digital INTEROFFICE MEMORANDUM

SUBJECT: DEC Museum DATE: May 15, 1972

TO: Ken Olsen FROM: Roy Gould

DEPARTMENT: Trade Shows 5-3

After our conversation regarding the DEC Museum, I talked with Don Allen in the PR Department to see if there were any files or what had been done to date on it. He informed me that they (the PR Group) have budgeted monies for the design and construction of it. I suggested that he inform you of their plans.

jac

DEC 5 - 1043-C (4-70)

digital

INTEROFFICE MEMO

TO: Roy Gould

DATE: May 18, 1972

FROM: Peggy Dunn

SUBJ: MATERIAL FOR THE MUSEUM

K.O. property

I have several boxes of things that we might want to keep in the museum when we get it. There are some old modules, circuits and other doo-dads that might be of historical interest. I have them packed in boxes and they are stored on 11-3 in the Personnel Storeroom.

I also have quite a few plaques and pictures that we might want to use.*

This is just for your information and for the record so that when we get a place for the museum we will remember to send them to you.

* 8/74
Pictures of mill etc
collected & organized
via Photo lab w/copies
for file — Sally L-

DEC 5-(654)-1055-R571

INTEROFFICE MEMORANDUM

TO: Ken Olsen

DEC / oprint

DATE: May 19, 1972

FROM: R. L. Lane

DEPT: TP

MAY 23 1972

SUBJ: COMPUTER MUSEUM

On May 17, 1972, Rod Mooney called asking for some help in planning for the Computer Museum. I am not exactly sure what you have in mind but I provided him with the following suggestions for consideration. I also gave him the power requirements for each, and the physical size of each.

WORKING MACHINES	DISPLAY ONLY-NOT WORKING
PDP-1/30	LINC
PDP-4	PDP-6/166/Display Tube
PDP-5	Whirlwind Components
PDP-7/340	TX0 or TX1?
PDP-8	Module Display
PDP-9, 9/L	Logic Lab
PDP-8/S	Computer Lab
PDP-8/I	555 Dual DECtape Transport
PDP-8/L	DF32
LINC-8	

NOTE: I have only listed those which are currently Traditional and not any of today's machines. Your comments would be appreciated.

el

cc: Rod Mooney

Roy Gould

August 1972

253 4167

TXO from MIT for Museum

Contact: Prof. Zimmerman - ~~UN4-6900~~, ext. 253 2512

Their new building will be ready probably in April, ours in February.

We want to have the machine operational, so when they dismantle it the wires should be marked so that it can be reassembled.

We have offered our Field Service people to assist in the dismantling operation.

Searle Medidata, Inc. / 140 Fourth Avenue, Waltham, Massachusetts 02154
A SUBSIDIARY OF G.D. SEARLE & CO.
TELEX—MEDIDATA Tel. (617)890-6940

September 21, 1972

Museum Casino

Mr. Robert Lane
Traditional Products Dept.
Digital Equipment Corp.
Main St.
Maynard, Mass.

Dear Bob:

As you may have heard, we have been considering the question of what to do with our CASINO computer. The machine is nearing the end of its useful life. We have recently purchased a General Radio 1792 to supply the board testing function now being carried out on CASINO. I anticipate that within six to nine months we will have no further use for CASINO.

I would like to know whether Digital Equipment has any interest in the parts and components contained within the machine or whether you know of any other organization which might be interested. We are prepared to entertain any reasonable offer for disposition of the parts or of the machine as a whole.

The machine contains primarily 1000, 4000 and 6000 series systems units. Many of the 6000 series units have been modified or had selected transistors placed in them. In general, the modifications are minor. The units are, of course, largely in working order although unused portions of the units may have failed during the life of the machine without our noticing the failures. Most of the equipment racks are of the taper pin variety. However, in addition, there are perhaps twenty racks of the banana plug type. The relay racks are not standard DEC hardware; they were purchased from EMCOR.

In addition to the systems units and racks, the machine contains a couple of major components of DEC manufacture. One of these is a type 30 scope which may have been modified but probably not drastically. A second item is the basic 4K memory. This memory consists of two PDP-1 memories placed on tope of one another to provide 38-bit words. The stacks and drivers could conceivably be quite useful to you. The entire stacked up memory array was manufactured by Digital Equipment in 1960. The bulk of the memory in the machine is a 16K Fabri-tek memory of 40-bit word length. I am presuming that this memory will be of no interest to DEC.

In addition to these items, there are several other peripherals which may or may not be of interest. These include three Potter tape transports, one of which has Potter electronics. The other two of these units contain SMI constructed read and write electronics. We have a couple of used but still useful Friden Flexowriters, some paper tape equipment which I am sure is not of interest to DEC, and a Cal-Comp plotter. I would like to retain the latter except that I cannot for the life of me see how we will manage to use the thing without a big software program which I cannot afford.

If all of this sounds at all interesting to you, perhaps the best way to consider it would be to come and take a personal look at the hardware - seeing it as parts instead of as a machine. I would certainly be interested in your reactions to this suggestion.

Best regards,

Ed.

Edward B. Rawson

EBR/ceg

digital

November 28, 1972

Mr. Edward B. Rawson
SEARLE MEDIDATA, INC.
140 Fourth Avenue
Waltham, Massachusetts 02154

Dear Mr. Rawson:

Your letter to Mr. Robert Lane has been referred to me for reply. Digital Equipment Corporation is planning to build a museum based on the history of the minicomputer at our new Parker Street facility in the very near future.

At the present time, we have not finalized our plans as to what will be displayed in this museum and how. Bob has mentioned to me perhaps some of the equipment that you mention in your letter to him may be of interest to us for use in this museum, however, being that we are in such early planning stages, I cannot make that decision yet. Therefore, when our plans do become more finalized, I would like to communicate with you again regarding the feasibility of using some of the equipment you mentioned.

Thank you for your kind offer and I will be in touch with you again soon regarding this.

Sincerely,

Roy G. Gould
Exhibits Manager

RGG/jac

DIGITAL EQUIPMENT CORPORATION, 146 MAIN STREET, MAYNARD, MASSACHUSETTS 01754
(617)897-5111 TWX: 710-347-0212 TELEX: 94-8457

TUREENS, OLD MONEY, WHISKY— BOOM IN COMPANY MUSEUMS

More and more corporations are finding that a look backward can pay off—in prestige, in public attention, and even in sales and profits.

American companies in growing numbers are dipping into their treasuries to help underwrite some specialized glimpses of the past.

They are doing this by setting up corporate museums, or by sponsoring traveling exhibits linked to their principal line of business. For example—

- The Campbell Museum in Camden, N.J., financed chiefly by the Campbell Soup Company, attracts some 1,500 visitors a month to its permanent collection of soup tureens assembled from all over the world. The collection of porcelain, silver and pewter tureens—many valued in the thousands of dollars each—is the only one of its kind in existence.
- Scheduled for a formal opening in May at Niagara Falls, N. Y., is the world's first museum devoted entirely to ceramics. Sponsored by the Carborundum Company, it will depict the history, technology and art of ceramics, ranging from priceless Chinese Ming pottery and ancient Greek vases to linings for the nozzles of today's rocket engines.
- The village of South Otselic, N. Y., was caught up in a one-day celebration last September when the Gladding Corporation, manufacturer of sporting goods, opened an International Sport Fishing Museum there. The village has been a center of the fishing-line industry since 1816, when pioneers from Rhode Island found the adjacent hills excellent for growing flax. The Gladding collection occupies a restored house that is itself a museum piece—a 142-year old eight-sided mansion.
- The Schwinn Bicycle Company in Chicago has been assembling hundreds of bicycles for eventual display in a private museum, says Frank V. Schwinn, president. The bicycle industry has been enjoying such a boom, Mr. Schwinn adds, that "we haven't had the time or the space to get started on a permanent home for our collection."

Money to coffee pots. Other well-known corporate names show up on the list of firms with their own museums or collections which are open to the public. Chase Manhattan Bank in New York has a noted display of monies of the past and present. So does the National Bank of Detroit.

Wells Fargo Bank in San Francisco exhibits relics of its banking history going back to gold rush days. In Baltimore, the B&O Railroad maintains an elaborate museum of railroading.

The Winchester-Western division of Olin Corporation has a gun museum in New Haven. Taylor Wine Company shows early wine-making implements and glasses at its headquarters at Hammondsport, N. Y.

Proctor & Gamble, through its subsidiary, the Folger Coffee Company, has an expensive collection of antique English coffee pots spanning the eighteenth and early nineteenth centuries.

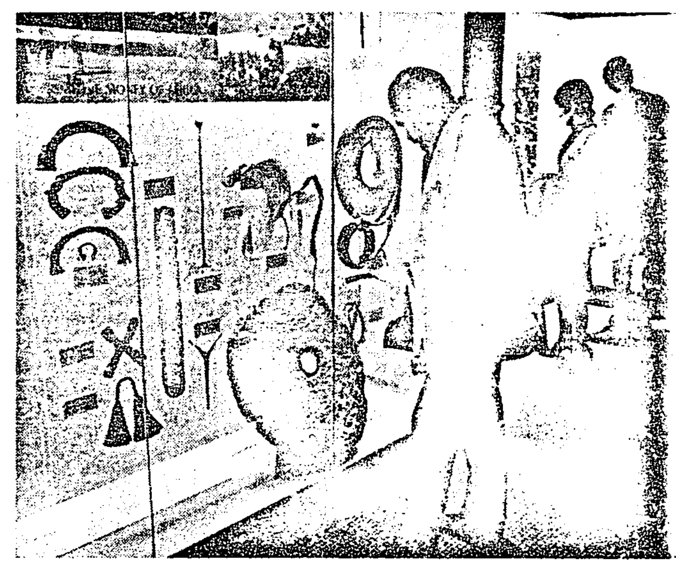
Many nationally known companies, such as International Harvester, Maytag, General Motors, IBM, Commonwealth Edison and United Air Lines, maintain permanent exhibits which are centered on their principal products or services at the Chicago Museum of Science and Industry.

Through the ages. Perhaps the most widely known of all museums devoted to a single type of product is the Corning Museum of Glass in Corning, N. Y. There, a full-time staff of 18 watches over a comprehensive collection devoted to every aspect of glass from 1500 B. C. to the present.

Severe floods that accompanied Hurricane Agnes last June ruined some valuable items and severely damaged many others. "About 400 glass objects out of 13,000 in our collection were broken," says Dr. Robert Brill, the museum director. "We have a team of conservators at work now, and we hope we can restore all but perhaps 50 of the damaged pieces." Half of the museum's library of 7,000 volumes was waterlogged. The soaked volumes were put in freezers to forestall mildew. Gradually they are being thawed out and dried.

While Corning Glass Works originally financed the museum, it is operated now by the Corning Glass Works Foundation, an autonomous, nonprofit educational institution.

Firms provide funds. A few other well-known museums, now independently operated, have a similar relationship to the companies that established them. For instance, Eastman Kodak Company contributed shares of its stock to a trust fund to help provide support for the International Museum of Photography at George Eastman House. The museum, set up in co-operation with the University of Rochester, is a repository for materials related to the history of photography and to motion pictures. The Kodak Company has donated samples of cameras, projectors and related equipment, and movie films of archival value.



Primitive money, too bulky to carry, is featured at the Chase Manhattan Bank's museum in New York.

The Hagley Museum in Wilmington, Del., devoted to the history of industry on the Brandywine River, was set up through an endowment by the Du Pont Company. It is part of the Eleutherian Mills-Hagley Foundation which occupies 185 acres along the Brandywine. The museum occupies an 1814 textile mill. Nearby are powder mills operated by Du Pont in the early 1800s. There is also a library of 80,000 volumes concentrating on American economic, industrial, business and technological history.

The John Deere Foundation maintains

(continued on page 50)

CORPORATE MUSEUMS

[*continued from page 48*]

buildings at the site of a blacksmith shop at Grand Detour, Ill., where John Deere built a self-scouring steel plow in 1837. The National Park Service has designated the site as a national historic landmark.

The Henry Ford Museum and Greenfield Village, at Dearborn, Mich., were originally set up with Ford-family funds, but are now independent of Ford Motor Company support.

Variety of exhibits. There's almost unlimited diversity in the fields covered by company museums.

Whisky has its day at the Barton Museum of Whisky History at Bardstown, Ky.

A collection of antique locks is on display at the Schlage Lock Company in San Francisco. Eli Lilly & Company, Indianapolis, in addition to a large exhibit center, maintains a duplicate of its founder's original laboratory.

International Business Machines Corporation displays historic calculating machines at its Madison Avenue offices in New York City.

Many companies have turned over collections of historic products or rare individual items to public museums.

General Electric Company, as an example of this, presented some early types of electrical household appliances to the Smithsonian Institution in Washington.

Prestige value. Why the rising interest in museums and collections tied to specific companies and their products?

An obvious reason, corporate executives acknowledge, is the value of such collections in building a firm's prestige, keeping its name before the public and helping stimulate sales.

Old-time locomotives, cabooses enthrall youngsters at B&O Railroad Museum.

Officials of some companies say, too, that they feel an obligation to provide information about their industries' background and development to the public.

Museums of all kinds, privately and publicly supported, have become an important industry in themselves.

The American Association of Museums in Washington, D. C., publishes an annual directory of more than 1,000 pages listing all types of museums in the U. S. and Canada.

Scores of companies make a business of supplying exhibit cases, lighting equipment, display materials and storage supplies for the museum trade.

Expensive venture. Assembling a privately owned collection worthy of public display can be a painstaking and expensive venture.

Consider the case of the Campbell Museum, which was set up by the Campbell Soup Company in 1966 and chartered by the State of New Jersey as a nonprofit educational institution. It moved into its own permanent building in Camden in 1970.

Campbell retained John M. Graham II, retired vice president of Colonial Williamsburg, as consultant and to help it acquire what Museum President William C. Parker describes as "symbols of elegant dining" from 24 countries. The acquisition process is still on.

Included among the nearly 200 showpieces listed in the Campbell Museum's latest catalogue are a silver soup ladle made by Paul Revere, porcelain tureens from France, faïence items from Holland, England, Ireland and Scotland, and a silver tureen made for Catherine the Great of Russia.

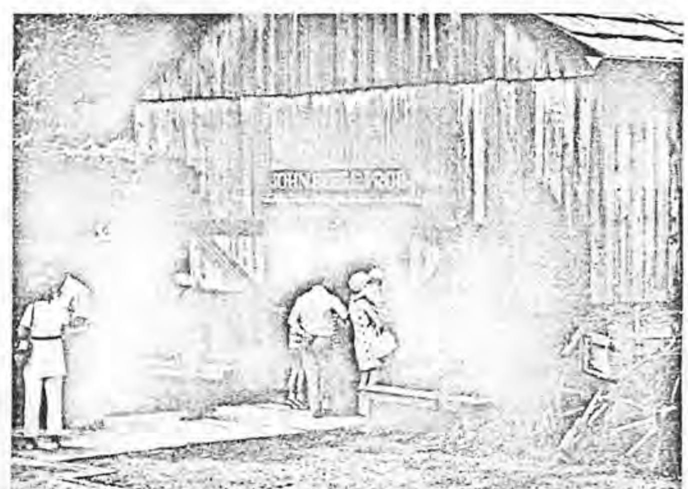
Mr. Parker notes that portions of the permanent collection have been exhibited by some of the country's best-known museums and have been seen by more than 1 million people. In recent weeks, part of the collection was shown at the Boston Museum of Fine Arts, and some items are on loan now to the Toledo Museum of Art. Exhibitions from the Campbell collection are scheduled for later this year at the Metropolitan Museum of Art in New York City and at the Victoria and Albert Museum in London.

Growing trend. Some companies long have been important collectors of paintings and sculpture which often are available for public exhibit. Included are South Central Bell Telephone Company, Philip Morris, the J. C. Penney Company, Helena Rubenstein, Inc., Container Corporation, Chase Manhattan Bank, Gulf Oil Corporation, Atlantic Richfield Company and Distillers Corporation-Seagrams.

But the latest swing is toward items identified closely with a company's particular line of business. It's a trend that shows steady and vigorous growth.

Rare octagonal house in upstate New York is site of Gladding Corporation's International Sport Fishing Museum.

Blacksmith shop at Grand Detour, Ill., is the place where John Deere developed first successful steel plow in 1837.

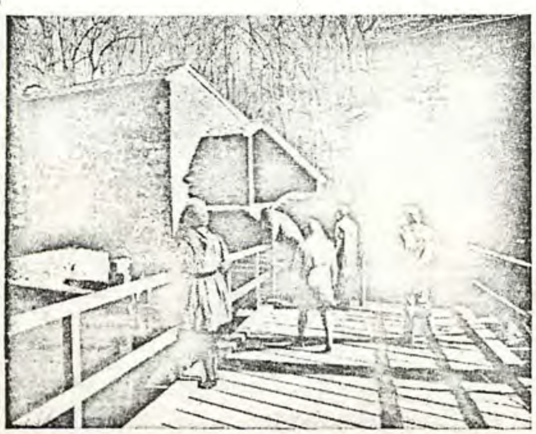


Relics of the stagecoach era and California's gold rush captivate visitors to the history room of Wells Fargo Bank in San Francisco.

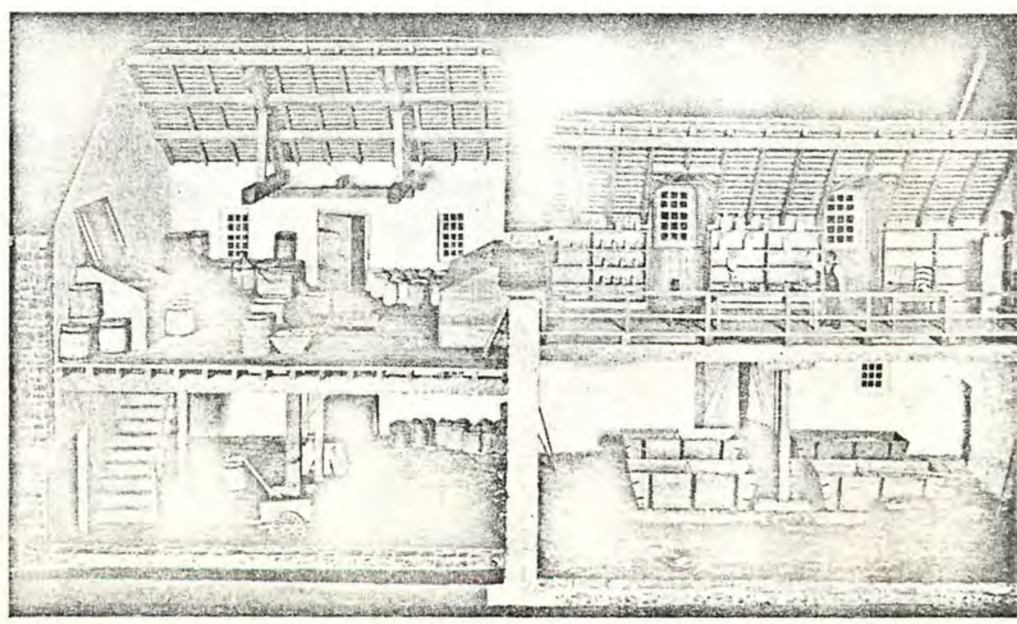
IBM display traces development of sophisticated computers from ancient calculating machines.

Craftsman at Corning Glass Museum restores a delicate piece of sixteenth-century Venetian glass damaged by floods from Hurricane Agnes in June, 1972.

Tureens, ladles, other symbols of elegant dining are on display at one of the country's newest private museums, opened by the Campbell Soup Company at Camden, N. J., in 1970. It has pieces dating from the sixth century B. C.



Powder mills once operated by the Du Pont Company are part of Hagley Museum, a restoration of early developments along Delaware's Brandywine River.



Model of nineteenth-century saltpeter refinery, a diorama in the Hagley Museum.

digital INTEROFFICE MEMORANDUM

TO: Ray Gould

cc: Ed Kramer
Gordon Bell

DATE: 8/1/73

FROM: Dick Clayton

DEPT: Medium Scale Computers

SUBJ: Material for DEC Computer Museum

A friend at MIT, who currently has responsibility for ARC-I, has indicated it is now obsolete and they want to get rid of it. If we are interested we could have it for free. ARC-I was the first hard-wired Average Response Computer. It was built of parts used to test packaging and some circuit concepts for TX-2.

ARC-I was the forerunner of such machines as CAT (Computer Average Transients) and several devices built by the various nuclear instrumentation houses. It also lead to the signal Averging and Histogram packages originally developed by Bruce Delagi for the Lab-8 and its brothers and sisters.

I believe it is an appropriate device for the Museum. I have a warm spot in my heart for this particular one of a kind beast (having made it run for a few years) and would like to see us accept MIT's offer. Are you the King of the Museum, if so, what do I do next, if not, do you know who is?

Thanks.

RJC/ph

digital INTEROFFICE MEMORANDUM

TO: Ray Gould

cc: Ed Kramer
Gordon Bell

DATE: 8/1/73

FROM: Dick Clayton RC.

DEPT: Medium Scale Computers

AUG 02 1973
8-15

SUBJ: Material for DEC Computer Museum

A friend at MIT, who currently has responsibility for ARC-I, has indicated it is now obsolete and they want to get rid of it. If we are interested we could have it for free. ARC-I was the first hard-wired Average Response Computer. It was built of parts used to test packaging and some circuit concepts for TX-2.

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Thanks.

RJC/ph

Ray I'd like a chunk (plug-in) if possible.

GBell.

digital INTEROFFICE MEMORANDUM

TO: Dick Clayton
Gordon Bell
cc: Ken Olsen

DATE: August 7, 1973

FROM: Roy Gould

DEPT: Trade Shows 5-3

EXT: 2302

SUBJ: Your Memo of August 1 - Material for DEC Computer Museum

I am currently the collector of items for the DEC Museum. You should have your friend at MIT get in touch with me and we can work out the arrangements to transport the machine to Maynard. One point of interest, however, is there may be legal complications such as the ones we are having with the TX0 machine at MIT. MIT being a government institution is having problems writing the TX0 off on their books to a private organization.

We are currently dealing with Professor Zimmerman at MIT regarding the TX0 and perhaps your friend should get in touch with him regarding the problems he has encountered.

Thank you for your interest in the Museum.

jac

digital INTEROFFICE MEMORANDUM

TO: Rod Mooney
CC: Pete Buckley
Roy Gould
Bob Pike
Al Sidel

DATE: 8/17/73

FROM: Frank Kalwell

DEPT: Traffic/Office Services

EXT : 2343

SUBJ: TRAILERS

This memo confirms an earlier note to George Beebe on the three 40' trailers in the PK-3 lot, loaded with computer parts for the museum.

I would like to shortly (60 days or less) find a home for these, possibly at the new facility in Marlboro where they can be neatly layed out prior to reassembling these units. An estimated 5,000 sq. ft. could be used on a <u>temporary basis</u> as these units cannot be stacked due to their delicate nature (vacuum tubes).

One move (hopefully) to the museum site is all I would recommend due to double handling problems.

mcw

digital INTEROFFICE MEMORANDUM

TO: Roy Gould

DATE: August 20, 1973

FROM: Ken Olsen

DEPT: Administration

EXT : 2300

SUBJ: MUSEUM

If you are over at the RCA building sometime, take a look at the addition to the cafeteria which was never finished. It is the section added on nearest the Tower and it has a grand staircase and big, beautiful windows. If we sell the Tower, we have to sell that with it because it contains the utilities and is the cafeteria for the Tower. However, if we keep the Tower, I don't know what we would use this area for but it would make a beautiful museum. Will you get the floor plan and think about how you would use this for a museum. It sure would beat a blank room in the middle of an office building.

We had to collect all the Whirlwind equipment before it went to the dump and so Frank Kalwell picked out all the stuff I asked for, plus a lot of other things, and is storing them in a trailer. When we have a location for the museum and a work area we can start laying it out. With a little encouragement, I might also dictate some notes on the various parts that I hope we salvaged.

/d

To: Gordon Bell
Ray Yaulde

Ken

AMERICAN USED COMPUTER CORPORATION

15 SCHOOL STREET • BOSTON • MASSACHUSETTS 02108 • 617/227-8634
TWX: 710-321-6388 • CABLE: USEDCOMP

a BOSTON COMPUTER GROUP company

SEP 7 1973

Museum

August 31, 1973

Bob R.
I will watch Comp. World & Elec News for Sonny's suggestions - Pls advise on his offerings
WR 9/5/73

Mr. Robert Reed
Digital Equipment Corporation
PK-3, ML 25A
146 Main Street
Maynard, Massachusetts

Dear Bob:

It was nice hearing from you and I'm glad things are going well.

Among the equipment I think you should perhaps try to accumulate would be in the IBM area - IBM 604, 650, 701, 702, 705 and 704 -- there may be a 650 in one of the moving companies in Boston that's been sitting there for a while.

Also, I think that you ought to acquire a Philco 2000 as it is a beautiful representative of an old machine. ?

With respect to Univac, a Univac 1, 2 or 3. With respect to Burroughs a Datatron 205. There is some other equipment you should buy such as Monorobot 11 and many small semi-computers. ?

We have in our warehouse an RCA 301 CPU which is very interesting because of the mammoth size of it and you may have it free provided that you pay transportation.

Also we have a stripped Honeywell 800 which is quite an enormous piece of equipment and you may also have it free. Looking forward to hearing from you.

With best regards,

Sonny

Adolf F. Monosson
President

AFM:PS

WE BUY, SELL, TRADE AND APPRAISE ALL COMPUTER EQUIPMENT

digital INTEROFFICE MEMORANDUM

TO: Ken Olsen

DATE: September 5, 1973

FROM: Roy Gould

DEPT: Trade Shows 6B-2

EXT : 2302

SUBJ: TXO Machine

I am still in touch with Professor Zimmerman and he is waiting for the Government to release the TXO. As soon as he gives me the word, we will pick it up.

jac

1026

722

INTEROFFICE MEMORANDUM

TO: Roy Gould, Curator of the DEC Museum

CC: Bob Lane
Ken Olsen
Stan Olsen
Bob Reed

DATE: September 17, 1973

FROM: Gordon Bell GB 12-1

DEPT: Engineering

EXT : 2236

SUBJ: DEC MUSEUM

I would also like to keep in touch with our plans for a Museum/Display and be a part of it. Since I spent 6 years in a scholarly environment at CMU and worked on looking at the early machines, I think I can be useful. In many of the university and other laboratories I know people or am known. It seems to me that Ken's acquisition of Whirlwind was a stroke of genius, because it is one of the very early stored program computers (I give it #3 or 4) in time for being operational--we have an item for trading. As we all travel about, I would like us to begin getting parts from some of the more important machines and other peripheral parts.

Also, I would either like to acquire some early computer parts on a personal basis in parallel with DEC, or if DEC is not interested in particular items I would like to acquire some of the parts and loan them to the museum. (Some of the items I would like are rather large to store in a home that is reasonable sized.) There are a number of books which I have, or am considering which also fall into this category.

I would like also to meet with Monosson if useful and work on this problem, if it won't perturb things.

I think it is critical to decide what we want and to go after them quietly and slowly, rather than big dealing it.

My views as to what's important are pretty well expressed in the book by myself and Allen Newell, and numerous copies are around the company and the library; also there is an historical time chart on pages 43-46 of which gives the time relationship of various machines.

The following items are important, I believe--perhaps more so for the Smithsonian, but it gives a starting point. The starred items (*) give high priority.

Classical Computers (by place)

U. of Illinois

ILLIAC* I,II,III and IV--some representative parts. I-I is probably most famous. I-II might show some special independent logic. I-IV is now being operational, a real fiasco; Mel Pirth at NASA AMPS is the director of the lab. There are a number of ILLIAC I descendants; if we wait to flatter Illinois, we might try to get parts. I-I used Williams tubes.

BTL

Leprechan*--first transistorized calculator. An early relay computer used at a distance to Dartmouth was first remote computing

Cambridge (Maurice V. Wilkes)

EDSAC I*--first, stored program computer
EDSAC II--claimed to be first microprogrammed computer

MIT (Whirlwind)*

Core memory (first); diode time pulse distributor--first microprogrammed machine I believe, which gave Wilkes the idea. First displays; light gun; tape units Raytheon?)

Lincoln Labs

TX-0* (forerunner of DEC circuits and PDP-1)
LINC* (DECtape forerunner)

Manchester (I know most of the people there--I probably should visit them).

I--there was a little known experimental machine which was truly the first machine. I doubt if they have parts of it. Also Williams Storage Tubes were first memories.

Mark I*--first index registers (B tubes)--would like the tubes.

Atlas*--paging, extra codes (idea behind UUO's)--the fast extra code store would be great to get--an early or first ROM.

Von Neuman--influenced machines

The Institute for Advanced Study machine (relatively late and unsuccessful)*.
RAND*--Johniac (Smithsonian may have it all)

National Physics Laboratory

ACE*(worked on by Turing and Wilkinson)--sentimental to me because I worked on DEUCE (an ACE descendant). A drum with moving heads and delay lines would be nice to get.

National Bureau of Standards

SEAC, DYSEAC (dynamic logic--never quite made it)

U. of Penn. (Moore School)

ENIAC*--first electronic computer
EDVAC*--the Eckhert/Mauchley stored program computer

Harvard*

Hopefully we could get parts of various Marks.

U. of Toronto

First 12-bit computer. Forerunner? to minicomputer.

Rice University (virtual memory implementation)

IBM

650
701, 704, 7090, 7094II (parts only)
Printers 407
CPC, 607, 604--all early non-computers
1401
Stretch?

CDC, Bendix

160* (first commercial 12-bit computer)

RCA

Part of 601

UNIVAC (ERA)

Univac I*--especially to get first tapes and drums
ERA1101, 1103

Burroughs

Datatron 205

Intel or Fairchild or?

First microprocessors and first integrated circuits.

ICL

Ferranti-Pegasus--first general register machine.

Zuse* equipment

Technology to Show

Terminals

Displays: Whirlwind, + Type 30, 5" precision, color, 338--all are firsts.
Typewriters: Flexourters; Teletypes*--a number dating back would be interesting.
First alphanumeric?
First dot matrix printer?
Card reader/punch/keypunchers: something from IBM/Univac--here we want to have a chart to show how much data processing has been set back by punched cards.
Tape readers etc.
Analog-digital: old EPSCO unit + Whirlwind + new chip.

Memory

Delay lines: Manchester, NPL
ROM:--Atlas
Storage tubes: MIT, earlier Manchester Williams Storage Tubes
Core: Whirlwind; old DEC; new DEC
Tape units: Whirlwind; possibly Honeywell Datamatic big drives
Disks: IBM, RAMAC, IBM 1311 (removable), DEC RS64 (not unique); IBM floppy
Drums: DEC swapper a la BBN or MIT; also NPL; also Whirlwind

DEC PARTS

PDP-1 with display. It might also have swapping drum nearby--we can claim it used in first or early timesharing. This should be kept operational and used for playing space war.

A GT40 with moonlander would also be a nice interactive display.

Terminals to RSTS or a PDP-10 might also show terminals and timesharing.

Computers--rest of PDP's should be on display, but need not be operational.

Modules--A demo with the first building blocks! Also, we might show the evolution through various computers on a larger, time-line display. Also, 30 Mhz, RTM's. Our first receiver and transmitter modules for Teletype--first UART (now fits on a chip). — Note we were first!

Packaging--vivid with the computers. Shows a mess + wirewrap technology including our own machines for this.

Power Supplies--reduction in weight and size with time

Terminals-- VT05, LA30, Teletypes (especially 28 on PDP-4). Also type 30 display + 338 + color.

Drums--from PDP-1 including a large one from PDP-6) and RS series.

Disks--RK05

Memories--evolution from "1K PDP-1" through PDP-11 16K.

Tapes--DECtape + TU10 (maybe some old Potter 906's), cassettes.

Books (for historical use)

Bell and Newell; Goldstine--The Computer from Pascal to Von Neumann (princeton); Bowden--Faster Than Thought (Pitman)

Software

Here we need something. Perhaps a library of reference manuals would be significant.

Pre-stored Program Computer

I'd like to see things like the Jacquard Loom (punched card control), Thomas Arithometer. I'll spend a day with the British Museum in the next year or so.

GB:mjk

PDP23?

DEC Archives
DEC manuals
" machines
Historical books
non-DEC machines
" manuals

Indian 8,11
Cuban
DCC
Hungarian
Sue
Sprague
ITT

INTEROFFICE MEMORANDUM

TO: Roy Gould and Museum Group

DATE: October 1, 1973

FROM: Gordon Bell

DEPT: Engineering 12-1

EXT : 2236

SUBJ: DEC MUSEUM

I don't think we want an IBM 705. (I don't know what, if any, contribution it made to computing. In essence, I recall it is a 702 with core.)

Today, Prof. Murray Allen at the U. of N.S.W. in Australia, promised me some parts of the English Electric Deuce (Turing helped design) and an IBM 650. (I asked him to deliver it to the Sydney DEC office for shipment to us.) In return, he wandered through our surplus parts.

Let's get together to discuss my memo on list of parts.

GB:mjk

digital INTEROFFICE MEMORANDUM

TO: Gordon Bell

cc: Ken Olsen

DATE: October 8, 1973

FROM: Roy Gould

DEPT: Trade Shows 6B-2

EXT : 2302

SUBJ: MUSEUM

Thank you for your recent memos regarding equipment for the DEC Museum. As you have probably realized, the location of the museum has not yet been decided.

We are currently holding parts of the Whirlwind Computer in storage and hopefully the TX0 from MIT will be turned over to us within the next four to six weeks. It is currently being held up due to government paperwork.

At your convenience, Gordon, I will be glad to get together with you and the rest of the museum group to discuss our progress to date.

jac

digital INTEROFFICE MEMORANDUM

TO: Gordon Bell ✓ | DATE: October 8, 1973

cc: Ken Olsen | FROM: Roy Gould

DEPT: Trade Shows 6B-2

EXT : 2302

OCT 09 1973

10-9

SUBJ: MUSEUM

Thank you for your recent memos regarding equipment for the DEC Museum. As you have probably realized, the location of the museum has not yet been decided.

We are currently holding parts of the Whirlwind Computer in storage and hopefully the TX0 from MIT will be turned over to us within the next four to six weeks. It is currently being held up due to government paperwork.

At your convenience, Gordon, I will be glad to get together with you and the rest of the museum group to discuss our progress to date.

Ken + I + Good Come over

jac

6 Beacon St
Suite 620
Boston Mass

(3

digital INTERROFFICE MEMORANDUM

TO: Gordon Bell
Roy Gould

DATE: October 17, 1973

FROM: Ken Olsen

DEPT: Administration

EXT : 2300

SUBJ: WHIRLWIND COMPUTER

Last week Mr. Nixdorf of Nixdorf Computer came by and when I told him about our pieces of Whirlwind for our museum he indicated he would like to swap pieces for parts he has in his museum.

I expect we will be sending some people over to study what they are doing while we consider possible ways of cooperation and that time we might ask those people to look into what pieces of hardware we might want to swap.

/ma

digital INTEROFFICE MEMORANDUM

TO: Ken Olsen
Gordon Bell
Public Relations

DATE: 12/3/73

FROM: Dick Maliska

DEPT: Diagnostic Engineering

EXT: 3714 LOC: 3-5

SUBJ: PDP-4

Dick
See Bob Grahl
about this
[illegible]

About a year and a half or maybe two years ago, the Drafting Department phased out their use of PDP-4 #1. Because of this, some of our people were temporarily left without a machine to do preliminary software debugging for "AMT" programs.

Since Drafting had decided to scrap the machine, and no one else wanted it, we decided to take it into our area for our own use. Since that time, our use of the machine has been reduced to none. So there it sits, and what do we do with it?

On at least three occasions I have spoken to the Public Relations Department, inquiring as to whether or not the "computer museum" was still planned and if they wanted PDP-4 #1 - no reply. So I assume that they either are not planning a museum or they do not want this machine.

I spoke to the Traditional Product Line and they don't want it either. (It seems that there is not a big market for used PDP-4's)

It seems a shame to let that machine get into the merciless hands of the salvage area. I feel that the sentimental value is worth something, but I would like you to have that choice.

Sometime in January (?) I will be transferring to our Marlboro plant and I would appreciate having PDP-4 #1's fate decided by then. I really don't want to move it over there.

Please find a home for my orphan.

cc Bob Lane

Should I grab this for the museum Bob

Gay

CONFIGURATION LIST

PDP-4 #1

1 central processor
8K memory
1 line printer (Analex)
2 card readers (Burroughs)
4 tape units (Potter - I think)
1 card punch interface (IBM)
1 Dectape control
2 555 Dectape transports
1 KSR-27 teletype
1 paper tape reader/punch

Computer report VII

The effervescent years: a retrospective

Behind the Computer Revolution lay the vision and perseverance of a handful of pioneers committed to open information exchange

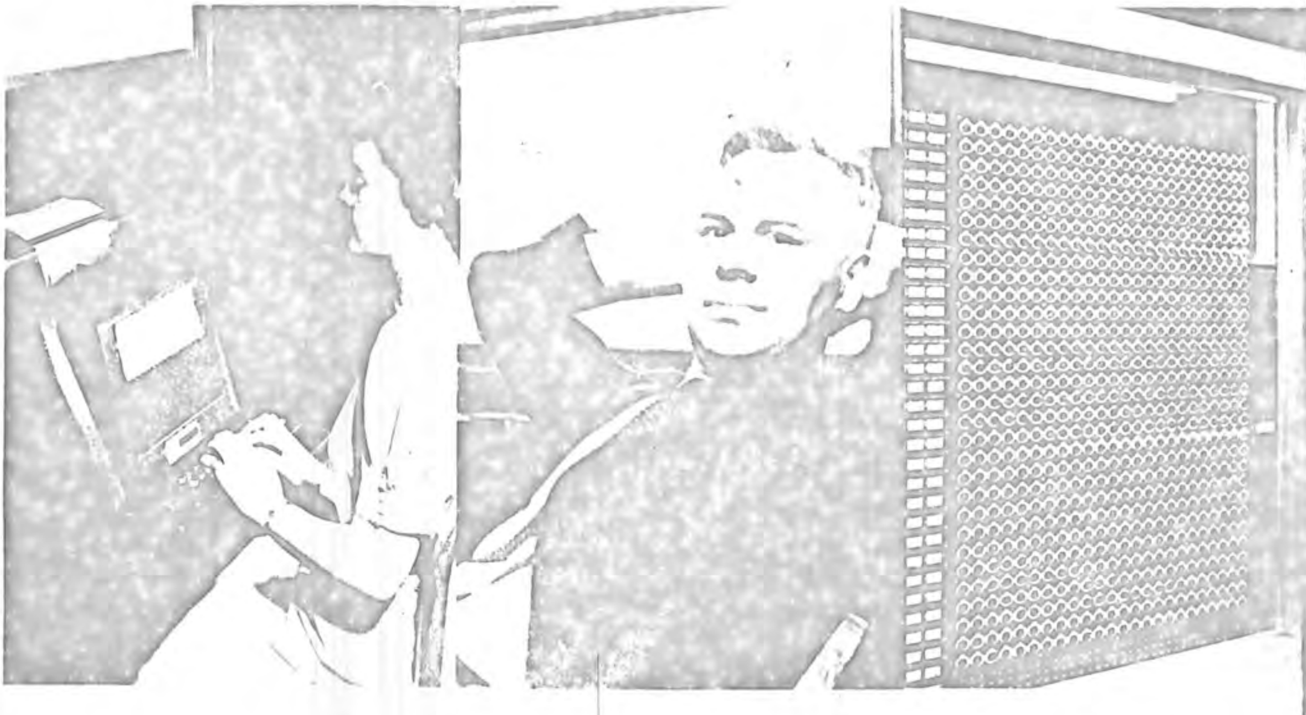
The following alarm was sounded in 1950 by a prominent mathematician: "There is currently such a shortage of trained mathematicians required to operate the modern computing machine that these machines are not working full time. With the number of machines being built or projected it is probable that within ten years, two thousand persons will be required in this work. . . , this is a substantial fraction of all professional mathematicians in the country."[1] Eight years later, a RAND Corporation scientist told a computer conference that "Southern California is today generally regarded as a center of activity in high-speed computing, having perhaps the highest density of machines and active prominent people as any area in the world." In support of this claim, he displayed a map of digital computers installed and operating in Greater Los Angeles. It revealed a grand total of 32 machines![2]

These appraisals provide a good indication of how small the computer world looked during the 1950s. And yet only a few years were to pass before computers found their way into virtually every large factory and office in the United States, Europe, and Japan. The reasons for this surprise explosion are many and complex, involving a web of technological, architectural, conceptual, economic, and marketing decisions too complex to be tracked in an article such as this. One strand can be unravelled, however; it ties a small group of technical pioneers into the environment for computation that existed between the mid-1930s and the early 1950s, a period which has so far received relatively little attention from historians of science and technology.

Henry Tropp Humboldt State University

The seeds of the computer revolution were sown between 1935 and 1950, by men of great vision whose primary interest lay not in accumulating patents and "shares of the market," but in disseminating their newfound knowledge to all who would listen. As I examine the computational environment between 1935 and 1950, I will be sketching the broad outlines of this process, necessarily omitting much that occurred in an effort to bring out what I consider to be the highlights (see Box, p. 78).

The 1930s and 1940s were decades when the word "computer" generally meant a person rather than a



machine. Three hundred years of well-documented work by mathematical and inventive giants like Pascal, Leibniz, and Babbage had led to a great array of ingenious mechanical devices for tabulation and record-keeping. Furthermore, there was little interest in large scale, systematic computation in industry, even among those who might have been expected to be the most interested—the mathematicians. Such interest as there was existed among a handful of men working quite independently of one another on specific and complex research problems in such disparate fields as astronomy, weather forecasting, space charge physics, and network analysis. It was these men—principally George Stibitz, Howard Aiken, and John Mauchly—who built the first automatic digital computers in order to do their own particular research.

The Stibitz and Bell Labs relay machines

George Stibitz was a young mathematician who had been intrigued with electrical gadgetry since his boyhood in Dayton, Ohio. (He remembers nearly setting his home on fire at the age of eight when he overloaded the living-room circuits running an electric motor his father had brought him.) Stibitz attended what for the World War I era was a very experimental and advanced high school—one that had been established in Dayton by Charles Kettering and some associates from Delco. The school was quite informal and the science program heavily oriented toward individual student projects.

When Stibitz went to college he concentrated on experimental physics and mathematics. He received his M.S. from Union College in 1927, and spent the following year making radio propagation measurements for the General Electric Co. This work was performed in an isolated farmhouse, and he and his partner rigged a voice-actuated electrical communication link that allowed them to operate their equipment by remote control. They also used the link on winter mornings to open the damper on the fire in the coal stove before leaving their home.

After the year with GE, Stibitz went to Cornell for his Ph.D. in mathematical physics, which he received in 1930. That fall, he joined Bell Telephone Laboratories as a research mathematician and became involved with investigations into circuit theory that eventually led him into relay circuit problems. One evening, in 1937, he brought home a couple of relays, some flashlight batteries and bulbs, and wired up a simple binary adder that is referred to in the literature as the Model K (for Kitchen) Computer. This was a significant event because although Stibitz had been introduced to the notion of binary arithmetic in his high school math book, this was the first time we know of that anyone actually successfully adapted the concept to mechanical computation.

While Stibitz's colleagues were amused that relays could be used in this way, his computer didn't seem to arouse any serious interest. Stibitz's main assignment at this time at Bell Labs involved working on switching network problems that required dealing with complex numbers. These computations were so laborious that they had to be done by a group of about ten women using pencil and paper along with the crude mechanical calculators of the day. One day

[1] At the far left is one of the three operator stations for the first Bell Laboratories relay computer, which went into operation in January, 1940. The computer evolved out of the pioneering work of research mathematician George Stibitz, shown in the accompanying photo, which was taken in the early 1940s at Bell Labs.

[2] The first thoroughly automatic computing machine was the Automatic Sequence Controlled Calculator, or Mark I (below), which was built at Harvard between 1939 and 1944 by IBM engineers under the leadership of Howard Aiken, who is shown in the accompanying photo from that period. (Harvard Univ. Computation Lab photos).

a fellow employee suggested to Stibitz that the work might go faster if two or three calculators could somehow be hooked together. Stibitz knew nothing of earlier attempts to do automatic computation (he had never even heard of Babbage), but the suggestion interested him and he proceeded to design a circuit for an electromechanical calculator that could multiply and divide complex numbers. Stibitz's Complex Number Calculator was built by a team of Western Electric engineers headed by Sam Williams, and when it was completed in 1939 (with modifications so it could also add and subtract), it could perform these arithmetical operations three times faster than had heretofore been possible.

But the Complex Number Calculator had some unusual features that made it far more than just another special purpose calculator. First, it had an extremely high degree of reliability—one that would not be exceeded in the electronic automatic computers for many years. Second, because Stibitz felt so strongly about the need to prevent the machine from making arithmetic errors, he built in a checking code so that if a relay failed, it would be impossible to get a wrong answer. This Excess-3 code, as it is now known, also allowed a defective relay to be readily identified.

Another notable feature of Stibitz's machine was that it could be operated from a remote teletypewriter terminal. The demonstration of this to a meeting at Dartmouth College in the summer of 1940 marked the first public display of remote data processing.

