett-Packard strings and you may have to modify the programs for your system. Booklet includes: *NUMBER, LETTER, STARS, TRAP, BAGELS, BAGEL2 (Beyond Bagels), MUGWUMP, HURKLE, SNARK, CHOMP, REVERSE, BUTTON (Button, button, who's got the button?), TAXMAN, SUNSIGN, CAVES1, CAVES2, CAVES3, TREE SUBROUTINES, PUBLIC CAVES KIT, HUNT THE WUMPUS, SUPER WUMPUS, & STAR TRADER.*

Problems for Computer Solution
by Fred Gruenberger & George Jaffray

from: John Wiley and Sons, Inc.
605 Third Avenue
New York, NY 10016

or PCC Bookstore

$6.95
1965; 401 pages

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

Project SOLO Materials

Publisher: Hewlett Packard Company
Available from PCC Bookstore

This National Science Foundation Project, directed by Thomas Dwyer of the University of Pittsburgh explored new ways of teaching using computing technology. SOLO produced curriculum material reflects the project's basic philosophy; the computer is a tool to be used and controlled by the student. As such, the computer becomes part of an environment in which students make discoveries.

BASIC Programming *by Kemeny and Kurtz*
(2nd Edition)

from: John Wiley and Sons, Inc.
605 Third Avenue
New York, NY 10016

or PCC Bookstore

$6.95
1967, 1971; 150 pages

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

Here is a sampling of section titles –

What is BASIC? What is Timesharing? **String Variables** Curve Plotting **Prime Numbers** Random Numbers **Dealing a Bridge Hand** Knight's Tour **Tic-Tac-Toe – A Heuristic Approach** Tax Depreciation **Critical Path Analysis** String Files **Linear Regression** Electrical Networks **Markov Chains** Polynomials **Marriage Rules in a Primitive Society** A Mode from Ecology **Harmony in Music**

tapes

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TREE SUBROUTINES	4.00
HUNT THE WUMPUS **	4.00
SUPER WUMPUS **	4.00
SUNSIGN **	3.00
CHOMP	3.00

*** These program use HP Strings*

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Problems for Computer Solution	6.95		
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Basic BASIC	5.95		
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MUGWMP	2.00		
SNARK *Please circle your choice*	2.00		
STARS	2.00		
NUMBER	2.00		
LETTER	2.00		
TRAP	2.00		
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REVERSE	2.00		
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CAVES 1	3.00		
CAVES 2	3.00		
CAVES 3	3.00		
CHOMP	3.00		
PUBLIC CAVES KIT	8.00		
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SUPER WUMPUS	4.00		
STAR TRADER	10.00		

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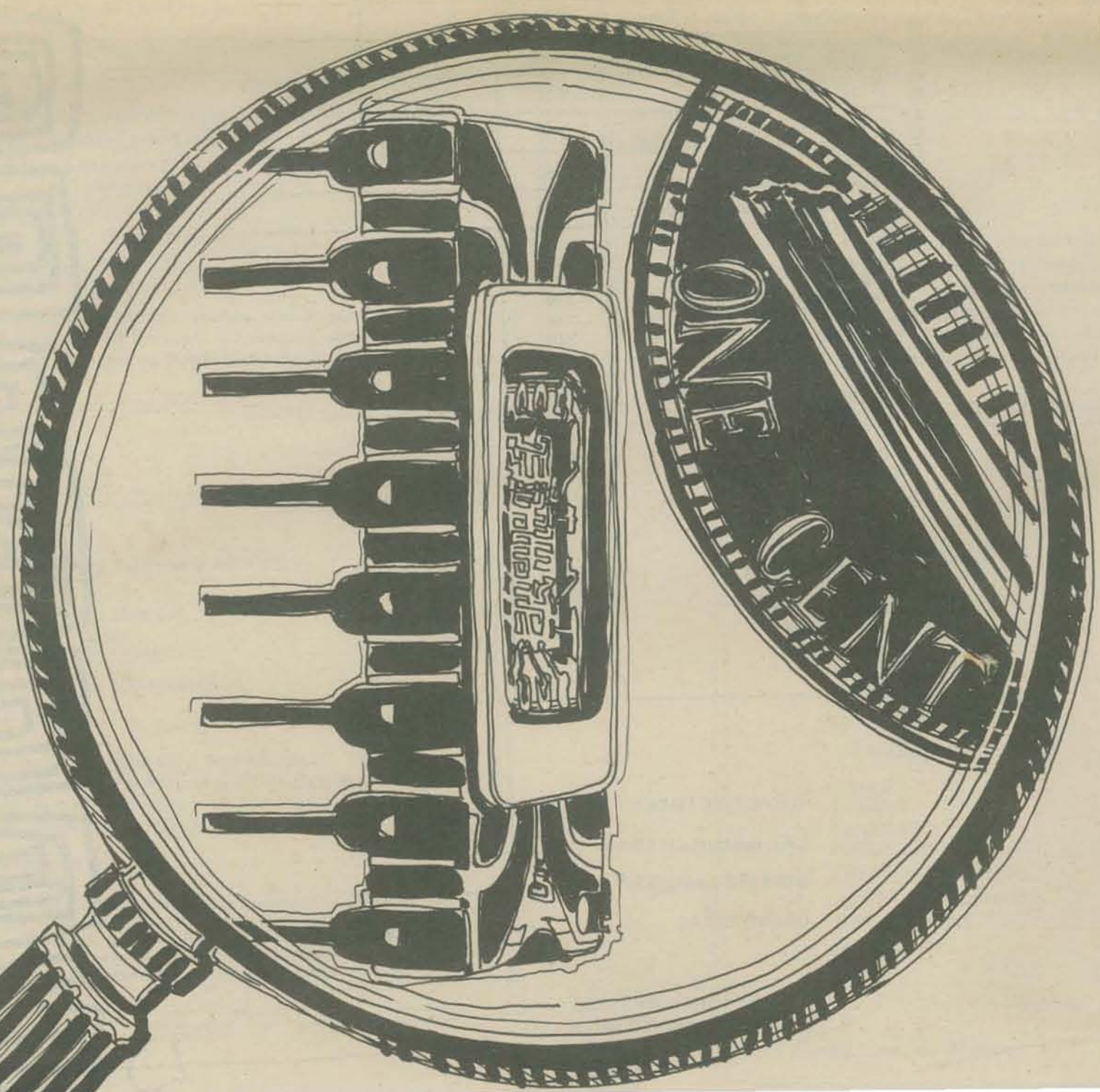

The drawing is of an INTEL chip. Two such chips are the guts of most four function calculators.

PCC LOOKS AT HARDWARE

Volume 2 No. 4

March 1974