It is quite conceivable that Stibitz's contribution to the future of computers could have ended with the construction of the Complex Number Calculator. Shortly after it was finished, he approached the management at Bell Labs with a request for approximately \$50 000 to take the next major step and build a large-scale computer, but he was turned down. Management evidently didn't share his feeling for the importance of automatic computation, at least to a telephone company. However, World War II changed all this, because now the need for computation became crucial, particularly in ballistics where research had been underway at the Aberdeen Proving Grounds since the early 1930s. As a result of his work, Stibitz and others at Bell Labs were asked to aid the Army, and a series of five relay computers were eventually built for the prime purpose of doing ballistics and other calculations important to the defense effort.

The Bell program was highly significant, for it demonstrated that relay calculators could perform essentially error-free calculations around the clock, seven days a week, with minimal down time due to malfunction. Thus, although it became apparent that the increase in speed would probably level off to roughly a factor of ten over manual computation, the reliability and ease of maintainability of these computers made people extremely reluctant to move into electronic computers until the 1950s, when new confidence in this technology began to emerge. Moreover, the Bell relay computers had special features which, though designed to meet specific wartime needs, found their way into the mainstream of the postwar computer art. For instance, the 1942 Model II relay computer had a tape program input and also utilized biquinary error detection*; while floating, rather than fixed, decimal computation—which Stibitz conceived in 1940—made its appearance in the Model V computer.

The achievements of George Stibitz have probably not received the public recognition they deserve. This is at least partly due to the fact that he is a rather shy, retiring man who to this day is reluctant to do much public talking about his achievements, with the result that one learns about them mostly from others.

In some respects Stibitz presents a marked contrast to Howard Aiken, another great technical visionary of the preelectronic computer period. While Aiken was not a publicity seeker, neither was he retiring. He was an extremely forceful personality whose perseverance and determination not only led to remarkable technical achievements, but made an indelible impact on all who encountered him.

Aiken and the Mark I computer

Howard Aiken grew up in Indianapolis, Ind., and was forced to go to work after the eighth grade. His first job was as a switchboard operator twelve hours a night, 30 nights a month, with the Indianapolis Light and Heat Company. During the day Aiken attended Arsenal Technical High School, which was another first-class secondary school of its time. The superintendent of schools in Indianapolis took a personal interest in Aiken and arranged a series of examinations so that the boy could graduate early and thereby ease his work-load somewhat. This same superintendent then encouraged Aiken to attend the University of Wisconsin by assisting him to get a similar job with the gas company in Madison. In 1923, Aiken received his B.S. degree and, overnight, a promotion to chief engineer of the gas company.

Aiken had been a power engineer for more than ten years when he decided in 1935 to go back to school and enroll first at the University of Chicago and then Harvard as a graduate student in physics. His doctoral research on the laws of space charge involved him in laborious hand calculations of nonlinear differential equations which, in turn, led him to investigate the possibility of high-speed, automatic calculation.

Harvard in those days was an extremely unlikely place in which to find support for this kind of research project. It was a center of "pure" research, and Aiken was forced to persevere in the face of considerable skepticism and, in fact, very strong opposition. For instance, some people claimed that a machine to do what Aiken proposed would require so many parts that, based upon elementary probability theory, some parts would just never work. (A similar argument was later advanced in opposition to Eckert's and Mauchly's ENIAC project.) Others held that even if Aiken were lucky enough to get his machine working, it would only be a short time before it would have performed all the work it could possibly be required to do, thereby ending up as a museum piece, which was something a university should not produce! Thus, although Aiken received important encouragement from the astronomer Harlow Shapley and Business School Professor Ted Brown, his was essentially a lonely battle, won only by his great determination to reach a very specific and carefully thought out goal.

* A scheme wherein each decimal place is represented by seven relays arranged in groups of two and five.

This goal was to build a thoroughly automatic computing machine controlled by a coded sequence of instructions and capable of producing a punched card or typewritten output. Aiken wrote his proposal for such a machine in 1937 and this document was published in *Spectrum*, August 1964. The reader of the document will be impressed by two things. First, of course, is the tremendous technical vision it reveals. But even more striking is its similarity to the actual machine that was dedicated at Harvard seven years later, in 1944—the Mark I. It is quite clear that what Aiken did was first to analyze carefully the procedure for solving mathematical problems by hand and then to specify a procedure for performing the same operations mechanically.

One of Aiken's first attempts to build his machine was made with the Monroe Calculating Machine Company. He went to Monroe's chief engineer, G. C. Chase, who has described how "Aiken outlined to me the components of a machine which would solve his problems. His plans provided automatic computation and the four rules of arithmetic, preestablished sequence controls, storage and memory of installed values, sequence control which could automatically respond to computer results or symbols, together with a printed record of all that transpires within the machine, and a recording of all the computed results.[3] Chase was convinced Aiken's machine would be important to Monroe's future business and did his best to get his management to agree. But they decided it was too impractical and turned him down. Chase then urged Aiken to approach IBM and suggested that Professor Brown of the Harvard Business School would be a good initial contact. It was through Brown that Aiken met Thomas Watson, Sr., and in 1939 a contract was signed whereby IBM, with financial support from the U.S. Navy, would build the Mark I.

The Mark I is sometimes called a Babbage-type machine, but although Aiken readily admitted to "learning more about computation from Babbage than any other individual," it would not be fair simply to infer, as some have, that Aiken built Babbage's machine. Without trying to detract from the fantastic accomplishments of Charles Babbage, I would point out that he and Aiken differed in a very important way. Babbage evolved a series of technical concepts, first for building a difference engine and later for building the analytical engine, which he conceived in 1833 (this was the first design for a universal automatic calculator). However, in every case, before any significant portion of his machine was physically completed, Babbage would go off into new and better conceptions. One has the image of wandering with this quirky British genius through an infinite series of rooms, each representing some new and yet unfinished level of machine development.

With Aiken, however, his Mark I was conceived at some point in the mid-1930s, articulated very carefully and precisely, and built almost to specifications with, moreover, materials already on hand. There is no technology in the Harvard Mark I that was not available in the 1930s.

The development of the Mark II, III, and IV at Harvard is characterized by much the same methods, with each model designed to take advantage of a specific level of technology. It is clear from my interviews with Dr. Aiken and his colleagues that at some point he would say, "at this stage, new ideas stop and we build. Any new ideas that come afterwards will be saved for the next machine." His first electronic machine, the Mark III, was only built at a time (the late 1940s) when he felt the technology was sufficiently reliable. Many people have interpreted the late arrival of Mark III as a reluctance on Aiken's part to admit that electronics "was the way to go." This was not true. He merely waited until the reliability of the components reached his exacting standards.

Computers in Iowa

The unfriendly environment in which Aiken worked contrasts with the supportive one that existed at Iowa State College in Ames. While all but a few of the most enlightened universities were ignoring computation during the 1930s, Iowa had become an important center for mathematical statistics as a result of the interest of Henry Wallace. Wallace (later President Roosevelt's Secretary of Agriculture as well as Vice President) introduced IBM tabulating equipment at Iowa during the 1920s when he demonstrated its use for statistical analysis in agriculture and weather forecasting.

The following letter, which Wallace wrote to Cuthbert C. Hurd, Feb. 21, 1965, provides a nice feeling for what it was like in those days:

In the late winter [February and March] of 1923 I taught a course in machine calculation of correlation coefficients at Iowa State, using a cheap key driven machine. In the concluding session of ten lessons I decided to demonstrate how the IBM machine could be adapted to correlation work. For this purpose I used a truck from the farm to enable me to haul an IBM machine from Des Moines to Ames. I never used an IBM machine as an aid to breeding work but I did try to use it for some time in trying to predict weather. While this work was a flop, I think that Larry Page, the man who conducted it for me had something to do with starting [Jerome] Nemias of the Weather Bureau on his long-range weather forecasting.

For purposes of assembling yield test data in form to study, the Pioneer Hi-Bred Corn Co. of Des Moines has long used punched cards and the IBM machine so as to assemble the facts so they may be studied. The company now owns a machine and keeps it busy assembling data on yield test with both corn and chickens.

An extensive program in computation evolved from this start and, by the mid-1930s, a computer project was begun by John V. Atanasoff, a professor of physics and mathematics. In a letter to the college research council in March 1939, Prof. Atanasoff explained that as early as 1933 he had begun thinking about mechanizing the otherwise "extremely arduous" solution of systems of linear simultaneous equations having many unknowns. Continued Atanasoff:

About two years ago I came to a realization that computing machines can be much simplified by changing from the use of numbers to the base 10 to the use of numbers to the base 2. Further study has reinforced this point of view and it now seems possible to build into a small machine of perhaps the size and intricacy of a Monroe a computational ca-

to be continued - machine BROKE !!

digital INTEROFFICE MEMORANDUM

TO: Gene Smith

DATE: January 2, 1974

FROM: Roy Gould

DEPT: Trade Shows

EXT: 2302 LOC: 6B-2

SUBJ: Museum and Dick Maliska's memo of 12/3/73

Gene, I am on top of this and I have made arrangements to pick up the PDP-4 #1 which Dick is referring to in his memo.

As far as the status of the museum is concerned, there is still going to be one; however, where is the question. I have talked with Ken about it and when he finds some time we are going to get together along with Gordon Bell and get the ball rolling.

jac

this page only.

digital INTEROFFICE MEMORANDUM

TO: Jack Shields
Ken Olsen
Gordon Bell
~~Public Relations~~ whole
John Trebendis
Roy Gould.

DATE: 12/3/73

FROM: Dick Maliska

DEPT: Diagnostic Engineering

EXT: 3714 LOC: 3-5

DEC 05 1973

SUBJ: PDP-4

About a year and a half or maybe two years ago, the Drafting Department phased out their use of PDP-4 #1. Because of this, some of our people were temporarily left without a machine to do preliminary software debugging for "AMT" programs.

Since Drafting had decided to scrap the machine, and no one else wanted it, we decided to take it into our area for our own use. Since that time, our use of the machine has been reduced to none. So there it sits, and what do we do with it?

On at least three occasions I have spoken to the Public Relations Department, inquiring as to whether or not the "computer museum" was still planned and if they wanted PDP-4 #1 - no reply. So I assume that they either are not planning a museum or they do not want this machine.

I spoke to the Traditional Product Line and they don't want it either. (It seems that there is not a big market for used PDP-4's)

It seems a shame to let that machine get into the merciless hands of the salvage area. I feel that the sentimental value is worth something, but I would like you to have that choice.

Sometime in January (?) I will be transferring to our Marlboro plant and I would appreciate having PDP-4 #1's fate decided by then. I really don't want to move it over there.

Please find a home for my orphan.

I say put all but tape units, ~~and~~ card reader, and card punch into a ~~stock room~~ warehouse to hold for eventual DEC Museum!
Scrap Tape Units, Card stuff unless Field Service or TPL want it.

Do you FS or TPL.
Roy Gould where are the things to be stored? G Bell.

CONFIGURATION LIST

PDP-4 #1

1 central processor
8K memory
1 line printer (Analex)
~~2 card readers~~ (Burroughs)
~~4 tape units~~ (Potter - I think)
~~1 card punch interface~~ (IBM)
1 Dectape control
2 555 Dectape transports
1 KSR-27 teletype
1 paper tape reader/punch

digital

January 4, 1974

Professor Henry J. Zimmerman
Director of Research
Electrical Engineering Department
Building 26 Room 231
77 Massachusetts Avenue
Cambridge, Massachusetts 02139

Dear Professor Zimmerman:

The purpose of this letter is to restate Digital Equipment Corporation's interest in regard to the TXO computer at MIT.

As you know we are planning a museum on the history of computers and we feel, as you do, that the TXO computer would be a very important part of this museum. If we are fortunate enough to obtain the TXO, our plans are to keep it in an operating state in the museum.

The museum at present is planned for our Marlboro, Mass. facility and would be open to the public.

Please feel free to contact me if I or Digital can be of any assistance to you on this matter.

Sincerely,

Roy G. Gould
Exhibits Manager

RGG/jac

cc: Ken Olsen

Roy Gould

digital

January 15, 1974

Mr. Tom Scanlon
I.B.M. Corporation
1 Gateway Center Newton Corner
Newton, Mass 02158

Dear Tom:

We are trying to establish a computer museum. Can you suggest whom we might contact at IBM to aid us in locating some earlier IBM equipment? We would be willing to trade, purchase, or barter for parts, sub-systems or whole machines. Would appreciate any assistance you can offer.

Sincerely,

Harry

HENRY CROUSE
Corporate Manager of Purchases

/cp

DIGITAL EQUIPMENT CORPORATION, 146 MAIN STREET, MAYNARD, MASSACHUSETTS 01754
(617)897-5111 TWX: 710-347-0212 TELEX: 94-8457

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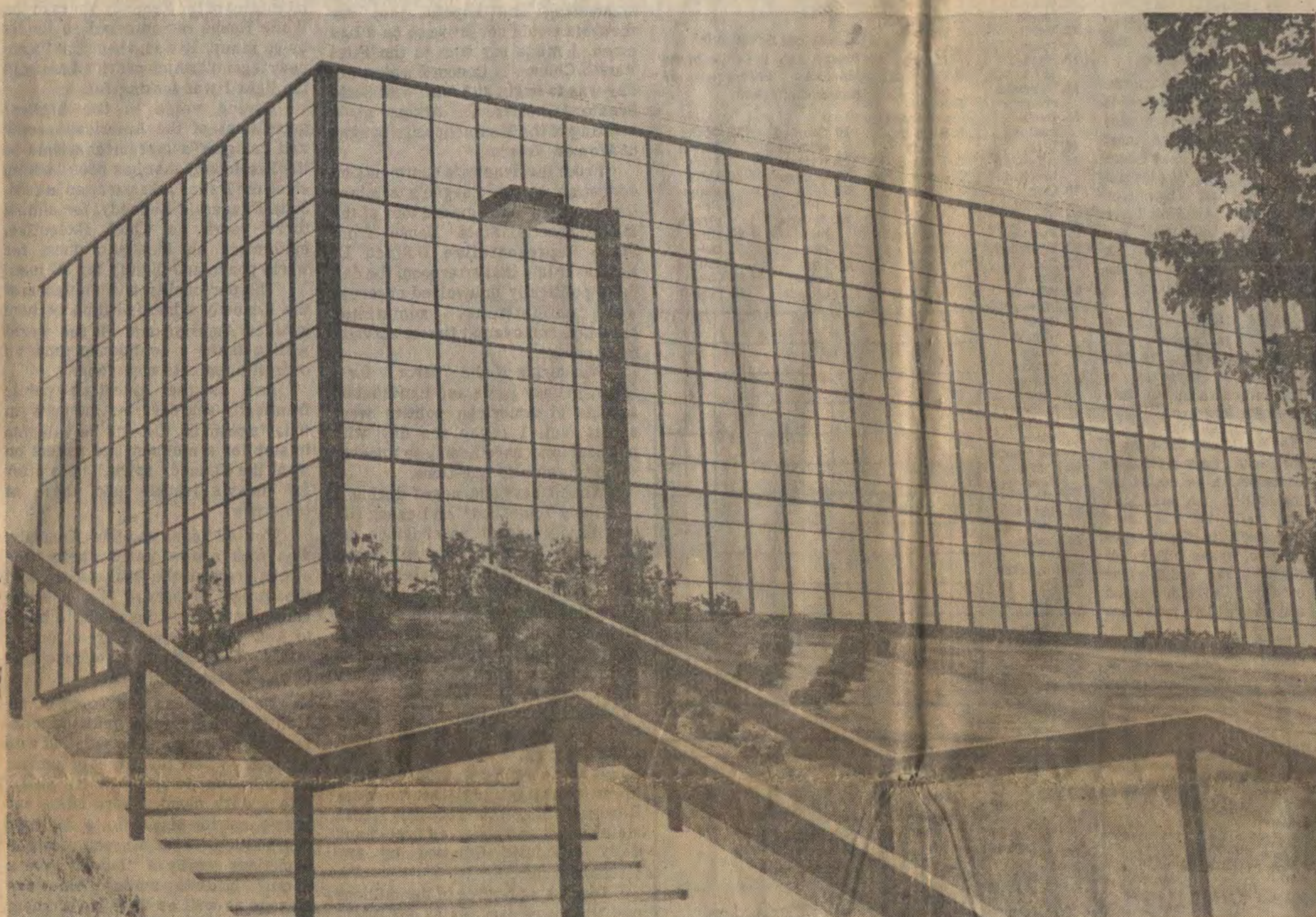
VOLUME 3
Third Year

Number 6 | 16 Pages | The Free Enterprise | Wednesday, February 13, 1974

PUBLISHED WEEKLY BY THE ENTERPRISE-SUN
250 MAPLE ST., MARLBORO, MASS.

Office building will become showplace

Digital to house computer museum



Staff photo by Art Phaneuf

THIS BUILDING will house a new computer museum planned by Digital officials for Marlboro. Kenneth Olsen, president of the Digital Equipment Corporation, told members of the Marlboro Rotary Club yesterday that he has been looking for space for the museum for some time and the Marlboro branch of the company is ideally suited for his purpose.

by EMDON D. MacKAY
(Of the Enterprise-Sun Staff)

MARLBORO — "We'll have one of the best, if not the best, museum in the world" in the Marlboro division of Digital Corp., according to Kenneth H. Olsen, president of the firm that is known as the largest manufacturer of minicomputers in the world.

Olsen, who spoke at the meeting of the Rotary Thursday noon at Marlboro Country Club, said the former Marlboro RCA complex is ideally suited for the computer museum to house Digital equipment beginning with the first whirlwind models.

He added that Digital has been looking for space for a museum for several years, but "every time we found floor space, we decided it would be more economical to use the area for building or testing new computers."

Olsen, who introduced John Leng as plant manager of the Marlboro Digital complex, said that, although Digital is known as a manufacturer of minicomputers, the ones built in Marlboro will be the "king-size" DEC system-10, the largest made by the firm.

Of the 1,000 Digital employes expected to be employed in the Marlboro plant by mid-1974, many will be local residents, Olsen said. "We could conceivably have more local people, but it is not our policy to rob employes from other industries," he added.

Olsen said the Marlboro plant will bring the company to a total of 3.5 million square feet of floor space occupied by Digital plants worldwide.

Besides the headquarters in Maynard, "where it all started in 1957," Olsen said, other plants in the Bay State are located in Westminster and Westfield. Digital also has plants in Puerto Rico and in Ireland.

Grow Carefully

"Why did it take us a year to make up our minds to move to Marlboro?" Olsen answered his own question by reminding the audience that it always has been the policy of Digital to "grow carefully and with caution."

Besides, he said, "many people didn't want to leave the old mill." Olsen noted — in tracing the history of Digital — that the former American Woolen Mills building where the first Digital computers were designed was taken over floor by floor in keeping with the company policy of caution in growth.

In fact, Olsen said that when Digital was developing, "growth wasn't important . . . we just wanted to a job we could be proud of."

He said that when Digital started, they didn't want government money, and, in addition, unlike most other companies, were determined to be a profiit-making industry.

The $70,000 that Digital borrowed to get started, was taken with the promise "that we'd make money," Olsen said. In answer to a question, Olsen noted that the $70,000 loan has never been repaid, but those who lent the money now own 80 per cent of Digital stock.

Founded in 1957

Founded by Olsen in 1957, Digital occupied 8,500 square feet of floor space in the Maynard mill, and there were three employes. Olsen noted that one of his chores, in addition to designing the early computers, was to fill in as janitor.

Today, the company has more than 13,000 employes worldwide, with more than 7,500 of these in its Massachusetts plants. Digital ranks second to IBM in the number of computers installed worldwide, but is the world's leader in the minicomputer field.

It manufactures more minicomputers than all other computer companies combined.

Olsen noted that the first true minicomputer was the PDP-5, introduced by Digital in 1963. This handmade machine, costing $27,000, created a market that industry analysts estimate will top the $1 billion mark by 1975.

By contrast, the DECsystem-10, the computer to be manufactured in Marlboro, will cost up to $2 million, depending on the use it will be put to. It is a time-sharing computer, which can be used by several customers

Olsen cautioned the Rotarians that he cannot guarantee that Digital will not go the way of RCA (which dropped the computer business and closed its Marlboro operations about two years ago) but "we intend to keep designing and making computers as if we were going to be there forever."

He added that the move to Marlboro was made, "because we needed the space . . . and I feel we're wanted here."

2/21/74

Sally Burch Lymberg
779-6601
Bolton

Telephone Notes on her background:

Librarian for Architects Collaberative
Established the library.

Completed design courses in electrical, mechanical, civil engineering around 1958 at U. of Arkansas--they would not let a woman go in the field so she did not get her degree.

Geo Physics Corporation of America?
Established library right after Sputnik--had to do with documentation of government secrets on a computer.

Reflectron Electronics, Conn.
Simulation for B-52, worked with Director of Research and Engineering in setting up and coordinating all information necessary for simulation. Did navigation programming on the computer for the Japan "C".

Sperry Rand, Norwalk
International Section of Business machines.
Worked for Marshall Truex, VP of patents. They decided to coordinate and collect all information on Sperry Rand and go back to first computers. The place where the action was, was not where the interest was, so the project died. They did decide to go ahead with the business machines--forgetting the computers. She was in charge, started it up, and completed this museum, which I guess is a big success.

She has worked with Chuck Stevens, MIT, Lin. Lab (1717 K St., N.W., Wash. 20036.

On call at Simmons to talk to the class on systems analysis.

Worked at Intelek

Working/charter member of every society involved with computers. Has these contacts, many of whom would be willing to publisize and help procure things for the sake of history.

Worked with IFIPS ,collecting a listing of international programs on computers to be shared with the Europeans.

Doing work now on a consulting basis for Lin. Lab trying to standardize the information for catalogues and requests for information between university programs on a computer.

3/18/74 visit
has contacts, friendly,
Starter.

2/21/74

Gordon,

A friend of Sally Lymberg told her about our museum article in the Marlboro paper.

She is extremely interested, has been for several years, in the idea of a computer museum. She wanted to know if it was going to be international not just DEC.

She seemed to be a very energetic, enthusiastic woman, with great credentials for this project.

I made an appointment for March 18 and have already set up Ken, and Roy Gould, Bob Reid. With her programming background I thought Portner would be interested too?

The attached is only a smattering of what she said--I couldn't get it all down.

mj

digital INTEROFFICE MEMORANDUM

TO: Gordon Bell

DATE: March 15, 1974

FROM: Jim Bell Jim

DEPT: R & D Group

EXT: 2764 LOC: 3-4

#2

MAR 20 1974

SUBJ: Dr. Sumner

Attached is a copy of the telex arising from your request via Ira Potell. Apparently, Dr. Sumner in return wants a copy of your Atlas 1 manual if possible. You should work through Peter Burton of our Manchester office on this matter.

JRB:cw

Attachment

who he I don't know any

To: Peter Burton
cc: Roy Gould
We're in the process of collecting manuals, photos, and sample parts from ~~old~~ early and significant computers for the a ~~possible~~ DEC museum. I would very much like these for MU 1, 2, 3, 4, and 5.

F/6 4/11
from G. Bell 4/11/74

SUBJ: DEC MUSEUM IN MARLBORO COUNTRY
Note: This is a draft--Ken, please read before I send out. Roy and I should co-author this.

Roy, please review. any comments? MJ

←←

We have a great opportunity to establish a computer museum in the Marlboro building, in what would otherwise be totally useless space. Several of us have the interest to embark on this project; once set up, the incremental personnel operating expenses will be constrained to about 2 people.

Webelieve it may turn out to be financially rewarding, although it is difficul to justify. Its uses include:

1. Being used to exhibit computers to the local and computer community.

2. Establishing us as an intellectually serious vendor via its embedded lecture hall for multiple functions.

3. Showing our working computers and products.

4. Showing our own past and present technology.

5. Using it as a liaison to various U.S. and European laboratories and universities who were also computer midwives.

6. It would be a possible place for technological and business historians to visit by placing our own literature there plus company archival data.

7. It being a place to collect books, manuals, computers, and technology outside of DEC.

The 20,000 sq. ft. museum could be utilized in the following ways:

1. Historical time line (family tree) evolution of minicomputers utilizing our NCC exhibit. This would show EDSAC (we have to get a part from Cambridge), Whirlwind (a bay and some peripherals), TX-0, PDP-1, PDP-4, and on to various 8 and 11's. Here we could show off-shoots like the Indian 8, 11; Cuban 8, DCC, Hungarian, Sue, Sprague modules, and ITT's copies.

2. As a really nice conference/seminar hall for: a museum lecture series, press conferences, PDP-10 lectures, IEEE and ACM meetings, some of our own meetings. This would be reserved 1/2 time for these activities. It should hold about 50 to 100 people.

3. Working DEC computers: PDP-1 and NSA super console PDP-4 with space war, ...PDP-11 with moonlander, terminals to various machines. People could visit this just to look at and use our various consoles.

4. Technology displays. We have many exhibits that can be set up from time to time. Eg., history of displays from

SUBJ: DEC MUSEUM IN MARLBORO COUNTRY (1026) 4/16/74

TO: Operations Committee
Product Line Managers

From: Gordon Bell
Roy Gould

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set up from time to time. Eg., history of displays from Whirlwind and includes our first color and first precision displays. Also, we had first UART in 62--show the package evolution to UART on a chip with chips and microphotographs. In general, this would cover computers, computer parts, and technology (eg., logic, displays, printers, tapes, power-supplies).

5. Computers from universities, research labs and other vendors.

6. A place for machine and programming manuals for us and for the above technologies.

7. DEC archival information on computers and business.

8. A place to debug trade-show booths.

9. Historical computer books.

MODUS OPERANDI:

The museum will report to Roy Gould, who will hire a curator to live there for day-to-day operations, collect, guide and buy various internal services. A board of directors, consisting of Roy, the curator, myself, Ken, and 2 other people, will guide them, review plans and establish priorities. The operating budget will be presented to the F&A Committee.

ACCOMPLISHMENTS SO FAR:

Already, Ken has established the basis for our having the most significant operation because we have Whirlwind (first mini, core, microprogramming, display, tape, and A/D). Also a great trading basis. We have the TX-0 (first transisterized machine) which will be operational! All our prototype machines are available and work. I've collected parts from ACE (UK-Nat. Phys. Lab), a 650, a 704, MIT Dif. Analyzer.

GB:mjk

~~Attachment: Museum Budget~~

Copies: Gordon Bell
Ray Gould ✓

APR 29 1974

SANDERS ASSOCIATES, INC.

CORPORATE HEADQUARTERS
DANIEL WEBSTER HIGHWAY, SOUTH
NASHUA, NEW HAMPSHIRE 03060
PHONE: (603) 885-5182

In reply refer to:
0-1160-74-65
25 April 1974

Mr. Kenneth H. Olsen, President
Digital Equipment Corporation
146 Main Street
Maynard, Massachusetts 01754

Dear Mr. Olsen:

The last time I talked with you, about a year ago, was at the Finance Executives Institute where you were the guest speaker. At that time, I indicated that Sanders Associates, Inc. had an operative PDP-1 and inquired as to the number still in use. You were not certain of the exact figure but indicated there were relatively few and also indicated that you were not aware that Sanders had this computing system.

It has served well our purposes here and still is in excellent operating condition. We recently have concluded that the usage of this computing system is so marginal now that we would like to dispose of it. Recognizing that the market for used computing systems is unstable, I should like to inquire whether DEC would be interested in acquiring this system from Sanders, in view of its age and excellent operating condition. It might be that you people would want to display it somewhere or perhaps cannibalize it to maintain similar PDP-1 systems.

I would be appreciative if you could let me know, or if you would forward this inquiry to the appropriate executive at DEC. To help in assessment of your interest, attached is a configuration of our PDP-1 computing system.

I will appreciate any interest on your part.

Cordially yours,

SANDERS ASSOCIATES, INC.

E. B. Matthews

E. B. Matthews, Director
Corporate Computer Sciences

EBM/ilb

Attachment

cc: E. Gettel

SA-00-37 (3-69)

digital

Museum

June 11, 1974

Miss Jane Pughe
Asst. Keeper, Computing Section
Science Museum
Exhibition Road
London, SW7, England

Dear Miss Pughe:

It was a pleasure talking with you on Friday, June 7, regarding possible interaction with you and the Science Museum. Professors Wilkes and Randall have spoken enthusiastically of your efforts and exhibits at the Museum.

I'm interested in some means of cooperating with you in the establishment of our own DEC museum in Massachusetts. DEC is a manufacturer of mini (and larger) computers with sales of about $400M (about 1/3 of which is in Europe). It was founded in 1957, and its antecedent machines include MIT's Whirlwind and the Lincoln Laboratories TX-0 and TX-2. A booklet of DEC is attached. Our own museum will include parts of Whirlwind, the TX-0 (operational), other machines (operational) and various technological parts.

The cooperation we might explore:

1. Exchange of computers or computer parts with the Science Museum. We have nearly all of Whirlwind. Also, we have parts or complete machines of our early DEC machines. I (and Prof. Wilkes) feel that Whirlwind should be represented in your museum. Similarly, I believe it might be interesting to have a working U.S. machine (minicomputer) exhibit, too.

2. Your acting as a purchasing agent for early British and European, computing instruments for me. Here, I would like to personally buy machine parts which could be loaned to our museum; I have no intention of having our corporation buy parts which would not have wide appeal to the general American public. Since you have knowledge of this field, I would like to prevail upon you to consider such an arrangement. (I will wait until I hear from you before I contact Sotheby's 1 Bond St. W1). This arrangement would have to be cleared through the Science Museum.

3. Since we (I and others directly involved in our own museum) are considering a museum, we would like to have benefit of your counsel from time to time.

4. As a student of computing machinery, I would like to establish contact, because I may write other books about computing. Enclosed is a book

written by myself and Allen Newell of post Von Neuman computing; and this may eventually go into another edition.

Please consider the above possibilities, and I look forward to hearing from you, and eventually visiting with you.

Sincerely,

Gordon Bell

Gordon Bell
Vice President, Engineering
Professor, Computer Science
Carnegie-Mellon University (on leave)

GB:mjk

cc: Ken Olsen
Geoff Shingles
Roy Gould
Sally Lymberg

Museum

UNIVERSITY OF MINNESOTA
TWIN CITIES

Bio-Medical Library
Diehl Hall
Minneapolis, Minnesota 55455

7.4.1

July 15, 1974

Ms. Sally Birch Lymberg
Museum Consultant
Digital Equipment Corporation
146 Main Street
Maynard, Massachusetts 01754

Dear Ms. Lymberg:

Audrey is no longer directly associated with the mini-computer project at Bio-Medical Library, so I am taking the liberty of responding to your letter. We hope your tape deck was recovered, but suspect that it wasn't.

We do have a mailing list, and I have added both you and Mimi Cummings to it. We will send copies of earlier reports that may be of interest, and will include you in the future dissemination of this information. Our next progress report will be in late August or September.

There is no connection between our project and the University of Illinois. Glenn Brudvig, Gene Lourey, and Audrey presented papers at a meeting held there in May of this year.

About the project -- as you probably know, we are building a comprehensive integrated library operations system to include acquisitions, serials management, cataloging, reference services, and circulation. Patron services will be added in the future. The system is being written in assembly language (MACRO-11) for the PDP-11/40. We are writing all of the software including the operating system. Sorry we can't say we are using DEC software, but sales can take heart from the number of libraries that want to install the completed system, and the fact that it will only run on a PDP-11.

Thanks for your interest in our project, and if you are out this way, please come visit us.

Sincerely,

B Denney

Bob Denney, Co-Director
Mini-computer Project

To: Roy Gould + Sally + Wold.

SCIENCE MUSEUM

South Kensington London SW7 2DD

Telephone 01·589 6371 ext

JUL 30 1974
7-32

Professor Gordon Bell
Vice-President, Engineering
Digital Equipment Corporation
146 Main Street
MASSACHUSETTS 01754
U S A

Your reference GB:mjk

Our reference 100/123/13

Date 24 July 1974

Dear Professor Bell

First of all please let me apologise for the delay in replying to your letter of June 11th. This has been due to circumstances quite beyond my control, and I assure you it does not at all reflect a lack of interest on my part to the content of your letter.

What can we do here?

I will answer the points raised in the same order. Concerning exchanges of objects, this can be a possibility, depending on the items involved. If you could give me a better idea of exactly what sort of artifacts you are looking for, I hope we will be able to come to a mutually satisfactory agreement. I am certainly very keen to have some parts of a Whirlwind, for instance.

I have been advised that I may be able to act as a purchasing agent for you, provided that this did not conflict with my Museum work and interests. It is not clear whether you are interested in just computers or also early calculating machines and mathematical instruments. Again I would be grateful for details of what you think this would involve, as it will have to be considered by senior officers here.

As to the other points, I shall be most pleased to give you any help and advice that I can for your new Museum etc. I was delighted to receive your book, thank you very much indeed. We had not seen a copy before, and it has already proved most helpful in the preparation of one part of our forthcoming exhibition.

I look forward to hearing from you.

Yours sincerely

E Beeklake

pp Jane Pugh
Assistant Keeper
Department of Astronomy
Mathematics & Earth Sciences

Also a Kit of DEC Stuff. Let's start by an offer

digital INTEROFFICE MEMORANDUM

TO: Ed Schwartz

cc: Ken Olsen
Gordon Bell

DATE: July 30, 1974

FROM: Roy Gould

DEPT: Trade Shows

EXT: 2302 LOC: PK3-2

SUBJ: Museum - Non-Profit Organization

Would you please check into the possibility of setting the <u>Digital Computer Museum</u> up as a non-profit trust, foundation, or corporation whichever is appropriate. This would aid us in donations of displays as no one will donate to a profit organization. This is part of the problem we are having with MIT turning the TX-Ø over to us.

I have enclosed a study done by Harvey H. Lippincott, Corporate Archivist for United Aircraft, for your information.

jac
enclosure

Computers have changed our lives — they solve our little problems and our big ones, like directing air traffic.

The computer revolution

By Isaac Asimov

Calculating devices of one sort or another are as old as arithmetic. As soon as primitive man got the notion of numbers, he used his 10 fingers as a device for keeping track, and for adding and subtracting.

Then came the abacus, which used pebbles or counters in rows of 10, like many sets of fingers. One row kept track of the units, the next of the tens, the next of the hundreds and so on. Centuries later came the move to mechanize the process — to make as little of it as possible the result of human manipulation, and as much of it as possible automatic.

In 1642, the French mathematician Blaise Pascal invented an adding machine consisting of a set of wheels connected by gears. Each wheel was marked with the digits from one through nine, plus a final zero. By turning the wheels backward and forward the proper amounts, numbers could be added and subtracted and the results read off the device. In 1674, the German mathematician Gottfried von Leibnitz arranged wheels and gears in such a way that multiplication and division also could be done.

These machines were curiosities and didn't come into wide use. But in 1850, an American inventor, D. D. Parmalee, patented a machine in which the wheels weren't moved by hand, but by pushing down marked keys. That was the "cash register" which was *the* calculating machine of 1900 and for a number of years afterward.

Even the most advanced calculating machine in general use in 1900 was scarcely any advance at all over counting on your fingers. It did only the simplest arithmetical computations and it had to be supervised at every step.

However, there were signs of something more than that. If one had a simple and repetitive task to do, could one "instruct" the machine once and for all and have the machine do it without further human supervision?

In 1900, something of this sort was only three years old. It was the pianola or "player piano," which reached the peak of its popularity in the 1920s. A roll of stiff paper was perforated in a careful pattern and that pattern was the instruction. By the action of foot pedals, air could be blown through those perforations to activate piano keys.

Such punch-card techniques were invented in 1804, by a French weaver Joseph Marie Jacquard. The presence or absence of holes in this place or that on a rectangular piece of cardboard depressed or raised the threads and created automatic designs in silk-weaving.

In 1822, English mathematician Charles Babbage thought of using punch cards to guide a calculating machine. By using

continued

This is another in a series of articles telling the story of the extraordinary scientific and technological developments of the 20th century.

a proper combination of holes, a sufficiently complex machine could be instructed (or "programmed") to do every kind of mathematical operation known to man. Babbage spent years trying to build a machine that was sufficiently complex for the purpose but failed. His theory was perfect but the mechanical techniques of the 19th century were insufficiently sophisticated.

Simpler punch-card calculating machines were working by 1900, though, and they were improved over Babbage's attempt by using electricity to move the gears rather than mechanical pushes and pulls.

As the decades of the 20th century passed, there was a constant and growing need for mechanical devices that could do calculations of a more and more complex kind in less and less time. With advances in science, complicated equations of all kinds had to be solved; and as social life grew more complex, more and more statistics had to be analyzed.

First computer was a giant—but it wasn't fast enough

In 1925, American electrical engineer Vannevar Bush constructed a machine capable of solving complicated "differential equations." It was a successful version of what Babbage had tried to do a century before, but it still worked with mechanical switches and wasn't fast enough.

In 1937, Howard H. Aiken, who was working at Harvard for his Ph.D., produced plans for a complicated device that would solve differential equations by using electrical rather than mechanical switches. The device was completed in 1944 and was called "Mark I."

It was the first large-scale automatic calculating device — the first machine we could call a "computer." It weighed five tons, had more than 3,000 electrical relays and 500 miles of wiring. It could add and subtract 23-digit numbers in three-tenths of a second and multiply them in six seconds.

Yet that still wasn't fast enough. Even as Mark I was being constructed, World War II was raging and the need for faster computations was growing.

In place of the electric switch, there came the electronic switch. Instead of closing a contact by an electromagnetic pull, there came the much faster stopping and starting of a flow of electrons in a vacuum tube.

By 1946, a vacuum-tube device was completed under the direction of John P. Eckert and John W. Mauchly at the University of Pennsylvania. It was called "Electronic Numerical Integrator and Computer"; in abbreviated form, ENIAC. It was the first *electronic* computer. It contained 19,000 vacuum tubes and was much faster than Mark I, but it weighed 30 tons.

Hungarian-American mathematician John von Neumann suggested methods whereby the computer could store not only the data fed into it and the results it obtained, but even the operating instructions. It was then unnecessary to start from scratch each time you wanted the computer to do some work: If you already had the general instructions stored in the machine, you merely introduced the necessary modifications.

Once the transistor became practical in the early 1950s (see "The Electronic Revolution," Modern Maturity, June-July 1974), it became possible to replace the comparatively bulky vacuum tubes by the much tinier and much more rugged transistors. The result was that computers became much smaller without becoming less complicated.

Punch cards vanished, too, for it was found that data and operations could be stored on magnetic tapes far more concisely, so that even a moderate-size computer can have an enormous memory. As time went on, various "computer languages" were devised, each closer and closer to ordinary English. Now it is almost as though you can talk to a computer and have it talk back to you.

Computers worked so rapidly that almost any reasonable problem could be answered in a matter of millionths of a second. Even if many problems were fed into it at the same time, the computer could solve one after the other and even the last person in line would not be aware of having had to wait.

Don't blame the machine when you find an error

In 1965, therefore, the concept of "time-sharing" was introduced. Many different people could have a typewriter connected to the computer, some at considerable distances. Each could use the computer freely, taking his turn, without ever being aware of delay.

As early as 1948, two years after ENIAC, small electronic computers were being produced in quantity; within five years, 2,000 were in use; by 1961, the number was 10,000; by 1970, the number had passed the 100,000 mark — and it is still going up rapidly.

Computers have become essential for keeping government statistics in order in these days of income tax, Social Security and welfare. Scientists have used them in solving problems in every field. Businesses use them to keep track of a thousand matters from warehouse items to orders to billings. Computer memories are serving everyone now, even when they are scarcely aware of it.

And what of the future? Will computers ever take over? So far, there's no question of that. They are still loyal servants of mankind, doing what they're told, and when they make a mistake, it is never the computer that errs, but the man who has given it its instructions.

And the annoyance with mistakes is completely overwhelmed by the convenience of what computers make possible for us at every moment.

Box 315
Bolton, Massachusetts 01740
August 5, 1974

Computer History Project
Smithsonian National Museum of
History and Technology
Room 4601
Washington, D.C. 20560

Dear Sir:

The IEEE Spectrum of February 1974 had an article by Henry Tropp, former investigator for the Smithsonian History Project. Do you have any bibliographies or descriptive material of the contents of your project that are available at this time?

I am very interested in tracing certain points in the history of computers for a research project. Is it necessary to visit the Smithsonian and your Computer History Project in order to use the material?

Sincerely,

Sally Birch Lymberg
Research Librarian

SBL/jac

no answer!!

digital INTEROFFICE MEMORANDUM

TO: Roy Gould

cc: Marietta Ethier

DATE: 12 August 1974

FROM: Ed Schwartz

DEPT: LEGAL

EXT: 5500 LOC: Maynard PK-3/2

SUBJ: MUSEUM

X-4288

I have asked Marietta Ethier of my department to look into the pros and cons of establishing the museum as a non-profit corporation.

In addition, we want to check out the various tax laws to be sure that even if we can establish it as a non-profit corporation that it would have the benefit of tax free status so to take advantage of contributions, as you indicated.

I trust that Marietta will be in touch with you shortly.

lml

Danish National Tourist Office

Art and nature blend at Louisiana Museum in Danish countryside

Denmark's indoor-outdoor museum

Three million people have visited rural 'cultural milieu' since 1958

By Diana Loercher

Humlebaek, Denmark

If you visit Denmark, don't pass up its most popular, and most unusual, museum. Traditional museums tend to be gray stone monoliths, cold storehouses of culture which intimidate the visitor with their vast

Art

treasures. Moreover, the urban location of most major museums enhances this atmosphere of institutional formality.

The Louisiana Museum of Modern Art, a few miles outside Copenhagen bears little resemblance to its predecessors. Designed in 1958 by Jorgen Bo and Vilhelm Wohlert and completed in 1958, the one-story building is made of whitewashed brick, red clinker, teak, and pine, and has a light, airy, informal quality that reminds one more of a ranch house than a museum. Moreover, it sprawls, twists and winds in an irregular fashion that obviates the monotony on the traditional museum design and introduces an element of perpetual surprise to the visitor's wanderings. The rooms also tend to be spacious and light, and the atmosphere lacks of oppressiveness. One almost feels as if one were outside while inside, and impression which owes much to the fact that windows are everywhere, facing out onto the sea, the sculpture garden and into the woods. One of the most striking instances of the harmony between art and nature is the square high-ceilinged room filled with Giacometti's slender, spare figures which look like reflections of the trees and reeds outside the huge window which fills an entire wall of the room.

Dynamic director

Louisiana's dynamic director is Knud Jensen who sold his cheese business nearly 20 years ago to open a museum of modern Danish art. He deliberately selected a nonurban location, in Humlebaek, North Zealand, on the property of a nobleman who called his estate Louisiana after his three wives, all named Louise. Since it opened, the museum has attracted 3 million people, an astonishing figure when one considers that the museum not only is outside the city but deals with modern art, which exerts increasingly little popular appeal. But the combination of Louisiana's scenic location, intensive program of changing exhibitions, and gradual shift in emphasis from the Danish to the international scene has apparently proved irresistible to the average person.

Moreover, Louisiana has become a major influence on the Danish art scene. One of its most important exhibitions held in conjunction with the Moderna Museet in Stockholm, "American Art 1950-1970," introduced pop art to Scandinavia. As Gunnar Jespersen, an art critic for one of Copenhagen's major newspapers, said of Mr. Jensen, "without him it would be rather boring to be an art critic in Denmark."

It is clearly the implementation of Mr. Jensen's museum philosophy that accounts for its unusual success. In a recent interview Mr. Jensen explained: "I hate the word education but in presenting a wide variety of material you do stimulate people's joy in looking at things. I guess you might describe my approach as 'art without tears.' There is a long tradition maintained by idealistic bourgeois people that people go to museums not for fun but because it's an obligation, a visit to the temple of culture. Then too there's the complexity of modern art which they have to deal with."

Denmark's indoor-outdoor museums

The result, Mr. Jensen feels, is that people often feel alienated, even diminished by museums, and part of his purpose in creating Louisiana was to "avoid the loneliness and unhappiness that the visitor often feels." To this end he endeavored to bring art down to human scale by integrating functional architecture, abstract art, and modern design even of the furniture with each other and with nature. His theory is that the unification of these various elements is conducive to a feeling of comfort and relaxation in which the art experience becomes a pleasure rather than an affliction.

In keeping with this view Mr. Jensen hopes to turn Louisiana into a "cultural milieu," similar to the Museum of Modern Art in New York and the Stedelijk Museum in Amsterdam, where films, concerts, and theatrical performances also are held. Art, according to Mr. Jensen's view, should be a "a social event" and the museum a place to experience "togetherness" not only between the various people and between the various arts but between art and life.

August 19, 1974

Mr. Roy G. Gould
Exhibits Manager
Digital Equipment Corporation
146 Main Street
Maynard, Massachusetts 01754

Dear Roy:

In a conversation with Sally Lymberg this week, she said you were interested to learn some of the legal advantages and disadvantages of setting up a company museum as a company owned museum and a non-profit organization. I am happy to pass on to you my findings as a result of my company museum study. The findings, of course, reflect Connecticut law and may be different in Massachusetts law.

It certainly was a pleasure to meet with you and Sally last week, and I wish you every success in your endeavors to establish your company museum.

Sincerely,

Harvey H. Lippincott
Corporate Archivist

HHL:dc
enc.
cc: Mrs. Lymberg

Factors in Establishing and Maintaining a Company Oriented Museum

Federal and State Income Taxes. Company contributions to a Connecticut membership corporation to form or maintain a museum could be arranged to be either a charitable deduction or an "ordinary and necessary" business expense.

A contribution by a corporate foundation to a museum would, of course, be a valid contribution if the museum had an exempt ruling under section 501(c) (3) of the I.R.C. A museum open to the public which displayed past products of a company and provided historical and educational material probably could get a Federal exemption. It would be a "private foundation" unless its receipts (contributions or admission fees) from the public were at least one-third of its total receipts, but the primary disadvantage would only be a 4% tax on any investment income, which probably would be negligible. Contributions could be cash or the fair market value of any property given to it.

Property Taxes. A Museum holding a Federal exemption as a charity probably would not be subject to the Real Estate Property Taxes, under Section 12-81(7) of the Connecticut Property Tax Law. Section 12-89 of that Law provides that town Assessors shall determine the exemption status of such organizations. It would seem likely that an agreement on this point could be reached.

Form of Organization

The most serious legal problems are the tax considerations. However, no particular form of organization is required to obtain tax exempt status under the Internal Revenue Code. Generally, a non-profit organization such as a museum would take one of two legal forms: a membership or non-stock corporation, or a trust. Some states have enacted statutes which provide for the establishment of non-stock corporations with minimum expense and effort. The charitable trust is a creature of the common law. Either could be used to establish the museum. The corporation would be required to file annual reports with the Secretary of State, but these are brief and not a serious problem. Often the choice between the corporate form or the trust form is made on the basis of a comparison of the powers and liabilities of directors and trustees. Trustees' powers are more limited and the extent of their liabilities is less certain than is the case with directors.

Advantages and Disadvantages of the Forms of Organization

As previously mentioned the museum organization can be handled two ways, depending upon the use to which the company wishes to use it.

It could be:

1. A wholly owned company facility

2. A non-profit, tax exempt corporation, foundation or trust supported by the company.

In usage and in cost advantages, neither way is entirely advantageous for the company.

If the museum were wholly company owned, advantages would be:

1. Full company control of the museum and its presentation, thus insuring that the presentation is fully satisfying to the company and correctly reflects its image.

2. Full, unrestricted use of the museum for any purpose, including sales promotion, engineering studies, technical presentation, public relations and the like.

3. A likelihood that the cost of the museum, at least its annual operating expense, as a valid public relations and business expense can be included in general overhead and administrative costs used in price negotiations would be acceptable to the government. Such would not be acceptable if the museum were a separate non-profit corporation or foundation.

Disadvantages would be:

1. Loss of town or city property tax exemption for the museum.

2. Possible over-balance of company control and dictation could adversely affect the museum's mission, presentation effectiveness, and quality.

If the museum was owned by a non-profit, tax exempt corporation, trust or foundation, supported by a company, advantages would be:

1. A higher degree of permanency should company control, policy or direction change. While obviously affected, the fortunes of the museum would not be directly tied to that of the company. The museum might possibly be able to refinance and continue to function independently of a company. It would be harder for an unsympathetic company management to arbitrarily shutdown the museum and disperse the exhibits.

2. More autonomy for the museum to establish its own operating and exhibition policy without outside distraction which would possibly result in greater operating stability for the museum and ensure a continued high quality professionalism.

3. Availability of town or city property tax exemption.

4. Availability of state sales and other tax exemptions.

5. Exhibits would be the property of the museum and not subject to possible disruptive requirements or removal for other company interests.

Disadvantages would be:

1. Outside of customer tours of the museum the company would be unable to utilize the museum for business purposes, such as sales and technical presentations, meetings and promotional usages. Such usage would prevent the museum to hold a federal tax exemption. Without such an exemption, a non-profit museum depending upon donative and charitable support cannot survive.

   However, it may be possible to get around this problem by renting facilities and selling services to the company. However, these services would have to be available to anyone or any organization at the same rates with all funds so earned used solely in the museum operation and improvement.

In summation:

1. From an overall write-off standpoint it will make little difference whether the company writes off the museum building construction and annual operating expense as a public relations business expense or as an outright grant for donative write-off to a non-profit organization. There is little advantage one way or the other. The bill is the same.

The probability of expensing the museum cost in general overhead and administrative expenses in product price may balance out the loss of town or city property tax.

2. To maintain an acceptable company image and presentation, a very liberal amount of support from a company would be necessary if the museum were a non-profit corporation, trust or foundation. Under these circumstances, it would be very difficult to raise outside funding to support a company oriented museum.

Control of the Organization

A company would wish to be sure that any organization created would continue to carry out the purposes for which it was established.

In the case of a non-stock corporation this would be accomplished by providing in the certificate of incorporation that there would be no voting members and that at least a majority of the Board of Directors would be current employees or officers of the company. The trust agreement would require that trustees receive the approval of the company.

Liability of Directors or Trustees

The law places heavy responsibilities on both trustees and directors of charitable corporations. The organization documents should be drafted to limit their liability and to provide for indemnification to the extent possible. As indicated above this is somewhat easier to achieve in the case of the non-stock corporation.

Name

If the museum is created as a non-stock corporation under Connecticut law, it must include "Corporation", "Incorporated", "Corp." or "Inc." in its name. If it is established as a trust, this is not necessary. However, if incorporated, it can reserve the name and prevent others from using it.

Right to Property upon Dissolution

Since a company would either be constructing a building for the museum or providing the funds so that the museum can construct the building and exhibit it would naturally wish to protect its investment by insuring that in the event the museum ceases for any reason to continue to operate, the title would return to the company. Accomplishing this does raise tax problems in that it could affect the museum's tax exempt status.

Corporate Archives
United Aircraft Corporation
August 19, 1974

digital INTEROFFICE MEMORANDUM

TO: Roy

DATE: August 21, 1974

FROM: Sally

DEPT:

EXT: LOC:

SUBJ: Future Conference on Museums.

Ned Pearce, Boston Museum of Science, has given me the following conferences which might be of interest to Digital:

1) American Association of Museums, New England Conference
   Augusta, Maine
   State of Maine Museum
   September 27-30

X 2) Seminar on Operations of Small Foundations (with part emphasis on usefullness to company sponsored museums, exhibits, etc.)
   Conducted by American Bar Association
   Winston-Salem, North Carolina
   November (dates will be furnished if we are interested)

Agendas for both meetings are available upon request.

The first meeting is supposed to discuss changing trends in museum operations based on actual expenses. The second meeting is more for function and legal methods rather than operational procedures.

X Get info please

digital INTEROFFICE MEMORANDUM

TO: ~~Gordon Bell~~

Roy Gould

cc Sally

DATE: August 26, 1974

FROM: Jim Bell Jim

DEPT: R & D

EXT: 2764 LOC: 3-4

AUG 27 1974

SUBJ: Attached letter

What information on the Computer Museum do you have that I can forward to Bert Raphael?

JB:cw

Attachment

SRI
STANFORD RESEARCH INSTITUTE
MENLO PARK, CALIFORNIA 94025
(415) 326-6200

RECEIVED
AUG 20 1974

August 13, 1974

Dr. James R. Bell
Manager
Research and Development Group
Digital Equipment Corporation
146 Main Street
Maynard, Massachusetts 01754

Dear Jim:

Charlie passed your recent note on to me. Please send us more information about the proposed Computer Museum. It is certainly one of the possibilities we shall consider as a final resting place for Shakey (although I would miss having him around--he makes a nice quiet office mate now).

It is a pleasure to be back to the comforts and conveniences of SRI and the USA. Perhaps we can get together before too long.

Best regards,

Bert

Bertram Raphael
Director
Artificial Intelligence Center

BR:dt

digital INTEROFFICE MEMORANDUM

TO: ~~Gordon Bell~~

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cc Sally

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Best regards,

Bert

Bertram Raphael
Director
Artificial Intelligence Center

BR:dt

INTEROFFICE MEMORANDUM

TO: Roy Gould

DATE: August 26, 1974

FROM: Marietta Ethier Marietta

DEPT: Legal

EXT: 4428 LOC: PK3-2

SUBJ: Digital Computer Museum

1. Ed Schwartz asked me to respond to your memo inquiring into the possibilities of making the proposed Digital Computer Museum a non-profit entity. It is certainly possible. At the moment, I think a corporation, chartered under Chapter 180 of the Massachusetts General Laws (popularly known as the charitable corporation statute) might be the most flexible form of organization. However, leaving that consideration aside the question becomes whether a non-profit entity is the desirable operating vehicle for the proposed museum.

2. I have set forth below a comparison of the company-owned concept and the separate non-profit approach with reference to several important features.

	Independent Non-Profit	Company Owned
Taxes:	Other things being equal, Larry Ricci informs me that there is no distinct advantage either way. If company controlled contributions to the museum, in whatever form, could probably be labeled as advertising for the most part, and, therefore, an ordinary and necessary	

	Independent Non-Profit	Company Owned
Taxes: (Cont.d)	business expense. Contributions to a legitimate non-profit entity would be a charitable deduction. (There is a maximum level but Larry thinks we probably would never reach it). However, in order for the contributions to be classified as charitable and, therefore, deductible, the non-profit entity would have to qualify under the Internal Revenue Code as a tax-exempt organization and would have to conduct its affairs so as to maintain this status.	
Control:	All control rests in the managing body - A Board of Directors elected by members in the case of a corporation and the trustee or trustees for charitable trusts. (Note if in the corporation charter or by-laws, we attempt to severely	Total unrestricted control.

	Independent Non-Profit	Company Owned
Control: (Cont'd)	limit membership to DEC officials or employees or at a minimum attempt to assure that a majority of members would be DEC affiliated, or if the Trustees have to be approved by DEC, this might mean denial of a tax-exempt status initially; or possibly loss of it eventually. - I don't think the Trustees of a charitable trust could be DEC officials).	
Use for Promotional Purposes:	Almost any use of the museum for advertising or promotional purposes by DEC would probably result in loss of tax-exempt status.	As with other company-owned divisions the facilities can be used for any legitimate purpose.

	Independent Non-Profit	Company Owned
Use of Museum Facilities:	DEC would probably have to pay for use of museum facilities and services. Again, unrestricted free use might result in loss of tax-exempt status. Also, technically, competitors might also be entitled to use of the facilities on the same basis as DEC.	Free unrestricted use.
Availability of Donations:	Clearly, this is the biggest advantage. The museum's tax-exempt status would allow corporations and individuals to deduct the actual cash value of their gifts to the museum and the non-profit, separate identity status would provide justification to	DEC might have to rely on loans, if they can be arranged, or resort to outright purchases.

	Independent Non-Profit	Company Owned
Availability of Donations: (Cont'd)	other entities, such as universities, in making such gifts, not opening them to the charge of giving away university assets to a profit making corp.	
Irreversibility:	A gift is a gift, is a gift! Property given to the museum would probably be forever loss to DEC. Loans could be arranged, but then DEC would lose at least some tax benefits.	

3. There are, of course, other valid and important social considerations which are well outlined in Mr. Lippincott's memo entitled: "Survey of Company owned, sponsored and supported museum." (See especially page 2).

4. Briefly, in order to achieve and maintain tax-exempt status so as to attract donors, the museum would have to operate somewhat autonomously. Does DEC want to relinquish that amount of control?

5. The pros and cons should be weighed carefully, thoroughly discussed and considered. At least during the organizational stage, I would recommend that the museum be kept within the corporate structure. In the long run, my feeling would be to maintain it as an integral part of the corporation until such time as it becomes evident that the museum's success will be greatly compromised by its' inability to attract badly needed gifts. We can always convert it to a non-profit entity, but we can't easily reverse the process.

ME/dt

digital INTEROFFICE MEMORANDUM

TO: R. Gould✓
L. Ricci

cc: Ken Olsen
Gordon Bell

DATE: 27 August 1974

FROM: John Fisher

DEPT: Administration

EXT: 4515 LOC: 12-1

SUBJ: Museum

I believe that the changes to the tax law eliminated the benefit of giving inventory to charity but continued the benefit for depreciable assets. Accordingly, there may be a significant tax benefit in setting up the DEC Museum as a charitable institution and donating depreciable and rotation property to be used for the exhibits. It could be that the tax benefit from doing this would more than pay for the out-of-pocket cost of getting the museum started.

nkp

X 2237 Gordon Bell Gould X2302

SUBJ: CAPTAIN HOPPER

DATE: 08-27-74
FROM: GORDON BELL

* *
PLEASESEND TO: BOB LANE PK3-1
* *

Roy Gould
Lou Darannne
you are following on this?

SUBJ: (HONOPARIUM) GIFT TO CAPTAIN HOPPER

To: Distribution

CC: Ken Olsen

We need to give Capt. Hopper something besides the expenses. I don't think a financial honorarium is appropriate.

Intel gave her a set of MOS processor chips, which she uses in her talks.

As soon as we get mini-COBOL on a PDP-8, would it be appropriate to send a CLASSIC-8? An 8/A board set might also be appropriate.

We really need a first rate exhibit which would be suitable for an office wall or desk. Also, we still have to trade a large exhibit of this type with UK's Science Museum.

Any ideas?

Lou
9.20

GB:mjk

Distribution

Roy Gould
~~Bob Lane~~ Geo Chamberlain
Sally Lymberg
Mike O'Connell

Yes, I've talked to Gordon. It's a case Bob basically leaves it
TPL.

THE MITRE CORPORATION

BEDFORD, MASSACHUSETTS

5 September 1974
B33-L65

Ms. Sally Birch Lymberg
Digital Equipment Corporation
Parker Street
Maynard, Mass. 01754

Dear Sally:

Under separate cover, copies of AC-6 Whirlwind I Computer (MIT Project 6345), AC-23 Memory Test Computer, and AC-31 Lincoln TX-0 and TX-2 Computer were sent to you.

These copies are for your retention.

Cordially,

Edward X. Casey

Edward X. Casey
Archivist

EXC/ecc

digital INTEROFFICE MEMORANDUM

TO: Gordon Bell
Ken Olsen
cc: Roy Gould

DATE: September 13, 1974

FROM: Sally Lymberg

DEPT: Museum

EXT: 2302 LOC: PK3-2

SUBJ: Museum Collection

I am making a list of objects that are available for a display in the museum. By this I mean pre-DEC material or artifacts from all companies. May I have your assistance in compiling an inventory? To avoid duplication, I have come up with the following list of the in-house collection:

1) Whirlwind et al
Ken ⟷ Roy

Parts from ACE (UK-NPL) (Gordon's references)

650 & 704 (Gordon's references)

MIT Differential Analyzer (Gordon's references)

Have there been any offers from outside sources for items such as manuals, old items, or old machines not listed above?

2) The following are from the Museum file (Roy's)

PDP-1
Early Manuals
ARC
CASINO
Museum Material
TXO
Nixdorf Computer
IBM - request for purchase of early objects

3) DEC - Early Prototype Machines
(Roy has list and will coordinate)

Upon receipt of this list, I can then begin to fill in any reference sources for documentation of outside equipment if it is needed. For Whirlwind, TXO et al, I look to Ken for suggestions on documentation or commentary. Lincoln Labs, MIT, MITRE, Boston Public, will all cooperate as well as ONR, Boston, as soon as we know our needs for manuals, reports, or documents.

Enclosure: Digital Museum Project

DIGITAL MUSEUM PROJECT

As a result of the research for the Digital Museum project, a resource file has been created. It consists of the following parts:

1) Historical File - alphabetical and chronological (3 x 5 cards)

2) Backup file for source material and information for the above

3) Bibliography of primary and secondary sources

4) Reports, correspondence, and reprints file on museums

Bibliography of references used with list of current literature as reviewed to establish two points:

1) What has been done already in computer museums, science museums, or exhibits in any related field.

2) What has been written about the same subjects together with trends for the future. This information covers subjects relevent to company sponsored museums, computer exhibits, history of computers, computation, mathematics, etc.

With this background research accomplished, I began to collect appropriate historical data without duplication of an exhibit already established as well as an awareness of what was already in planning stages in our fields of interest.

LIST OF MUSEUMS AND SCIENCE CENTERS VISITED:

Massachusetts	Boston Museum of Science Boston, Massachusetts
	Children's Museum Boston, Massachusetts
Toronto	Royal Ontario Museum Toronto, Ontario, Canada
	Ontario Science Center Toronto, Ontario, Canada
	Ontario Place (Civic Center) Ontario, Canada
	McMicheal Canadian Historical Museum Kleinberg, Ontario, Canada
	Pall Mall of Rothman Ltd. Toronto, Canada
New York	Corning Glass Museum Corning Glass Center Corning, New York
Connecticut	United Aircraft Company East Hartford, Connecticut

MUSEUMS VISITED BY OTHERS AT MY REQUEST:

New York	IBM New York, New York
Germany	Munich Museum Munich, Germany

MUSEUMS CONTACTED OVER PHONE FOR ATTENDANCE RECORDS:

Fruitlands Museum Harvard, Massachusetts	DeCordova Museum Lincoln, Mass.	Mass Dept of Education Boston, Mass.

ASSOCIATIONS AND INSTITUTIONS

American Association of Museums

Association of Science Technical Centers

Association of Computing Machinery

Computer History Project
Smithsonian Institute
Washington, D.C.

Federal Archives & Record Center
New England Archivists
Special Libraries Association

Codasyl

PERIODICALS

Museum News

"PEOPLE IN THE KNOW"

Last, but not least, I have collected a valuable source list of individuals, companies, librarians, and others who have already supplied source information for both Roy's and my use for the "Digital Museum Project".

Mimi Cummings in the DEC Corporate library has been a valuable asset in this research both inside and outside company history.

At present, potential museum source material is being kept in the library.

All names, addresses, notes on meetings, reprints of articles, and references are available.

BIBLIOGRAPHY

BOOKS

Bell and Newell; Computer Structures

Goldstein; The Computer from Pascal to Von Newmann

John Von Newmann; The Computer and the Brain

Nigel Hawkes; The Computer Revolution

Bowden; Faster Than Thought

Eames; A Computer Perspectence
(IBM Exhibit)

Brian Randall; The Origins of Digital Computers

Pamphlets on "Computer History Project"
Smithsonian Institute
Washington, D.C.

Encyclopedias, Computer Surveys, Technical Reports, Abtracts, etc.

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Museum News: 1974 January, February, March, April
1973 January, April, May, June, September, October, November, December
1972 January, February, April, May, September, November
1971 September

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digital INTEROFFICE MEMORANDUM

TO: Gordon Bell
Ken Olsen
cc: Roy Gould

DATE: September 13, 1974

FROM: Sally Lymberg

DEPT: Museum

EXT: 2302 LOC: PK3-2

go over with her

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Codasyl

PERIODICALS

Museum News

where

"PEOPLE IN THE KNOW"

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Whirlwind

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Nigel Hawkes; The Computer Revolution

Bowden; Faster Than Thought

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Guide to Massachusetts Museums, Historic Houses, and Points of Interest by Jerome and Cynthia Rubin

9/16/74

ROUGH DRAFT - MUSEUM PHILOSOPHY

In reviewing all the pages and pages of "historical stuff" about "history of", I find a definite pattern in my notes --- it's not original, it's the result of this recording. There are two basic ways:

1) By concentrating on the equipment and the technology
2) On the ideas and the people who conceived them.

I have chosen arbitrarily to give ideas and people first place -- I think it is the more interesting approach for PEOPLE.

This is important to me because I think it tells also a story about DEC -- which is People.

In ~~all~~ most of the books prior to the last two years -- 72/73, the approach for "history of computation" was based on first premise -- equipment/hardware.

In order to "translate" into the people position, I am accumulating a lot of information which has been ignored in favor of technology. I believe part of my job is to tell "how I see it" and why "it's that way" -- from basis of data reviewed. I also believe this is an important change in general and should be recommended as a difference in presenting material or information as a basis for display of facts.

digital INTEROFFICE MEMORANDUM

TO: Mike Rasdkin

cc: Larry Ricci
Roy Gould ✓
Gordon Bell
Ken Olsen

DATE: 26 September 1974

FROM: John Fisher

DEPT: Administration

EXT: 4515 LOC: 12-1

SUBJ: DEC Museum

I didnot make myself clear on the subject of donating property to a charitable foundation to start up the 'DEC Museum''. I don't think it is a question of selling versus donating property but rather it is a question of valuing unique and perhaps antique equipment. Certainly, this equipment has a limited value as a substitution for modern fourth generation computers. On the other hand, as unique, last of a kind'a la Smithsonian' it might be possible to get a sizable outside appraisal that would hold up for tax purposes. If you find there is any merit to this approach let's get together to discuss it and make a conclusion.

nkp

digital INTEROFFICE MEMORANDUM

TO: Roy Gould ✓
Cc: John Trebendis

DATE: September 27, 1974

FROM: Ken Olsen

DEPT: Administration

EXT: 2300 LOC: ML12/A50

SUBJ: SURPLUS FLEXWRITERS

In the surplus junk room there are one or two old flexwriters. You probably should put them aside and try to make them look in decent order for our museum, because they are the machines that we originally used in the PDP-1, and close to the original flexwriters in the old World War I movie.

/ma

John,

Let me know if they are safe there. If not I will pick them up & put them in storage with my other stuff.

Roy

DIGITAL COMPUTER MUSEUM & SCIENCE CENTER
"Marlboro"

Roy Gould OCT. 7 (?)
Presentation & Operations committee

BUILDING

Cafeteria area for the tower, 12,000 square feet, within the building. 3,000 square feet mezzanine and 9,000 square feet on lower floor.

ACCESS

Easily accessible from Routes 495, 290, 20, and 85. However, no walk-in traffic; i.e., accessible only by car, no public transportation available.

PARKING

Foresee no problems with parking. Lots are more than adequate.

FOOD SERVICE

The cafeteria could be utilized with extra security so as visitors would not be able to enter the plant.

COST OF FITTING UP

Cost of fitting up to ready the area would consist of:

1) Sprinklers
2) Electrical
3) Air Conditioning
4) Tile in some areas
5) Construct an entrance easily accessible from parking lot and create a walk to the door
6) Labor
7) Provide toilet facilities in museum area
8) Some lighting

Total cost: 95K

SPACE RENT

$14,400 per quarter
$57,600 per year

EXPANSION

Another 4,000 square feet available if Direct Mail is moved.

SUMMARY

The building in Marlboro is new and modern, however, it is referred to as the "old RCA building" and in Digital's family is just over a year old.

TENTATIVE
MUSEUM OPERATION PLAN

1) <u>WHAT WILL MUSEUM SHOW?</u>

The museum will show the history of the computer. This will begin by deplicting how man first learned how to count, the first counting machines, important steps in technology, hands-on demos will be used, up to our present day computers. All this will be done with graphics, copy, parts of machines, and actual machines.

2) <u>PROPOSED MUSEUM HOURS</u>

Sunday	11:00 AM to 4:00 PM
Monday	-Closed-
Tuesday	9:00 AM to 4:00 PM
Wednesday	9:00 AM to 4:00 PM
Thursday	9:00 AM to 4:00 PM
Friday	9:00 AM to 4:00 PM
Saturday	10:00 AM to 4:00 PM

Hours are designed so as not to have any affect on already existing peak traffic hours.

3) <u>ATTENDANCE</u>

a) I estimate that approximately 2,000 people will tour the museum per week. This figure should be greater during the summer months.

b) Attendance would be from DEC employees, DEC visitors, the general public, school and group tours, and general tourism.

c) I estimate that 1,000 will be on Saturday and Sunday; for example, the Fruitlands Museum in Harvard averages 600 on a Sunday during the summer months.

d) Weather, of course, is a definite factor on attendance.

4) <u>SCHOOL TOURS</u>

My figure of 2,000 should be average each week of the year do to the fact that when the heavy summer tourism season has ended, I anticipate a large turnout of schools during the winter months. Due to the scope of the museum, tours would be for fifth grade on up.

5) <u>PUBLICITY</u>

The Digital Computer Museum plans an extensive publicity campaign.

6) CENTENNIAL CELEBRATION

We anticipate heavy traffic at the museum, regardless of location, during these periods. Perhaps as much as 75-100% greater, especially on weekends.

7) ADMISSION

At the present time, there will be no charge for admission.

8) STAFF

Staff would consist of myself as cost center manager, an operations manager, an assistant, and a clerk for the gift shop. I see no reason for a curator in the true sense of the word. Future acquisitions and displays would be done by the Board of Directors of the museum.

In addition to the full time personnel, part-time students would be employed for the peak summer months as guides. Also, guard and custodian service would have to be contracted for through the Corporation.

9) GIFT SHOP

A gift shop would be incorporated into the museum selling such items as computer books, post cards, film and accessories, jewelry items made from IC's, paperweights, computer aided designs, photographs and drawings, etc., marked Digital Computer Museum.

The monies received here would compensate someone to work in the shop and anything above that would go into the operation of the museum.

10) MUSEUM AS A NON-PROFIT TRUST

At the present, our Legal Department is researching the pro's and con's of whether this is wise.

digital INTEROFFICE MEMORANDUM

TO: Bob Francisco

DATE: October 11, 1974

FROM: Sally Lymberg

DEPT: Museum

EXT: LOC:

SUBJ: Resources for DEC Museum

As per telcon and your check list, I understand you already have the following material:

PERIODICAL REPRINTS

Man & Computer
New York Times 1972

Denmark's Indoor/Outdoor Museum
Christian Science Monitor August 1974

Those Overlooked Business Machines
Hartford Times June 16, 1974

Port Gamble "A Logging Museum"
Christian Science Monitor July 1974

In addition to the above, I am providing you today with:

1) Tureens, Old Money, Whiskey -- Boom in Company Museums
2) The Computer Revolution
3) Rethinking Corporate Charity
4) How to Avoid Taxes
5) Cobol
6) The Effervescent years: a retrospective
7) The Whirlwind I Computer
8) Historical section from Computer Structures
9) Five Generations of Computers
10) Teaching With Computers
11) The Honeywell Computer Exhibit at the Boston Museum of Science

To supplement reprints and those listed above, the legal reference referred to in our last meeting is also attached.

Interoffice Memo dated August 26, 1974

In addition to the above, the following books are for your use:

1) Charles Babbage and his Calculating Engines — Lincoln Labs
   by Charles Babbage & Others

2) The Analytical Engines: Computers -- Past, Present and Future — Lincoln Labs
   by Jeremy Bernstein

3) The Computer Revolution — Museum of Science
   by Nigel Hawkes

4) The Computer and the Brain — Museum of Science
   by John von Neumann

5) The Computer from Pascal to von Neumann — DEC Library
   by Herman H. Goldstine

6) A Computer Perspective — DEC Library
   by Charles & Ray Eames

At a later date, there will be several general reference books available for you to read.

The film, "Making Electrons Count" is being shown today.

jac
Attachments

ADMORE
INCORPORATED
56 Summer Street
Shrewsbury, Mass.
Zip Code 01545
Phone (617) 844-6321

October 17, 1974

Mr. Roy Gould
DIGITAL EQUIPMENT CORPORATION
Maynard, Massachusetts 01754

Dear Roy:

Let this serve as a re-cap of our meetings with yourself, Mr. Olsen, Mr. Bell and Mrs. Lymberg in an attempt to define the purpose and direction for what will be called (for the time being) the DEC Computer Museum. The following:

I. PUBLIC RELATIONS

A. Level One

1. To soften the image of the computer in general, to allay the general public's fear of computers and computer related things, to lessen the sense of mystery surrounding computer sciences, to present computers as a servant of man as opposed to a threat.

M. O. for Accomplishment:

1. Educate the public as to the basics of how a computer functions.

2. Educate the public as to the myriad uses of computers. The elements in our daily lives that would not have been possible without the computer.

B. Level Two

1. Establish Digital Equipment Corporation as a public conscious people-oriented company, stable and with as much tradition as one can have in such a new field.

M. O. for Accomplishment:

1. Name of museum should reflect D. E. C. name in some way.

2. History area should reflect D. E. C.'s contributions.

3. D. E. C. equipment will be used as basis for all interactive computer exhibits.

II. ARCHIVES

A. To preserve historically significant artifacts such as the Whirlwind computer and place it in context with the development of computer technology. To present the people behind the advent and history of the computer. To reflect on the influence of the computer upon our society. To reflect on the possible future direction of computers.

Cordially,

Bob

Robert J. Francisco
Executive Vice President

RJF/s

ADMORE
INCORPORATED
56 SUMMER STREET
SHREWSBURY, MASS.
ZIP CODE 01545
PHONE (617) 844-6321

October 21, 1974

Mr. Roy Gould
DIGITAL EQUIPMENT CORPORATION
Maynard, Massachusetts 01754

Dear Roy:

Here is a brief recap of our meeting with Jim Lowe at I. B. M. gallery in New York on October 18th.

Gallery covers 8000 sq. feet - Jim's estimate to get entire thing up - about one million and a half dollars.

Three I. B. M. people on floor at all times. This I feel is due to the incomprehensibility of the copy and general message of the exhibits. Jim agreed with this observation. The hardware is beautifully detailed and makes very elegant "furniture." Age level is supposedly Jr. High School. To understand most of what is there would take a considerable pre-knowledge of the subjects and a great deal of reading time. The exhibit is very "teachy" and essentially a beautifully packaged text book.

Jim agreed that it generally reinforces the incomprehensibility of computers and I. B. M. and the stupidity and unworthiness of the general public.

They handle about two school groups per day. They use a film theatre with several Eames I. B. M. films. They do not solicit elementary school groups. The gallery is open 4 days per week.

No admission charge. Gallery is not a separate non-profit organization.

Gallery does not present subjects directly related to computers. Most exhibits are science oriented and travel after spending average of one year in gallery.

Staff consists of 10 people - 2 managers and 8 "floor" people - 3 on floor at a time for one hour duration. Staff consists of I. B. M. people from all different disciplines who are assigned to gallery usually for duration of 2 years on their way through the ranks.

Mr. Roy Gould
DIGITAL EQUIPMENT CORP. -2- October 21, 1974

Yearly exhibit maintenance is contracted to an outside exhibit company - budgeted at about $15,000 per year for totally static graphic panels.

Jim's ideas on planning:

Most important - set criteria and objectives first. They didn't do this and Jim says they tend to rationalize things after they are done. This makes the direction of the gallery very weak. Eames, the designer, tends not to listen to the gallery people and functions on his own.

Starting next month, the gallery is going to be closed indefinitely and used as a window exhibit (seen from sidewalk). Jim would not disclose why, nor would he give me his annual budget.

Cordially,

Bob

Robert Francisco
Executive Vice President

RF/s

digital INTEROFFICE MEMORANDUM

TO: George Chamberlain

DATE: October 24, 1974

FROM: Roy Gould Roy

DEPT: Museum

EXT: 2302 LOC: PK3/M36

SUBJ: Chicago Museum of Science & Industry

I recently visited the subject museum and met with Mr. MacMaster, President, and Victor Danilov, Director, and discussed DEC's possible help with their project "America's Inventive Genius" for the Bicentennial.

We discussed how a Digital mini could be used in their Phase II part of the program where the computer would have twelve terminals (video) each one being an audience participant program where the individual asks questions about one of twelve subjects which America has played a large or leading part such as industry, aerospace, farming, etc. We, of course, would be given substantial recognition in the exhibit.

This exhibit would be in place for 2½ years and it is estimated that 10 million people will view it. I talked about the possibility of loaning them the equipment for this length of time rather than giving it to them. They seem to accept that idea. Maintenance, of course, would be a main concern. It is my recommendation that we do something for them. If we do not come up with the equipment, they made it clear they would take any money we can give them!

Shall we meet to discuss?

10/31/74

George,

jac

Danilov is inquiring if we are going to do anything for him. Are we?

Roy

digital

October 25, 1974

Mr. Robert Nolan
Department of Education
State Agency for Surplus Property
Boston, Massachusetts 02111

Dear Mr. Nolan:

Thank you for the time you spent with me during our recent telecon.

This letter is to reinstate the interest the Digital Computer Museum has in obtaining the MIT TX-0 Computer for a permanent working display in our Museum.

The Digital Computer Museum is scheduled to open in May of 1975 and will be located at our Marlboro, Massachusetts facility. We are now in the process of making the Museum a separate non-profit corporation under the laws of Massachusetts. The Museum will be open year round to the general public, school groups, civic groups, etc. There will be no admission charge.

The Museum will show early computers up to present day computers. It will teach how computers work, what they can do, and what they are doing in many fields such as medicine, science, and industry.

The TX-0 was an important step in the technology to develop today's modern mini-computers. Our plans are to keep the machine in a running condition in the Museum. The computer industry is only 25 years young, yet a lot of significant machines, papers, and films have already been lost forever. We see the Museum playing an important role in preventing this in the future. Any help you can give us, Mr. Nolan, in seeing that the TX-0 is not lost forever would be appreciated.

Sincerely,

Roy G. Gould

Roy G. Gould
Museum Director

digital INTEROFFICE MEMORANDUM

TO: Ken Olsen
Gordon Bell

DATE: October 25, 1974

FROM: Roy Gould

DEPT: Museum

EXT: 2302 LOC: PK3/M36

SUBJ: TX-O

Attached is a copy of a letter I have sent to Mr. Nolan of the Department of Education - State Agency for Surplus Property.

He has told me we are not eligible to receive the machine, but we could bid on it if someone in education doesn't grab it!

Can you offer any assistance?

jac
Attachment

File Museum + to Gould + Lynmkey

digital INTEROFFICE MEMORANDUM

TO: Gordon Bell

CC: Charlie Spector

DATE: November 11, 1974

FROM: Sally Bower SRB

DEPT: Education Products

EXT: 3084 LOC: 5-5

NOV 13 1974

Right on gb

SUBJ: Minicomputer Museum

It occured to me during a recent instructional computing conference that the museum effort might benefit from the ideas and experience of educators and museum directors. I'd like to recommend that the group in charge of the museum project consider sponsoring a seminar to generate ideas for the implementation of the museum - effective board of experts might include:

Thomas Dwyer - Project SOLO, University of Pittsburgh

Bob Albrecht - PCC, Menlo Park, California

Marion Ball - Temple University Medical School (Author of What is A Computer, Houghton Mifflin 1972)

Peg Pulliam - Lexington P.S. (Elementary Education Computing Program)

Bill Mayhew - Children's Museum, Boston

__________ - Boston Museum of Science

Etc.

Perhaps you can pass the idea onto the appropriate people?

SRB:jls

BIT REGISTRATION

AND MEMBERSHIP FORM

NAME ____

STREET ADDRESS ______________________________________

TOWN ____

STATE ____________________ ZIP CODE __________________

⬡ Registration only
($1.00 contribution)

⬡ 74-75 dues already paid
($3.00/year)

⬡ 74-75 dues attached
($3.00/year)

B I T

FALL MEETING: Friday, November 22, 1974 7:30 p.m.

PLACE: Belmont Hill School, 350 Prospect Street, Belmont, Mass. 02178

DIRECTIONS: Rte 128 to Rte 2. Head east towards Boston. Take Park Ave.,exit. At end of exit ramp turn right at lights. Belmont Hill is ¼ mile ahead at rotary.

PROGRAM

7:00-7:30 Registration and coffee

7:30 Guest Speaker: Kenneth H. Olsen
President, Digital Equipment Corp.

******** A unique opportunity to hear about history from a man who made it, and to contemplate the future with a man who will halp shape it.

8:30 Coffee

9:00 Special Interest Sections

Section 1: Investigating Means, Sequences, and Series
Rodgers Close, Medford High School

Section 2: How to Provide More Computing Sevice for Less Cost
Ned Canty, Babson College

Section 3: How You Can Make Use of Calculators
Kermit Schroeder, Wang Laboratories
Dom Gualtieri, Wang Laboratories

10:00 END

BIT is a computer users group designed to provide information about the many uses of the computer and calculator in the educational environment and to promote interest in the use of these tools in many disciplines.

MEMBERSHIP dues for the year 1974-75 are $3.00 and may be sent along with your name and address to Walter Koetke, Lexington High School, Lexington, Mass. 02173.

WE'RE planning a meeting for the winter oriented towards the application of the computer in the sciences. If you know of a teacher in your school who would be willing to participate in the program, please let us know.

Directors for the year 1974-75 are:

Buddy Bates
Belmont Hill School

Ned Canty
Babson College

Joe Hannigan
Framingham North H.S.

Bob Haven
Project Local
westwood

484-4410

Walter Koetke
Lexington H. S.

Dick Rader
St. Mark's School

Ted Sage
Middlesex School

Paul Shapiro
Newton Public Schools

Jean Stritter
Middlesex School
Concord

Ann Waterhouse
South Portland H.S.

digital INTEROFFICE MEMORANDUM

TO: Irving Berg
Jim Gracie
cc: Ken Olsen
Gordon Bell

DATE: December 6, 1974

FROM: Roy Gould

DEPT: Museum

EXT: 2302 LOC: PK3/M36

SUBJ: Museum

This will confirm our recent telephone conversation that the construction of the museum is in a "temporary hold". This means that no funds would be available for outfitting the area in Marlboro (MB-1) that the museum is slated to go to. This does not mean that the area is released as the site for the museum. You may continue to use the area as a storage area, but it should not be assigned to anyone else.

I would like to also reinstate our interest in the area currently being used by Software Services in the Mezzanine be earmarked for the museum for its theatre if and when Software Services relinquishes that area.

Thank you, Irving and Jim, for your help in the past and I look forward to working with you in the future when the project is started again.

Roy

jac

MUSEUM OF SCIENCE AND INDUSTRY
FOUNDED BY JULIUS ROSENWALD

57TH STREET AND LAKE SHORE DRIVE | JACKSON PARK | TELEPHONE MUSEUM 4-1414

CHICAGO, ILLINOIS 60637

December 13, 1974

Mr. Roy G. Gould
Exhibits Manager
Digital Equipment Corporation
146 Main Street
Maynard, Massachusetts 01754

Dear Mr. Gould:

I am writing to check on whether a decision has been made to provide computer terminals for the Museum's Bicentennial exhibit on "America's Inventive Genius."

We are opening the first phase of the exhibit on January 15 and already are involved in the design of the section opening this summer that would involve the use of the terminals.

Incidentally, I hope you will be able to attend the opening of the Bicentennial program in January. It should be a sparkling affair.

Sincerely,

Victor J. Danilov
Director

Lewis Carroll's puzzle-book

The conjurer was a rabbit

The Magic of Lewis Carroll, edited by John Fisher. New York: Simon & Schuster. $9.95. London: Thomas Nelson. £3.

By Robert Nye

Lewis Carroll used to relax by playing his musical boxes backward. Alternatively, he would doodle away, making apt anagrams of the names of eminent Victorians — Florence Nightingale soon became "Flit on, cheering angel."

He was in private life, as Charles Lutwidge Dodgson, don, mathematician, clergyman, a curious dissolving mixture of his own White Knight and his own White Rabbit. Like the White Knight, he had blue eyes, shaggy hair, gentleness and a trick of seeing the world upside down. Like the White Rabbit, he was more than a bit of an amateur magician.

When you think of that image of the White Rabbit in "Alice in Wonderland" — with his watch, his gloves, and his top hat — you are only one step away from the Victorian drawing room and a children's party where a conjurer has been called in to entertain. Only instead of a rabbit produced from a hat, you are confronted with a rabbit in charge of the conjurer's properties.

The change is characteristically Carroll in its looking-glass magic, its inversion of the expected, its pleasure in topsy-turvydom. Dodgson, a mediocre man while he took himself seriously, became a profound one when he started to joke. He stepped through the looking-glass of logic himself, and found some of the problems of modern physics.

The implications of that have already been well discussed, along with cabbages and kings, in Martin Gardner's "The Annotated Alice." This new book by John Fisher is not so substantial, but it is very nice. It performs a function which Carroll himself intended to achieve but never did — namely, the collecting of all his games and puzzles and conundrums.

Carroll would have called his own collection "Alice's Puzzle-Book," according to an entry in his diary dated March 1875. Mr. Fisher cannot quite so presume, but he has done his homework admirably and what we have here is as complete and anthology as anyone could desire. Remembering the experiences of Marghanita Laski when she tried out one of Carroll's games on her children and ended up playing it herself out of a sense of duty, perhaps "The Magic of Lewis Carroll" is *more* than anyone could desire. . . . I must admit I skipped the pages full of complicated mathematical exercises.

Carroll's idea of magic was sometimes no more than a complex plan for baffling the commonsense of little girls. This plethora of puzzles will certainly do that, but it would be sentimental and untrue to claim that much in it extends the imagination in any worthwhile way. Perhaps we should remember that Carroll was an insomniac, and forgive him a number of substitute dreams in the form of acrostics?

It would be safe to say that this book is full of fun and headaches, and that pedantic children and conscience-stricken nuclear physicists will adore it at 3 a.m.

All the same, it is startling to see how modern some of his ideas are. (Could it be that the twentieth century is only the mirror-image of the nineteenth? And that we are all left-handed Victorians?)

Thus, you will discover that amongst his inventions was a prototype of the miniature traveling chess set, a primitive kind of double-sided adhesive tape, a game uncommonly like "Scrabble," a plan for controlling the London traffic at Covent Garden, and a novel new scheme for Proportional Representation in voting.

Similarly, you will find several of his word-games anticipating more solemn tricks by such as James Joyce, Borges, and Nabokov. It was Carroll who first drew attention to the fact that if you spell the word LIVE backwards you get another word which might be taken to represent the activity of living backwards. He left it to James Joyce to draw attention to the word DOG. And to Vladimir Nabokov to draw attention to the word REPAID.

There is a special and rather precious category of literary criticism: that department which parodies its own seriousness by spending it upon a trivial object, quite consciously and in some cases condescendingly. Alice's critics fall down this particular rabbit-hole fairly frequently, offering stuff about sex and mathematics and photography, and nonsense about the poor girl being the first acid-head in children's fiction.

She has been analyzed and eulogized and made into a structure for adult fantasy. Last year there was even a book called "Aspects of Alice," edited by Robert Phillips, which added the anima and the Oxford Movement to the usual round of puns, chess, and philosophy. It was a book with few pictures and fewer conversations, and it was a book in which Alice's Wonderland was marked strictly Adults Only.

Mr. Fisher's is not so exclusive. I can imagine an intelligent older child having fun with its elaborate verbal gambits. Its main interest, however, is in providing literary commentators with the background of playful mystification from which the Alice books grew. And beyond that purpose ("curiouser and curiouser," said Alice) one may note the paradox that when Lewis Carroll wrote "straight" mathematics and logic he was essentially second-rate, but when he started fooling around he won through to what Mr. Fisher calls "the spiritual company of mathematicians as distinguished as Leibnitz and Newton, Abel and Pascal, obsessed with probability and methods of scoring, paradox and ciphers, new games and newer versions of old ones."

Nobody reads Dodgson's "Symbolic Logic." But Russell and Whitehead and Wittgenstein would all have been at home in "Alice" — in fact, come to think of it, perhaps they appear round about that famous tea-table under different names?

Robert Nye, a young poet, is poetry critic for the Times (London).

An engraving of John Tenniel's famous illustration.

COMPUTER GENERATIONS

There's never been anything like the computer in the history of civilization. Historians will eventually have a field day. Computers have changed more in five years than the automobile since its invention. In the twenty-five years of computing, many performance and cost indices have improved by factors of 100,000. Every two years nearly twice as much computing power is available for the same money; or conversely, every two years computers halve in price.

Although computing goes back to the Chinese Abacus—or the Japanese version, the Soroban—the roots of modern computers are found in punch card equipment, particularly its ancestor, the Jacquard loom, which may have operated in the DEC mill at one point. Calculators were built by mathematicians Pascal and Leibetz, but modern mathematicians have given up computer design—leaving computers to the engineers. Though calculators are historically and technologically interesting, they're really dull in comparison to the modern stored-program computer, which gets its power by variable programs, with the ability to calculate rapidly, hold lots of information and even learn.

We mark computer generations by the logic technology they're built from. We're currently in the fourth generation, called large-scale integrated circuit technology. The first generation began in 1945 with vacuum tubes and ran until about 1958. The single transistor package started then and lasted until about 1966. At that time, multiple transistors were put in a package to form a single functional array. In 1972 the fourth generation began, at which time a whole processor was put on a single substrate.

The first modern stored-program computer was probably the Manchester University prototype and we have a valve (tube, to us) from it—so Prof. Sumner, who sent it to us, said (it's clearly not from his TV set). The first useful stored-program computer was EDSAC of Cambridge University, built by Maurice Wilkes' group; Wilkes also invented the micro-programming concept. Wilkes was at the University of Pennsylvania where Eckhart, Mauchly and von Neumann worked to conceive the stored-program computer, which we now also call the von Neumann computer.

We now, overzealously I suspect, attribute Charles Babbage as being the father of modern computing. He had the notion of the stored-program calculator in the mid-1800's, but never got one of his computers to run, because each time he got a better idea for a new computer before the old one worked. In fact, he established other traditions carried into modern computing, including working with unbuildable technology. This caused him to solve a number of peripheral problems, such as making gears better than they had ever been made before. He also was about the first person to receive a government grant—for calculating nautical tables. These research projects were late and had cost overruns.

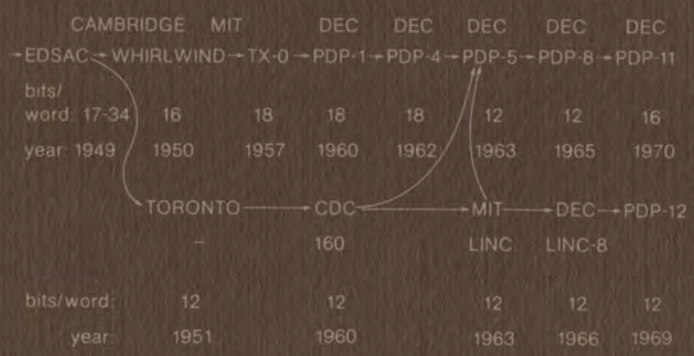
If Charles was the father of computing, then Lady Loveless, his benefactress, co-worker, and friend, was at least a midwife. But more importantly, she was probably the first programmer. Another tradition established there was that she complained that the machine specification was always changing.

If we look at the ancestry of the minicomputer, it is clearly MIT's Whirlwind. These machines and people had a profound effect on DEC. Ken Olsen, Dick Best, George Gerelds and several others of DEC are Whirlwind alumni, and I even wrote a program for it once. The PDP-1 was very much like Lincoln Lab's TX-0 (one of the earliest transistorized machines), and TX-0 like Whirlwind. Beginning with Whirlwind, we can see four generations of minicomputers. It was operational in 1950 and was packaged in a two-story building. The second, our own PDP-1,

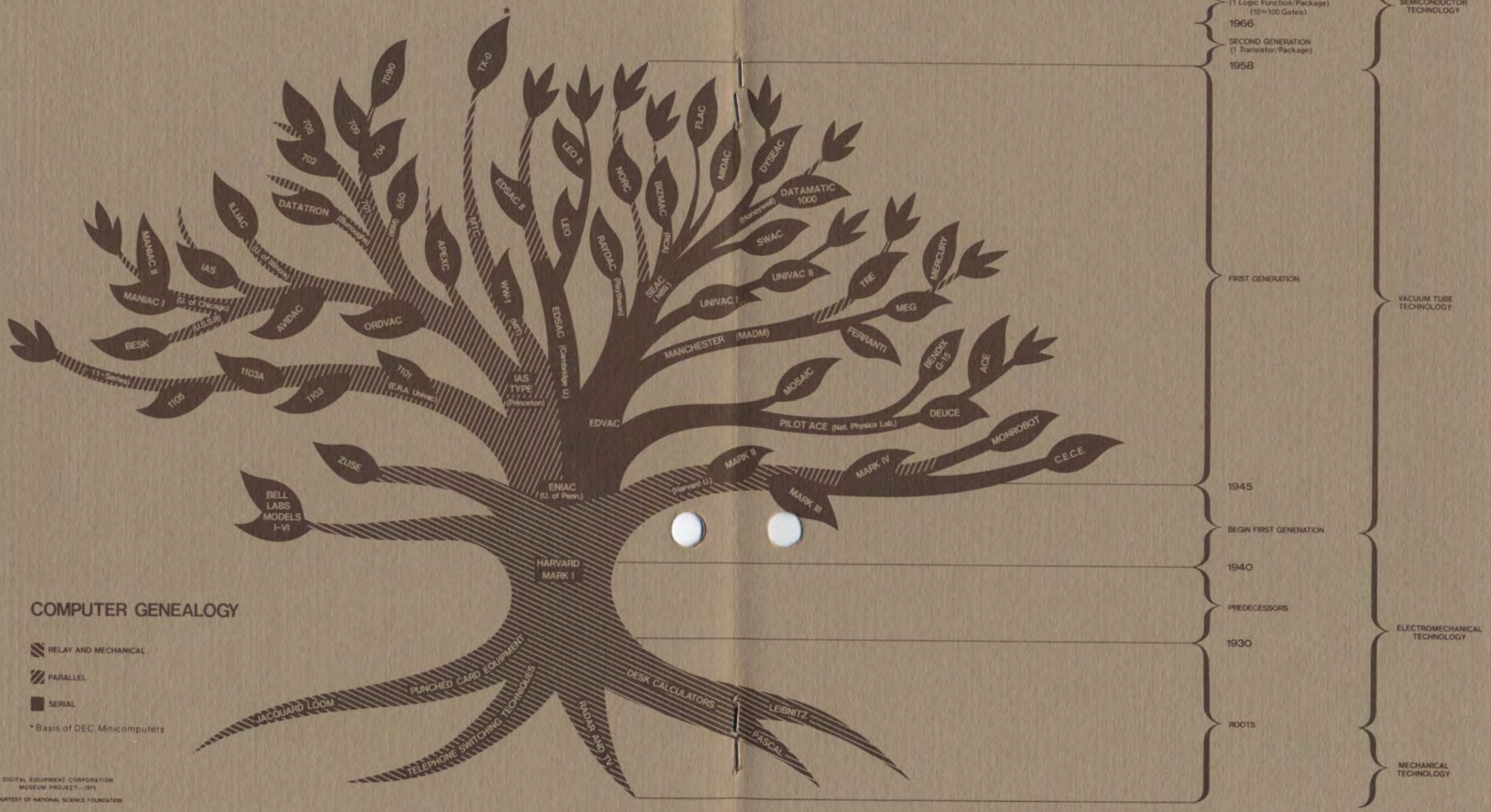
FOUR GENERATIONS OF MINICOMPUTERS

	MIT WHIRLWIND	DEC PDP-1	DEC PDP-8/I	DEC LSI-11
GENERATION	first (1950)	second (1960)	third (1968)	fourth (1975)
PRICE	?	$120,000	$10,000	$650
PACKAGE	Building	4 Cabinets	Box	Board
SIZE	50'x50'x20'	8'x2.5'x6'	2'x2'x2'	8.5"x10"x.5"
POWER (Watts)	150,000	2,500	250	50
SPEED (Memory accesses/second)	80,000	200,000	600,000	833,000

(PART OF) EARLY COMPUTER HISTORY INFLUENCING MINICOMPUTERS



COMPUTER GENEALOGY



DIGITAL EQUIPMENT CORPORATION
MUSEUM PROJECT—1975

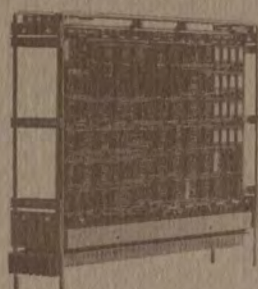
COURTESY OF NATIONAL SCIENCE FOUNDATION

MIT Whirlwind (very early first generation)

PDP-1 (early second generation)

PDP-8 (late second generation)

PDP-8/L (8/I derivative; mid third generation)



LSI-11 (early fourth generation)

was packaged in only four six-foot cabinets. The third generation PDP-8/I occupied about eight cubic feet and now, in the fourth generation, we have the single-board LSI-11, which is ½" x 8" x 10", but it also has over ten-times the calculating power of Whirlwind. Most important, the price has come down by a factor of nearly 200 these last 15 years, which amounts to about 41% compounded per year; that is, every two years the price has halved. This permits new uses of the computer that are in the scale of the application.

The size too has changed, going from a building to a single board. The input power has decreased by a factor of 3,000 from Whirlwind. Whirlwind required 150,000 watts and when it ran, the lights in Cambridge dimmed. A Whirlwind flip flop, which stores a single binary-digit (bit) occupied a volume of about eight cubic feet. In the LSI-11, the same function takes an area of silicon that is only about one hundredth by one hundredth of an inch. Whirlwind had the five conventional computer elements: input, output, control, arithmetic, and storage. Control was an area of the room that one walked through. The storage tube invented at Manchester University was initially used. The arithmetic element gives us the notion of word length. Whirlwind word length was thirty-two feet and a bit slice took up about two feet. We could walk along the bits and the various registers were piled on top of one another. The console was also a place one walked around to look at lights and flip switches. Here we've not made similar strides in console design because there haven't been advances in miniaturizing people.

Whirlwind made important contributions to computing including the cathode ray tubes and light pen input which most computers still don't have, but eventually will if they communicate with people. But Whirlwind is probably most remembered for its innovative magnetic core memory, which is still in use over three generations.

The University of Illinois was particularly prolific. They used the storage tube (invented at Manchester University) in ILLIAC I, a direct descendent from the Princeton Institute for Advanced Studies' machine. A number of the ILLIACs were made and distributed around the world. Illinois built ILLIAC II, and ILLIAC III, second generation machines, but their most recent machine, ILLIAC IV, built with Burroughs, is still to be fully operational.

Industry began building computers in the early 1950's. English Electric built a machine called the Deuce which came out of the English National Physics Laboratory. Contrast this with modules from the IBM 650, and the 704. Probably one of the most easily produced second-generation packaging technologies was that of IBM for the 7090. Burroughs had an interesting package called Cordwood.

DEC's own modules came at the beginning of the second generation. The first modules allowed experimenters to easily build digital systems together. The systems modules allowed permanent digital systems to be made, but more important, they provided the basis for building digital computers. These were the modules from which the PDP-1, -4, -5, and -6 were made.

The flip-chip modules were built for the PDP-7 and -8 so that modules could be made more easily and the back panels could be wrapped automatically. Subsequently, this style of module packaging has been used to include more components and has lasted us through the third generation with the integrated circuits and on into the fourth generation, where it is used for the LSI-11. And there's really no reason to change unless the fifth generation is a big surprise, but that's a few years away, if past generations are any indication.

Gordon Bell

GORDON BELL
Vice President, Engineering

DIGITAL EQUIPMENT CORPORATION
MUSEUM PROJECT—1975

digital equipment corporation
maynard, massachusetts 01754

PRINTED IN U.S.A. EA 05541 76 01-/14 05

* *
PLEASESEND TO: ROY GOULD PK3-2
* *

SUBJ: MUSEUM POLICY AND MUSEUM PROTOTYPE IN MILL

To: Roy Gould
cc: Ken Olsen, Jim Bell

Since we are not going to do the museum for a while, I would like to take a section, since you are still continuing the funding on it, and put on various temporary exhibits in the lobbies of the mill and possibly in Parker Street.

Parker Street might even be more urgent because the people there don't know about computers. This would be a warm up for the full museum and it would test the output of the group that we have been funding.

I visited Bell Labs last week and they have a PDP-11/45 running there on their own operating system--UNIX, to manage all the displays in the front lobby, which is in fact about 25. The displays are the usual junk that one sees and would expect at a museum where a spectator pushes a button and sees some lights blink, or hear some talking.

If the museum is non profit, I think we can get a copy of their operating system and the various types of programs to do this. This is a really impressive system because it allows you to go in and program any kind of behavior quickly. I would like to urge that as a matter of principle, nothing in our museum be built that isn't computer controlled.

GB:mjk

cc: Jim Bell
Ken Olsen
Harold Trenouth

DIGITAL EQUIPMENT CORPORATION

February 3, 1975

Jane M. Pugh
Assistant Keeper
Science Museum
South Kensington
London SW7 2DD
England

Dear Miss Pugh:

Ken Olsen just handed me your letter of January 8, regarding MIT's Whirlwind. We have it in storage now, and Ken is keeping it for the Smithsonian. The MITRE Corporation is also trying to get it back. Hence, it is somewhat in limbo. We cannot promise a core memory or core memory plane to you just now, but we could make some other parts available--such as a switch register or a fli-flop from its accumulator. Ken would like to keep one of the cores systems in tact, and give it to the Smithsonian, and dismantle the other stack so that planes could be made available to various museums. But until this matter is cleared up with MITRE and the Smithsonian, we can't really move. Therefore, we will try to get a loan of a part of the the memory core system, but we could get you other parts and photographs if you are interested.

As for your letter of 24 July to me, I have certainly been late in responding. We have been in the mode of cutting back our museum program, because we have increased pressure for capital and people in the current unsettled economic climate. Nevertheless, we are still proceeding, and in fact, since our museum group really had little noticeable output for their expenditure of time, capital, etc., it is just as well that we are doing little. It has been really difficult to get the museum going.

I had asked Roy Gould to prepare a kit of parts that had to do with the minicomputer part of technology for you and others, but he has not made progress along these lines. I hope he will take this opportunity to assemble some materials and forward them if you're interested. I am starting to get some material from other places (e.g. the University of Illinois, Manchester,) and would like to get these parts put into perspective and will get them into displays around our facilities to build up interest in the historical section. Our museum will consist of 2 parts: the collection of old parts, and the working part that explains machines with demonstrations. As a Corporate Office, I'm pushing for the later, because of the general need, but I'm personally interested in the archival section (which will be small).

I would like you to give me an idea of some of the machine parts that you could obtain. I will buy these most likely for my personal collection, which I will loan to our museum; DEC and/or Ken Olsen may also buy some of the parts.

I am interested in all types of historical parts: mechanical calculators, early data processing and storage equipment and conventional 1st and 2nd generation computers.

I think it is important to get some functional mechanical equipment, and I personally want a Thomas Arithometer.

I would hope that some parts of early English machines are still around in various junk stores (e.g. STC, ICT, Ferranti). In this regard, I have some pieces of the DEUCE, but would like to get some of ACE, and PEGASUS, together with other machines that were commercial versions of the Manchester machines. STC made a copy of our PDP-1, and I would like part of it, but we probably should go after it through ITT. In fact, if you have names of people within the UK computer industry, I would correspond directly.

As for the mechanics of purchasing, please let me have an idea of the parts and the money involved, and I'll send a check for the account. We should try a few purchases, and see if it is all right with both you and I. I'm sure we can get lawyers (solicitors) involved, but if we keep it simple, that pain can be avoided. Your commission should be whatever you think is fair--I have no knowledge of these matters. The equipment can be delivered to our DEC office in London (and to Reading) for transshipment. It might be useful to talk with our manager, Mr. Geoff Shingles of the U.K. office, because I've talked with him about this from time to time--hopefully he'll call you first at Ø1.589.6371, but the UK office number that he's at is: 58 35 55.

I hope we can get started with the collection.

Sincerely,

Gordon Bell
Vice President, Office of Development

cc: Geoff Shingles, U.K. Office
Roy Gould
Ken Olsen
Mimi Cummings

DIGITAL EQUIPMENT CORPORATION
146 Main Street
Maynard, Massachusetts Ø1754

INTEROFFICE MEMORANDUM

TO:	John Clarke	PDP-8	DATE:	February 4, 1975
	Jeff Blundell	FS		
	Pat McCormick	PE	FROM:	Mary Jane Keeney
	Mimi Cummings	Library		
	Harold Trenouth	PE	DEPT:	OOD
	Willie McCleary	Receptionist		
			EXT:	2237 LOC: ML12/A51

SUBJ: LOBBY EXHIBIT--CAN WE DO IT BY APRIL 20?

Gordon has some antique computer parts in his office which will eventually find their way into our DEC museum. As a warm up to this museum, Gordon would like to set up displays in our various lobbies.

John Clarke is putting together an -8 for the New England Conservatory to do a music synthesis demo. We would like to use this display to start the lobby exhibits.

Do you think we could do the following?

Completed by	Responsible	Responsible for
3/20	Pat	John Clarke can tell you the size of the equipment for the demo. Jeff can tell you what he is planning for the demo--maybe some can be used for the lobby. Sketch a simple layout for the Main Street Lobby. Mimi will give you an idea as to the size needed for a display case--if we don't have anything we can use in house, please give a plan for this also to Harold.
4/10	Harold	Complete the display cases, special wiring (if needed), and exhibit area.
~~3/1~~ 2/25	Mimi	Give Pat some idea as to the space needed for for the enclosed display.
4/10 2/25		Please document, write a short description, put in order, the antique computer parts in Gordon's office.
4/15	Mimi	Mount in display cabinets.
4/20	Jeff	Pleaee return the -8 to the Main Street Lobby and check Willie out on its operation.

What do you think? Can we do it? Please let me know if you see any hitches. Thanks.

mj

Mimi, Pls ask Earl G to do this.

Museum of Sally & Gordon
2/12/75

27
31 IBM 650
late 1st gen.

29
28
32 toys 9B

~~30~~
~~23~~ toy

31
10
~~4444~~
~~12~~
~~17~~
~~18~~
~~14~~ West. Elec. ceramic substrate for thick film - ? thin
~~15~~
~~22~~
~~16~~
~~4~~
~~5~~

~~5~~
~~13~~
~~10~~

20 DEC - Ter on ceramic substrate

24
25 IBM 7090
1st autom.
wire wrap

21 Univac ?
military
missle launch
comp.
c. 1960
unsure
transistorized

26 (gel 2 better)
1st DEC module
for autom.
wire wrap
whole series
progression of modules
diff. sizes & shapes
Dick Best
late 2nd gen.

14 mid 2nd gen.
DEC PDP 6
functional ~~pkging~~ packaging
bit slice pkg - accumulator
4 registers
multiplier
quotient
memory
buffer
indicator
register

33 part of
fixed store of
atlas comp.

all arith for - a digit

DEC system module

8. Early 2nd gen

2. Value from Manchester marc II

~~5~~

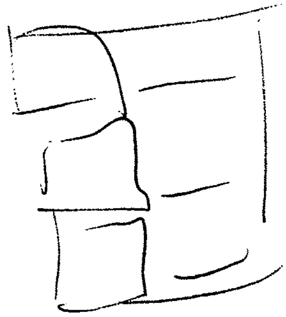
4. parts from ~~ace~~ DEUCE | some of arithmetic logic mid 50s

3. mercury Delay Line - 32 bit - Eng. Electric Deuce Commercial version of ace Touring designed ace

\+ amplifier operated a a megacycle bit rate

2. Harvard MARC IV (?) early shift register magnetic " " Bob Trocchi's father in law gave it to him

1. a Digit from Whirlwind accumulator (AB get other digits? Stack would → a digit)



Early 50s

1 all = 1/4 of 14

H.-

DEC LA30 print head

head cordwood construction
from Burroughs
(Field Service hated)

what's happened to the telescope
module — to a chip
11-75

9's top's

Omit

~~28~~
32
29
20
10
22
23
30
12
13
16
15
5

John Trelanders
Bob Reed — Trad. Prod.

They might help

June – Eng. Newsletter

1964?

SUBJ: LOBBY EXHIBITS

DATE: 02-17-75
FROM: GORDON BELL

* *
PLEASESEND TO: MIMI CUMMINGS ML5-4
* *

SUBJ: EXHIBITS IN OUR FACILITIES (PRELUDE TO THE MUSEUM)

To: Roy Gould

I am intending to put together various exhibits on computer technology which might be put in various DEC buildings (for the time being, I would like to do one, and see what it looks like).

The exhibit would include the parts I currently have in my office, plus those which other people are sending me.

In order to make a really effective exhibit, I want to include Whirlwind! Would you please get me a list of the parts so that I can select some? or if possible, I would like:

1. One each of the registers: AR, AC, BR, IOR, PC to show the digit slice approach. We'll hang them together from the ceiling as they were in WW.

2. A plane and photo of core memory.

3. An electrostatic storage tube (if there were any).

4. Diode matrix for time pulse distributor (for changing control easily).

5. I/O--what can we have? a CRT, light pen/gun would be nice?, a flexometer.

6. A console register.

7. Part of marginal check/maintenance console.

8. Drum and/or tape.

9. Some interconnection cable.

SUBJ: LOBBY EXHIBITS

DATE: 02-17-75
FROM: GORDON BELL

The emphasis will be to show WW as:

1. The first (early mini) 16 bits, in contrast to other long word machines.

2. The memory: core, disk, tape.

3. Unique I/O--CRT and camera (just now in use).

4. The flexo as an I/O device (used in late 2nd).

5. Marginal checking to increase reliability (used until 3rd gen.).

6. Bit slices (still used).

7. Design for reliability.

8. Forerunner of microprogramming.

WHEN:

GB:MJK

CC: Mimi Cummings, Mary Jane Keeney, Ken Olsen, Bob Reed, John Trebendis

DATE: 02-17-75
FROM: GORDON BELL

* *
PLEASESEND TO: MIMI CUMMINGS ML5-4
* *

2/19

Sally -

Consultant pay 3 mo. — $4000
6 mo. 8000

parttime only

now on cal. project - I suggested $6-8 /hr.
4 hr. a day
for 2 wk.
- Tues. 2/25

I'll supervise her

Museum form

1. ~~Item #/~~ ~~Name~~

for parts

2. Name: Technical

cataloging Info.

3. Overall ~~physical~~ Common dimensions

Physical Description

4. Description or sketch

5. Suggested Method or manner of display

6. Date cataloged

7. Present location

put at end

for use in cataloging

Name of comp
Use of computer — Commercial/gov't?
" mfg, ~~Central Region~~
" country
" year
" generation

Source of info. for cataloging ___

Other: ___

1

Item #

Name: Tech.

Date cat.

Present Location

~~Cataloging info~~ →

Physical Description / dimensions

desc. or sketch

2

suggested method of display

Hist. 3 imp.

Name of comp. (system)

" " mfg. or originating group

designer

country

year

generation

Source of info

→

digital INTEROFFICE MEMORANDUM

TO: Sally Lymberg

DATE: 2/24/75

FROM: Mimi Cummings

cc: Gordon Bell
Dick Best
Mark Abbett

DEPT: Library

EXT: 6465 LOC: M15-4

SUBJ: Consulting Job with reference to Digital Museum

This will serve as a written confirmation of the arrangments we have made concerning your work here at Digital as Museum Consultant. It also will clarify, I hope, for all of us what you can expect from us and vice-versa.

You are currently engaged on the following two projects:

1. Cataloging the antique computer parts in Gordon Bell's office. This work began around February 17 and will be completed by February 28. You will be compensated at the rate of $7 for this work. I will help you with this project and supervise your procedures, as necessary.

2. Submitting a written report which will cover your work here at Digital as Museum Consultant over the past 6 months. This is considered the logical extention of that work and therefore you will not be compensated additionally for this report. This report should be due to Gordon Bell on March 14.

   I hope that this report will contain the following:

   A. Your charter as you understood it.
   B. Broad outline of the steps you undertook to carry out this charter.
   C. Breakdown of what you did physically, e.g.
      People you contacted
      Museums you visited - your reactions to these as well as information on what worked well, what they would do differently etc.
   D. Material available for the Museum including what we already have at DEC, what we have been offered, what we might trade etc. Include location of any of these items you know about.
   E. Archives and Documentation you know of, either in-house or available on the outside, which will be necessary or desirable as a back-up to the actual collection of materials
   F. Resources you collected including books in the Library's collection, slides, movies etc. Annotate these resources if you can and indicate where they are currently located.

G. Personal Recommendations: This part is perhaps the most important one for us of all. I would like to know what you see as being the possible philosophies behind a corporate museum. How do you interpret DEC's desires with reference to the possible choices? How do you feel personally?

We are eager to have any suggestions you have to make to us with reference to actual exhibits, audiences to be aware of, etc.

H. Lastly, can you visualize what remains to be done prior to the actual decision to go ahead (and the attendant funding) - or what might you do for us within the present economic constraints?

I hope that these ideas will clarify your two projects and not impede your progress. I am sure I speak for all of us in saying that we are looking forward to your report with great enthusiasm.

Once we have examined your report and considered where the entire projects stands at the present time, I promise that we will be back in touch with you.withAt that time you can expect us to tell you what opportunities there are for future use of your consulting services.

Mimi

digital INTEROFFICE MEMORANDUM

TO: Sally Lymberg

DATE: 2/24/75

FROM: Mimi Cummings

cc: Gordon Bell
Dick Best
Mark Abbett

DEPT: Library

EXT: 6465 LOC: M15-4

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      People you contacted
      Museums you visited - your reactions to these as well as information on what worked well, what they would do differently etc.
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Mark,

Here is a draft for Mimi.

mj

Mary Jane -
Sounds great -
Mark

Sally Lymberg

Dear Sally:

as to

This is to summarize our verbal discussion a~~nd outline~~ what we would like you to accomplish in the next 3 weeks:

1. Catalogue antique computer parts in Gordon Bell's office. This started February 17 and will be completed by February 28. You will be compensated at the rate of $7 per hour for hours worked.

2. Submit a report covering the 6 month period you were on contract here. This is to tie up your work and is considered part of that work for which you have already been paid. This report should include:

   A. People you contacted.
   B. Parts/archives made available.
   C. Location of parts for possible acquisition.
   D. Trip reports to museums--what worked, what didn't work, what they would suggest doing differently.
   E. Your suggestions on how to set up the DEC museum
   F.
   G.
   H.

   This report will be due March 14 to Gordon Bell.

We are looking forward to your report and are sure it will be a great help and guide as we go forward with the DEC museum. At the completion of the lobby exhibit and an examination of your report, we will let you know what opportunities there will be in the future for your consulting services.

Sally
1) PR
2) Peggy
3) Lib.

1 | ——— ~~Charter~~ ✓

2 ——— steps → physically (label)

3 ——— philosophy (changing philosophy) of. museums & co's / possible things

4 ——— Things — in-house — known
out — "

5. Bkg. Source mat. — list →

following + established =

1. ——— what. phys. des. blurb hist.

Gordon's Office

6. Sugg. ——— where to put what

Bring that museum is — need = Engineering =

Sally Birch Lymberg
Consultant
Box 315, Bolton, Ma. 01740

To: Digital Equipment Corporation
146 Main Street
Maynard, Massachusetts 01754

For: Consulting Services, DEC Museum Display

Feb. 12 - Feb. 27 68 Hours @ $7.00 per hour

$475.00

Sally Birch Lymberg
Consultant
Box 315, Bolton, Ma. 01740

To: Digital Equipment Corporation
146 Main Street
Maynard, Massachusetts 01754

For: Consulting Services, DEC Museum Display

Feb. 12 - Feb. 27   68 Hours @ $7.00 per hour

$475.00

C.K. Lopay
2/27/79

- [x] ROUTE SLIP
- [ ] TELEPHONE MEMO

digital

TO Mimi Cumming

DATE 3-20-75 5-4

location / mail stop

MESSAGE

- [ ] PLEASE RETURN CALL
- [ ] WILL CALL AGAIN
- [ ] WANTS TO SEE YOU
- [ ] PLEASE RUSH

FROM PURCHASING

DATE

location / mail stop

TAKEN BY: ML5/P66

Use on all inter-office mail with the exception of confidential bulky items. Staple to one corner.

DEC 5(633)-1105-N175

RECOMMENDED SUPPLIER AND ADDRESS	REQ. DELIVERY	APPROX. TOTAL COST	APPROVAL SIGNATURE & DATE
Sally Lymberg		$475.00	

BADGE NO.	COST CTR.	ACC'T.	ACT. CODE	1	2	3	BUYER CODE	REQUESTED BY:	TEL. EXT.	LOCATION
26351	69F	07651				07651	33	Mimi Cummings	6465	ML5-4

digital

REQUISITION / PURCHASE ORDER

No. MA 65790

DIGITAL EQUIPMENT CORPORATION

VENDOR

Sally Lymberg
Box 315
Bolton, Mass.

SHIP TO

THOMPSON ST., MAYNARD, MASS. 01754 AREA CODE 617-897-5111 BLDG. ______ DOCK ______
1111 SOUTHAMPTON RD., WESTFIELD, MASS. 01085 AREA CODE 413-568-9511
DIGITAL DRIVE, WESTMINSTER, MASS. 01473 AREA CODE 617-874-0111
1 FEDERAL ST., BUILDING 111 FLOOR 3, SPRINGFIELD, MASS. 01105 AREA CODE 413-781-7010
PARKER ST., MAYNARD, MASS. 01754 AREA CODE 617-897-5111 BLDG. PK.

NOTE

- [x] RECEIVING REPORT NOT REQUIRED (Please Check)
- REFERENCE DEC. BASIC AGREEMENT NO. ______

SALES TAX: TAXABLE [ ] TAX EXEMPT [x]

DATE	CONFIRMING PHONE ORDER	SHIP FRT. COLL. [ ] PPD. [ ] VIA	TERMS	F.O.B. (CITY, STATE)
3/4/75			n/30	—

ITEM	QUANTITY	DESCRIPTION/NUMBER	UNIT PRICE	TOTAL	DELIVERY
1	1	Consulting work on DEC museum	$475.00	$475.00	
		Feb. 12 to 27 at $7/hour, total not to exceed $475.00			
		Payable to: Sally Lymberg			
		Box 315, Bolton, Mass.			
			TOTAL PRICE	$475.00	

BUYER SIGNATURE (LEGIBLE)	DATE

REQUISITIONER NO. 2

THIS ORDER SUBJECT TO TERMS AND CONDITIONS ON THE FACE AND BACK HEREOF.

DEC 8-(490)-1039D-R873

copies to OC + Kramer, Spector + Woolsey; O²D. + mini + File

Gordon

Nice use of machine.

Bursting at the museums

Boston's Children's Museum offers computer fun and education to thousands. Online services may soon extend beyond the museum's buildings.

For most adults, computers are physically and conceptually inaccessible; they are objects of suspicion, saddled by their critics with the mistakes and even personalities of their operators. When bills are wrong or credit records mixed up, the computer can be blamed, and often is. And the public swallows that blame whole. As Ted Nelson has pointed out in our pages, cybercrud goes down easy. Isn't anyone doing anything about this?

Yes. Bill Mayhew is.

Mayhew is the computer center coordinator at Boston's Children's Museum. He thinks that people will accept the computer for whatever it is, given half a chance. He also believes that people will get to know the computer for what it isn't.

Computers, or at least an understanding of what they are, must be brought into the world at large, the world outside business offices, labs and classrooms. "They must," says Mayhew, "be made accessible to the public." So Mayhew views it as natural that the 60-year-old Children's Museum should possess a multi-terminal timesharing system. The museum is private, nonprofit and independent of the other Boston area museums.

Three years before, rehashed

The museum's Visitor Center, one of its three major divisions, began computer activity three years ago under the leadership of Richard Gardner. At that time Mayhew was a part-time "associate developer." Mayhew had studied computer science and urban planning at MIT, and was dividing his time between the museum and his own firm, Elcheapo Industries, which he characterized as "dedicated to low-cost, human-oriented uses of technology."

Now 22, Mayhew coordinates computer group functions with other museum activities, directing his program principally toward "children old enough to begin developing an understanding of computers but not too old to ask questions without embarrassment."

At various times during its three years of existence, the computer component of the museum has used a variety of resources, including a PDP-8/I mini and a Teletype donated by Digital Equipment Corp., dial-up service on Dartmouth College's *Basic* timesharing system, the *Logo* system run by Bolt, Beranek and Newman, Inc., of Cambridge, the *Mimic* minicomputer simulation system developed by Applied Data Research and operated by First Data Corp., and a four-user Wang mini system.

The Children's Museum found the PDP-8/I *Basic* system most effective. Although it was a single-user interactive system, more than 550,000 people used it between 1971 and early 1974, when it was retired. They played number games and computer checkers with it, and they ran a "turtle," a primitive robot that responds to simple computer commands.

Grants to 'em

The value of the interactive computer exhibit was apparent from the start. "We felt we had demonstrated the success of our approach," Mayhew recalls, "and in 1972 we had already begun to investigate enlarging the resident system."

The arduous search for funds delayed the upgrade until last spring when, with aid from a Charles Hayden Foundation grant and Digital Equipment, the museum exchanged its PDP-8/I for its present PDP-11/40 system. Equipped with 48k words of memory, two disk pack drives, a line printer and a paper tape reader, the system supports eight interactive terminals. The museum uses three crts, four DECwriter hard-copy terminals, and a Teletype. The operating system is *UNIX*, a multilanguage timesharing system developed by Bell

not ours

Laboratories which is partially modeled after the MIT-originated *Multics* system, now Honeywell's largest interactive system offering.

The system introduces visitors to interactive computing almost as soon as they arrive, since it asks for their names, birth date and residences. The system can then cough up tabulations of the data it has gathered. This catalog has become a popular souvenir. The ages and residences of visitors are also added to a disk file that provides museum personnel with a measure of computer appeal, while names are discarded in the interest of privacy.

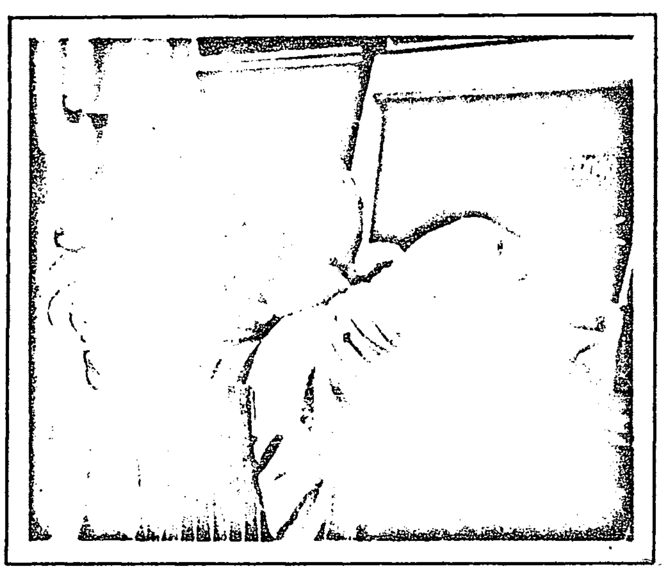
Cursor—foiled again

Upstairs, in the area set aside for computers and computer visitors only, terminals open a dialogue with an outline of games that may be played: number games, word guessing games (e.g., Hangman), graph games, tic-tac-toe and others. Each user is limited to a three-minute dialogue, after which the computer politely asks him to let the next visitor have a turn.

The system has been altered to give it resiliency. "We painted the carriage return keys green to make them easy to find," explains Mayhew. "We also disabled the cursor controls on the video terminals to prevent wanted text from being wiped out, inserted a check routine to prevent the carriage return from working on empty lines, and made certain that programs could accommodate a full buffer of characters to avoid overload crashes. And, of course, we have tried to make the programs as immune as possible from the entry of garbage."

Diversity people

Mayhew now spends about four-fifths of his time keeping the system alive and growing. The museum shifted work formerly done outside to its mini—such necessities as accounting, fund-raising support, mailing list maintenance—offsetting most of the system maintenance costs. In whatever time he has left, Mayhew chats with visitors and watches their activity, with an eye toward improving of the museum's program. One addition has been instruction. The museum holds an hour and a half class in computer languages and programming once a week for interested schoolchildren.



It's very tempting to undertake more and more of this kind of activity, observes Mayhew, "because of our success with it. But except for occasional workshops, we don't contemplate enlarging the teaching function. Our primary effort has been and will continue to be to provide an environment for discovery."

Mayhew and the Children's Museum staff have worked out future projects to lead participants through progressive steps of man-computer interaction, beginning with simple switch-activated and theremin-generated commands to control lights, audio synthesizers, and electric trains, moving eventually into simple computer programming. They would like to develop a robot that could perform various actions under computer control as visitors build up their skills. The museum is also trying to raise $4,000 for an online voice synthesizer; full software for the synthesizer has already been developed by Bell Labs.

The last phase of the envisioned expansion of computer activities is the Portaputer project. A small computer with a Teletype and a grab bag of modules would be circulated to schools and neighborhood centers through the museum's Resource Center loan department.

Firmer than some of these plans which await funding are activities involving other institutions that serve the public. The Children's Museum is completing arrangements with the Metropolitan Cultural Alliance, an association of area institutions including the Museum of Fine Arts, the Boston Symphony Orchestra, the Institute of Contemporary Arts and others. They plan to place a remote terminal in the MCA headquarters which will be used to process business data for the alliance and its members.

The filters I want us (LDP) to offer

Access to grind

The museum's computer staff has proposed a public information system for the 1975-76 Boston Bicentennial Celebration which would sprinkle terminals around the city so that people could get up-to-the-minute schedules of cultural events as well as information on landmarks, tours and accommodations.

Yet another possibility is a permanent public information access system. The model for the Children's Museum efforts is San Francisco's Resource One, which placed terminals in stores, libraries and other convenient sites. The terminals may be used to access everything from programs to poetry and constitute an electronic bulletin board of sorts. If several such setups were established in different cities, they might eventually be interconnected, yielding a system for nationwide public computer access.

Whether the computer will be the town crier of tomorrow or the weekend amusement of today, Mayhew's plans for it "revolve about one central purpose: to provide a realistic and nonhostile view of computers for large and diverse groups of people. We can do it by making computers work for them, by making the process an experience of pleasurable discovery.

"What else are computers for, if not to work for people?" □

digital

March 17, 1975

Management Information Corporation
140 Barclay Center
Cherry Hill, New Jersey 08034

Gentlemen:

In the centerfold of one of your Data Entry Awareness Reports there is a tree showing an historical route system, a time line with dates and a tree showing the various computer families. For the past several months I have been doing research in behalf of a computer museum. I have used the National Science Foundation tree of computers with their generations marked.

Since this is a different type of tree, I wonder if you could give me more information about its background, its author, or an original of the tree in a larger size. I am interested in using this as a reference resource in my work because of the graphic character of the information. I would be happy to hear from you and would appreciate any assistance that you can give me.

Sincerely,

Sally Birch Lymberg

Sally Birch Lymberg
Museum Consultant

SBL/mrg

cc to Mimi

digital INTEROFFICE MEMORANDUM

TO: Gordon Bell
Mimi Cummings
Roy Gould
Ken Olsen

DATE: March 26, 1975

FROM: Sally ~~Birch~~ Lymberg

DEPT:

EXT: LOC:

SUBJ: Museum Project

This Progress Report for the DEC Museum Project gives a quick, general overview of company museums, and computer exhibits in larger museums. It is in two sections. There is only one copy of Section II, Photographs of Science Centers and Museums; it is being attached to Gordon Bell's report.

There is so much to learn and so much to see that it's hard to tell it all. I've tried to hit the high spots -- which are my own, based on the information and guidelines given to me at the beginning of the project.

I'm sure there must be much left untold in my notes and references that could be of more value, if applied to a specific program.

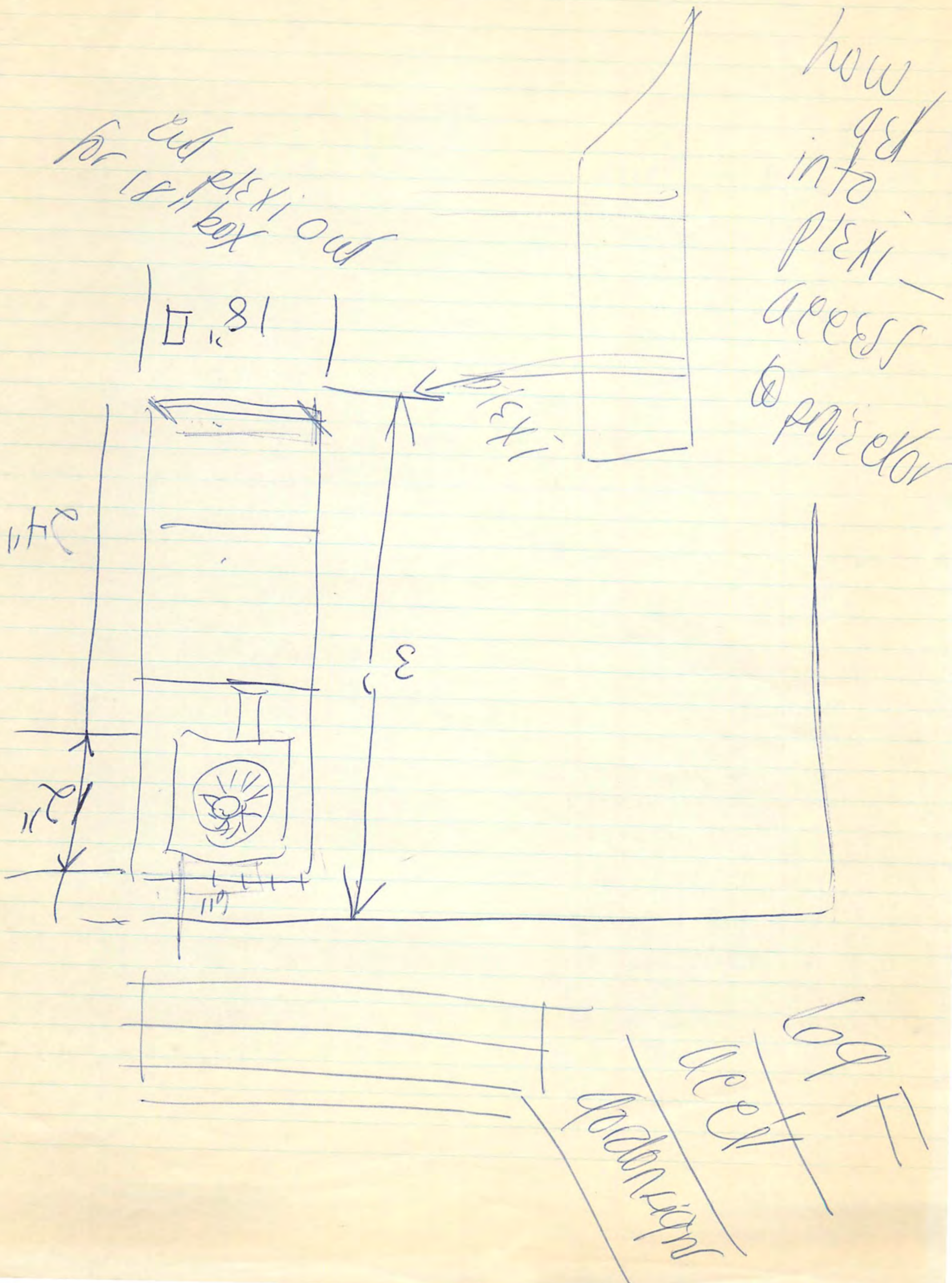
I would be very happy to participate in any way possible toward the completion of this museum project.

If a discussion of the report would be helpful, I am ready when you are.

/mrg

#1 all whirlwind photos, slides, archives collection books (as noted on attached) color prints are with Peggy [illegible]. 12-1 (includes negatives)

#2. all Antique Computer Parts identification with MJ (she plans to make copies for you. Kemeny (12-1)



cut plexi out for 18" box
how get into plexi — access to projector
plexi
18"

SUBJ: DEC MUSEUM IN MARLBORO COUNTRY (1026) 4/16/74

TO: Operations Committee
Product Line Managers

From: Gordon Bell
Roy Gould

We have a great opportunity to establish a computer museum in the Marlboro building, in what would otherwise be totally useless space. Several of us have the interest to embark on this project; once set up, the incremental personnel operating expenses will be constrained to about 2 people.

We believe it may turn out to be financially rewarding, although it is difficul to justify. Its uses include:

1. Being used to exhibit computers to the local and computer community.

2. Establishing us as an intellectually serious vendor via its embedded lecture hall for multiple functions.

3. Showing our working computers and products.

4. Showing our own past, and present technology.

5. Using it as a liaison to various U.S. and European laboratories and universities who were also computer midwives.

6. It would be a possible place for technological and business historians to visit by placing our own literature there plus company archival data.

7. It being a place to collect books, manuals, computers, and technology outside of DEC.

The 20,000 sq. ft. museum could be utilized in the following ways:

1. Historical time line (family tree) evolution of minicomputers utilizing a computer exhibit. This would show EDSAC (we have to get a part from Cambridge), Whirlwind (a bay and some peripherals), TX-0, PDP-1, PDP-4, and on to various 8 and 11's. Here we could show off-shoots like the Indian 8, 11; Cuban 8, DCC, Hungarian, Sue, Sprague modules, and ITT's copies.

2. As a really nice conference/seminar hall for: a museum lecture series, press conferences, PDP-10 lectures, IEEE and ACM meetings, some of our own meetings. This would be reserved 1/2 time for these activities. It should hold about 50 to 100 people.

3. Working DEC computers: PDP-1 and NSA super console PDP-4 with space war, ...PDP-11 with moonlander, terminals to various machines. People could visit this just to look at and use our various consoles.

4. Technology displays. We have many exhibits that can be

set up from time to time. Eg., history of displays from Whirlwind and includes our first color and first precision displays. Also, we had first UART in 62--show the package evolution to UART on a chip with chips and microphotographs. In general, this would cover computers, computer parts, and technology (eg., logic, displays, printers, tapes, power-supplies).

5. Computers from universities, research labs and other vendors.

6. A place for machine and programming manuals for us and for the above technologies.

7. DEC archival information on computers and business.

8. A place to debug trade-show booths.

9. Historical computer books.

MODUS OPERANDI:

The museum will report to Roy Gould, who will hire a curator to live there for day-to-day operations, collect, guide and buy various internal services. A board of directors, consisting of Roy, the curator, myself, Ken, and 2 other people, will guide them, review plans, and establish priorities. The operating budget will be presented to the F&A Committee.

ACCOMPLISHMENTS SO FAR:

Already, Ken has established the basis for our having the most significant operation because we have Whirlwind (first mini, core, microprogramming, display, tape, and A/D). Also a great trading basis. We have the TX-0 (first transisterized machine) which will be operational! All our prototype machines are available and work. I've collected parts from ACE (UK-Nat. Phys. Lab), a 650, a 704, MIT Dif. Analyzer.

GB:mjk

~~Attachment: Museum Budget~~

Draft - not sent

June 19, 1974

Professor Henry Tropp
Humboldt State University
Arcata, California

Dear Professor Tropp:

Your article in the IEEE Spectrum February 1974, (with references to the Smithsonian History Project) appeared at just the right time for me. I enjoyed it very much. Have you any other similar publications?

From the earliest days of Digital Equipment Corporation, there has been a strong and continuing desire by our President, Kenneth Olsen, and others, to eatablish a computer museum with a documented historical and archival base. Many times in the growth of the Company space has been allocated, but in each instance production needs claimed the space before the museum could take actual form.

In early February of this year a decision was made. To paraphrase Lewis Carroll;

> "The time has come, the Walrus said, to talk of many things ....of cabbages and kings."
> 'Of Ace to Zuse, abacus, Babbage, Deuce, ENIAC and Whirlwind I.'"

In short, the museum is now in its planning stage.

I am researching background, history and other computer oriented museums or displays from the viewpoint of historical and archival content. It is not the desire of the Company to duplicate any work or information already successfully documented. We are fortunate to have Gordon Bell as our Vice President of Engineering. Mr. Bell was formerly professor of Computer Science and Electrical Engineering at Carnegie-Mellon University. He is also author of Computer Structures: Readings & Examples, C. Gordon Bell.

In reviewing as much of the revelant literature as I have been able to locate, I cannot find any record of a complete source for a history of computers all in one place. Perhaps it is "pie in the sky", but I would like very much for Digital Equipment Corporation to begin what would be a never ending process, namely, a start for a museum of the history of computers as a research tool available to the computer world. In addition, there would be artifacts, antique parts, manuals, on-line computer operated displays, games, etc.

Can I "talk" about this to you for a few sentences? IBM has its Eames book, the ACM has its 25th Anniversary edition, and the Smithsonian has its Computer History Project. Since so much has already been accomplished, no time should be spent in duplicating this work. However, as a researcher, myself, in the field of information processing, I feel there should be some place where these questions could be asked or answered; with a high priority on feedback; from a documented data base;

1) What is it?
2) Who did it?
3) When was it done?
4) Where is it?
5) Who has it?
6) Could we use it? Look at it?
7) What is its importance?

Since DEC's prime product is computers, a good beginning could be made with a data base of references, people (whether living or not), publications, proceedings, books, artifacts, and displays. I envision even the opportunity to borrow or loan historical objects such as parts of Whirlwind, Mark I, and early abacus, or even a facsimile of a punch card from the Jaquard Loom.

I have not had the opportunity to visit the Smithsonian, but I understand that much still needs to be cataloged or processed for actual use by the public. Boston seems to be a logical place and a central location for the beginning of a resource center, because of the many historical events occuring at, in, or near; Harvard, MIT, Lincoln Lab, MITRE, etc., to say nothing of the evolution of the mini-computers in Maynard at the old American Woolen Mill site in 1957.

If your schedule is not too heavy, I would love to hear from you with any comments, critique, or suggestions that you may have.

File

MEMORANDUM

To: DOD Survey Respondents

Case:

Date: July 15, 1975

Page:

Subject: Survey results

Carol Johnson of AFCRL has completed the survey requested of attendees at our April meeting at Hanscom Field.

I am attaching a copy of the resulting report she sent to Mr. Sauter at DDC. These reports are being sent to the contact person for the Route 128 Special Librarians Group in each participating organization. If a different person in your company was also involved, I would appreciate it if you could see that they receive copies as well.

Thanks are due to those who took their time to help the DDC and, in turn, all of us, in responding to this survey. I also appreciate the fine job Carol Johnson did in taking on this project.

Jeanne Bracken

From Jeanne Bracken, Research Library
15 Acorn Park, Cambridge, Ma. 02140

Bldg./Room 15L/304 Ext. 864-5770 X3015

Arthur D. Little, Inc.

ADL-115-874

DEPARTMENT OF THE AIR FORCE
AIR FORCE CAMBRIDGE RESEARCH LABORATORIES (AFSC)
LAURENCE G. HANSCOM FIELD, BEDFORD, MASSACHUSETTS 01730

REPLY TO ATTN OF: SUOL/Carol Johnson
Coordinator of Route 128 Libraries Survey — 25 June 75

SUBJECT: Utilization of DDC Services:
Report on a Survey of Route 128 Libraries

TO: Hubert Sauter, Administrator,
Defense Documentation Center

1. Copies of Especially DDC were distributed to 48 organizations in the Boston area during April, 1975.

2. Recipients were requested to review, comment and evaluate the report, as well as to make additional observations or recommendations to be considered by DDC.

3. Responses were received from 25 organizations, including 7 branches of Raytheon (see attachment 1). It is believed that these respondents represent the major DDC user population in the Boston geographic area.

4. Responses have been consolidated and are reported in attachment 3.

5. The Route 128 Librarians' Group looks forward to a continuing dialog with DDC to facilitate transfer of DOD generated information through channels to the ultimate user.

Carol A Johnson

CAROL A. JOHNSON
Director
AFCRL Research Library

Attachments

Organizations Responding from the Route 128 Librarians' Group (Boston)

1. Air Force Cambridge Research Laboratories
2. Analytical Systems Engineering Corp.
3. Army Materials and Mechanics Research Center
4. Army Natick Laboratories
5. Arthur D. Little
6. AVCO Systems Division
7. Digital Equipment Corp.
8. Charles Stark Draper Laboratory, Inc.
9. Dynamics Research Corp.
10. General Telephone & Electronics Lab., Waltham Research Center
11. GTE Sylvania/Eastern Operations
12. Honeywell Information Systems
13. Itek
14. Kennecott Copper Corp.
15. M.I.T. Lincoln Laboratory
16. MITRE Corp.
17. Raytheon Corporate Headquarters
18. Raytheon Co., Equipment Div. (Sudbury & Wayland)
19. Raytheon Co., Missile Systems Div. (Andover & Bedford)
20. Raytheon Service Co.
21. Raytheon Co., Microwave & Power Tube Div.
22. Raytheon Co., Research Div.
23. Raytheon Co., Submarine Signal Div.
24. Sanders Associates, Inc.
25. Softech, Inc.

Attachment 1

Summary of Responses: Route 128 Librarians' Group (Boston)

1. Everyone responding felt that the Washington, D.C. committee had performed a great service by conducting such a thorough review of the DOD Information Transfer Process.

2. There was general agreement with observations and recommendations presented by the Committee on Information Hang-ups in Especially DDC.

3. Users were enthusiastic about the interest of DDC in soliciting user reactions to their services.

4. There was overwhelming agreement that DDC provides an essential focal point for DOD generated reports and that the overall efficiency and scope of DDC is to be commended.

5. In general, the greatest problems are in the areas of communications and lack of coverage of considerable DOD sponsored work.

6. Below are listed some specific areas of concern, as well as some suggestions for services and directions for development. Most of these have been mentioned in Especially DDC but they are reiterated here as being of special concern to the Rt. 128 Librarians' Group.

a. Users are poorly informed about DDC services and products.

(1) Publish a User Manual for all DDC services explaining services in greater detail than the November 1974 Users' Guide. It would also be helpful if phone inquiries made to the phone numbers listed in the guide could be routed directly to a knowledgeable person capable of answering the specific questions.

(2) Publish some sort of reference directory on how to obtain types of DOD documentation not handled by DDC, or staff an office capable of answering telephone inquiries about same.

(3) Conduct "User Training Seminars" on various services such as preparation of report bibliographies.

b. There is unanimous dissatisfaction with the incompleteness of reporting work unit information summaries. Erratic input causes users to lose confidence in the system.

(1) Establish some sort of enforcement mechanism for reporting of DOD sponsored reports and current and projected research projects.

(2) DOD should be made aware of this situation and requested to study the problem to determine where the 1498s go astray.

c. Access to limited documents continues to be a problem, although there was a concensus that some improvements were made when DDC streamlined the requesting procedures and revised Form 55.

(1) Investigate ways of improving access to DOD generated information. Particular problems are overclassification, overly restrictive distribution statements, and the problems associated with unclassified limited reports.

(2) Publish a cumulated index to changes in "limited" as well as downgraded or declassified documents.

d. Overlaps/gaps in indexing and coverage between DDC and other government agencies is a problem which causes uncertainty and frustrations in retrospective bibliographic searching.

(1) Investigate relationship of DDC with the non-DOD sponsored information clearinghouses (AEC, NASA, NTIS). Explore possibility of networking and using common access procedures for each other's data bases.

(2) Explore possibility of accessing the DOD sponsored Information Analysis Centers through a DDC-IAC network.

e. Expansion of DDC services and products are considered a necessity by all respondents.

(1) Publish a DOD acronym listing.

(2) Publish cumulative indexes to TAB (1953-60), (1960-69).

(3) Introduce capability to access documents by project names.

(4) Provide a link between WUIS/Report numbers.

f. Installation of Defense RDT&E on-line system in the downtown Boston area was considered to be impractical and inaccessible by Rt. 128 Librarians.

(1) Plan to provide centralized access by contractor/government organizations in a suburban location.

(2) Coordinate part-time use required by most of the respondents.

g. Miscellaneous Comments:

(1) It has become necessary for most organizations to curtail their purchase of documents due to increased charges.

(2) Respondents were pleased to notice that an investigation of mail delivery is being conducted to trace problems of delayed document delivery.

(3) Five organizations indicated that their users definitely preferred full-size hard copy reports to microfiche. The volume of reports ordered dropped significantly when fiche is the primary format made available to users.

(4) One respondee objected to the inconsistency in terminology used to retrieve documents. Key words used by authors do not match those found in the DRIT.

(5) When reports are ordered from DDC using a Form 1, bills are received from NTIS·for charges against deposit accounts. These bills do not provide the individual requestor's name, which makes bookkeeping an impossible task for the librarian.

(6) At least one user felt that the policy of distributing classified materials directly from DDC to the field site of request, rather than to a local D.C. address of that organization, inhibited their ability to expedite a "rush" request.

(7) Strong opposition was expressed by a couple of respondents to the idea of reinstating field offices. Service provided by field representatives in the past had not been uniformly rendered.

(8) It was expressed by one user that the AD numbers were too long, making the possibility for error too great when ordering documents.

(9) One respondent with on-line access to DDC indicated that the system was "down" 50% of the time they tried to use it.

digital

INTEROFFICE MEMORANDUM

TO:
Peggy Dunn
cc:Ken Olsen
Dick Best
Mimi Cummings

LOC/MAIL STOP
ML12-1/A50

DATE: July 18, 1975
FROM: Carolyn Sweeney
DEPT: Library
EXT: x6465
LOC/MAIL STOP: ML5-4/A20

Whirlwind

SUBJ: Response to your request for a memo and thesis on character generation, with emphasis on author and affiliation.

Mimi and I searched the Digital historical files for a memo (M series) or an engineering note (E series) containing information or reference to character generation, but could not locate such . Through our interlibrary loan cooperation with M.I.T./L.L. we asked them to search their archives for an Olsen memo on character generation. They found only two K. Olsen memos from 1952, neither dealing with character generation. Unfortunately, neither M.I.T./L.L. nor Digital has a subject index to these files, so they could only be checked by date, author, and title.

The thesis which Sidney Bradspies completed at M.I.T. was entitled " A magnetic-core memory with external selection," 1955, 169 pages, Master's in Electrical Engineering. Dick Best agrees with me that this title does not appear to be relevant to the topic of character generation. However, if you care to see the thesis it is available for viewing at the M.I.T. Archives, or the M.I.T. Barker Engineering Library, and it can also be purchased.

In an attempt to locate other references which might lead to the particular item you'd like to see, I searched the abstracting and indexing services of the Digital library's reference collection. Perhaps bibliographies from some of these citations will yield the information you seek:

Jones,E.D.," A versatile character generator with digital input," WESCON Convention Record of IRE, 1959, vol. 4, pp. 16 ff. (cited in W.W.Youden, Computer Literature Bibliography, 1946-1963,U.S.Dept. of Commerce, N.B.S.)

Redman, J., " Advanced display techniques through the Charactron Shaped tube, " Proceedings, 1st National Symposium, Society for Information Display, Santa Monica, Calif.,March, 1964, pp. 31-46. (cited in S. Sherr, Fundamentals of display system design, c. 1970)

Peterson, R.M. and R.C. Ritchart, "Recent developments in shaped beam display and recording techniques," IRE Convention Record, 3, pt. 3,(1958),pp. 21-30. (cited in Sherr)

* Loewe, R.T., et al.,"Computer generated displays," IRE Proceedings, v. 49, #1, January, 1961, pp. 188-190.

Gilbert, Barrie(Tektronix,1970),"Monolithic analog READ-ONLY memory for character generation," IEEE Jour. of Solid State Circuits, Feb.,1971, pp. 45ff.

________,"Priniticon: a new character generating monoscope for use in visual display systems, IEEE, Trans.,Electron Devices, 1971,Feb.,pp. 118 ff.

* The bibliography from this article is attached.

12(a) lists several possible alternatives for direct viewing by individuals or small groups. Some systems use magnetic storage for one frame of data. Any of the various symbol generation techniques may then be used with a CRT for display. Instead of magnetic storage for image regeneration, image storage after digital-to-image conversion may be performed using hard copy or display storage tubes (see Fig. 1).

Where large audiences must be accommodated, a projection technique may be used, as is illustrated in Fig. 12(b). The image may be projected directly from a CRT or oil film or it may be projected from one of many types of image storage media.

For any set of requirements for computer-generated displays, there may be a number of feasible functional flows and a number of techniques for each function. Careful analysis of the many possible combinations should lead to a very effective computer-generated display within the present state-of-the-art.

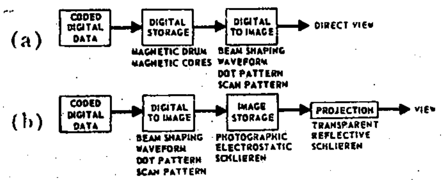


Fig. 12—Several typical functional flows and implementations.

Acknowledgment

The authors are indebted to representatives of many firms for supplying information, and are grateful to the many associates at Aeronutronic, including Dr. H. Weiss, Dr. R. H. Meier, P. Rosenblum, R. L. Kuehn, and J. Deutsch, who contributed information and assisted in various ways.

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digital INTEROFFICE MEMORANDUM

TO: Ed Schwartz

cc: Ken Olsen
Gordon Bell

DATE: July 30, 1974

FROM: Roy Gould

DEPT: Trade Shows

EXT: 2302 LOC: PK3-2

SUBJ: Museum - Non-Profit Organization

Would you please check into the possibility of setting the Digital Computer Museum up as a non-profit trust, foundation, or corporation whichever is appropriate. This would aid us in donations of displays as no one will donate to a profit organization. This is part of the problem we are having with MIT turning the TX-Ø over to us.

I have enclosed a study done by Harvey H. Lippincott, Corporate Archivist for United Aircraft, for your information.

jac
enclosure

Box 315
Bolton, Massachusetts 01740
August 5, 1974

Computer History Project
Smithsonian National Museum of
History and Technology
Room 4601
Washington, D.C. 20560

Dear Sir:

The IEEE Spectrum of February 1974 had an article by Henry Tropp, former investigator for the Smithsonian History Project. Do you have any bibliographies or descriptive material of the contents of your project that are available at this time?

I am very interested in tracing certain points in the history of computers for a research project. Is it necessary to visit the Smithsonian and your Computer History Project in order to use the material?

Sincerely,

Sally Birch Lymberg
Research Librarian

SBL/jac

digital INTEROFFICE MEMORANDUM

TO: Roy Gould

cc: Marietta Ethier

DATE: 12 August 1974

FROM: Ed Schwartz

DEPT: LEGAL

EXT: 5500 LOC: Maynard PK-3/2

SUBJ: MUSEUM

X-4288

I have asked Marietta Ethier of my department to look into the pros and cons of establishing the museum as a non-profit corporation.

In addition, we want to check out the various tax laws to be sure that even if we can establish it as a non-profit corporation that it would have the benefit of tax free status so to take advantage of contributions, as you indicated.

I trust that Marietta will be in touch with you shortly.

lml

digital INTEROFFICE MEMORANDUM

TO: Gordon Bell
Mimi Cummings
Roy Gould
Ken Olsen

DATE: March 26, 1975

FROM: Sally Birch Lymberg

DEPT:

EXT: LOC:

SUBJ: Museum Project

This Progress Report for the DEC Museum Project gives a quick, general overview of company museums, and computer exhibits in larger museums. It is in two sections. There is only one copy of Section II, Photographs of Science Centers and Museums; it is being attached to Gordon Bell's report.

There is so much to learn and so much to see that it's hard to tell it all. I've tried to hit the high spots -- which are my own, based on the information and guidelines given to me at the beginning of the project.

I'm sure there must be much left untold in my notes and references that could be of more value, if applied to a specific program.

I would be very happy to participate in any way possible toward the completion of this museum project.

If a discussion of the report would be helpful, I am ready when you are.

/mrg

Progress Report for

DEC Museum

Project

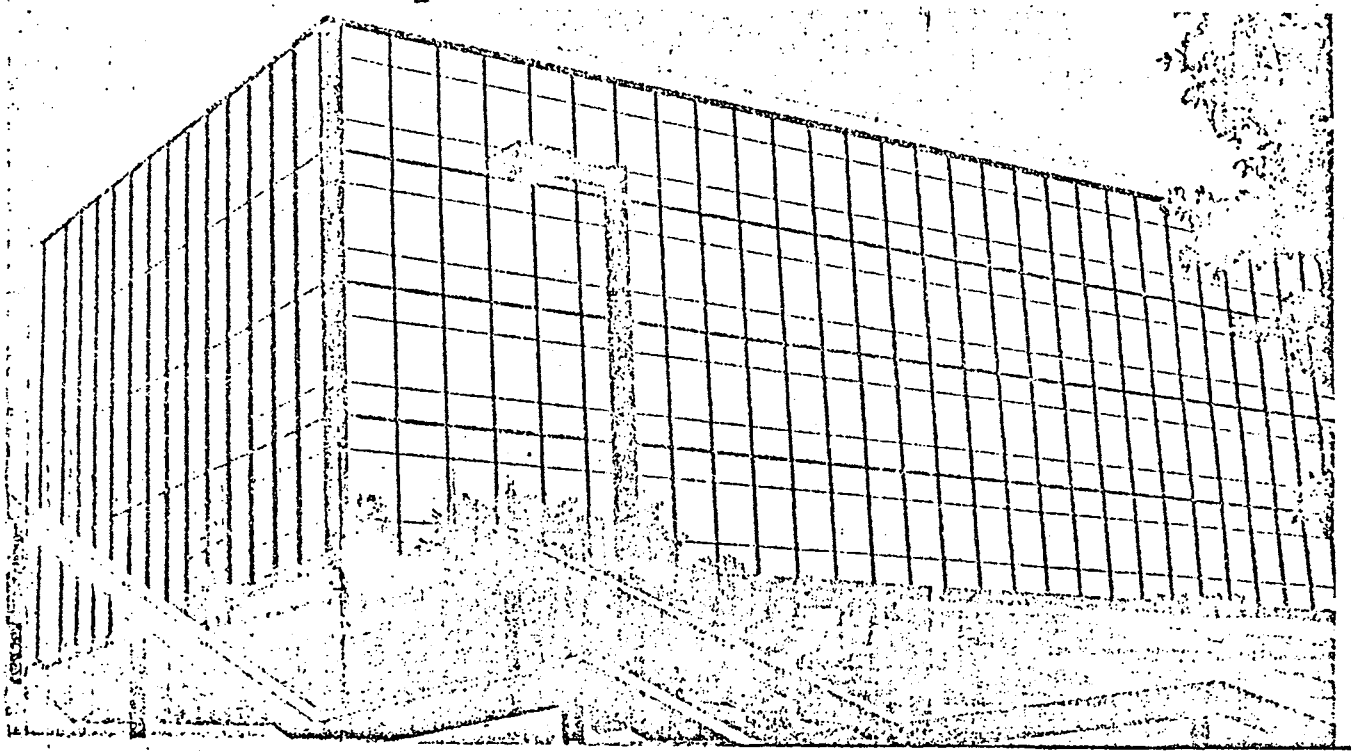
Period Covered

May 20, 1974 to November 20, 1974

Submitted March 21, 1975

Sally Birch Lymberg
Museum Consultant

Digital computer museum



by EMDON D. MacKAY

(Of the Enterprise-Sun Staff)

MARLBORO — "We'll have one of the best, if not the best, museum in the world" in the Marlboro division of Digital Corp., according to Kenneth H. Olsen, president of the firm that is known as the largerst manufacturer of minicomputers in the world.

Olsen, who spoke at the meeting of the Rotary Thursday noon at Marlboro Country Club, said the former Marlboro RCA complex is ideally suited for the computer museum to house Digital equipment beginning with the first whirlwind models.

He added that Digital has been looking for space for a museum for several years, but "every time we found floor space, we decided it would be more economical to use the area for building or testing new computers."

The Free Enterprise

Wednesday, February 13, 1974

My interest in the DEC Museum project really began with this newspaper release. I began to think, and wonder if all the interest that I had found while planning for a Univac museum at Sperry-Rand several years ago still existed. A few notes and conversations with former associates convinced me that there was still an on-going enthusiasm, with an exciting quality. I believed that this same enthusiasm if properly "harnessed", had no proprietory bounds. In other words, many companies had many displays of their own history or product. But, no one in the computer world had develope a continuity of historical landmarks covering all companies, hardware or software, at a professional level. In other words, the DEC Museum is valuable as an idea for the whole industry, for the state of the art, and as a central source of information. Unless someone begins to think the "year 2000" today -- there will be nothing to preserve, because the pace is so swift that historical records fall by the wayside. The computer industry is probably the only one in which men and women today are outliving their own contributions to the world of technology.

My association with DEC began May 20, 1974. I find no formal guidelines or outline for duties in my notes taken at that time. I reported to Roy Gould as a cost center, with support services, telephone and secretarial assistance furnished by his department. He made his complete file on the museum and museum related subjects, (dating back to May 15, 1972) available as references. There was a short meeting with Roy and Gordon Bell on May 23, 1974, to discuss ideas. As a result of this, I began to search in historical records for a "computer museum."

- to cover all the steps in the design of "computers" from year unknown, to 1957 when DEC was formed.

- to span the period between the Whirlwind-- and TXO eras to PDP-1 with as much primary source information as possible.

- to locate as much as possible within DEC, of "archives*" of historic** value, other than hardware itself.

The above three categories reflect what I think one of the memos from Gordon Bell, dated September 17, 1973, was saying about contents and priorities for a DEC Museum.

*An organized body of records pertaining to an organization (DEC)

**Historic is largely restricted to what is important in or contributes to history. (Not necessarily confined to DEC archives)

(American Heritage Dictionary)

The next benchmark I found was a memo dated April 16, 1974, which could be considered modus-operandi for discovering other museums, science centers, or company sponsored exhibits,

---- what are they doing?

---- why are they doing it?

---- does it work?

---- what would they do differently?

---- how much does it cost?

If you combine the above questions with priority and "how to," it is essential to find out what has already been done in "computer museums," who did it, was it any good, and could "people use it."

As a start, I combined field trips with written inquiry, and local telephone requests for information. Beginning in our own backyard, Boston, I started with the Boston Museum of Science on May 29th, 1974.

Field Trips -

Boston

Boston Museum of Science

Roy Gould and I met with the following:

Pamela Cook, Director of Exhibits

John Drabik, Director of Program

Edward Pearce, Librarian/Archivest

John Radloff, Designer

for a guided tour and then "questions and answers"--

There is a Honeywell donated, designed and maintained exhibit in this museum. It was installed on July 19, 1973. The display consists of six parts:

1) Panel 1 - INFORMATION PROCESSING IS AS OLD AS MAN

   A series of light boxes are illuminated in chronological sequence when an actuator button is pressed.

2) Panel 2 - THE COMPUTER HAS A LANGUAGE OF ITS OWN

   A large punched card shows how alphanumeric information is represented in punch form, and the visitor is challenged to interpret a 6-character word punched into the card, but not identified. A pushbutton-activated light box also displays the binary equivalents of several numeric and alphabetic characters.

3) Panel 3 - THE COMPUTER HAS FIVE BASIC ELEMENTS

   The panel when activated by a pushbutton suggests the flow of information through the elements via sequentially lighted, pulsating arrows.

4) Panel 4 - COMPUTER COMPONENTS HAVE BEAUTY AS WELL AS FUNCTION

   An array of typical computer components has been mounted on a panel in an esthetically pleasing arrangement to form a contemporary sculpture. The panel consists of two parts, each containing a duplicate array. On the left side, the parts appear in their natural colors. On the right, the parts have been sprayed the same color as the background and thus appear as interesting forms (no attempt is made to identify the various components and subassemblies).

5) Panel 5 - PROGRAMMING IS THE PREPARATION OF DETAILED CODED INSTRUCTIONS FOR THE COMPUTER

   Displayed are a typical payroll flowchart, a handwritten coding form, and a source and object listings.

6) Panel 6 - THE COMPUTER IS HELPING TO IMPROVE THE QUALITY OF LIFE

   A series of twenty computer applications is presented to the visitor in the form of lighted panels. The visitor selects from ten categories such as space, medicine, law, industry, business, and agriculture, and, by pressing the corresponding button, is presented with two brief descriptions of computer applications in that field.

After almost a year of operation, several patterns were recognized by the museum staff which were peculiar to this exhibit. Because of a desire to assist us, this review of the past year's problems became a pretty accurate account of "real-time" and not just a P.R. report. The following consensus of the opinions of the staff covered several points:

a) Because of the density of users, (as many as 2500 school children in one day), downtime often affected the plans of groups who came primarily to see that exhibit and this often disrupted the programs. The computer alone was not enough to hold their interest.

b) It was unanimous that this display did not "Cope" with the purpose that the Museum had had in mind for a computer display in a museum.

   - it was too technical
   - there were inadequate instructions for any hands-on user.
   - identification of panels, content of labels, and style/design of labeling did not attract or hold interest of spectator.
   - there are 11 games in all. Only 3, TicTacToe, Simple Simon and NIM, allow a contest between a person and the computer.

No imagination in selection, or the game was too difficult to comprehend. Leaves a trace of hostility between user and machine.

- to produce a more effective display for all it would have been better to use a designer who would receive input from both donor and recipient. Honeywell was not really happy, and neither was the Museum.
- recognize vandalism and its results in expense of maintenance as well as down-time. Protective devices and plexi shields are expensive, but in the end they were not as expensive as not doing anything about vandalism. Nothing is really safe!!

After this discussion, the group disbanded and I was briefed on visitor services, security, and school scheduling in the museum, as well as other museums/ science centers with similar displays worth seeing· Toronto Science Center, Royal Ontario Museum (science display), Ontario Place, Carborundum Museum (Niagara Falls), and Corning Glass Works. The latter two are company sponsored. Letters of introduction were offered to all of them from the Boston Museum of Science; this assistance was accepted. (It was recommended that a personal membership be taken out in the American Assn. of Museums, to serve as a "union-card" in contacting other museums. This was done in Roy's name, through the Library. I have used it very successfully).

The Children's Museum

The Children's Museum was closed for part of the summer in order to install a new PDP Computer, and build the display area.

In October, the new computer display showing DEC PDP8 was opened. At the last minute, Dick Berube asked for help in coordinating their lobby display. He furnished the corporate highlights and I was able to make necessary arrangements with Houghton Mifflin to use their book, "What is a Computer?" for the copy to illustrate parts of a computer. Edu Systems cooperated in supplying "Computers are for Kids," and other presentation material. Sally Bowers also loaned several enlargements of children at Computers. Roy Gould supplied a memory core, with a plastic shield as well as a small vial of ferrite cores. The exhibit was ready on time!!

In comparison to the Boston Science Museum, you would almost think this display was held together with "baling wire." However, as part of a newer trend in museum displays, a lot of preparation is left out of "black boxes" to offset the "mystery" of "black boxes" -- since the age level at Children's Museum is probably ten or under, accompanied by parents, rather than large groups; it is a different type of presentation than any others visited.

I was impressed by lack of a lower age limit, since even small ones could use it by experimenting with "Mr. Turtle" designed by Bill Mayhue out of parts and pieces of an erector-type toy set. The ability to read, really is the governing factor for use of the terminals.

Field Trips -

Out-of-State

From Sunday, June 9 through Saturday, June 15, the following museums were visited: (These visits coincided with a special Library Assn. meeting at the same time):

<u>Carborundum Museum, Niagara Falls, New York</u>

Company sponsored, built by company but leased back to the museum. Excellent lighting, good displays, of uses of Carborundum and related subjects, fee charged but not adequate to cover expenses. Staff too small for adequate security measures to cope with overflow from Niagara Falls on cold days -- building almost overpowers mission of museum.

<u>Toronto: Ontario Science Center</u> (See photo in Section II)

Contacts: William Castledine
Chief of Electronics
(Design Dept. in his area)

John Fowles,
Sr. Education Officer

One of the older IBM exhibits from a worlds fair had been "cannibalized" by them as a basis for a large computer display. In contrast to the Honeywell exhibit in Boston, this exhibit tries to show principles of operation in all computers. As an interesting part of the tour, Mr. Castledine said he had a surprise to show me as a finale. He took me to see the TicTacToe exhibit again, down a corridor, behind a screen to see what ran the game -- a PDP 8!!

John Fowles, Education Officer, had a complete package made up for us of "how to book a school visit," through final record keeping forms. It was most interesting that their vandalism rate was much less than Boston Museum, and as a result made a great difference in the type of their displays. I consider this a AAAA museum to be studied for their method of solving problems with the public. Their exhibits are excellent, in content and display. It is colorful, fun, with a warm welcome by their "hosts" in white coats. Since all of their displays lean toward a non technical approach, there is excitement in finding and discovering new items for each visitor. An "Ask Us" phone network really works for in depth questions.

ask us is the Ontario Science Centre's scientific and technical information service. We answer questions about: 1 technical problems in the home and at work* 2 hobbies 3 Science Centre exhibits 4 whatever interests you · *Replies are given in writing, and if we can't answer your question, we will tell you who can. *(we don't do entire school projects for students!).*

I know, I tried it, and the answer arrived back at DEC before I did! This is undoubtedly the best example of "how to" for a museum with hands on participation from the time you enter the front door until you leave - open to the entire public - kindergarten through Sr. Citizens.

Since the Province of Ontario funds them each year, there are no budget problems. The staff invites further visits, will share ideas or answer questions and believe that a "For-Profit Company Sponsored" museum of the scope proposed is one of the most rewarding achievements for the museum world. I think their phrase was "heritage, festival, and horizons," which can translate "history - fun and games -- and future year 2000."

Ontario Place: (Civic Center)

Many little theaters, much color, very contemporary, non-technical.

Pall Mall of Rothman, Ltd. (Company sponsored)

Traveling art, graphics, print, displays as loan exhibits to non-profit museums, institutions (colleges, etc.) paid for and sponsored in full by Pall Mall as a Company Museum to enhance their image without saying "smoke our cigarettes." The Stratford Art Museum furnished a permanent home for this collection. If we had a museum that qualified, they would be happy to send their graphic or prints -- Michael Nye, Asst. Director had seen our display at the recent trade show, in U.S. (ANPA?).

McMichael Canadiana Historical Museum
Klienburg, Ontario

I went to this out of curiosity to see how a building similar to the Mill in Maynard could be used. It was a delightful combination of old artifacts, with simple design, clear labels and dates, intermingled with historical copy - a very non-boring display.

In conjunction with the Library meeting, I met with the museum groups and science and technology sections to renew my entre into the archival and historical information sections of other computer companies.

Elizabeth Brown, IBM, Armonk, N.Y., is an old friend and welcomed the opportunity to be of assistance in any way possible. She, in fact, set up all our contacts with John Lowe, Exhibit Manager in N.Y.C. where the Eames Wall is, and she will cooperate in all possible ways in the future to put us in touch with the right thing.

While in Toronto, I also attended several meetings at Mimi Cumming's request to bring back names or papers from the meetings attended, since she had a conflict in schedule that prevented her attendance.

United Aircraft Corporation

Upon my return from Toronto, I was referred to the United Aircraft Corporation for information concerning a "Survey of Company owned, sponsored and supported Museums." I understand copies of this have already been routed by Roy Gould; a list of 50 museums in this country and 16 in Europe. Harvey Lippincott made this survey in October of 1973 as a company confidential document. He is an Engineer - turned Corporate archivist, with a very comprehensive overview of the technology - oriented content of a museum similar to what we have discussed.

Roy and I made a one day field trip in August to discuss in detail, portions of his report which were better discussed in person than in writing, as it could merge on UAC company confidential figures or decisions. We were shown his collection of slides, and he discussed at length UAC's philisophy, legal aspects of museum in relation to company, and final cost of plan as it was presented for their museum.

Since the plan for the UAC Museum included a new building, a new location, an over-ambitious design planned by an architect, and finally ended in costs of a million and over, no action was taken by UAC. The cost did not include any aircraft or engine displays. I had the feeling that none would ever be taken, but this feeling was based on the plan as presented. The interest in collecting and preserving company history and old engines did not diminish. Their choice items will be used as company exhibits in various locations. Later Mr. Lippincott did supply a summary "factors in establishing and maintaining a company oriented Museum" for review by DEC's Legal Department, where Marietta Ethier did an excellent comparison between company-owned-sponsored museums and museums as a separate non profit entity.

Corning Glass Center

Contacts: Robert B. Wake
Operations Manager

Francis J. Doherty, Jr.
Mgr., Public Relations

These men met with Roy Gould, Bill Harrington (of E.T. Fahey, an exhibit house used for trade shows) and me for a one day tour and "how we do it" session. As explained by Frank Doherty, Corning was almost forced into some means of supplying "culture" to their management employees in order to keep them, when the decision was made to locate glass works in the "backwoods" of New York State, where there was an adequate labor market many years ago, for the glass factory. Social responsibility by Mr. Houghton (founder) and later members of his family was the basis for many contributions to the community in the form of buildings and financing of the arts.

In 1951, when the International Headquarters of this growing company was located in Corning; the Glass Center was built to do several things. It celebrated the 100th anniversity of Corning Glass Works, it helped establish an image of a growing company, desirous of improving the quality of life for its people. Later a large auditorium was added which has really become "the community center." So much for philosophy and paternalistic history. The make-up of this Center is really in three parts, each showing a different aspect of glass:

- The Corning Museum of Glass

  The entire history of glass is presented in chronological order with thousands of glass objects from earliest items to the present. This is truly a collection of historical value, from all over the world.

- The Hall of Science and Industry

  This section presents the manufacture and uses of glass in today's world. There are pushbutton exhibits as well as some slide shows.

- The Steuben Crystal Gallery

  A guided tour shows the factory where the Steuben glass is poured, engraved and polished.

This Museum is a good example of the drawing power of the Glass Center, since it is 50 miles from "nowhere," and yet has become a major tourist attraction for three quarters of a million people each year.

The method of funding/sponsored/profit/no profit status was a delicate balance handled legally by the Center as a separate independent Corporation. Funding came from several sources, the major one being Corning Glass Foundation (back to original Houghton family philosophies). It was my understanding that the Center as a whole did not pay its own way, but once integrated into the community, politically and socially, it became difficult to withdraw to any degree.

Dr. Jack Martin, Administrator for Corning Museum and John Peck, Corporate Attorney, Corning Glass, are two names given to use for future reference if DEC counterparts would like assistance or background information at their own professional level. They've been through it all, and would like to share their knowledge, to keep us from making some of the mistakes they made.

IBM

Exhibit Center of International Business Machines Corp.
57th and Madison, New York City

John Lowe, Exhibits Director

Since I have not visited this exhibit, I feel the best summary of many of my telephone conversations can be summarized in a trip report by another. I gave Mimi Cummings as much background as I could before she made a trip to N.Y.C. for another meeting. Because of her interest in this whole museum project, she offered to meet John Lowe and take a tour. I quote as excerpts from her trip report:

Visit with Exhibit Director, John Lowe 7/10/74
by Mimi Cummings

Most important step is to determine

1. WHY you want a museum or exhibit?
2. WHAT you want in it?
3. For WHOM this will be - what audience?
4. HOW you will evaluate its success afterwards?

Originally IBM had its products only in this exhibit. This lasted for about 7 years. Then 3 years ago they changed over to this museum concept and have found it much more in line with their objectives than just exhibiting their "wares." The following are suggestions gleaned from my visit.

Be sure that your exhibit or museum does not duplicate any other exhibits in your geographical area. In otherwords, even in Maynard, it would not be wise to attempt to compete with the Museum of Science or the Childrens Museum.

There are definitely conservative and more liberal philosophies behind museums and their objectives. Determine what these are and be sure that your concepts behind your museum fit in with the philosophy of your company on other matters.

If your Why you want a museum is go educate people in general about computers - John Lowe says "forget it." The industry is changing so rapidly that no museum can say something to everyone. The very sophisticated person will not find what he wants, and it is very difficult to teach something about computers to someone who knows nothing to start with.

IBM's WHY is partly an attempt to show that a technology oriented company that makes cold hard things like computers can have a place that is physically attractive with real human beings in it that speak to you when you come in and attempt to help you relate to some of the hardware which is demonstrated there.

Therefore, IBM's objective is not to teach the general public, but to enhance IBM's image with the general public, and to show people that they can have some sort of relationship with a computer that is not negative. Then, hopefully, they may want to learn more about computers or at least think more highly of IBM.

The cost is much bigger than you will first estimate because the cost of staffing to keep the museum going and productive will keep growing, in order to make whatever sort of exhibits you have meaningful.

You must have good literature to take home because no one can take in what you are trying to tell them on a once-around the exhbits.

People mainly come to exhibits or museums to be quiet, or get warm, or be mildly entertained. Their desire to be educated is not usually their number one motivation.

Don't be parochial or pat your company on the back. Be more subtle.

If you are an exhibit, say so - don't pretend to be a museum.

If you have anything in the way of exhibits that people operate themselves, each must be constantly moderated by a staff member. Every machine must be duplicated to handle "down time" - it would never do for the company's own machines to be inoperable.

Don't try to say so much to the person that you put him on the defensive. If the museum says to him, I know more than you do, he will not leave with a feeling of satisfaction. Rather he will say, boy am I stupid, and will feel negatively about your company subconsciously.

Be prepared to make some changes in exhibits with the seasons.

Some further statistics for the same gallery:

- covers 8000 square feet
- two school groups handled per day (age level, Jr. High)
- a short tour, then a film theatre with several Eames IBM films.
- no admission charge
- gallery is completely company controlled and sponsored.
- size of staff varies up to 10 in all
- 2/3 on floor at a time, for one hour duration
- two managers and eight "floor people" in all
- staff taken from many disciplines and assigned for one to two year duration. (This period can be flexible if a wrong selection is made for a "floor" person).
- outside exhibit company provides annual maintenance at about $15,000 per year for just panels and graphics.

There have been several different exhibits - Astronomy, Copernicus, plus a "green growing corner" in addition to Eames exhibits and IBM consoles. However, I understand that in November '74, the entire exhibit center was closed indefinitely, and what could be used as a window display would be so used.

In October, after a week of interviewing museum designers and planners, Roy Gould selected Admore, Inc., from Shrewsbury. For about six weeks I worked closely with them to provide orientation in the computer field, historical references, books, reprints, films, and as much background as I could. Field trips were arranged so that they might have first-hand experiences with children and computers at as many age levels as possible. These field trips are briefly summarized as follows:

IBM, N.Y.C. Bob Francesca and Fred Moore met with John Lowe, in N.Y.C. at the IBM Exhibit.

Chicago Science Center - Fred Moore of Admore accompanied Roy Gould to Chicago to visit their exhibits on October 1 and met with Victor Danilov who has written many articles for Science Center and museum publications. It was really a double purpose visit since Chicago Science Center was soliciting funds for their exhibits to celebrate the Bicentenainal. Their theme was "American Inventive Genius" and they were looking to American industry to finance it. Roy advises that he went in reply to their request for funds and reports that none were donated.

Lexington School System - The following suggestions made from many sources within DEC for the best exposure for the Museum design firm seemed to be visits to schools with DEC installations. Peg Pulliam who is a math specialist in Lexington brought a group of five third or fourth graders to the Lexington High School Computer Center. Some of these students had not seen a computer since their classes a year before, but they picked it right up again.

Newton North High School - The Newton System was quite different. The head of the Dept. called in three students who actually used their own time after school to do some needed programming for school, to list all programs available, and they were paid an hourly rate. Their enthusiasm and creativity came through loud and clear as an example of "student and machine." All three students wanted a job in the museum!! Along the way somewhere we met a 16 yr. old who had been in an MIT summer session as a teacher for BASIC, on one of the computers down there.

Childrens' Museum - Here again was another age segment to look at, with the types of displays, ages, sizes and needs for a staff. Bill Mayhue was most cooperative in explaining their reasons for displays and programs. He felt that having the electrical connections from DEC Writers to Central Console so that children could trace it did no harm, because they all knew that there were wires to and from their telephones, too. This is the most simplified of all the computer displays, and in many ways the most successful with the visiting public (October to March 1, over 80,000 visitors).

I accompanied the designers to the above three appointments.

Other Reference Sources

Whirlwind

Late in August I received a request to research some background for Ken Olsen's talk. During this period we obtained a copy of NBC's "See it Now" series by Edward R. Murrow, with a 15/20 minute section on Whirlwind from their archives. In addition, a film "Making Electronics Count" was loaned by MITRE as well as some 45 to 50 black and white negatives, which were copied and which I have documented exactly as MITRE did. In addition, we have three volumes from their archives as listed below:

- AC-6 Whirlwind I Computer (MIT Project 6345)

- AC-23 Memory Test Computer

- AC-31 Lincoln TX-O and TX-2

This is their inventory of what was sent to the Smithsonian Computer History Project. In establishing our need for these references previous to Ken's request, I found that many original documents from this historical period were being destroyed by both MIT and Lincoln Lab as they were microfilmed for permanent and legal records. I began to "collect" just to keep from destruction.

A number of the early report series on Whirlwind I were among those contributed from various sources. These reports were added to those already on file in the Library. Since this is not a complete collection, it would be most interesting to get as many of the historical reports as possible in their original form. I am working on this. Professor Hartley at MIT archives loaned us many needed references in this search.

The Engineering notebooks requested by Ken are available, but only from microfilms, "they say." I know the archives and Library group well, many were originally in either Div. 6, or one of the sections concerned with computers and some things are "squirreled away" as souveniers. I feel sure that if we can take some sort of positive action prior to these individuals' retirement, we might have some more interesting items than just "copies" from a film. John A. Kessler, in the Director's Office of Lincoln Lab, has extended an open invitation to use his records, or ask for guidance in looking for what we need. I have tried not to abuse this privilege until I really have a bonafide list.

While researching the Whirlwind era I found several books in preparation:

<u>MIT</u> - Professor Karl Wylde is writing a history of servo-mechanisms and electrical engineering departments with Gordon Brown, in active support of the project. I have been invited to review his manuscript when typing is completed. WWI in included briefly.

<u>Smithsonian</u> - Manuscripts for two books, each started by principal investigators for the Computer History Project, never really were completed. Copies of these are with Ken McVickers at MITRE. They are also available for reference.

<u>MITRE</u> - Ken McVickers is working in a History of Whirlwind, showing some of the "Whirlwind Firsts." He gave me a short summary copy, which is included in the second section of this report.

<u>Bell Labs</u> - Several books are being written or edited in various parts of the country, that have references to items of interest for us.

KEM
30 November 1972

WHIRLWIND "FIRSTS"

Although it is difficult to say who was "first" with the many innovations spawned by the fast growing computer field in the 1950's, WWI was the first high speed digital computer intended for real-time applications to run reliably. As a result, it provided a chance for a multitude of enthusiastic and inspired technicians and users to develop their ideas and realize their rewards in an operating system, an inspiring environment replete with exciting opportunity.

This same situation, the opportunity to "do something" and "see it happen" was to result in a spur to do something better rather than to publicize what was done. Although Whirlwind was perhaps the best documented computer in history, it was the most poorly publicized. In a book published in 1950 entitled "High-Speed Computing Devices," published by McGraw Hill, Whirlwind is not even listed in the chapter on Large

Scale Digital Computing Systems even though others, behind Whirlwind in development at the time, are described. Of the approximately 400 references cited in that book, only three were related to Whirlwind and all of those to electrostatic storage.

Among the firsts which should be credited to Whirlwind are:

1. development of high speed digital circuits operating at a clock rate of 2 megahertz and utilizing pulses $.1\mu s$ in duration;

2. first computer to operate with a magnetic core memory;

3. first computer for which a "simplified" or "user oriented" language was created;

4. first computer with a family of utility programs for input conversion, program assembly, program trouble shooting;

5. first computer to use diagnostic programs to locate machine malfunctions;

6. first computer to run with diagnostic programs designed to locate defective components to plug-in-unit level, to component level;

7. first computer to incorporate a voltage variation sequence, imposed while the computer was running, to locate deteriorating components and anticipate failures. This technique called marginal checking permitted many potential

failures to be located before they happened and allowed the machine reliability to exceed statistical predictions;

8. first digital computer to drive a cathode ray tube with a display of the results of its computation;

9. first digital computer to incorporate a "light gun" which enabled an operator to designate to the computer a single display point out of a multiplicity of display points on the cathode ray tube face;

10. first computer to accept digital data transmitted over a phone line;

11. first machine to operate with a remotely located interactive terminal - (CHARM -

TTY at Logan connected by phone line to WWI);

12. first machine to operate with a multiplicity of input (keyboard, light gun, TTY, typewriter, digitized radar data)

13. first digital computer to operate in real time with on-line man-machine interaction;

14. first machine to operate with multiple on-line operators simultaneously; the first "time shared" computer;

15. first computer to perform track-while-scan on remoted digitized radar data;

16. first computer to conduct a live intercept of one aircraft by simultaneously

tracking both the pursued and the pursuit aircraft, making the necessary intercept calculations and providing vectoring instructions for the interceptor;

17. first machine to demonstrate a pattern-recognition capability in which an object could be placed on the detecting surface at any location with any orientation and be recognized by the computer;

18. first digital computer to be used for remote control of aircraft via a data link;

19. first machine to run a document retrieval capability.

Smithsonian

Several years ago, the Computer History Project was established in the Natural Museum of History and Technology at the Smithsonian, Washington, D.C. The American Federation of Information Processing Societies (AFIPS) attempted to fund the project with necessary funds, since all that could be furnished at Smithsonian was space and limited manpower. This fund raising attempt was not successful as an on-going project. When an Exhibit is installed there, it is usually funded by the donor, since it becomes an item of historical value, by being accepted. A number of computer reference collections have been sent to the Smithsonian. The same list that MITRE sent has been given to us in three volumes, from their archives.

John Kessler in the Director's Office at Lincoln Lab has no copy of their master list as sent to the Computer Project; however, we have access to their complete collection, including archives. This is a valuable source for continuity in documenting Whirlwind.

My impression of holdings at Smithsonian is that one must walk in the door to use the collection. A very small part of it is available to the general public, the balance is either boxed, in storage and often even restricted in user access, as designated by original donors. I also understand that items are available for loan under right conditions.

Conclusions

Part I - Actual Resources available to the DEC Museum Project

Part II - Modus Operandi

Part III- Personal Recommendations

Conclusions

The early history of computation, math, counting and calculating, etc. has been almost overdone. So a wealth of source material is readily available. Harvard, MIT and Boston Public Library resources and collections are all useful and available. MIT has stored a number of their engineering notebooks prior to 1940, with the Boston Public Library archives. We will have any access needed. MIT archives have already helped in many ways, with loans or copies; and Harvard is as cooperative.

Lincoln Lab collections, library, archives and documents control are so closely entwined with MITRE and their archives, that I am referring to them as though they are one. This open door policy includes John McKenzie, with all TXO documentation, (Cambridge), John Kessler, Lincoln Lab, Office of the Director, and the entire MITRE organization. Needless to say, this is possible because of Ken Olsen and the total background of the history of DEC. If it's still "alive and well" and not destroyed, we may use, borrow or copy!

DEC company archives are a different story. There is a huge gap in the continuity of historical records about the company that is almost frightening. Annual reports give a bare bones skeleton. "On-line" from the first issue are stored in Marlboro and give a better clue. But not any backup records. In the short time of my project, three or four file cabinets full of historical files have been filled and stored in the Library.

Included are several early scrapbooks, an incomplete collection of technical reports on Whirlwind. When the Mill was purchased, I became the coordinator to pull together a record of what had been floating around, and list the items. This includes copies of early photos, some enlargements, and some Maynard Historical society films, etc. All items will be stored in the Library where they can be documented. Non DEC archival material in the form of other computer manuals has been offered by a number of individuals. Mike O'Connell and Sal Crisafulli are two who have discussed their collection of "good junk" in detail. I gather their wives need more space in their attics!! Since there was a space problem, all I have at the present is just lists.

As a result of the research for the Digital Museum Project, a resource file on historical references and computers has been created. It consists of the following parts:

1) Historical File - alphabetical and chronological (3 x 5 cards)

2) Backup file for source material and information for the above

3) Bibliography of primary and secondary sources

4) Reports, correspondence and reprints file on computer displays as well as museums.

5) Access to authors' of books currently being written, not yet published.

From the contacts that are already established, I feel safe in saying there would be no difficulty of any kind in collecting information from archivists, from other companies with historical displays, or discussing loan or exchange of like items, either hardware or software, with DEC. The response has been consistent, "tell us when you are ready, tell us what you would like and we will help in any way we can" --- Obviously, this is from the basis of non-proprietary items or information.

Conclusions: (Modus Operandi)

Records show that in at least 75 percent of the companies with museums one or two persons in executive authority collected artifacts, of a related nature, or even used personal collections or early company products as a nucleus for a museum. DEC is in line 100% with this premise. However, there are so many other factors, plus the changing face of museums, as well as the state of the art in Computers, that I would like to summarize a few factors that have been common to several museums:

1. The highest priority I give is to the consideration of cost of establishing a good museum, for the public. This comes from the many individuals who are already in a company museum and bluntly it has been "Can you afford it?" No specific costs were discussed but there are individuals who are willing to reveal some details of their own experience, should we go back with a firm charter, as guidelines. Not a single company museum visited was self supporting. There was always a subsidy someplace in the background, i.e. Corning Glass Foundation for Glass Center; and as of late 1974 the IBM Exhibit closed, with just a sidewalk window display. Based on hearsay, and "guesstimated" figures, museum "startup" and operating costs in relation to company sales range from a small fraction of 1% to 5%.

2. Since many companies that are growing find they are expected to have also a growing awareness of social and political problems as they affect the general public, museums open to the public can be construed as a company effort in good citizenship. I am sure DEC has already gone over this route of thinking many times. It is image, public relations, as well as useful as a tool at times for customer relationship or better company morale.

3. Type of Museum - In planning a museum from scratch all roads led to "keep it as non-technical as possible." One museum manager even listed reasons people come to museums as, "to be quiet, get warm, sit down, or be mildly entertained." Perhaps this is farfetched, but is is a factor in planning. No one has seriously indicated that education was a high priority of the general public.

   Participation at some level by all who visit is a must. As Victor Danilov at Chicago has written "push a button, turn a crank" has no substitute today. Interested visitors are also less apt to be destructive. To have integrity, the exhibits must lead one to more curiosity, or even an "ask us" button. AV displays are increasingly being used as a means to orient the public or bring variety and change to programs.

4) Size of Museum - Contrary to "museum myths" size has nothing to do with the caliber of the museum, or its designation as a museum. Many company museums started (about 30%) with a choice collection used in conjunction with a company anniversary.

Successful company museums vary from 2000 square feet to 185 acres in size. Generally speaking, 75% of the museums surveyed have a floor area less than 10,000 square feet, as a starting point. Those exhibits which show quality, excellence, integrity of content, good documentation of archival material are accepted as being as professional as any in the museum category.

The fear of commercialism often associated with many company activities does not usually extend into company museums. Most companies want their museums to be museums in the highest cultural and artistic sense, even though they expect to reap benefits for the company.

Personal Recommendations

My first reaction to the news that the museum project was going on the "back burner" was "it's a good thing." This could be an opportunity to consider "feedback" from all sources, plus an evaluation of what has already been researched. There is a better chance that what was an undefined charter in the beginning, can now be defined within bounds of achievement. Based on a memo concerning display of computer parts that we already have, as I wrote September, 1974, I feel we already have a good start toward the display of an antique collection. This has been an unchanging and ongoing desire of management as I have read the "signs," and I prepared background material accordingly.

I am told that the combination of individuals involved, Ken Olsen with his MIT background, the impact of DEC as a company in the computer technology, Gordon Bell as an author and designer, is a combination that invites cooperation at the highest level at this particular time in history. I have already found this to be a fact. PDP has been described as "PDP-eople" I believe this is part of the reason for the success and cooperation both within and without the company in collecting information.

The planning of a museum which will include the contributions of all other companies without proprietary emphasis as a museum collection is a most valuable asset. Much of the material available now should be collected in one location before it is forgotten so that it may be properly placed in a time line. I think it is important to establish the relationship between the early large systems as developed in the cooperative university environment and the later development of the mini computer from one of the same sources.

I feel that the guideline for a corporate company museum is already established which serves as a firm foundation for implementation. I see no attempt to depreciate a museum with company commercialism, lack of good taste, or lack of professionalism. There seems to be a DEC image with a line down the center, one side is "go-go"/the other is conservative "let's see."

I feel Corporate management still wants to get started on a museum. My enthusiasm and interest have increased as I have learned more. The budget seems to be the controlling factor today. I would like to disregard this item and make a few suggestions.

Let's assume that a DEC Museum can do certain things for a company:

- enhance its business standing with its customers,
- enhance the name and image in the Public's eye,
- provide a broader base of understanding of of what a company does, for a company that has as many employees in many different capacities. Better employee relations. (Few departments know what the one next to it even does),
- show that company technology is good, hence a good product result,
- increase public good will, recognition of integrity as a people-oriented "anti-big," even if a big structure exists,
- increase awareness toward company by other companies, and professional groups.
- increase public understanding of the industry which can have economic, and political benefits,
- for a company with non-consumer products, the museum can be a means of becoming better known to the public. (Help dispel fear of a "black box" or "Computers mess up my charge accounts" syndrome).

The next step is to determine how, when and where. I do not feel that it is necessary to tackle the total expenditure or commitment of a budget until a number of other planning facts are established, and perhaps even implemented and results evaluated. There are no figures available on how to measure quantitively the effect on business, but most businesses are convinced that museum visitors do benefit in some way that could lead to referring a lead or buying a product.

I suggest tackling the museum as other DEC products have been produced; by modules or building blocks, which can add up to a complete system as an end product. Costs can be controlled, if experiments can be made, the unsuccessful can be replaced with a better solution. As an example, the present lobby exhibit, if planned correctly, could have certain portions produced in such a way that there could be multiple exhibits, for loan, or travel all over the world to DEC offices.

One office in Kanata, Ontario, has designed its own display of a combination of "history" and today's company products. Brian Coll has supplied pictures which are in the second section. It has been most successful. In a discussion with him he was unaware of the time sequence or relationship of WWI to DEC and would have omitted it completely for future additions in his display. It now stops with Babbage analytical engine diagram, but I gave him a copy of the WWI chapter from Bell and Newell and a time line chart, which made a big difference!! An initial exhibit with the "historical tree" can certainly set the stage for the second "DEC family tree." AV/or graphics designed for public consumption, in support of either the history line or the DEC family tree, would be a good company employee orientation device of great benefit here and abroad. From this as a starting point, some reaction can be expected for level of reception from the viewing public.

As a beginning, establish an "intent" or policy statement that can be implemented at this time to put a museum plan into operation.

Establish a central location for control of material already collected. This does not mean everything has to be in one place, but the helter-skelter of the past, resulting from the fast growth pattern of the company could be better controlled. What is collected should also be useful to everyone at DEC to end needless duplication in search of corporate history or background. Some communication should be attempted within a reasonable limit at this time to locate what has been done, or is being done with archival or historical type files, since there is already material similar to this in the Library. I suggest it be continued in the same location, with one person as a control point, as an I/O station.

If this is established, whether anyone is actually assigned to a museum staff, there will be an opportunity for forward motion outside the company to continue to supply information or resources, instead of destroying or "forgetting."

Establish the next step for a display to include WWI, perhaps using as a base some or all of the material as furnished by MITRE to the Smithsonian. Determine what other relevant outside computer "swaps" are desirable, then begin to trade WWI, or ask for reciprocal loans. With a "museum intent" statement, this is then in order. How and when we display it becomes incidental, as long as it's within a "museum framework."

Establish an "ad hoc Committee," whose function is to operate under guidance of Ken and Gordon with enough flexibility and authority to show achievement and progress. By tying together guidance, authority, research, plan for design, its implementation or functions, there could be continuity. Perhaps such a system could manage to ride with all other factors, on a demand basis, without having so many "startovers."

Now to displays of DEC equipment, I feel it should be for fun and participation; an interaction on the basis that a visitor assembles his own experience. Some type of proper orientation or familiarity, when the visitor is on an area unknown to him, can assist him to identify the beginning of an experience. Once he has this overview, he can select his own area of interest and needs. There are already enough people who know what is good in this field for me to comment on the extent of display or hardware used. Just keep it as non-technical in explanation as possible.

From Computer: Atlas

IDENTIFICATION OF DEC MUSEUM COLLECTION

Antique Computer Parts, Reports, Records & Archives

1) Item #: 1
Date: 2/14/75
Present Location: G. Bell

2) Item Name: Circuit Board
(Common or Technical)

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3) Donor/Source: G. Bell (U. of Manchester) Rc'd June, 1974
Professor Sumner

Physical Description,
Overall Dimension: (Sketch) 5" x 8" x 1/4 thick

How Used, Function, or Purpose:

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4) Full Identification of Item:

a) Name Circuit Board

b) Name of Computer (or system): Atlas I
Use of Computer:

Original Designer or Manufacturer: Atlas prototype - designed by U. Manchester, Atlas I & II mfd. by Ferranti Corp.

Government Agency:
Year of Origin: 1959 proto 1963
Generation: Late first or second
Country of Origin: U.K.
Author: Year:

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5) References for Above:

1. Person G.B. Correspondence
2. Book B&N p. 274
3. Company
4. See Also:

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6) Other Historical Information: The Atlas is one of the most important of the early machines. The prototype was originally designed and constructed at Manchester University. The Atlas 1 and Atlas 2 were produced by Ferranti Corp. (prior to becoming part of I.C.T.). Atlas 1 is the most interesting; it incorporates most of the features of the Atlas prototype. The Lincoln Laboratory TX-2 influenced some Atlas

(over)

features. Atlas was about the earliest computer to be designed with a software operating system and the idea of user machines in mind.

From Computer: Atlas

IDENTIFICATION OF DEC MUSEUM COLLECTION

Antique Computer Parts, Reports, Records & Archives

1) Item #: 2
Date: 2/14/75
Present Location: G. Bell

2) Item Name: Digits
(Common or Technical)

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3) Donor/Source: G. Bell (U. of Manchester) Rc'd June, 1974
Professor Sumner

Physical Description, Very small plug-in
Overall Dimension: (Sketch) 1/4" x 1"

How Used, Function, or Purpose:

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4) Full Identification of Item:

a) Name

b) Name of Computer (or system): Atlas prototype or Atlas I (?)
Use of Computer:

Original Designer or Manufacturer: U. of Manchester (prototype)
Ferranti Corp.

Government Agency:
Year of Origin: 1959 - 1963
Generation: Late first - second
Country of Origin: U.K.
Author: Year:

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5) References for Above:

1. Person G.B. Correspondence
2. Book B&N
3. Company
4. See Also:

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6) Other Historical Information: The Atlas is one of the most important of the early machines. The prototype was originally designed and constructed at Manchester Universtty. The Atlas 1 and Atlas 2 were produced by Ferranti Corp. (Prior to becoming part of I.C.T.). Atlas 1 is the most interesting; it incorporates most of the features of the

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Atlas prototype. The Lincoln Laboratory TX-2 influenced some Atlas features. Atlas was about the earliest computer to be designed with a software operating system and the idea of user machines in mind.

From Computer: Deuce

IDENTIFICATION OF DEC MUSEUM COLLECTION

Antique Computer Parts, Reports, Records & Archives

1) Item #: 3
Date: 2/18/75
Present Location: G. Bell

2) Item Name: Mercury Delay Line
(Common or Technical)

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3) Donor/Source: G. Bell (English Electric Co., Ltd.)

Physical Description, Black Box
Overall Dimension: (Sketch) 5" x 2 1/2" x 6" long with wires to a metal tube.

How Used, Function, or Purpose:

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4) Full Identification of Item:

a) Name 32 bit mercury delay line

b) Name of Computer (or system): Deuce
Use of Computer: Commercial

Original Designer or Manufacturer:
National Physics Lab -- English Electric Co.

Government Agency:
Year of Origin: ACE - 1950 - Deuce 1953-54
Generation: First
Country of Origin: U.K.
Author: Year:
(Alan M. Turing credited with basic design of ACE)

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5) References for Above:

1. Person Professor Murray Allen, U. New South Wales
2. Book B&N p. 191, 193
3. Company
4. See Also: G.B. correspondence w/ circuit designs for equipment rec'd

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6) Other Historical Information: Deuce is "second A.C.E.". (Automatic Computing Engine) mfd. by English Electric Co. as a commerical version of ACE.

From Computer: Deuce

IDENTIFICATION OF DEC MUSEUM COLLECTION

Antique Computer Parts, Reports, Records & Archives

1) Item #: 4
Date: 2/17/75
Present Location: G. Bell

2) Item Name: Arithmetic Logic Element
(Common or Technical)

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3) Donor/Source: G. Bell (National Physics Lab.)

Physical Description, Overall Dimension: (Sketch) Large plug-in unit, with transistors & tubes, (possibly a Williams tube)

How Used, Function, or Purpose:

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4) Full Identification of Item:

a) Name One digit of arithmetic element (?)

b) Name of Computer (or system):
Use of Computer: Commercial

Original Designer or Manufacturer:
National Physics Lab - English Electric Co.
Government Agency:
Year of Origin: ACE 1950 - Deuce 1953-54
Generation: First Second
Country of Origin: U.K.
Author: Year:

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5) References for Above:

1. Person
2. Book B&N
3. Company
4. See Also:

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6) Other Historical Information: Deuce is "second ACE" (Automatic Computing Engine) mfd. by English Electric Co. as a commercial version of ACE.

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From Computer: MARK I
U.K.

IDENTIFICATION OF DEC MUSEUM COLLECTION

Antique Computer Parts, Reports, Records & Archives

1) Item #: 5
Date: 2/18/75
Present Location: G. Bell

2) Item Name: Valve/Tube
(Common or Technical)

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3) Donor/Source: G. Bell (Manchester University, U.K.)

Physical Description, Overall Dimension: (Sketch) Small "can" 1 1/4" diameter by 3 inches.

How Used, Function, or Purpose:
(Need)

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4) Full Identification of Item:

a) Name Valve/Tube

b) Name of Computer (or system):
Use of Computer: (Need)

Original Designer or Manufacturer: Manchester University

Government Agency:
Year of Origin: 1946-47
Generation: First, early
Country of Origin: U.K.
Author: Year:

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5) References for Above:

1. Person
2. Book
3. Company
4. See Also:

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6) Other Historical Information: (Need)

(over)

From Computer: MARK (Harvard)

IDENTIFICATION OF DEC MUSEUM COLLECTION

Antique Computer Parts, Reports, Records & Archives

1) Item #: 6
Date: 2/18/75
Present Location: G. Bell

2) Item Name: Unit or Rack
(Need) (Common or Technical)

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3) Donor/Source: G. Bell - via Trocchi & Harvard

Physical Description, Overall Dimension: (Sketch)
Rack with handle - tubes on top
Large unit, plug in
4 Banks of components running lengthwise. 5 x 5 square x 30"

How Used, Function, or Purpose:

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4) Full Identification of Item:

a) Name
(Need)

b) Name of Computer (or system): MARK (I, II, III, IV)
Use of Computer: Military

Original Designer or Manufacturer: Aiken, Harvard

Government Agency: U.S. Navy/Air Force/Bureau of Ordnance
Year of Origin: 1944
Generation: Early first, or (even prior electro-mechanical)
Country of Origin: U.S.
Author: Year:
Babbage - Aiken in design time line, about 100 years- 1834-to 1944.

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5) References for Above:

1. Person
2. Book Goldstine p. 114, & Randall
3. Company
4. See Also:

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6) Other Historical Information: MARK series produced at Harvard began in 1944, need more information to establish time line on this item.

(over)

From Computer: W.E.

IDENTIFICATION OF DEC MUSEUM COLLECTION

Antique Computer Parts, Reports, Records & Archives

1) Item #: 7
Date: 12/14/75
Present Location: G. Bell

2) Item Name: Hybrid Circuit
(Common or Technical)

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3) Donor/Source: G. Bell (Western Electric)

Physical Description, Overall Dimension: (Sketch) Printed Circuit 1 1/4" x 1 3/4" x 1/16" thick

How Used, Function, or Purpose: Circuitry used in Communications

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4) Full Identification of Item:

a) Name Hybrid Circuit

b) Name of Computer (or system):
Use of Computer: (non-computer use?)

Original Designer or Manufacturer: Western Electric Company

Government Agency:
Year of Origin: (need)
Generation:
Country of Origin: U.S.
Author: Year:

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5) References for Above:

1. Person
2. Book
3. Company
4. See Also:

Circuits 7, 8 and 9 should be viewed through a microscope to be effective display. Detail is "gold lace."

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6) Other Historical Information: Need

(over)

From Computer: W.E.

IDENTIFICATION OF DEC MUSEUM COLLECTION

Antique Computer Parts, Reports, Records & Archives

1) Item #: 8 & 9
Date: 2/14/75
Present Location: G. Bell

2) Item Name: Hybrid Circuits
(Common or Technical)

3) Donor/Source: G. Bell (Western Electric)

Physical Description, Printed Circuit on thin film
Overall Dimension: (Sketch) 3/4" x 1 1/2" x 1/16"; same mounted

How Used, Function, or Purpose: Used in Communications Equipment

4) Full Identification of Item:

a) Name Hybrid Circuit

b) Name of Computer (or system):
Use of Computer:

Original Designer or Manufacturer: Western Electric

Government Agency:
Year of Origin: Need
Generation:
Country of Origin: U.S.
Author: Year:

5) References for Above:

1. Person
2. Book
3. Company
4. See Also:

6) Other Historical Information: Need

(over)

From Computer: UNIVAC

IDENTIFICATION OF DEC MUSEUM COLLECTION

Antique Computer Parts, Reports, Records & Archives

1) Item #: 10
Date: 2/14/75
Present Location: G. Bell

2) Item Name: Amplifier Driver
(Common or Technical)

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3) Donor/Source: G. Bell (Unknown)

Physical Description, Overall Dimension: (Sketch) Metal Plug in-unit w/handle & plug ins "Cow Bell"
7 1/4" w x 7" high x 2" thick

How Used, Function, or Purpose:

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4) Full Identification of Item:

a) Name

b) Name of Computer (or system): UNIVAC (need more details)
Use of Computer: Bureau of Census, March, 1951

Original Designer or Manufacturer: Eckert - Mauchly Computer Corp.
Eckert & Mauchly
(Remington Rand 1950)
(Sperry Rand 1955)

Government Agency:
Year of Origin: 1947 - 51
Generation: Second
Country of Origin: U.S.
Author: Year:

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5) References for Above: UNIVAC = (Universal Automatic Computer)

1. Person
2. Book Goldstine, B&N
3. Company
4. See Also:

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6) Other Historical Information: UNIVAC II, 1955 - Magnetic Core Memory

(over)

From Computer: WHIRLWIND I

IDENTIFICATION OF DEC MUSEUM COLLECTION

Antique Computer Parts, Reports, Records & Archives

1) Item #: 11
Date: 2/18/75
Present Location: G. Bell

2) Item Name: Accumulator
(Common or Technical)

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3) Donor/Source: G. Bell - Lincoln Lab - (Wolfe)

Physical Description,
Overall Dimension: (Sketch) 27" x 27" x 8" square with plug in and handles.

How Used, Function, or Purpose: Fitted into floor to ceiling rack.

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4) Full Identification of Item:

a) Name Accumulator for digits 1-14

b) Name of Computer (or system): WWJ WHIRLWIND I
Use of Computer: Military, then research

Original Designer or Manufacturer: M.I.T.

Government Agency: Office Naval Research & Inventions
Year of Origin: 1944 - 1953
Generation: First
Country of Origin: U.S.
Author: Year:

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5) References for Above: WWI WHIRLWIND I

1. Person K. Olsen, D. Best, etc.
2. Book B&N: Goldstine, Tech. Reports from L. Lab.
3. Company
4. See Also: Slide collection, b&w photos, color photos, full documentation & Tech. Reports.

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6) Other Historical Information: 1st 16 bit computer to become "grandfather" of 16 bit minicomputer.

(over)

From Computer: IBM

IDENTIFICATION OF DEC MUSEUM COLLECTION

Antique Computer Parts, Reports, Records & Archives

1) Item #: 12 & 13
Date: 2/14/75
Present Location: G. Bell

2) Item Name: Tubes
(Common or Technical)

3) Donor/Source: G. Bell

Physical Description,
Overall Dimension: (Sketch) Small frame 1 1/2 diameter, with tubes enclosed.

How Used, Function, or Purpose:
(Need)

4) Full Identification of Item:

a) Name Tubes

b) Name of Computer (or system): IBM 650
Use of Computer: In Universities and businesses

Original Designer or Manufacturer:

Government Agency:
Year of Origin: 1954-55
Generation: Late first
Country of Origin:
Author: Year:

5) References for Above: IBM - International Business Machines

1. Person
2. Book Goldstine 330, B&N
3. Company
4. See Also:

6) Other Historical Information: Magnetic driven machine, magnetic core memory, magnetic tapes, - for first time a large group of users had a profound effect on programming & programmers. (Fast Machine)

(over)

From Computer: IBM (7090)

IDENTIFICATION OF DEC MUSEUM COLLECTION

Antique Computer Parts, Reports, Records & Archives

1) Item #: 14 &15
Date: 2/14/75
Present Location: G. Bell

2) Item Name: Circuit Boards
(Common or Technical)

3) Donor/Source: G. Bell Not Known

Physical Description, Overall Dimension: (Sketch) 2 Circuit board each 2 1/2 x 4 1/2

How Used, Function, or Purpose:
Need

4) Full Identification of Item:

a) Name Circuit Boards

b) Name of Computer (or system): IBM 7090
Use of Computer:
(Need)

Original Designer or Manufacturer:

Government Agency:
Year of Origin: 1960
Generation: Early Second
Country of Origin:
Author: Year:

5) References for Above: IBM International Business Machines

1. Person
2. Book GB - Goldstine
3. Company
4. See Also:

6) Other Historical Information:

Need -

(over)

From Computer: ILLIAC

IDENTIFICATION OF DEC MUSEUM COLLECTION

Antique Computer Parts, Reports, Records & Archives

1) Item #: 16 & 17
Date: 2/20/75
Present Location:

2) Item Name: Williams Storage Tube
(Common or Technical)

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3) Donor/Source: G. Bell, Illinois University

Physical Description,
Overall Dimension: (Sketch)

How Used, Function, or Purpose: Storage Device for Memory

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4) Full Identification of Item:

a) Name Williams Storage Tube

b) Name of Computer (or system): ILLIAC I
Use of Computer:

Original Designer: Frederic Callard Williams, F.R.S.

Government Agency:
Year of Origin: 1946 - (Notebook entries 1948 for U.S. patent)
Generation:
Country of Origin: U.K.
Author: Year:

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5) References for Above:

1. Person
2. Book B&N Goldstine
3. Company
4. See Also:

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6) Other Historical Information: This tube was considered the best device until the invention of the magnetic core. Tubes now considered "great curiosities" manufactured in U.S. by duMont & RCA - first used in U.S. "In a true random - access...or parallel memory... in 1951... at the University of Illinois Institute of Advanced Science". Pomerene from IAS, Princeton & Meagher worked at same time on problems connected with Tube.

(over)

From Computer: ILLIAC I

IDENTIFICATION OF DEC MUSEUM COLLECTION

Antique Computer Parts, Reports, Records & Archives

1) Item #: 18
Date: 2/20/75
Present Location: G. Bell

2) Item Name: "Technical Report"
(Common or Technical)
Single Page diagram - A Guide to ILLIAC Programming.

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3) Donor/Source: G. Bell; Illinois University

Physical Description,
Overall Dimension: (Sketch)

How Used, Function, or Purpose:

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4) Full Identification of Item:

a) Name: Technical Progress Report Feb. 1, 1954 to Feb. 28, 1954, University of Illinois Graduate College, Digital Computer Laboratory

b) Name of Computer (or system):
Use of Computer:

Original Designer or Manufacturer: University of Illinois

Government Agency:
Year of Origin: 1952
Generation: First
Country of Origin: U.S.
Author: Year:

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5) References for Above:

1. Person Clifford E. Carter, Asst. Director Engr., University of Illinois
2. Book
3. Company
4. See Also:

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6) Other Historical Information:
Also included in this package of data:
1. Single page diagram
2. Financial statement
3. A Guide to ILLIAC Programming.

From Computer: ILLIAC I

IDENTIFICATION OF DEC MUSEUM COLLECTION

Antique Computer Parts, Reports, Records & Archives

1) Item #: 18-A
Date: 2/18/75
Present Location:

2) Item Name: PHOTO COLLECTION
(Common or Technical)
(7 sets to be catalogued as a series)

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3) Donor/Source: G. Bell - University of Illinois

Physical Description, Overall Dimension: (Sketch) Early photos of Illinois

16 Photos

How Used, Function, or Purpose:

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4) Full Identification of Item:

a) Name: See listing for each photo attached

b) Name of Computer (or system): ILLIAC I
Use of Computer:

Original Designer or Manufacturer: Illinois University

Government Agency:
Year of Origin:
Generation:
Country of Origin:
Author: Year:

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5) References for Above:

1. Person Clifford E. Carter, Asst Director, Engr. University of Illinois
2. Book
3. Company
4. See Also:

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6) Other Historical Information:

From Computer: ILLIAC I

IDENTIFICATION OF DEC MUSEUM COLLECTION

Antique Computer Parts, Reports, Records & Archives

1) Item #: 19 | 2) Item Name: Tube Chassis (Common or Technical)
Date: 2/20/75
Present Location: G. Bell

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3) Donor/Source: G. Bell Illinois University

Physical Description,
Overall Dimension: (Sketch) 12" wide 4" h. 20" long

How Used, Function, or Purpose: One section holds Williams Tube

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4) Full Identification of Item:

a) Name: Tube Chassis

b) Name of Computer (or system): ILLIAC I
Use of Computer:

Original Designer or Manufacturer: University of Illinois

Government Agency:
Year of Origin: 1953
Generation: First
Country of Origin: U.S.
Author: Year:

---

5) References for Above:

1. Person Clifford E. Carter, Asst. Director Engr., University of Illinois
2. Book
3. Company
4. See Also:

---

6) Other Historical Information:
Also included in this package of data:

1. Single page diagram
2. Financial statement
3. A Guide to ILLIAC Programming

From Computer: ILLIAC II

IDENTIFICATION OF DEC MUSEUM COLLECTION

Antique Computer Parts, Reports, Records & Archives

1) Item #: 19.1
Date: 3/31/75
Present Location: G. Bell

2) Item Name: Sample Core Plane
(Common or Technical)

3) Donor/Source: Clifford E. Carter, U. of Illinois at Urbana-Champaign

Physical Description,
Overall Dimension: (Sketch)

flat, 9 1/4" X 9 1/2"

How Used, Function, or Purpose:

4) Full Identification of Item:

a) Name

b) Name of Computer (or system):
Use of Computer:

Original Designer or Manufacturer:

Government Agency:
Year of Origin:
Generation:
Country of Origin:
Author: Year:

5) References for Above:

1. Person
2. Book
3. Company
4. See Also:

6) Other Historical Information:

From Computer: ILLIAC II

IDENTIFICATION OF DEC MUSEUM COLLECTION

Antique Computer Parts, Reports, Records & Archives

1) Item #: 19.2
Date: 3/31/75
Present Location: G. Bell

2) Item Name: ILLIAC II Programming Manual--3/1963
(Common or Technical)

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3) Donor/Source: Clifford E. Carter, U. of Illinois at Urbana-Champaign

Physical Description,
Overall Dimension: (Sketch)
8 1/2 X 11 manual (3/4" thick)

How Used, Function, or Purpose:

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4) Full Identification of Item:

a) Name

b) Name of Computer (or system):
Use of Computer:

Original Designer or Manufacturer:

Government Agency:
Year of Origin:
Generation:
Country of Origin:
Author: Year:

---

5) References for Above:

1. Person
2. Book
3. Company
4. See Also:

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6) Other Historical Information:

From Computer: ILLIAC II

IDENTIFICATION OF DEC MUSEUM COLLECTION

Antique Computer Parts, Reports, Records & Archives

1) Item #: 19.3
Date: 3/31/75
Present Location: G. Bell

2) Item Name: Chassis from Interplay (block multiplexor)
(Common or Technical)

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3) Donor/Source: Cliff Carter, Assist. Dir. of Eng., U. of Illinois at Urbana-Champaign

Physical Description,
Overall Dimension: (Sketch)

How Used, Function, or Purpose:

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4) Full Identification of Item:

a) Name

b) Name of Computer (or system):
Use of Computer:

Original Designer or Manufacturer:

Government Agency:
Year of Origin:
Generation:
Country of Origin:
Author: Year:

---

5) References for Above:

1. Person
2. Book
3. Company
4. See Also:

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6) Other Historical Information:

(over)

From Computer: ILLIAC III

IDENTIFICATION OF DEC MUSEUM COLLECTION

Antique Computer Parts, Reports, Records & Archives

1) Item #: 19.30 ~~xxxxxxxxxxxxxxxx~~
Date: 4/16/75
Present Location: G. Bell

2) Item Name: STALACTITE BOARD
(Common or Technical)

3) Donor/Source: Clifford E. Carter, U. of Illinois at Urbana-Champaign

Physical Description, 2 flat boards 4 3/4" X 5 1/2"
Overall Dimension: (Sketch)

How Used, Function, or Purpose:

4) Full Identification of Item:

a) Name

b) Name of Computer (or system):
Use of Computer:

Original Designer or Manufacturer:

Government Agency:
Year of Origin:
Generation:
Country of Origin:
Author: Year:

5) References for Above:

1. Person
2. Book
3. Company
4. See Also:

6) Other Historical Information:

From Computer: ______

IDENTIFICATION OF DEC MUSEUM COLLECTION

Antique Computer Parts, Reports, Records & Archives

1) Item #: 19.31
Date: 4/16/75
Present Location: G. Bell

2) Item Name: Circuit board
(Common or Technical)

3) Donor/Source: Clifford E. Carter, U. of Illinois at Urbana-Champaign

Physical Description,
Overall Dimension: (Sketch) Flat board 4 3/4" X 5 1/2"

How Used, Function, or Purpose:

4) Full Identification of Item:

a) Name

b) Name of Computer (or system):
Use of Computer:

Original Designer or Manufacturer:

Government Agency:
Year of Origin:
Generation:
Country of Origin:
Author: Year:

5) References for Above:

1. Person
2. Book
3. Company
4. See Also:

6) Other Historical Information:

From Computer: ILLIAC III

IDENTIFICATION OF DEC MUSEUM COLLECTION

Antique Computer Parts, Reports, Records & Archives

1) Item #: 19.32
Date: 4/16/75
Present Location: G. Bell

2) Item Name: Complete set of drawings for Stalactite
(Common or Technical)

3) Donor/Source: Clifford Carter, U. of Illinois at Urbana-Champaign

Physical Description,
Overall Dimension: (Sketch) 18 legal-sized sheets

How Used, Function, or Purpose:

4) Full Identification of Item:

a) Name

b) Name of Computer (or system):
Use of Computer:

Original Designer or Manufacturer:

Government Agency:
Year of Origin:
Generation:
Country of Origin:
Author: Year:

5) References for Above:

1. Person
2. Book
3. Company
4. See Also:

6) Other Historical Information:

From Computer: ____________

IDENTIFICATION OF DEC MUSEUM COLLECTION

Antique Computer Parts, Reports, Records & Archives

1) Item #: 19.33.1-19.33.10 2) Item Name: ____________
Date: 4/16/75 (Common or Technical)
Present Location: G. Bell

3) Donor/Source: Clifford Carter, U. Of Illinois at Urbana-Champaign

Physical Description, 11 manuals listed separately on reverse side.
Overall Dimension: (Sketch)

How Used, Function, or Purpose:

4) Full Identification of Item:

a) Name

b) Name of Computer (or system):
Use of Computer:

Original Designer or Manufacturer:

Government Agency:
Year of Origin:
Generation:
Country of Origin:
Author: Year:

5) References for Above:

1. Person
2. Book
3. Company
4. See Also:

6) Other Historical Information:

19.33.1 Report No. 308, PARAMETRIC DESCRIPTION OF A SCAN-DISPLAY SYSTEM, by: Lawrence Dunn, Lakshmi Goyal, Bruce McCromick, Val Tareski, Feb. 5, 1969, Dept. of Computer Science, U. of Illinois at Urbana-Champaign (2 copies)

19.33.2 Report No. 148, The Illinois Pattern Recognition Computer (ILLIAC III), By Bruce McCormick, Aug. 20, 1963, presented 18th Annual ACM National Conference, Denver

19.33.3 Report No. 338, The Pattern Articulation Unit of ILLIAC III IMPLEMENTATION OF THE HOMOGENEOUS INSTRUCTION "BOOLE", by Richard Borovec, June 20, 1969, U. of Illinois, Urbana

19.33.4 Report No. 400, STANDARDIZATION OF CONTROL POINT REALIZATION, by Ronald Martin, May 21, 1970, U. of Illinois, Urbana

19.33.5 Report No. 406, EXPERIMENTS WITH AN IMAGE PROCESSING COMPUTER, by Bruce McCormick, June 19, 1970, U. of Illinois at Urbana

19.33.6 SHOW AND TELL, AN INTERACTIVE PROGRAMMING SYSTEM FOR IMAGE PROCESSING SYSTEM SPECIFICATIONS, Report No. 429, by John Read, Feb. 18, 1971, U. of Illinois at Urbana

19.33.7 Report No. 433, ILLIAC III REFERENCE MANUAL, VOLUME I: The Computer System, edited by B. McCormick and B. Nordmann, Jr., February 17, 1971, U. of Illinois at Urbana

19.33.8 Report No. 434, ILLIAC III REFERENCE MANUAL, VOLUME II: Instruction Repertoire, edited by B. McCormick and B. Nordmann, Jr., Feb. 26, 1971, U. of Illinois at Urbana

19.33.9 Report No. 472, ILLIAC III REFERENCE MANUAL, VOLUME IV: Supervisor Organization, edited by B. McCormick and B. Nordmann, Jr., Aug. 12, 1971, U. of Illinois at Urbana

19.33.10 Report No. 473, ILLIAC III REFERENCE MANUAL, VOLUME III: Input/Output, editred by B. McCormick and B. Nordmann, Jr., Aug. 13, 1971, U. of Illinois at Urbana

From Computer: ILLIAC

IDENTIFICATION OF DEC MUSEUM COLLECTION

Antique Computer Parts, Reports, Records & Archives

1) Item #: 19.34
Date: 4/16/75
Present Location: G. Bell

2) Item Name: ____________
(Common or Technical)

3) Donor/Source: Clifford Carter, U. of Illinois at Urbana-Champaign

Physical Description,
Overall Dimension: (Sketch) 8" X 8" photograph

How Used, Function, or Purpose:

4) Full Identification of Item:

a) Name

b) Name of Computer (or system):
Use of Computer:

Original Designer or Manufacturer:

Government Agency:
Year of Origin:
Generation:
Country of Origin:
Author: Year:

5) References for Above:

1. Person
2. Book
3. Company
4. See Also:

6) Other Historical Information:

From Computer: ILLIAC

IDENTIFICATION OF DEC MUSEUM COLLECTION

Antique Computer Parts, Reports, Records & Archives

1) Item #: 19.35
Date: 4/16/75
Present Location: G. Bell

2) Item Name: ____________
(Common or Technical)

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3) Donor/Source: Clifford Carter, U. of Illinois at Urbana-Champaign

Physical Description,
Overall Dimension: (Sketch) 8" x 8" photograph

How Used, Function, or Purpose:

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4) Full Identification of Item:

a) Name

b) Name of Computer (or system):
Use of Computer:

Original Designer or Manufacturer:

Government Agency:
Year of Origin:
Generation:
Country of Origin:
Author: Year:

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5) References for Above:

1. Person
2. Book
3. Company
4. See Also:

---

6) Other Historical Information:

(over)

From Computer: DEC Modules

IDENTIFICATION OF DEC MUSEUM COLLECTION

Antique Computer Parts, Reports, Records & Archives.

1) Item #: 20
Date: 2/14/75
Present Location: G. Bell

2) Item Name: Display, Hybrid Circuit
(Common or Technical)

---

3) Donor/Source: G. Bell, DEC

Physical Description,
Overall Dimension: (Sketch) Plastic display case
3 1/2 w x 5 1/4 x 3/4 thick

How Used, Function, or Purpose: Hybrid Circuits

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4) Full Identification of Item:

a) Name: Display of "integrated circuit mfging steps"

b) Name of Computer (or system): DEC MODULE
Use of Computer:

Original Designer or Manufacturer: DEC

Government Agency:
Year of Origin: To be determined
Generation:
Country of Origin:
Author: Year:

---

5) References for Above:

1. Person Tom Stockebrand - Dick Best
2. Book
3. Company
4. See Also:

---

6) Other Historical Information:

From Computer: PDP's

IDENTIFICATION OF DEC MUSEUM COLLECTION

Antique Computer Parts, Reports, Records & Archives

1) Item #: 21   2) Item Name: System Module
(Common or Technical)
Date:
Present Location:

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3) Donor/Source: G. Bell, DEC

Physical Description,
Overall Dimension: (Sketch) 4 1/2 x 7 x 1/2" Thick

How Used, Function, or Purpose: As inverter (5 mounted on one board) should be mounted in systems Modules mounting panel #1901 to be effective in display.

---

4) Full Identification of Item:

a) Name: Systems Module

b) Name of Computer (or system): PDP 1 through PDP 5
Use of Computer:

Original Designer or Manufacturer:

Government Agency:
Year of Origin: 1958
Generation: Early second
Country of Origin: U.S.
Author: Year:

---

5) References for Above:

1. Person D. Best
2. Book A-705-50m 362, Digital Modules
3. Company
4. See Also:

---

6) Other Historical Information:

From Computer: PDP

IDENTIFICATION OF DEC MUSEUM COLLECTION

Antique Computer Parts, Reports, Records & Archives

1) Item #: 22
Date: 2/18/75
Present Location: G. Bell

2) Item Name: Print Head & Flip Chip
(Common or Technical)
Print Head Connector
Board.

---

3) Donor/Source: G. Bell, DEC

Physical Description,
Overall Dimension: (Sketch) 2 units with 5' long flexible 2" tape
Print Head - 6 x 6 with long tube inbetween
Flip Chip - 2 1/2" x 4 1/2" x 1/2"

How Used, Function, or Purpose:

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4) Full Identification of Item:

a) Name: Print Head & Flip Chip

b) Name of Computer (or system): PDP (to be determined)
Use of Computer:

Original Designer or Manufacturer: DEC

Government Agency:
Year of Origin:
Generation:
Country of Origin:
Author: Year:

---

5) References for Above:

1. Person Russ Doanne - Tom Stockebrand
2. Book
3. Company
4. See Also:

---

6) Other Historical Information:

From Computer: PDP-6

IDENTIFICATION OF DEC MUSEUM COLLECTION

Antique Computer Parts, Reports, Records & Archives

1) Item #: 23
Date: 2/18/75
Present Location: G. Bell

2) Item Name: Arithmetic Register
(Common or Technical)

---

3) Donor/Source: G. Bell, DEC

Physical Description, Overall Dimension: (Sketch) 9 1/2" x 11"x 1/2" circuit board with aluminum band around edge

How Used, Function, or Purpose: Should be shown in systems mounting panel for display.

---

4) Full Identification of Item:

a) Name: Arithmetic Register

b) Name of Computer (or system): PDP-6
Use of Computer:

Original Designer or Manufacturer: DEC

Government Agency:
Year of Origin: June, 1963
Generation: Mid second generation
Country of Origin: U.S.
Author: Year:

---

5) References for Above:

1. Person Tom Stockebrand
2. Book
3. Company
4. See Also:

---

6) Other Historical Information:
This element includes several functions all packaged together:

1. Anthetic register (accumulator)
2. Memory buffer register

ID#403

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Subject: **Museum Update and Response to Fujitsu**

To: Dick Berube, PK3-2/M18
Dick Flaherty, MK1-2/H32
Roy Gould, PK3-2/M36
Andy Knowles, ML10-2/A52
Bob Lane, MK1-2/B11
Ken Olsen, ML10-2/A50

Date: 8 JAN 79
From: Gordon Bell
Dept: OOD
Loc: ML12-1/A51 Ext: 223-2236

follow up 1/29/79

Fujitsu is sending some parts for our museum. They have an exhibit which includes a working demonstration of their first relay computer. Also, they have panels of various technologies, along the lines of our first panel...but not as good (I'm biassed at putting the first panel together). These parts will be a valuable addition. I would believe the right thing is to send chapters 5, 6, 7, 9, 16, and 21 on modules, 18-bit, 12-bit, 2 on 16-bit, and 36-bit computers to cover the documents (Mary Jane has these). For parts, should we send a building block, system module, core stack from PDP-1 or 8, and a hex or quad module from a PDP-11 model, and perhaps a DECtape unit? Roy, can you get the parts together?

I read that someone called Davis wants to make a computer museum and Dick Berube is helping. Furthermore, it's only going to cost 10K$. We need his help because this is about how much we spend now per year. What's the story? We need a worker (if this person is one) as opposed to a dreamer (like the ones like Ken and I and others) who'll put some exhibits together. Also, I don't see that we need another keeper-manager (Mary Jane and Roy are fine).

Bob Lane is exploring how much it will cost to refurbish several PDP-8's with the smoked glass and pedestal mounting. Here, the British Science Museum has repeatedly asked for one and I thought they had one. We could use a number of them for the Smithsonian and for exhibits (e.g., field offices) and I intend to buy one personally.

It's about time to consider building a really good memory display. It should include cores and stacks from our various machines before they get lost (Dick Flaherty has promised to collect them... and I would hope we can find the original 1K stack that was used on the first PDP-1 that was bought from RCA. The exhibit should also include drums, disks and tapes. It seems imperative to do this, just to test whether we have a reasonable inventory of the parts we have (including the Whirlwind drum and mag tape).

I can get Museum Collections (Division of Time Inc.) to make copies of simple antique calculating devices (e.g., Napier's Bones or slide rules. These might be a really great series of give-away marketing gimmicks.

Roy, let's talk and then get together with the other people on this memo and see if we can continue on and add a panel to the Distributed Museum this year and get ourselves a good inventory? (I'm worried about losing some critical parts.)

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Subject: Museum Thoughts

To: File

CC: Brig Bell, ML12-1/A51
Gwen Bell, ML12-1/A51
Mary Jane Forbes, ML12-1/A51
Wayne Furman, MR2-4/M38
Chris Landry, ML11-4/E53
Dick Schneider, ML11-4/E53
Dave Simler, MR2-4/M16
Russell Turner, ML12-1/A51

Date: 6/20/79
From: Gordon Bell
Dept: OOD
Loc: ML12-1/A51 Ext: 223-2236

Having spent some time looking through the prints, it seems clear to me that we should concentrate on content and quality of the individual displays. Thus, I want to keep a really simple strucuture, and get some nice cases for the pieces. The sketch for the layout is essentially alternative 13 in the plans. (See attached) The pieces to get on display are:

Real Computers (non-operational)
Real Computers (operational)
Case of Calculators
Case of Computer Logic taken from original Distributed Project
Gallery of all DEC Computer Consoles

<u>REAL COMPUTERS</u>

<u>Whirlwind</u> (non-operational, balcony, roped off)
Photo for background as in the current display to give the scale and depth. Use real parts to give it a 3d and real look. These would include:

- 1-bit each of all the registers in a bank as done in 12-1
- 1024 word core memory
- drum, perhaps with a glass cover
- mag tape also displayed somehow
- flexowriter
- a crt showing part of the console if we can find one
- paper tape reader, if possibly
- some lights and switches panels

- miscellaneous photos mounted somewhere
- writing explaining whirlwind
- perhaps a case to house some documents and possible block it off

<u>TX-0</u> (non-operational, balcony, roped off)
I talked with John McKenzie who operated TX-0. He is retired and lives at 53 Lodgelawn Lane, Lexington, 862-5125. He can help get the TX-0 into a shape it can be viewed. Brig and Russell should contact him and get him to help with the

work. He can work all next week except Tuesday. They should call him on Friday and pick him up for Monday and start to work to get the TX-0 into displayable condition. It would have:

the crt installed
paper tape reader on the console
flexowriter
anything else that's needed to make it look operational

miscellaneous photos mounted somewhere
writing explaining it
perhaps a case to house some documents and possible blockage

Classic-8 On a Pedestal (non-operational, downstairs, roped off)
Here, I'm not sure that we have one we want yet. It is imperative to have it in the right form. MJ should start tracking with Bob Lane, Gary Cole, or Jim Milton.

PDP-1 (Operational, downstairs, roped off)
includes the CRT so that Spacewar can be played...use the one from Inforonics

LINC (Downstairs, operationality up to LDP)

MINC (Downstairs, operationality up to LDP)

CASE OF CALCULATORS

Currently being worked on in exhibit form by GB and the Museum Crew. All the parts will be kept in GB office until the exhibit is ready. Photos to be available, but sizes are known now. The "Story of Calculators" will be built around polished descriptions of the individual pieces.

CASE OF LOGIC

This is the current logic exhibit that has been in Westfield. It will be brought back and put in the permanent cases.

CONSOLE GALLERY

This would go on side wall and represent each of the machines instead of having the actual machine. I would also like to have a family tree worked into this somehow. We would first collect the consoles and then work out the display. It could also have pictures. This probably can't get further than the design this summer. The 25 to 35 consoles:

1A,1B,1C,4,7,9,15	7
5,8,s,i,m or e,a	6
linc, linc 8, 12, minc	4
6,ka,ki,kl	4
11/20,05,40,45,60,70,03,34,23	9
780	1

D I G I T A L INTEROFFICE MEMORANDUM

DIST:

Brig Bell	ML12-1/A51	Gwen Bell	ML12-1/A51
Mary Jane Forbes	ML12-1/A51	Wayne Furman	MR2-4/M38
Chris Landry	ML11-4/E53	Dick Schneider	ML11-4/E53
Dave Simler	MR2-4/M16	Russell Turner	ML12-1/A51

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Subject: **Parts for Museum**

To: Rene' L. Roy WO/S61

Date: 7/6/79 Fri
From: Gordon Bell
Dept: OOD
Loc: ML12-1/A51 Ext: 223-2236

We would appreciate your dismantling and sending the following parts to our staging area in Marlboro (location for shipping: MR2-LA, contact Wayne Furman or Dave Simler).

PDP-1 - Teletype punch
Centronics paper tape reader
Front panel console

PDP-5 - Front panel console

PDP-7 - Front panel console
2-55 Tape units

Let me know if there is a problem in shipping the above to Marlboro by July 20! We are working under a "Grand Opening" deadline.

Dave Simler has probably contacted you already - they do want the LINC-8 and PDP-12.

GB:swh

September 26, 1979

Dear fellow Digital Computer Museum workers:

Please accept my personal thanks for your contribution in the design, construction, contribution of parts, and opening of the Digital Computer Museum. The museum is something that I think we can all be proud of, and I hope history and the response from our fellow workers at Digital will show this to be true. I hope it has been as personally satisfying to you as it has to me to work on a project that should have this lasting significance.

It seems to me there are many opportunities for it to be used now and in the future for various Digital functions, and I hope you and our contemporaries will take advantage of the facility.

Sincerely,

Gordon Bell
Vice President,
Engineering

GB:swh
GB0004/62

P.S. We note already a response to fill the space with more exhibits and there are requests to use the facility...therefore, this is not the end, but the beginning.

GB0005/7

d i g i t a l **interoffice memorandum**

Subject: **Museum Committee Agenda - November 5**

To: Dick Berube, PK3
Mary Jane Forbes, ML12-1/A51
Chris Landry, ML11-4/E53
Grant Saviers, ML3-6/E94
Joe Savignano, MR1-3/A47
Dick Schneider, ML11-4/E53
Peggy Sullivan, MR2-4/M16

Date: 10/15/79 Mon
From: Gordon & Gwen Bell
Dept: OOD
Loc: ML12-1/A51 Ext: 223-2236
EMS: @CORE

1. Response to date - Questionnaire Analysis — Gwen & Gordon
2. Current Maintenance - — Joe
3. Date and Goals for Public Opening - — Dick Berube
4. Second Museum Lecture
5. Phase Two - What Is It?

   Posters - Chris

   Labelle Towers, other cases, and furnishings

   Disk and Tape Exhibit - Grant

   Operating Lab Exhibit - (+Joel inputs) — Peggy

   Any other uses - (+Joel inputs) — Peggy

GB:swh

CC: Joel Schwartz - MR2-4/M51

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Subject: **Digital Computer Museum - Phase Two**

To: Charlie Conn, ML11-4/E53
Mary Jane Forbes, ML12-1/A51
Chris Landry, ML11-4/E53
Jamie Parker, ML12-1/A51
Grant Saviers, ML3-6/E94
Joe Savignano, MR1-3/A47
Peggy Sullivan, MR2-4/M16

Date: 11/7/79 Wed
From: Gordon & Gwen Bell
Dept: OOD
Loc: ML12-1/A51 Ext: 223-2236

Job list resulting from meeting Nov. 5, l979

Person responsible — Task

JP Current maintenance/improvement
See that all artifacts are clean and kept clean.
Have diffuser lights installed in cases.
Collect all changes on existing documentation and see that these are carried out.
Contact people in charge of maintenance of working machines and learn as much as possible about them. See if PDP-l can play Christmas carols -- and check on space war with Stan Shultz.
Start a log of all visitors to the museum (read through questionaires).
JP/CL/GBSort through materials in staging area. Pack display care, ship Classic-8's and 5 to Northboro, put non-flammables in Marlboro.
JPPhotograph and catalog all artifacts sent to Northboro that aren't already cataloged.
JP/CL/GB List all artifacts for classics gallery.
JPMaintain listing of all material in Marlboro storage

BROCHURE - QUICK MUSEUM GUIDE
JPPrepare a draft brochure idea (information for one piece of paper -- folded) with "what is the museum", floor plan maps, notes of special displays, material available (posters, Wilkes tape) and how one gets access to museum. Draft by Dec 7 for GGB. (Designers not brought in until later.)

POSTERS
GB Corrections on DEC tree to C Conn by Dec. 1
CCIdeas for calculator posters -- better readability/content.
JPContact Burton Harrison, president of the SEE Corp on purchase of Pascal calculators by DEC and potential sale/distribution of calculator posters by the SEE

company.
JPCheck on poster prices, etc. re selling posters in museum.

MUSEUM OFFICE/MARLBORO
CLMuseum desk specs for purchasing. Check out the organization of the museum side with Jamie.
JPWork out museum office space - plan, assess needs.
MJF Phone for museum office in Marlboro.

MUSEUM TOURS
JPCheck on all inquiries of school groups to date, and if computer classes arrange tours. Do as an experiment with written evaluation forms by teachers and students and evaluate prior to Mar. l5.
Investigate appropriate DEC sales and customer training groups for museum tours.

PS/JP LDP display
Plan the utilization of one tower with displays and Labelle system; work toward Feb. l installation. Plan LDP "real live working lab" exhibit.

GGB/JP CALCULATOR TALK/DISPLAY
Prepare Labelle talk and appropriate display for one tower.

CL/JP/GB LOGIC TALK
Have three towers (two listed above) modified for Labelles. Decide on artifacts for display and any text.

CLASSICS GALLERY
GB/CL List all units to be displayed...Nov. 30.
JP Gather / clear all units.
CL Design gallery prelim - Jan. 4.
GGB/JP Edit all blurbs - text - Feb. l.

CL/JP/GB COFFEE TABLES
Decide on artifacts for display. Nov. 30.
Modify tables
Edit any blurbs/ install. by Feb. l.

GS/JP DISK EXHIBIT
Collect artifacts for one case (2 feet by 4 feet; 2 shelves) -- prepare documentation. Any large freestanding artifacts (the RAMAC) can go on the wall between the PDP l and the 8. Prepare a l0 minutes labelle talk and artifacts for a 2 foot square shelf. Coordinate with JP or GGB on how much can be done prior to May l. JP will collect, catalog, and store any pieces that you identify.

OPENING AND LECTURE
GBInvite Stibitz or Arthur Barks for lecture on May 1.
JPDo research on Stibitz lecturer and plan one tower for a display of his/her works, etc. to be completed Mar. l.

JP/MJFStart keeping a listing of people to be invited.

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|   |   |   |   |   |   |   |
| d | i | g | i | t | a | l |                 i n t e r o f f i c e
|   |   |   |   |   |   |   |                   m e m o r a n d u m
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```

SUBJ: DEC CONTRACT BADGE

TO: Mary Bonner ML2-2/A18

Date: 1/17/80 Thu
From: Gordon Bell
Dept: OOD
MS: ML12-1/A51 Ext: 223-2236
EMS: @CORE

Please issue a CONTRACT BADGE to Gwen Bell. She is in charge of the Digital Computer Museum at the Marlboro Digital Facility. In this capacity, she is required to visit many of the DEC facilities in Massachusetts in the search of information and hardware.

Cost Center 383
24 hours a day
From 1/1/80 thru 1/1/81

____
Gordon Bell

GB1.S1.22

DRAFT 8/21/80 Thu 3:25

Digital Computing Museum
for the preservation of computing history.

PROPOSED PROGRAM

Collections and archives: maintain 50/50 DEC/non DEC--triple number of artifacts shown and stored. Develop a catalog.

Tours and visitors: Move from an average of three special tours per week (Fall 80) to three special tours per day, plus a large number of ad hoc tours.

Exhibits:

Ground floor lobby - Set up with permanent exhibits.

Elevator spaces -- Established for travelling exhibits that will change.

Stairwell -- Established with a time line of the history of computers -- with computer portraits and appropriate artifacts starting with 1936 to the present day.

Corridor to cafeteria -- Expansion of pre-computer computing device exhibits.

TX-0 and Whirlwind exhibits enhanced and documented. TX-0 should run with demonstration programs that are documented with video-tape before it is once more decommissioned.

Software - incorporated and explained in exhibits.

Computer art. The Cohen mural, painted in 1980, will be complemented by a second mural in 1982, and a piece of computer generated and user activated music in 1981. Art will be added on a yearly basis.

Viewing room on triangular office with full set of 10 one-hour video tapes of pioneer computer lectures and a number of 10-15 minute audio-visual user-activated tapes including the Whirlwind film, the EDSAC film, the logic talk, the calculator talk, the LDP talk, and a film on how the Cohen mural was made.

Museum store will have moved from the lobby desk to the second triangular spaced room and will serve the visitors and Marlboro working population with books, audio and visual tapes, replicas of calculating devices, photographs, slides, postcards, posters, wall charts, and various computer history and computer user articles.

Events:

Quarterly pioneer computer lecture series will conclude with the tenth machine and the second series will feature pioneering software efforts.

Yearly event on computer and the arts.

Yearly event honoring a DEC history-making object, e.g., the April 80 VAX party. Other candidates: 20 years of 36-bits or 12-bits; or CAD; 10 years of RSTS, RT11, M, the LA's, VT's, Disks, DECnet.

Alumni gatherings for the TX-0 and PDP-1 to run programs and do video tapings.

Bi-annual event with publication of each DEC Press book in the history series.

Occasional scheduling for meetings for educational groups, eg., Sept. 27th meeting of ASTC committee preparing an exhibit on "The Computer in the Pocket." Suggest CBI board meetings, and other groups hosted by museum.

Gordon Bell, Keeper
Gwen Bell, Assistant Keeper

GB1.S5.65

February 15, 1980

Mrs. Gwen K. Bell
Page Farm Road
Lincoln, MA 01773

Dear Gwen:

It is my pleasure to appoint you Assistant Keeper of the Digital Equipment Corporation's Digital Computer Museum at the Tower Building at One Iron Way, Marlboro, Massachusetts. We look for you to set up and manage all phases of this exciting project that will trace the evolution of computing. As such, you will design and lay out the exhibits and displays, schedule lectures, handle museum publications and, in general, do everything that is required to establish an interesting and representative display of computing history.

Digital's resources are available to assist you in your ambitious schedule, to open the museum at Digital's Board meeting, September 22, 1980. The resources include our purchasing functions so as to be able to obtain equipment and supplies.

More specifically, the original term of this appointment is the calendar year 1980 and, while such appointment neither designates you as an agent or an employee of Digital Equipment Corporation, you are to be granted the honorarium of one dollar ($1.00) per year. Of course, you shall be reimbursed all of your expenses in this activity in accordance with our existing policies.

Let me extend my personal appreciation for this most gracious contribution of your time to this undertaking of such importance to Digital. Please feel free to call upon me if I can be of help.

Very truly yours,

Shel Davis
Vice President, Personnel

Draft 8/21/80 Thu

Digital Computer Museum: Plan for the Future

To date, the Museum has primarily existed as a volunteer effort. The budget has been allocated for one employee plus the use of consultants specialized projects, and the presentation of lectures. All direction and administration of the Museum has been done on a volunteer basis as an experiment.

The activities generated in the first year have shown that there is a demand for the lectures and interest in the exhibits both on the part of the company's employees and the computing community.

Is this the time to establish the Museum as a self-contained entity with non-profit status and its own Board of Directors?

The advantages of non-profit status is that the Museum could then accept gifts (especially artifacts) from individuals who could obtain a tax deduction; it would be taken more seriously by the community as an educational service for computer experts (and we could maintain it for "adults only"); and it would more likely gain more contributions.

The administration and direction of the Museum has related to calling an informal review committee together on a quarterly basis. Advantages accrue from having a formal board that would meet semi-annually to evaluate and review exhibits and programs. It is suggested that the board would have the following 13 members:

5 outside DEC
  computer historian
  director of a science or technology center
  director of Charles Babbage Institute
  computer scientist
  .....
5 DEC employees
  President of the Corporation
  Manager of Marlboro Facility
  Publisher of DEC Press
  R & D leader
  Industrial design leader
3 ex-offico members
  Keeper
  Director
  Executive Secretary

Staffing and budgets would grow in workable increments for the next three years.

August 20, 1979

British Science Museum
Jane Raimes, Assistant Keeper
South Kensington London SW72DD
ENGLAND

Dear Jane:

We can give you a Classic PDP-8 (circa 1965) that we believe was the first minicomputer. It would sit on some pedestal (we'll supply if you want) and is approximately 2 1/2' high and 20W wide x 30" deep. Do you still want it?

We're in the throes of opening our own Digital Computer Museum in Marlboro, Massachusetts this fall. It includes a reasonably good collection of calculators; a logic exhibit; MIT's Whirlwind and TX-0; MIT's LINC, a LINC-8, PDP-12, and our MINC Laboratory series evolution, a PDP-1 (first Spacewar), a PDP-8, and a collection of artifacts from our machines.

What's the chance of borrowing some parts from the Science Museum for a year?

Sincerely yours,

Gordon Bell
Vice President
Engineering

GB:mjf
GB0004/36

October 11, 1979

Jane Raimes
Assistant Keeper
British Science Museum
South Kensington
London SW7
ENGLAND

Dear Jane:

We are sending the PDP-8 to the Science Museum to your attention. Also, I'm enclosing the specification we use in describing it at our exhibit.

Sincerely yours,

Gordon Bell
Vice President
Engineering

GB:mjf
GB0005/3

Enclosure

CC: Bob Lane - DEC

September 2, 1980

Richard Buxton
North European Regional Support
Digital Equipment Co. Ltd.
42-44 Portman Road
GB-Reading, Berkshire RG3 1JW
ENGLAND

Dear Richard,

Thanks for the information on the PDP8 serial no. 2. The Museum now has a table top 8 on display and has no money. However, 8's are in demand as museum pieces -- we've supplied one to the British and Canadian science museums. I suggest that you store it -- don't throw it out -- since I believe there are going to be more and more requests for these in museums. If you want to ship it to the US, then we can store it here.

I'm enclosing a copy of our latest newsletter and brochure. Do hope that you get the chance to see the Digital Computer Museum.

Sincerely yours,

Gordon Bell
Vice President,
Engineering

GB:swh
GB1.S6.28

Enclosures: Museum Newsletter + Brochure

STAFF	FY 80	FY 81	FY 82	FY 83
Keeper	v o l u n t e e r			
Director	volunteer	.5	.5	1.0
Secretary	v o l u n t e e r		.5	1.0
Archivist	volunteer	.25	.5	.5
Coordinator	1.0	1.0	1.0	1.0
Shopkeeper	-	.25	.5	1.0
Tour guides	-	.5	1.0	1.0
Plant Eng	volunteer	.1	.25	.25
Field Service	v o l u n t e e r			

BUDGET (in 1,000)				
Salaries & space	22	85 k*	125	180
Exhibits & artifacts	55	35	45	60
Events	25	40	40	40
Non-profit admin	--	30**	10	15

* 30K over budget + ** 30K not budgetted.

Gordon Bell, Keeper
Gwen Bell, Assistant Keeper

GB1.S5.71

April 21, 1981

Jean Sammet
IBM
Federal Systems Development
Bethesda, MD 20034

Dear Jean,

As Keeper of the Digital Computer Museum, I asked Gwen to look at and review the history section of the AFIPS TAXONOMY for our possible use. Enclosed is a copy of the review that she is sending to the Committee, although I don't think it is something for CR.

Let me urge you to not change the numbering system on Computing Reviews to that in the taxonomy. I don't think it's even 12 percent better as you might predict in using 9 nodes instead of 8 as in CR; and, like Grace Hopper, I've always hated those people who changed the order codes in the middle of the night. I have a written review of the taxonomy that I intend to submit to the committee and CR, in which I urge a recall of the taxonomy.

We're working hard to structure history accurately in the Museum, so that our visitors will have greater understanding of evolution. We've got the first handle on a genealogical and taxonomic structure and would be happy to share it with you if you are interested.

Do hope that you can schedule a visit to the Museum sometime that you are in the Boston area. Digital helicopters fly from Logan to Marlboro and Gwen could arrange your transport this way. Our next lecture, June 25, is John Brainerd on the University of Pennsylvania machines; and then David Edwards on the Manchester machines on September 9. But there is plenty to see without combining it with a lecture; and more everyday.

Sincerely yours,

Gordon Bell
Vice President, Engineering
Keeper, Digital Computer Museum

GB:swh
GB2.S5.35

Enclosure (1)

DRAFT FROM 7/81

THE DIGITAL COMPUTER MUSEUM

date: 1990

from: The Director's Office

After more than a decade of operation, the Digital Computer Museum encompasses the entire information processing family tree with a complementary program, document, photograph and film library. (see fig. l) Housed in a 120,000 square foot building, historic artifacts of computing, video- and audio- presentations by the engineers and programmers working on historic machines, examples of benchmark computer applications, and a library of relevant books, manuals, photographs, and programs are on display and available for reseach purposes. Classrooms, viewing rooms, and a computer data-base system provides resources for resident scholars, short-term seminars, and lecture series.

The collections have been built up from gifts from industry, universities, government agencies, and individuals. All materials more than 15 years old are considered for the collection. This formula is also The Annals of Computing History to verify collectable materials. The artifact collection started in 1973, grew to more than 500 pieces in 1981, is currently at 5,000 and continues to grow. The film and photo library was inaugerated in 1981 and is now the pre-eminent historic resource collection. The book and program library were opened in full scale on moving to the present site in 1987, although collections began in 1981. The site has sufficient space to expand to double or triple its 120,000 square foot facility.

The Digital Computer Museum is unique. It cannot be likened to Science Museums that emphasize visitor numbers by attraction exhibits, for example the live Muppet show was the outstanding draw of the last decade at Science Museums that then hope the public will also look at serious exhibits. Nor can it be likened to industry-related museums that allow specific companies to outfit exhibits that fundamentally become self-advertisements. Nor can it be likened to experiential museums that attract children and parents to find out and experiment for themselves. The Digital Computer Museum is most like a well-developed natural history museum, where collections are classified to show entire branches of the plant and animal kingdom and whole societies. The collection of the Digital Computer Museum tells the story of the "natural" history of information processing, pieces are added to the story not for their intrinsic value but because they have a place in that history. Because this is such a large field, the Museum like the great Museums of the late-nineteenth century virtually requires an ark to hold its population.

AUDIENCE: The audience is drawn from three levels.

<u>The primary audience</u> is the serious connoiseur of computing history. Exhibits, library facilities, serminars, lectures, and a visiting scholar program are geared to their needs. While their numbers are not large, their participation is absolutely essential to maintaining predominance in the field. A visiting scholar program provides one way for some of the pioneers of computing, computer historians, and computer artists and

musicians to be in residence and add to the richness of the environment.

The secondary audience includes all people who want or need some understanding of the evolution of computing. This includes most computer scientists, programmers, and engineers as well as other professionals employed in, or being trained for the computer industry. Special seminaras, lectures, half-day and one-day programs provide over-views of the historic evolution of computing. Members of the IEEE, AFIPS, and other professional organizations, customers of Digital and other computer companies, and retirees from the computer field are attracted to exhibits, the library, and the Museum's special programs and facilities.

The tertiary audience is made up of families of the first two groups, museum goers, and others who want to find out what the museum is all about. No attempt is made to amuse or attract this audience via low-level fun and games. But, experience shows that these people come and learn from quality exhibits.

SELECTION OF A PERMANENT SITE

Because Digital Equipment Corporation had the foresight to fund the establishment of the Museum, in 1981 they had the unique opportunity to benefit from planning a site for its long-term home.

A Museum building, itself, has very special needs: large exhibit halls with controlled lighting, theater type areas, and facilities for the public are important considerations.

Considering audience factors, four different sites were evaluated: Marlboro, Maynard, the Bedford/128 area, and central Boston/Cambridge. From the point of view of what was known in 1981, the best sites seemed to be Maynard or near the Bedford 128 location. The wild card affecting these sites is clearly the availability of a building.

Figure 2 shows the weighting of the site selection criteria, and some scenarios affecting location.

FIG. 2 SITE SELECTION CRITERIA

	Relative Weight	Marlboro	Maynard	Bedford	Boston	Other
AUDIENCE						
DIGITAL						
Primary	5	15	20	10	5	__
Secondary	4	12	12	16	4	__
Tertiary 2	4	8	6	2	__	
NON-DIGITAL						
Primary	5	5	10	15	20	__
Secondary	2	2	4	6	8	__
Tertiary	1	1	2	3	4	__

SUMS	37	56	56	43

FOUR SCENARIOS

Marlboro: Although it was known that the audience would have to be attracted to the site, the Marlboro campus facility of Digital was selected. A special museum building was erected on the site, tied into corporate displays in MR-2 and the use of public spaces in MR-1 and 3, especially after hours. With guest facilities for resident scholars and with on-site classes given by WPI and Northeastern, Marlboro became a center for computer history.

Maynard: , the Marlboro campus facility of Digital was selected. A special museum building was erected on the site, tied into corporate displays in MR-2 and the use of public spaces in MR-1 and 3, especially after hours. With guest facilities for resident scholars and with on-site classes given by WPI and Northeastern, Marlboro became a center for computer history.

Maynard: Two scenarios seemed appropriated: (1) The "Mill" centralized Digital's continued interest/support of the independent Museum, housing it adajcent to Corporate Headquarters, and Engineering. (2) A proper Museum was built in down-town Maynard providing life to the town and its redeveloped center and mall.

Bedford: Site and facility are independent. A site was developed (1) adjacent to Digital's Educational Services facility, (2) near the National Historic Park, (3) on Route 128, based on the following kind of facility, (1) an old shopping center, (2) new building, (3) reclaiming Lincoln Labs, or (4) something else. It became a center of activities for the large number of computer people within a half-hour of the Museum.

Boston: Much to everyone's surprise, the Digital Computer Museum was given a building in Boston. The following two choices seem to represent the polar possibilities: (1) The site is a well-kept secret, about like the glass flowers, and it is a peaceful oasis for computer buffs. (2) Along with the Aquarium the Museum has become one of the chief attractions in the downtown area although we have not comprimised any historic standards.

Fig. 1: The Collections

Period that the exhibit covers:

Craft	Mechanical	Electro-mec	Electronic	Transistor	IC
1600	1810	1900	1950	1960	1970

AUTOMATA---
including robotics

CONTROLS--- - - -
including water clocks and governors

MEMORIES---
including books and magnetics

LINKS & SWITCHES   --
including telephony anraphy

TRANSDUCERS   ---
including typewriters and printers

CALCULA   -- - - - -
Including analog and digital calculators

DIGITAL COMPUTERS   -------------------------------
including processors

AUTOMATA---
including robotics

CLASS CALCULA

ORDER	FAMILY -complexity	GENUS -structure	SPECIES
Analog	single part	drawing instruments	protractor, pen etc.
		fixed rule	proportional rules
	2-3 part	gunter rule	gunter rule
		sector	sectors
		slide rule	straignt, circular, spiral, log-log
		level reference	gunnery level
		integrator	mileage reader
	multiple part	drawing instruments	pantograph
		level reference	quadrant, sextant etc
		integrator	planimeter, etc.
	complex	level reference	auto-pilot
		equation solver	harmonic analyzer etc tide predictor, etc
	programmable	diff. analyzer	Bush, Hartree
		analog computer	Genl Precision, etc.
Digital	single register	stone, bead	counting table, abacus, soroban, etc
		Pascal wheel	Pascal wheel, strip, keyed wheel
	two register	tab indicator	
		keyed wheels	Burroughs
	3-4 register	stepped wheel	Leibniz, arithmometers automatic stepped wheel

	rotary	Baldwin, Odhner, Curta, etc.
	motor-driven wh.	Monroe, Friden etc
	battery electronic	"pocket" calcs.
complex	tabulator	Hollerith census, Powers-Samas
	equation-solver	ABC machine, pocket calculators,
	relay calculators	Bell Labs I
		difference engines
programmable	relay calculators	Bell Labs II-IV, Z3-4
	analytic engine	Babbage, Harvard MKs
	tabulator	Hollerith, Powers,etc
	plug-board	ENIAC
	battery electronic	pocket

CLASS MEMORY

ORDER -interface	FAMILY -technology	GENUS -structure of access	SPECIES
Non-mech.	Physical state	Fixed-permanent	stone marks, Napiers
		Fixed-erasable	Quipu, beads, abacus
Writable or Readable	Paper	Fixed	
		Linear	scroll
		Cyclic	rolodex
		Random	book
	Mech. stable	Fixed	switches
		Linear	piano roll
		Cyclic	drum, disk
		Random	card
	Chem. stable	Linear	microfilm
		Random	microfiche, videodisc
	Magnetic	Random	rope
	Electric charge	Random	capacitor
	Electronic	Random	diode, semicon. rom
Writable & Readable	Mech. stable	Fixed	calculator registers
		Random	Zuse memory
	Wave storage	Cyclic	mercury, optical, & magneto-strictive
	Electric charge	Cyclic	Atanasoff drum
		Random	Williams tube, capacitor, semicond.
	Magnetic flux	Linear	tape, wire
		Linear-cyclic	datacell

	Cyclic	fixed-head disk, drum
	Cyclic-linear	disk
	Random	core, disk
Electronic stable	Fixed	flip/flop, relays, stepping switches
	Random	semiconductor array, relay array
Chemically stable	Linear	photo store

11/30/81 Mon 13:58:55

THE DIGITAL COMPUTER MUSEUM

from The Director's Office

Dateline 1990

After more than a decade of operation, the Digital Computer Museum's collections encompass the entire information processing family. It has evolved to be similar to a well-developed natural history museum, where collections are classified to show entire branches of the plant and animal kingdom and whole societies. The collection of the Digital Computer Museum tells the story of the "natural" history of information processing with exhibits. Because information processing is such a large field, the Museum, like the great Museums of the late-nineteenth century, virtually requires an ark to house all its specimens. In cooperation with the archival projects of the Charles Babbage Institute, the Museum serves the scholar in researching topics in the history of computing.

This monumental achievement can be credited to a well thought out plan and policy articulated in early 1982. The clear identification of the audience, selection of a permanent location and building site, and conceptualization of an interpretive program for the collections provided the necessary direction for communicating the goals and ideas for the future.

Dateline 11/30/81

PROJECTED AUDIENCE

The audience is comprised of three parts. One group is the serious connoiseur of computing history. Exhibits, library facilities, seminars, lectures, and a visiting scholar program are geared to their needs. While their numbers are not large, their participation is absolutely essential to maintaining preeminence in the field. A visiting scholar program provides one way for some of the pioneers of computing, computer historians, and computer artists and musicians to be in residence and add to the richness of the environment.

Another group includes all people who want some understanding of the evolution of computing. Most computer scientists, programmers, engineers and professionals employed in, or being trained for the computer industry belong to this group. Special seminars, lectures, half-day and one-day programs provide overviews of the historic evolution of computing. Members of the IEEE, AFIPS, and other professional organizations, and retirees from the computer field are attracted to exhibits, the library, and the Museum's special programs and facilities.

The third group consists of families of the first two groups, museum goers, and others who are curious about the museum. Experience has shown that these people come and learn from quality exhibits. The Museum's exhibits are designed to communicate the history of computing and not to engage visitors in amusements.

LOCATION

Comparison of four different locations within Greater Boston suggest varying opportunities for the Museum.

Marlboro, in the building in which the Museum started: A pattern of visitors that evolved was never disrupted by moving the Museums location. The location on Route 495, close to the Massachusetts Turnpike, and within an hour of Boston, is isolated from other cultural or educational facilities. The site itself is outside of town and accessible only by automobile. Thus, the facilities must be developed to attract the visitor who will make a special trip and invest a half day in the trip.

Maynard, the home base of Digital Equipment Corporation and the "mini computer" capital of the world: The town is not on any main route, but within 45 minutes of most of the "computer engineering" community of Boston. All sites would be in a "downtown" with some bus transportation.

Route 128, the "high tech" nucleus of the sixties: 128 is the center of the computer community within Boston, and accessible to the interstate highway system. A number of building sites would be possible in the vicinity.

Boston or Cambridge, the center for the cultural institutions. While most students and tourists are confined to these settings with a large number of competiting cultural institutions.

Each location has its inherent attractions and difficulties. The critical decision point is the availability of a building with appropriate financing to make the Museum happen.

MUSEUM BUILDING

A Museum building has very special needs:

At least 120,000 square feet

60,000 square feet of exhibit halls with controlled lighting, temperature and humidity control, divided into at least ten different units ranging in size from 3,000 to 10,000 square feet, and including a theater for about 300 people, small meeting rooms and theaters for 12-100; space for a library,

store; restaurant; workshops for exhibit development; and facilities to allow for a flow of the public.

Parking for cars and buses.

Issues regarding MR-2 (using the present building)

Legal/financial. Two alternatives were considered. 1) Immediate acceptance of the entire building as a gift that would require raising a matching one-third from others for its renovation/endowment (as required by IRS regulations for public foundations). The Museum would lease back portions of the building to Digital or DECUS with their gradual withdrawal by 1989. 2) The separation of the building into three condominiums, each of two floors, to be given to the Museum in three stages: 1983; 1986 and 1989 at which time the Museum owned the entire building. At the time of the acquisition of each portion of the property one-third matching donations of $1.2, $1.5, and $2 million were attracted and divided equally between exhibit renovation and endowment.

Space. The configuration of the building and its associated property into a Museum poses the following issues:

Cost-effectiveness: if the expense to transform it into a Museum would be greater than building anew or looking for another site.

Appropriate timing of major spaces during the 10 year development period.

Establishment of free visitor flow throughout the space to encourage viewing many exhibitions, while maintaining use of part of the building for the other tenants.

Integration and use of computers and technology for interpretation and control of the Museum itself.

INTERPRETIVE PROGRAM

The draft catalog (attached) lists all the artifacts according to one taxonomy. Other classification concepts are useful in builing exhibits. The two in conjunction are designed to provide a rich interpretive experience. For example, the first major exhibit, the Pioneer Computer Timeline, is actually based on one of the major chapters of the catalog and features two of the more significant artifacts of the collection: the Whirlwind and the Atanasoff-Berry Computer. The ideas for further exhibitions are listed below.

Interactive computing: The TX-0, PDP-1, PDP-11/45 and other machines capable of running and demonstrating interactive programs.

Super computers: Texas Instruments's ASC, Control Data's 6600, IBM's Stretch, University of Illinois's ILLIAC IV, etc. -- standing as scuplture with associated films, photos and other interpretive materials.

Personal computing: From the LINC, LGP-30, to Altos, ATARIS, etc. with the potential for user interation.

Evolution of card programmed processing from a working Jacquard loom to a l950's card room and inclusive of other examples.

Robotics from deVaucauson's automata through the evolution of industrial robots with demonstrations.

Memory devices, tracing the read-only and write-only memory devices through such use as player pianos to current read/write devices.

Computer ancestors in the craft generation, between 1600 and 1800, providing a feeling for the whole technological context of the era.

Computing in the transistor generation during the sixties.

Computer graphics, arts, and music exhibits with permanent listening galleries, halls for changing exhibitions and laboratory demonstrations.

Computing in space -- on-board computers and what they do.

Mechanical calculating -- from the Pascaline to Lehmer's number sieves, with opportunities to operate the calculators.
Games and gambling -- playing with numbers in simple early games, the totalisator machines of the 30s, classic chess programs and other games of skill and chance.

Developing appropriate levels of interpretation through signage and/or a/v materials, and communicating a direction and flow to the exhibit space without a personal tour guide is critical in the development of the exhibition program. The standardized text panels and catalog entries provide scholarly documentation that needs to be supplemented with interpretive story lines. Video equipment and comfortable seating is needed to allow the use of the films that are being developed.

11/30/81 Mon 13:58:55

THE DIGITAL COMPUTER MUSEUM

from The Director's Office

Dateline 1990

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Marlboro, in the building in which the Museum started: A pattern of visitors that evolved was never disrupted by moving the Museums location. The location on Route 495, close to the Massachusetts Turnpike, and within an hour of Boston, is isolated from other cultural or educational facilities. The site itself is outside of town and accessible only by automobile. Thus, the facilities must be developed to attract the visitor who will make a special trip and invest a half day in the trip.

Maynard, the home base of Digital Equipment Corporation and the "mini computer" capital of the world: The town is not on any main route, but within 45 minutes of most of the "computer engineering" community of Boston. All sites would be in a "downtown" with some bus transportation.

Route 128, the "high tech" nucleus of the sixties: 128 is the center of the computer community within Boston, and accessible to the interstate highway system. A number of building sites would be possible in the vicinity.

Boston or Cambridge, the center for the cultural institutions. While most students and tourists are confined to these settings with a large number of competing cultural institutions.

Each location has its inherent attractions and difficulties. The critical decision point is the availability of a building with appropriate financing to make the Museum happen.

MUSEUM BUILDING

A Museum building has very special needs:

At least 120,000 square feet

60,000 square feet of exhibit halls with controlled lighting, temperature and humidity control, divided into at least ten different units ranging in size from 3,000 to 10,000 square feet, and including a theater for about 300 people, small meeting rooms and theaters for 12-100; space for a library,

store; restaurant; workshops for exhibit development; and facilities to allow for a flow of the public.

Parking for cars and buses.

Issues regarding MR-2 (using the present building)

Legal/financial. Two alternatives were considered. 1) Immediate acceptance of the entire building as a gift that would require raising a matching one-third from others for its renovation/endowment (as required by IRS regulations for public foundations). The Museum would lease back portions of the building to Digital or DECUS with their gradual withdrawal by 1989. 2) The separation of the building into three condominiums, each of two floors, to be given to the Museum in three stages: 1983; 1986 and 1989 at which time the Museum owned the entire building. At the time of the acquisition of each portion of the property one-third matching donations of $1.2, $1.5, and $2 million were attracted and divided equally between exhibit renovation and endowment.

Space. The configuration of the building and its associated property into a Museum poses the following issues:

Cost-effectiveness: if the expense to transform it into a Museum would be greater than building anew or looking for another site.

Appropriate timing of major spaces during the 10 year development period.

Establishment of free visitor flow throughout the space to encourage viewing many exhibitions, while maintaining use of part of the building for the other tenants.

Integration and use of computers and technology for interpretation and control of the Museum itself.

INTERPRETIVE PROGRAM

The draft catalog (attached) lists all the artifacts according to one taxonomy. Other classification concepts are useful in building exhibits. The two in conjunction are designed to provide a rich interpretive experience. For example, the first major exhibit, the Pioneer Computer Timeline, is actually based on one of the major chapters of the catalog and features two of the more significant artifacts of the collection: the Whirlwind and the Atanasoff-Berry Computer. The ideas for further exhibitions are listed below.

Interactive computing: The TX-0, PDP-1, PDP-11/45 and other machines capable of running and demonstrating interactive programs.

Super computers: Texas Instruments’s ASC, Control Data's 6600, IBM's Stretch, University of Illinois's ILLIAC IV, etc. -- standing as sculpture with associated films, photos and other interpretive materials.

Personal computing: From the LINC, LGP-30, to Altos, ATARIS, etc. with the potential for user interaction.

Evolution of card programmed processing from a working Jacquard loom to a l950's card room and inclusive of other examples.

Robotics from deVaucauson's automata through the evolution of industrial robots with demonstrations.

Memory devices, tracing the read-only and write-only memory devices through such use as player pianos to current read/write devices.

Computer ancestors in the craft generation, between 1600 and 1800, providing a feeling for the whole technological context of the era.

Computing in the transistor generation during the sixties.

Computer graphics, arts, and music exhibits with permanent listening galleries, halls for changing exhibitions and laboratory demonstrations.

Computing in space -- on-board computers and what they do.

Mechanical calculating -- from the Pascaline to Lehmer's number sieves, with opportunities to operate the calculators.

Games and gambling -- playing with numbers in simple early games, the totalisator machines of the 30s, classic chess programs and other games of skill and chance.

Developing appropriate levels of interpretation through signage and/or a/v materials, and communicating a direction and flow to the exhibit space without a personal tour guide is critical in the development of the exhibition program. The standardized text panels and catalog entries provide scholarly documentation that needs to be supplemented with interpretive story lines. Video equipment and comfortable seating is needed to allow the use of the films that are being developed.

00 BURT DECGRAM ACCEPTED S 18769 O 531 10-NOV-81 14:48:28

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* d i g i t a l *
****

TO: CONTRIBUTIONS COMM:
EST

cc: DIGITAL MUSEUM

DATE: TUE 10 NOV 1981 12:01 PM

FROM: GORDON BELL
DEPT: ENG STAFF
EXT: 223-2236
LOC/MAIL STOP: ML12-1/A51

SUBJECT: COMPUTER IN SCIENCE & TECHNOLOGY CENTERS (MUSEUMS)

	Historical Pres.	Application for Visitors	Operational for Museum displays	High-level "Magnet-school"	DEC rep.
SCI. MUSEUM, LONDON	***	*			*
SMITHSONIAN	*				
NAT'L MUSEUM OF SCI. TECHNOLOGY, OHAWA	**	**	*		**
LOS ANGELES SCI. MUSEUM	*	*			(IBM)
MARYLAND SCI. CENTER	*	**	*		(IBM)
BOSTON SCI. MUSEUM	*	*			(HONEY WELL)
BOSTON CHILE MUSEUM		**	*		*
CAPITAL CHILD MUSEUM	*	**			**
OMSI	*	**		**	**
LAWRENCE HALL OF SCI.		*		*	
TORONTO SCI. CENTER		***	*		*
CHICAGO MUSEUM					

OF SCI. & IND.			(IBM & BIG NEW FUNDS)
	*	*	
DEUTSCHES MUSEUM	*		
FRANKLIN INSTITUTE (?)			

Gwen and I put this together to aid in understanding future requests from these folks. Hope it's useful to you.

GB3.S2.36

Gwen Bell
Page Farm Rd., Lincoln, Ma., 01773

EDUCATION: Clark University, Ph.D., 1967; Harvard University, M.C.P., 1959; University of Sydney, Fulbright Scholar, 1957-8; University of Wisconsin, B.S., 1955.

PROFESSIONAL EMPLOYMENT: Director, Digital Computer Museum, 1981-present; Social Science Editor, Pergamon Press Inc., 1978-1980; Editor, EKISTICS, 1973-1978; Visiting Associate Professor, Graduate School of Design, Harvard University, 1972-73; Assistant Editor, EKISTICS, 1959-1972; Associate Professor, Department of Urban Affairs, University of Pittsburgh, 1966-1973.

PROFESSIONAL ACTIVITIES: Advisory Board: Contact, Journal of Urban and Environmental Affairs, Canada; EKISTICS, Athens Greece; Urban and Regional Planning, Pergamon Press, Oxford.

Consultant: Global 2000 Report, Council on Environmental Quality, 1979; Neighborhood revitalization, Kettering Foundation, 1978; United Nations Environment Program in Southeast Asia, 1975; National Housing Bank of Brazil, 1973.

Lectured on Planning at a large number of universities.

COMMUNITY SERVICE: New England Conservatory of Music, Trustee, 1975-80: Member, Exeuctive Committee 1976-8; Member, Presidential Search Committee, 1976-7.

BOOKS; Strategies for human settlements, University Press of Hawaii, 1976; Urban Environments and Human Behavior, Dowden Hutchinson & Ross, 1973; Human Identity in the Urban Environment, with J. Tyrwhitt, Penguin Books, 1972.

Numerous journal articles on planning and urban development.

DIGITAL COMPUTER MUSEUM STATUS 5/24/82

December 20, 1980 - OPERATIONS COMMITTEE APPROVED THE CHARTER OF THE DIGITAL COMPUTER MUSEUM

Preserve artifacts relating to the history of computing;

Carry on a lecture and educational program;

Loan artifacts and consult on exhibits;

Prepare exhibitions and arrange tours;

Provide a resource on computer history;

Develop and sell museum-related products;

Make the Museum a center of interest and activity; and

Investigate non-profit status.

August 18, 1981 - OPERATIONS COMMITTEE MINUTES

The Operations committee approved the proposal to establish the museum as a public non-profit corporation. Our intent is to support the museum on a continuing, stable basis and to treat it the same way as other important programs of the Corporation.

****

Presented: "Why can the Digital Computer Museum be Number One?"

Today: We are number one in quantity and quality of computer exhibits.

DIGITAL COMPUTER MUSEUM STATUS 5/24/82

PIONEER COMPUTER EXHIBITS IN MUSUEMS AROUND THE WORLD

Museum	Date & Machine
Science Museum, London	1840s Babbage Analytical Engine
replica Smithsonian	(partial)
piece, Boston Museum of Science	
prototype adder + teletype, DCM	**1939 Bell Labs Relay Calculator**
replica, Deutsches Museum	1941 Zuse, Z3
drum + breadboard, DCM	**1940 Atanasoff-Berry Calculator**
pulley for bedstead, DCM	**1943 Colossus**
Harvard, IBM	1944 Harvard Mark I
Smithsonian, DCM	**1946 ENIAC**
DCM (loan from Science Museum)	**1949 EDSAC**
	1949 EDVAC
Manchester Univ., DCM	**1949 Manchester Mark I**
Smithsonian, DCM	**1950 Whirlwind**
Smithsonian	1951 IAS Computer
Science Museum, London	1950 Pilot ACE

DCM = Digital Computer Museum

DIGITAL COMPUTER MUSEUM STATUS 5/24/82

ARTIFACTS ON DISPLAY AT THE DIGITAL COMPUTER MUSEUM

*** = WORTH A TRIP
PDP-1 operational with Spacewar
IBM 7030 "The Stretch"
TX-0, first transistor computer
Apollo Guidance Computer
LINC, first personal computer
Enigma, WWII cipher machines

** = WORTH A DETOUR
Bendix G-15
CDC 6600, Serial Number 1
LGP-30
PDP-8
Harold Cohen murals and "turtle"
Powers-Samas card system
Hollerith 1890 census machine (replica)
Texas Instruments ASC
Jacquard Loom Mechanism
Thomas arithmometer
Tinker Toy Computer
Napier's Bones
CDC 160A
Williams tube memory

NUMBERS AND SOURCE OF CATALOGUED ARTIFACTS

(Many computer systems have a large number of separate artifacts that, in fact, can be exhibited or loaned and treated as separate items. In this listing they are treated as one. The entirety of Whirlwind is one item, and a single transistor with its own serial number is also one item.)

	Number	Different Donors	Artifact
	21	14	Computers
	57	21	Computer components
	39	21	Computer options
	52	28	Memories
	57	23	Calculators
	..	48	Photographs and documents
TOTAL	226	*	

* From approximately 150 different donors.

DIGITAL COMPUTER MUSEUM STATUS 5/24/82

December 23, 1981 - APPLICATION SUBMITTED TO IRS

March 1, 1982, advanced ruling approved, with final determination on June 26, 1984.

Determination will be primarily based on:

DIVERSIFIED BOARD OF DIRECTORS

ONE-THIRD OF THE SUPPORT FROM THE PUBLIC

ACCESSIBILITY BY THE PUBLIC

DIGITAL COMPUTER MUSEUM STATUS 5/24/82

INITIAL BOARD OF DIRECTORS

Term	
1984	Charles Bachman, Cullinane Associates
1985	C. Gordon Bell, Digital Equipment Corporation
1984	Gwen Bell, Digital Computer Museum
1985	Harvey Cragon, Texas Instruments
1985	Robert Everett, MITRE Corporation
1986	C. Lester Hogan, Fairchild Camera and Instrument
1986	Ted Johnson, Digital Equipment Corporation
1984	Andrew C. Knowles, Digital Equipment Corporation
1986	John Lacey, Control Data Corporation
1986	Pat McGovern, Computerworld
1985	George Michael, Lawrence Livermore National Laboratories
1984	Robert Noyce, Intel
1985	Kenneth H. Olsen, Digital Equipment Corporation
1986	Brian Randell, University of Newcastle
1986	Edward A. Schwartz, Digital Equipment Corporation
1984	Michael Spock, Boston Children's Museum
1985	Erwin Tomash, Dataproducts and Charles Babbage Institute
1984	Senator Paul E. Tsongas

DIGITAL COMPUTER MUSEUM STATUS 5/24/82

1982-1983 FUNDRAISING

Raise $250,000 to match Digital's FY83 and FY84 budgeted contribution of $500,000 for the FY83 and FY84.

Numbers	Category		Return
50	Corporate Founders @ $2500		$125,000
300	Individual Founders @ $250		75,000
400	Corporate Members @ $125	50,000	
1000	Members @ $25		25,000
	TOTAL		275,000

STRATEGIES

DIRECT MAIL
- 2250 Letters April, 1982-(rec'd 40,300 by May 20)
- 4500 Letters & Reports, June, 1982
- 6000 Letters & Brochures, September, 1982
- 6000 Followups October, 1982

BROCHURE DISTRIBUTION

PERSONALIZED CORPORATE CAMPAIGN

SPECIAL GRANT APPLICATIONS

1982 FUNDRAISING PLAN

MAIL CAMPAIGN		Projected returns	
APRIL - 2,250 Letters (750 inside DEC)	200-400	$30,000 -	$50,000
JUNE - 4,500 Reports + letters (repeat mailing + list of Annals of Computing History & Digital Press Computer History Book purchasers)	250-400	35,000 -	50,000
SEPT - 6,000 Brochures + letters (repeat mailing + Museum - developed list)	300-600	40,000 -	55,000
OCT - 6,000 followups	300-600	25,000 -	55,000
BROCHURE DISTRIBUTION In the lobby & at conferences such as DECUS and SIGGRAPH. JUNE - DECEMBER	200	5,000 -	10,000
PERSONALIZED TARGETTED CORPORATE CAMPAIGN Including special packet of reference materials and some presentations. JUNE - DECEMBER			
40 Corporations		100,000	
100 Corporate Annual members		12,500	
50 Individual Founders		12,500	
TOTALS - Stated goal		260,000	340,000

FUNDRAISING WILDCARDS

Mail support for inserts or other promotion from:
- DECUS
- ComputerWorld

Large scale grants ($50,000 or more) from:
- AFIPS HISTORY COMMITTEE
- NATIONAL SCIENCE FOUNDATION

DIGITAL COMPUTER MUSEUM STATUS 5/24/82

EXPENSES		FY 83	FY 84
Labor (including overhead)		165 (20)	210 (25)
Exhibits and Programs		125 (20)	95 (35)
Store		20	30
Archives and Publications		65	70
Other		25 (20)	30 (20)
Total		410 (60)	435 (75)
INCOME			
Digital Equipment Corp	250 (60)	250 (80)	
Founders	200	45	
Membership	65	145	
Store/interest/functions	35	50	
		545 (60)	475 (80)
Surplus	145	20	

() Contributions by Digital through the cost center but not necessary to account to IRS.

DIGITAL COMPUTER MUSEUM STATUS 5/24/82

STAFF ANALYSIS

FUNCTIONS FY 79 & 80 FY 81 & 82 FY 83

DIRECTOR GORDON BELL GWEN
BELL--------------------

ADMINISTRATOR MARY JANE F. GWEN BELL -------------------

SECRETARIAL SUPPORT MARY JANE------------SUE HUNT--------------

CURATOR GORDON BELL--------GWEN BELL---------------

EXHIBIT COORDINATOR GWEN BELL-----JAMIE PARKER ----------------

PROGRAM COORDINATOR GWEN BELL-----JAMIE PARKER--CHRIS RUDOMIN--

COMPUTER MAINTENANCE JAY
MCLEMAN----------

ARCHIVIST GORDON BELL------GWEN
BELL--TRINKAUS-RANDALL

PUBLICATIONS GORDON BELL---GWEN
BELL --------------------

FUNDRAISING GORDON BELL---------GWEN
BELL---------------

MUSEUM STORE CHRIS
RUDOMIN-----

TOUR GUIDES GORDON BELL--- 4 STAFF + 20 VOLUNTEERS------

LEGAL COUNSEL JIM
DAVIS-------

DIGITAL COMPUTER MUSEUM STATUS 5/24/82

COMPARATIVE STATISTICS

MUSEUM	OPERATING BUDGET*	ATTENDANCE	SPACE IN SQUARE FEET: Exhibits	SPACE IN SQUARE FEET: Total
Museum of Science, Boston, est. 1830	4,000,000	900,000	113,000	279,000
Corning Glass Museum, established 1951	3,163,000**	550,000	20,000	40,000
Museum of Science & Technology, Ottawa, established 1966	4,200,000	700,000	112,000	140,000
Lawrence Hall of Science, Berkeley, est 1968	3,000,000	285,000	30,000	117,000
MIT Museum, established 1980	294,000**	4,500	11,000	26,000
Digital Computer Museum FY 82	250,000**	10,000	4,000	5,000
FY 83	400,000**		8,000	10,000

* Exclusive of capital funds and acquisitions.

** Exclusive of a number of overhead expenses given "in kind" including rent and maintenance.

SPACE ANALYSIS

SHARED SPACE	
(in lobbies and cafeteria)	4,000 square feet
Pioneer Computer Timeline	
TX-O	
Super Computers	
CREATED SPACE	
Archives 9/1/82	800 square feet
PRIME SPACE (rentable)	
Offices (1/82)	500 square feet
Four Generation Gallery (6/82)	2,000 square feet
Offices (9/82)	500 square feet
Interactive Computing	2,500 square feet
TOTAL	10,300 square feet

FUTURE SPACE NEEDS FY 1985-1986

Primary and Secondary Memories	2,500 square feet
Card computing	2,500 square feet
Archives	1,000 square feet
Analog computing	1,000 square feet
AN/FSQ-7 & other military computers	1,000 square feet
	8,000 square feet

POLICIES

* Preserve the history of computing.
"You must feel like the Director of the Museum of Natural History when he started to collect bones."
Jan Adkins, National Geographic

* Expand "oral" history via lectures and seminars by computer pioneers:
"There is no history, only biography."
Andy Knowles

* Make the machines themselves focal points:
"Well-engineered machines speak eloquently of their own elegance. Museum designers can't equal them."
Frank Oppenheimer, Director
The Exploratorium, San Francisco

* Interpret exhibits for the computer community:
"Hey, this Museum is for us big kids."
George Michael
Lawrence Livermore Laboratories

* Involve the primary audience:
"The Museum does not have to convince the computer community to support the museum because its artists are worthy; they <u>are</u> the artists."
Harold Cohen
Creator of the Museum's murals

STRATEGIES

1979 Built first exhibits; Held first lecture.

1980 Formed collections and exhibit policies; Opened for viewing by appointment.

1981 Organized the public non-profit foundation.

1982 Open to the public from 1-6 Sunday through Friday.

Raise $125,000 from the "public."

Establish archives.

Start a research program.

1983 Obtain accreditation from American Association of Museums.

Plan an endowment program.

DIGITAL COMPUTER MUSEUM STATUS 5/24/82

EXPENSES	FY 83	FY 84	
Labor (including overhead)		165 (20)	210 (25)
Lectures - 6 per year		25	30
Exhibits (one new gallery)		80 (20)	40 (35)
Store	20	30	
Publications (inc. fundraising)		30	40
Archives (start up)		35	30
Office Staff Support (legal, accounting, travel, etc.)		45 (20)	55 (20)
Total	400 (60)	455 (80)	
INCOME			
Digital Equipment Corp		250 (60)	250 (80)
Founders	200	45	
Membership	65	145	
Store/interest/functions		35	50
	545 (60)	475 (80)	
Surplus	145	20	

() Contributions by Digital through the cost center but not necessary to account to IRS.

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Raise $250,000 to match Digital's FY83 and FY84 budgeted contribution of $500,000 for the FY83 and FY84.

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BROCHURE DISTRIBUTION

PERSONALIZED CORPORATE CAMPAIGN

SPECIAL GRANT APPLICATIONS

DIGITAL COMPUTER MUSEUM STATUS 5/24/82

DIGITAL COMPUTER MUSEUM CATALOG

INTRODUCTION

The second duchess of Portland, born in 1714, was an insatiable shell collector. She never found a satisfactory artistic arrangement for the specimens until she hired a student of Linnaeus (1707-1778), the father of botanical classification systems. Then the collection was rearranged according to a taxonomy illustrating evolution and relationships between family members.

The collection of the Digital Computer Museum, relating to the whole family tree of computers from their earliest origins, also needs a disciplined classification scheme. Those who have tried to understand computer evolution have intuitively considered a tree structure -- the basis of taxonomies -- but none have been fully developed for the purpose (Bell and Newell, 1971; Bell, McNamara and Mudge, 1978; Rogers, 1980; Science Museum, 1975, Sieworek, Bell and Newell, forthcoming). The National Science Foundation tree of early computers shows roots and connections but does not name branches. A number of partial systems and som upon terms exist for defining a classification system. The classification system in Computing Reviews works very well for the extraordinarily broad range of materials including "mathematics, engineering, the natural and social sciences, the humanities, and other fields with critical information about all current publications in any area of the computing sciences" (Sammet, 1980). The work of the AFIPS Taxonomy Committee, Taxonomy of Computer Science and Engineering, provides a convuluted semi-lattice covering all possible issues (AFIPS Taxonomy Committee 1980). Other trees look at only a part of computing (Weizer 1981, Sammet 1969). The evolutionary model has also resulted in the identification of generations (Rosen, 1969).

Generations are the primary organizing element for the collection and the catalog. The first four sections present the pre-computer generations. The fifth section is devoted to the pioneer computers that spanned the revolutionary bridge. The remainder of the catalog and collection is open ended; inclusive of all historic generations, i.e., at least one generation removed from the present technological generation.

THE GENERATIONS

Within the broadly accepted idea of technological generations, clear criteria can be identified to mark each one. These are listed below with examples shown in Table 1.

* A new base technology;
* A new machine structure;
* Satisfaction of a newly perceived need;
* Resulting in significantly different use of computing devices.

TABLE 1. THE GENERATIONS

PRE-COMPUTER GENERATIONS

TECHNOLOGY	MANUAL	CRAFT 1620	MECHANICAL 1810	ELECTRO-MECHANICAL 1900
MACHINE	Abacus	Tables Gunter's Rule	Planimeter Jacquard loom	Hollerith census machine, Friden calculator
NEED	Taxes	Trade Exploration	Industrial Land Division	Census Business
USE	Counting	Arithmetic Navigation	Surveying Weaving	Sorting Accounting

COMPUTER GENERATIONS

TECHNOLOGY	ELECTRONIC 1950	TRANSISTOR 1960
MACHINES	Whirlwind UNIVAC 1 ERA 1101	CDC 160, IBM 7090, IBM 1401 PDP-1
NEED	Defense Weather prediction	Space Science
USE	Firing Tables Weather Forecasting Management	Simulation Training programmers Accounting

---

Generational change is modelled by a series of distinct steps with a new base technology at a significantly different level. The technology base never meets the aspirations and dreams of mankind because perceived needs are continually rising. A new base technology only creates a higher takeoff plane. (Maslow, 1943) With each new invention, one or two prominent people often note that it will fulfill all future computational needs; but each time the demand for more computational power only grows.

A number of ideas and machines are designed and even built out-of-phase with a technology. Ideas that occur before their time often lie dormant in an inventor's notebook until the technology evolves to match the idea. Later historians illuminate these early concepts, showing the contemporary entrepreneurs that they are not originators but only implementers of ancient ideas. In the mid-twentieth century, some letters of Wilhelm Schickard dated 1624 were unearthed. These contained the drawings for the first known digital machine to perform calculations. (Cohen 1980) It is doubtful that these ideas transmitted from Schichard to his friend Kepler influenced any of the mechanical calculators that were subsequently developed. Blaise Pascal, whose single-register, mechanical calculator of 1645 was widely known, appears to have invented this machine totally on his own, as a young man intrigued with a mechanical solution to the problems of accounting, with which his father occupied himself. The inventors who actually develop a baseline machine for a technology are often tinkerers, not scholars searching the literature for ideas.

Increasingly, computing devices are not the sole result of one invention but the convergence of many. As a set of benchmark ideas coalesce into a new machine relating to a new technological generation, then additional, incremental inventions result that also become part of the technological base. A new generation is marked after the project has proven itself, shown not to be a fluke, and has added a new layer to the technological base. The Computer Revolution and beginning of the electronic generation saw the use of vacuum tubes in the ENIAC on a scale of magnitude never before experienced and the invention of magnetic core memory on Whirlwind. Since a generation is a convergence of inventions, its emergence cannot be marked by a single event. A clustering of events, including patents, publications, and start-up dates are used to somewhat arbitrarily select a particular year.

Three pre-computer generations and three computer generations are clearly distinguished. Although calculating activities started with early civilization, it was not until the seventeenth century that a variety of calculating devices were invented and used. The collections begin in 1620 with the beginning of the "Craft Generation". Prior to that computation was carried out manually, in much the same manner for all of history. Defining computing power as the product of processing rate and memory size, a 20 order of magnitude increase can be measured from the time when people used stone-based, single register devices to the 1980s. The most significant increase -- a revolutionary change -- occurred with the beginning of the computer era. Before then, memory size was essentially constant at one. Afterwards, computing power began to increase at roughly twice the exponential rate of all past generations.

A generation is named for its predominant technology. The starting date of a generation is set not by the idea leading to a project that triggers the generation, but by the incorporation of a technology into a new product, concurrent with significant use. In most cases devices from a previous generation continue to be designed, manufactured, and used, often supplying a base on which the new generation is built. The electronic computer generation is marked at 1950. By that time the ideas of ENIAC had been replicated and the first commercial machine, the ERA 1101, was announced to the market. In the Computer Age, the naming conventions given by industry have been used, and they seem to accurately fit the model.

Table 1 lists representative needs, uses and inventions for each of the generations. During the pre-computer generations, evolution was exponential -- each period being about half as long as the one preceding it. The rapid change is similar to manufacturing learning curves, whereby a particular unit cost declines by 10-20% each time the cumulative number of units of a given type built doubles.

THE TAXONOMY

A taxonomy has been developed in parallel with the collection and the exhibits at the Digital Computer Museum. The taxonomy's basic framework is the PMS classification that describes the structure of computers (Siewiorek, Bell and Newell forthcoming). PMS allows any computing or software structure to be described hierarchically in terms of eight basic information processing primitives, but it does not deal with functional behavior, such as program interrupts that are not implied by a structure. The PMS system is generally used to provide a structural representation of the components of digital computer systems. In contrast, the Museum taxonomy classifies only whole computing systems and their antecedents. The following compares the two breakdowns:

TABLE 2. COMPARISON OF MUSEUM TAXONOMY AND PMS

MUSEUM TAXONOMY CLASS - CODE	CODE - PMS
Memories - M	M - Memories
Controls - K	K - Controls
Transducers - T	T - Transducers
Links & Switches - S	S - Switches
	L - Links
Calcula - D	D - Data Operation
	P - Processor
Digital Computer - C	C - Computer
Robotics - R	

The criterion defining the tree is the structure of the computing device, not the organization that made it or the purpose that it was meant to fulfill. To make an analogy with the animal kingdom, if the bone structure of a horse is that of a fine race horse then it would be classified as such; it would not matter if it were bred by the government and used to pick up garbage. In computing, the EDSAC, built at Cambridge University, is classified as neither an English nor a university computer, but as an EDVAC-related machine in the same family as the Maniac and ILLIAC. Thus, differentiation by manufacturers, countries, or intended users is not part of the taxonomy.

The classical scientific taxonomy system with its seven levels has been adopted to organize and classify all species of related inventions. The two top levels, kingdom and phylum, are technology and information, respectively. The Museum collection displays seven classes within the phylum of information. Each of these seven classes is broken down into order, family, and genus, and then identified by species. Table 3 lists the criteria used for the breakdown of the classes. Specific descriptions for each of the classes are found throughout the catalog.

Table 3. (in process)

Criteria used in differentiating orders, families, and genus.

CLASS	ORDER (Technology)	FAMILY	GENUS
Memory	Machine interface	Storage material	Structure of access movement
Controls	*	Degree of complexity	*
Transducers	*	Phenomena/material	*
Links & Switches	*	Degree of complexity	*
Calcula	Analog or Digital	Degree of complexity	Structure
Digital Computers	*	*	*
Robotics	*	*	*

* - To be determined.

Memory is probably the oldest class, starting with early markings on caves and continuing as a significant part of both computers and automata, and also as all kinds of human-readable aids to the brain. See Table 4 for more complete explanations.

Controls are rooted in early analog devices, such as the Greek water clocks, and have been significant in the mechanization process. At the beginning of the nineteenth century, card controlled looms introduced sophisticated pattern control to the industrial process through the use of a larger scale memory data-set than hitherto used. Card control ended with a great flourish in the early nineteen sixties with the tabulating machines. Again, with the advent of the computer on a chip, earlier technologies of control devices are rapidly becoming obsolete, being replaced by the "on-board" micro-processor.

Transducers take information in one form and put it into another. They are often associated with memory systems, allowing their replication; for example, printing use type (a transducer) to duplicate the information in books (a memory device). Transducers began with the movable type and include the teleprinter, tape transport, telephone, and television. These machines are becoming more and more sophisticated and less and less distinguishable from computers.

Calculators, other than the manual bead devices, did not develop until the 19th century and have been virtually displaced by computers. In the PMS notation, these are the data operators carrying out arithmetic operations. Either calculators have become embedded in computers or miniaturized computers have been embedded in what have traditionally been considered calculators. The taxonomy of Class Calcula is explained in the text. (See Table 5.

Links and switches evolved out of the needs of a large number of subscribers all desiring the use of a single system. The first telegraph was a simple device transferring information from one place to another. But the growth of telegraphy and telephony systems in the late nineteenth century created a need to establish elaborate networks linked together with a switching system. Computers still depend on linking and switching for cross communication.

Digital computers emerged in the late nineteen forties from a combination of calculator, control, transducer, links and switches, and memory technologies. The section "Pioneer Computers" shows the combination of elements that was adopted by the first 16 machines, many of which were patched together based on different technologies. Class Digital Computer is certainly more than the sum of these parts, as the parts have converged and been modified and molded into a new phenomenon.

Robotics actually started very early with man's desire to replicate life and took the form of doll-like automata. The experimentation in the sixteenth century however only served as entertainment for kings and in travelling sideshows. The ideas for what automata might do ranged far beyond the technology of the time. It was not until the second half of the twentieth century, that robots have become economically utilitarian. With smaller and more powerful computers, on board machines for sensing as well as calculating and thinking, robots will become more widespread in the future. This class is presently not included in the collection; but will be included in the future.

Each class, like a species, starts within a given generation, flowers, and dies or is incorporated within another class. Each started almost as an independent thread but is beginning to merge into one or two dominant classes: computer and automata. Figure 1 illustrates the potential scope of the collections, indicating the period in which each class emerged and for those, becoming extinct, the time of their gradual demise.

FIGURE 1: THE COLLECTIONS

```
              Period that the exhibit covers:
              Craft   Mechanical  Electro-mec   Electronic  Transistor  IC
               1600     1810          1900         1950        1960     1970


MEMORIES
              MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
MMMM
including books and magnetics

CONTROLS      KKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKK K K
including water clocks, and governors

LINKS & SWITCHES
              SSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSS
including telephony and telegraphy

TRANSDUCERS   TTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTT T T T
including typewriters and printers

CALCULA        DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD D D D D
including analog and digital calculators

DIGITAL COMPUTERS
              CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
including processors

ROBOTICS  RR R R R R          R    R   R   R   R     RRRRRRRRRRRRRRRRRRRRRRR
```

DMCAT1.6

Kim Igoe

Dear Kim Igoe,

Enclosed please find the questionnaire and check for $350 necessary to go forward with the Museum Assessment Program.

To help you, I am enclosing three sets of everything along with the MAP questionnaire: one for the AAM and one for each of the two on-site surveyors that you suggest. I have tried to be as complete as possible so that the surveyor can come to the site prepared and so that we can plan the visit to really get into some depth and set some priorities for ourselves. I believe that the trustees and I have a good idea of where we want to be some years hence; and now the question is the best, most efficient road to get there.

For the above reasons, I would like a surveyor who has helped an institution grow -- from an idea to a major established museum. Personally, Mike Spock is very helpful to have on our Board for this very reason -- he keeps warning me of the various pitfalls of growth along the way. Mike actually suggested that we start the MAP procedures and I am sure that he will be happy to be helpful in this project, provided he is in town, and I will be asking his advice about the final selection of a surveyor.

If possible, I would like to get some names before Christmas and select a person and a date for early in the year, so that we can compile all the information and have a report and our own proposal in the mail to The Computer Museum's Board in the spring.

Thank you for your help,

Cordially,

Gwen Bell

The Director is responsive to the Board of Directors following through on its requests and policies with the assistance of the personnel at the Museum.

The Director directly oversees the work of the Exhibits and Archives Coordinator, the Programs Coordinator, and the Store Manager. Much interaction is required in the programs area as new events and programs evolve requiring decisions unique to each.

A large portion of time is needed in the area of fundraising, writing letters and proposals and generally creating goodwill for the Museum.

The Director also oversees the publicaton of four reports annually. An assistant for Publications and Photographs will aid in the tasks of running down details, layout, proof-reading, and editing.

Approximately one day a week must be spent in preparing for the monthly meeting with the Executive Committee of the Board of Directors. The Director is a member of this committee which sets policy, watches the budget and generally keeps the museum on track in matters legal and financial.

The Director may assist in other projects as needed, give tours, and must be available to settle personnel problems as they arise.

10/24/82 Sun
TO: Staff

NOTHING BETWEEN THE CRACKS

PRIORITIES:

Short term:
Today, get overheads and all material for presentation to HOCC.
Get materials to Reno for Winter Report -- it must move.
Schedule Oct. Nov. - see below

Longer term:

Schedule all mailings and make sure people get things on time: we keep the members happy. Harry Huskey invitations should be out on time, with insert letter to "Locals". - Chris and Geri schedule this -- from doing the labels to stuffing etc. using the store women and Bill as appropriate.

Increase membership and financial support.

- At least 25 personalized letter's go out a week -- signed by me or some member of the Board -- to get major acquisitions and get things moving. (Geri let's keep a log of the numbers of personalized letters that go out each week for big bucks. Geri, it's your job to keep me at this and make sure they go out.)

- The December 9th, Pray, Mr. Babbage party should be used for a big membership drive. Chris, your main job is to get the publicity out for this and pull the whole party together. (Huskey should more or less take care of itself...without alot, and Bits and Bites is about done.) The goal should be 100 new members from Pray, Mr. Babbage. Invitations need to go in the mail on November 12th -- want you to use a great big mailing list (get our friends at DG etc., lots of internal Digital -- lets rethink the use of lists). They must send in money for tickets. $5. each for members (who may bring one friend for $5); non-members need to become members for $25 and then pay $5 for themselves and a friend.) -- Get me to call Charlie Conn today and set up a meeting for Friday, when we have all the details of the party and get them to design invites for free, must be done fast to go to the printers by the 5th for a week turn-around. This whole thing has to be quick and dirty, but with lots of style. I want to talk to you and Jamie about it for 15 minutes today. Then lets put the whole thing in final shape on Friday.

- Jamie, after the Pioneer Timeline is complete, then you must drive the planning for the lobby floor space, and the proposals for all the viewing and video equipment.
-

The Office Manager reports to the Director, the secretary to the DEC Operations Committee and a DEC Supervisor. Reporting to the Office Manager are the Secretary, Business Manager and Store Manager. (This area needs clarification from Gwen.)

A. Management of office
   l. Supervise secretary
   2. Supervise Business Manager
   3. To ensure smoothly-running operations, act as interface to Digital service organizations such as Facilities, Field Service, Payroll, Personnel

B. Assist Director with Fundraising

l. Goal - coordinate 100 solicitation letters per month (over $100)
   a. Director provides lists of persons/groups to whom letters will go
   b. edit Director's letters for format, accuracy, style
   c. input list into list processing
   d. mail letters
   e. copy to correspondence file
   f. copy to Office Manager's Monthly Solicitation file (green folder in O.M.'s desk by month)
2. Month-end Membership Report
   a. for Executive Committee
   b. shows how many new members in each category
   c. includes list of all current solicitations
   d. who responded
   e. what results
   f. filed in Executive Committee Book (white book in Business Manager's Office)

C. Manage Annual Cost Center Budget
1. WHAT -- $60,000 from DEC
   a. includes O.M.'s salary
   b. aviation expenses
   c. supplies from Stationery
   d. miscellaneous shipping
   e. other
2. HOW --
   a. make up budget
   b. track it monthly
   c. keep Director aware of status
3. Budget overrun -
   new process to be worked out with Director to voluntarily reduce contribution from DEC to compensate

Other activities of the Office Manager

A. Proposed installation and management of 11/45 computer connected to all museum users
    l. in location off lobby
    2. work with Field Service of DEC to install
    3. obtain correct programming for each function
        a. accounting
        b. correspondence
        c. members lists
        d. mailings
        e. librarian-archivist procedures
        f. program dates
        g. others

B. General Assistance
    1. mailings
    2. travel arrangement
    3. museum events and functions
    4. others

C. Supervision of Store Manager (?)

Floppies used:

A. GERI - correspondence and other
    l. filed in O.M.'s office (2 drawer file, under Floppies)

B. BUDGET - Director's floppy
    1. updated monthly
    2. filed in Executive Committee Book (white) in Business Manager's office
    3. contains Monthly Membership Report

C. SOLCI
    1. filed in O.M.'s desk in "solicitation" folder
    2. contains Update Form
        a. updted monthly solicitation lists
        b. positive or negative responses recorded
        c. paper file - left desk drawer under "Project - Solicitations over $100

The Business Manager reports to the Director.

The main function of the Business Manager is to free the Director, Exhibit Coordinator, Programs Coordinator, and Office Manager from bookkeeping and other money related chores.

From the Business Manager's viewpoint the Museum is divided into four areas: Director's Office, Exhibit Center and Archives, Program Center, and the Resource Center.

The Business Manager performs the following tasks areas and they relate to the four larger areas of the Museum mentioned above: payroll, insurance, bank accounts, bookkeeping and accounting, budget, taxes, state and federal reporting, store management, bill paying, invoicing, money handling, preparing for audit, relations with vendors, petty cash, and keeping track of fundraising. Also photography, report editing, and tasks for special events.

Payroll. Shawmut Automated Payroll Service -- Contact is Thomas Chatelier, 292-2197. In Payroll File see sample forms for: New Employee Setup for both salaried and hourly employees; Employee Revision Form for any change e.g. salary change, tax status; Employee Prelist (comes from Bank each payday, to be filled in with hourly employees' hours listed. Time cards are collected every 2 weeks. Employee Prelist Total is stapled to Prelist and must be into Bank by 2 p.m. on Monday following the end of pay period. Pay period is Sunday through Friday, biweekly. Checks are processed on Tuesday and can be picked up at the bank on Wednesday a.m.
Bus. Mgr. has key to the bank pouch. (More bank forms can be obtained from the bank when needed.)

All employees must fill out a W4 Form for Federal withholding tax and a M4 Form for State withholding tax. These forms may be obtained from the IRS Center in Holyoke.

Other forms: Employee Reference Card from bank will verify pay status of a new employee or that revisions have been made to the pay status of an existing employee.

Insurance. Two areas--Museum Insurance and Health Insurance.

Museum Insurance includes: 3 polices with Johnson & Higgins, 3 Center Plaza, Boston -- Joan Goldberg 742-5300

Director's and Officers' Liability

Underwritten by Chubb; includes areas of Embezzlement, Limits on Personal Liability, and others.

Blanket Excess Liability Policy

Underwritten by Fireman's Fund: includes areas of Bodily Injury, Automobile Liability, Workman's Compensation, and others.

Commercial Insurance Program (biggest area)

Underwritten by Federal Insurance Co. (Chubb): includes areas of Property and Building Losses, Bodily Injury (visitors, accidents), Employee Dishonesty, Personal Property.

Health Insurance Group # (or Employer #) is 26232. Plan Administrator is MSP (Multiple Security Program); Claim Office is John Hancock Mutual Life Insurance Co, St. Louis Group Claim Office, 13523 Barrett Parkway Drive, Building #2, Suite 250, Ballwin, MO 630ll, Telephone # 314/821/3002.

Health Insurance or more correctly called Small Group Insurance Plan includes: accident, hospital, dental, mental, surgical, $10,000 Term Life, long term disability, $10,000 accidental death and dismemberment.

Claim forms include: Statement of Claim (to Dr. or hospital)
Dental Claim Form
Group Hospital Insurance Form (to hospital)
plus Claims Filing Instructions.

Contact at MSP (Plan Administrator) is Vivien A. Benning, Contracts Service Coordinator at MSP Insurance Trust, P.O. Box 786, Boston, MA 02117, Tel. No. 421-5000.

To enroll new employee in plan two forms must be filled out and mailed to Vivien Benning: John Hancock/ MSP Group Insurance Enrollment Card and John Hancock/MSP Statement of Health.

Bank Accounts. The Business Manager maintains 3 accounts, writing checks, keeping registers , and reconciling bank statements for each.

All are at the Shawmut Community Bank, Marlboro West Branch; Manager, Susan Smith 485-6697.

l. A deposit account for VISA and Mastercharge sales. Account #294-4146.

2. A membership account (checking) formally called Non-DEC Contributions;
an interest bearing account; the general operting fund (the largest acct.)
Account # 275-959-4

3. Store and Events (checking) account; deposits from store, play, etc.
Account # 275-960-8. Out of this account comes money for store inventory, food for special events, expenses for any money-making event.

For Investment Information the contact is Gail Chadwick at the Framingham Office, 620-1100 X362--info on IRAs, CDs, etc.

Bookkeeping and Accounting. For each of four areas of museum there are income and expense records in file folders.

Budget. On Floppy kept in Gwen's Executive Committee Notebook, in pocket in back. Monthly Budget Report shows Projected, Year to Date, For Current Month, Total, Deviation. Income and Expenditures for all 4 areas.

Fiscal Year runs July l through June 30.

Taxes. Federal ID # is 042-747-017 (also called Employer ID # and Tax ID #.)

The most important filing is Tax Exempt Filings for Federal Form 990 and Schedule A; and for State Form PC. These are filed after close of Fiscal Year and a period of 5 months is allowed for filing. (The due date for the Museum would be November l5.)

Quarterly Sales Tax Form ST9Q (State form)

Withholding Taxes: Federal Form 941E--Quarterly Return of Withheld Federal Income Tax. (Museum has not yet filed with State in regard to withholding income taxes.)

We are in an Advanced Ruling Period with the IRS until June 1984. The IRS
will give permanent tax exempt status to the Museum at that time if in the
probationary period it maintains a 2-l ratio (For every $2 that is contributed by corporations, there is $1 from the public).

Store--info from Carole.

Bill Paying. Invoices come in and are 1. grouped by when they are to be paid, 2. o.k.'d by person initiating the expense securing as much info about it as possible, and 3. paid out of correct account.

Invoicing. Use invoice form. Mostly for dinners done for groups. Copy goes in Receivables folder. When paid goes in account folders.

Petty Cash. Taken out of membership account when needed. See Petty Cash file folder. Usually an expense voucher is filled out and must be ok'd.

Audit. Coopers and Lybrand do the auditing (gratis) after the FY is over. The Business Manager supplies the raw data from the income and expense files. Contacts at C&L are Scott Eston and Ed Gillis, 1 Post Office Square, Boston (574-5000). All information should be given to C&L in September so that tax forms will be ready by the November deadline for filing.

Relations with Vendors. The policy of the Museum is to pay bills promptly when due. They may be potential members of the museum or possible contributors of money or goods for special events.

Keep track of fundraising. Important to watch the income and to go slow on outgo, keep expenses down, and process deposits quickly when income is less.

The Business Manager is for the present the official photographer for the museum. Equipment is kept in the Twilight Zone and in the file cabinet in the Bus. Mgr.'s office. Equipment includes:

Cameras Nikon F body Serial #6972015
Nikon F Viewfinder Serial #497271

Lenses Nikkor-UD Auto 1:3.5 f=20mm Serial #434267
Micro-Nikkor-P Auto 1:3.5 f=55mm Ser #648625
Nikkor-P Auto 1:2.5 f=105mm Serial # 428755
Nikkor-Q Auto 1:4 f=20cm Serial # 198738

Accessories Nikon M2 (extender?)
Nikon HS-4 lens shde for 105mm
Nikon K1, K2, K3, K4, K5 (filter holders)
Aetna Close Up Lens #1 52mm
Aetna Close Up Lens #2 52mm
Nikon hot shoe

Davis and Sanford Model B Floating Action tripod
Panrite Universal tripod head
Mole-Richardson light stand
Larson Soff - Box flash diffuser
Larson Reflectasol Clamp

Studio FlashNorman 800 Flash Power Supply & Power Cords
(3) Norman Lh 2000 Flash heads
Norman aluminum light stand
Background stands
PC Synch cord

Good contact for photo advice is Steve Spellman, Brownstone Group, Brookline. He is a professional photographer and also a Founder member of the Museum.

The Bus. Mgr. has done some report editing and performed tasks for special events (such as stage mgr. for play).

Floppies are stored in "Software" file folder and are as follows:

Budget — Monthly budgets.

TWIT — Archives expense voucher, purchase order forms, invoice forms, list processing, etc.

DHB 001 — Notes to financial reports (taxes), other tax information, receipt form, information about Report.

File Folders contain procedures for payroll, preparing taxes according to printed instructions, accounting system. There are no printed instructions for most procedures but easily learned by a newcomer.

Legal Advice: Jim Davis at Bingham, Dana, and Gould, 100 Federal Street, Boston,specializing in legal affairs for non-profit organizations. (Expensive) Clerk of our Board of Directors. Sends copies of any legal or tax filings to Davis for locating potential problems.

Darman Wing, DEC Legal Department, Secretary to Executive Committee; also gives general advice

Legal information is filed in bottom drawer of file cabinet.

From DHB: Procedures for Processing Museum Store Sales, Procedure for Handling Money Given to Museum, Museum Store Purchasing of Inventory & Supplies, Procedure for Handling Money Given to Museum, Procedure for Handling Accounting for Functions. MB will go over these procedures when time permits.

June 6, 1983

Brian Randell

Dear Brian,

Gordon and I are both home for the summer. And I am beginning to feel relaxed, rested and ready to face the new opportunities ahead.

Oliver Strimple has been here for the last three weeks and I believe is quite excited to come to the States for a year. He is not interested in a "historic" gallery per se, but in doing a thematic gallery with an historic approach. He will probably do one on "The Computer and the Image" that will open in November 1984. If all goes well, Oliver will come January 1984 and leave a year later. It is not yet fixed with his director so please don't talk about it.

Jamie, Beth, Meredith, Bruce McIntosh (designer), and I will be working on revamping the present materials to do an integrated historic exhibit (using video) and being much more involving. This will open (with luck) on May 11.

As the Chairman of the exhibits committee, I think it would be a very good idea if you would/ or could call a meeting sometime in the winter to review what we will be doing (before it is done). The best time would be between November 1 and February 1. We'll work out a way to bring you over.

Then I think that a meeting of the committee on May 13th - Saturday - to review Oliver's ideas would also be a good idea.

The committee is made up of you, Ken Olsen, George Michael, and Eugene Fairfield (who declined). See enclosed letter. I will see if we can get an alternative IBMer, or a least, I. Bernard Cohen. Any other ideas? Let me know your preference on this.

<u>CBI Bibliography.</u> I'm enclosing my critique. It was written on just an awful terminal that we had in Gordon's hotel room in California. But the job got done. We approached the same problem from different angles.

<u>Books at the store.</u> Books still make up 25-30% of the purchases at the store; but for the amount of inventory and diversity that we must keep any individual title moves quite slowly. Yet, we believe that this is an important element in our stock and perhaps over the years, people will get into the habit of buying from us. (But, I believe that your remark on books at Sturbridge probably were much less costly and technical books than we carry.) Books like Randell, <u>History of Programming Languages,</u> <u>History of Computing in the Twentieth Century,</u> etc. are not impulse purchases. The best selling books are: <u>Computing Catastrophes</u> ($11.95 paper); <u>Soul of a New Machine</u> ($7 paper); <u>Discovering Computers</u> ($10.95 for children);

101 Basic Games
($10 paper). But the people who find the historical book that they want at the museum are very happy.

Thanks for coming,

Cordially,

Gwen Bell
Director

November 7, 1983

Andy Knowles
Nourse Road
Bolton, Massachusetts 01740

Dear Andy,

"If we invested money in the future rather than the past, then what?"

Each time I invest "in the past" -- it has future payoff.

The idea of a computer museum started for me, at Carnegie doing research for Computer Structures, a computer science reference that I consider mostly history. Allen Newell and I collected materials and objects from the past machines so that we could use them to build theories. The Unibus and general registers both came out of this work, and I can remember inventing the concepts by building an encompassing theory of past structures. Some of the architecture of the 11 and then the overall goals of the VAX grew out of a knowledge of the past. When I returned to Digital in 1972, I knew the truth of the statement: "Those who forget history are doomed to repeat it."

One goal at Digital was to build an engineering group who stayed at the cutting edge and this required understanding other views, including history. I started close associations with Universities (who fundamentally teach history), then put together Computer Engineering so that all the engineers in the growing organization could have a ready-reference to Digital's computer evolution, and finally helped establish the museum right in the middle of an engineering/marketing area of DEC. Although The Computer Museum itself is leaving, I hope that DEC keeps their own collection of historic machines on display.

Fred Brooks famous book, The Mythical Man Month, required reading for many engineering students, grew out of his historical observations from designing the 360 system software. It is a classic on the nature of organizations and work, especially with regard to large software developments. Neither Fred Brooks or I market books as history, but rather as fundamental understanding.

Computer Generations, marking technological time, are the main organizing principle. The Computer Museum provides the best place to gain an understanding of this powerful idea. Each generation's new technologies, startup companies, and new products are listed and displayed. For example over 100 minicomputer startups are recorded at the beginning of the third generation, and now the fourth shows a similar pattern for micro-based companies. Analyzing winners, losers, and also-rans provides some insight on what is happening today. This is in a paper (which you might want to look at) that attempts to provide insight on today's industry.

The Computer Museum, although presentely marketed as a historical museum, has another, and probably more important role: providing basic understanding for a variety of levels of visitors. Everytime I visit the museum, I get insight relevant to a current problem. A month ago while looking at the Honeywell 116, a very early IC machine, ideas jelled about board size, pins and function. Just last week I observed that nearly all of the micros repeated, for the third time, the time worn memory management evolution path that began in 1960 with Atlas, which we followed with the 10 in the 60's, and then again with minis in the early 70's.

At another level, four very bright kids from a New Hampshire prep school spent three hours trying to find out everything they could about old computers -- and their teacher felt this helped their fundamental understanding of computing. I continue to get statements from my friends in the U. K. when we tour the galleries together about how the Science Museum turned them on to science and technology.

Andy Van Dam, Professor of Computer Science at Brown and founder of ACM's Siggraph illustrated the importance of learning from the past in a wonderful two hour lecture composed of about 20 films on computer graphics to an audience of about 100 on a beautiful autumn Sunday. He gave his time and was able to get the films because it was for the Computer Museum's archives. Twice he noted how viewing the films had moved him and others to action, even though they were historical: Sketchpad and the Englebart system at SRI. I'll even conjecture that if the later film had been preserved and shown more widely, then the human interface would have evolved more rapidly. It is even possible that the work at Xerox Parc which post-dated SRI's work would have been unnecessary. Bob Kusik, one of DEC's CAD managers sat by me and remarked that the modern work is better, but NOT that much better considering 20 years has gone by; things would have gone much faster if people had built on earlier work. This is a major facet of the Museum and one which I'll bet your company will use sometime. <u>If you support The Computer Museum you are supporting an important educational institution for the present and future generation of engineers, programmers, artists, and hackers who will make history.</u>

In the fall of 1970, when The Computer Museum took its first non-Digital donation, we decided it was much better to try to learn from the whole past of computing, just not our own. People who stay insular don't have a see the alternatives. Looking at other peoples good and bad ideas provides perspective on your own. Being industry-wide is most economical and ecumenical. It's not a job to leave solely to IBM who invests a great deal in preserving its own history. Their excellent multi-million dollar presentation at 590 Madison Avenue exhibit claims they built the first stored program computer (the SSEC -- and they omit Eckert and Mauchly or Wilkes) and that Wang and RCA invented the core memory (while J. Forrester holds the main patent). <u>The Computer Museum provides the story of all the companies, not just the big ones, but the wide range of people, ideas and companies that made the world's most exciting industrial adventure.</u>

Museum's are the ultimate in the future: they provide immortality of all kinds. Look at baseball club owners supporting the Hall of Fame as well as training camps, or the Corning Glass Museum next to the Steuben factory which millions have visited. The PDP-1 playing spacewar -- elevates it to a famous status as the first computer game. Lawyers come there and prove that all the war game ideas existed in 1961-2: this keeps many games in the public domain. Many have commented on seeing the first mini, the PDP-8, in The Science Museum, London, along with Jacquard's Loom, Babbage's Difference Engine, Watt's Steam engine, etc. At The Computer Museum: the Apollo computer that went to the moon, the Altair (the first home computer with a company now hardly in existence), Whirlwind, other machines and the display of the Noyce patent and Fairchild planar process that really made the industry we know, all pay homage to seminal efforts. <u>The Computer Museum provides stature to our industry, can't we afford it?</u>

To make the Museum more contemporary, a major exhibition on the computer and the image is being planned and curated by Oliver Strimpel, a young Phd astrophysicist who's the computer section curator at The Science Museum. It will let the public and specialized or non-technical computer professionals into some of the "secrets" of computer graphics. Lewis Schure is giving the exhibit a working paint machine; HP is giving it a high-speed plotter controlled by a new touch sensitive screen personal computer; SIGGRAPH is providing all their tapes; **how would you feel about providing some display of a Lexidata product?**

It's not an either/or choice between the past and future. Tradeoffs between supporting, understanding, and preservation at the Museum versus many other lines on a corporate P&L such as engineering, marketing, PR, sales, library, personnel, corporate relations or the line that buys all the memorabilia to make everyone feel good for an instant. (It may be fitting that all of the four battery operated clocks given to me while at DEC have now stopped.) Or on a personal level between investments, tax shelters, luxury consumer items, or other giving. <u>Charitable giving to a cause in which you believe -- or the Museum that immortalizes and improves your industry -- is the ultimate in tax shelters.</u>

At last May's Board of Director's meeting, the notion was expressed that the Museum should develop some income-generating activities. As a result, the store (with no capitalization -- only bootstrapping) has grown from a thousand dollars a month in June 1982; to triple by January 1983; and we expect about $8-10K a month, mainly from mail order. With some capitalization and high level advice, the museum's retail and service activities could provide significant income and educational service. **We sure could use your marketing expertise here -- what about a couple of hours of your time to review the plan?**

The Museum is reaching more than 100 million people this year via the media. Each article, tv spot, and radio interview educates more people about computers. The first issue of Perspective the magazine you started at DEC, used the museum for the source of its cover and an article on the first personal computer, the Whirlwind. Data General, Fairchild and other companies have also used materials. In addition, the more popular magazines -- Ms., American Airlines Magazine, TWA Magazine as well as Channels 2 and 7 have major items based on the museum in October and November. In addition, the Museum sells the services of the use of its space a artifacts for litigation information, commercial television (such as 60 Minutes), historic exhibits in corporate headquarters (such as ADP), and helps with materials for centennial productions (Burroughs and NCR). <u>The Museum is about the most comprehensive source for materials on any historic aspect of computing.</u>

<u>In a fiercely competitive world, The Museum is something we can do together and point to with pride.</u> Everyday visitors enjoy and learn from the exhibits and more companies are supporting it with artifacts and money. Thus, it's the best hobby I've had. Given the infinity of displays, archives and research it needs, there's plenty of room for everyone to have it as a hobby too. Les Hogan got all the material for a major display on the chip. **Hope you too find something in this letter that you feel like becoming active in doing.**

The Computer Museum is a pleasant club; old friends meet there -- including machines and people -- and enjoy companionship while learning. Just recently, Bill Gates, founder and technical leader of Microsoft and Alexander Schure, President of NYIT and a computer graphics pioneer, support it, along with about 1000 others from Amdahl to Zuse. You may have different tastes but its a club to me and a number of others where we meet sociably and unlike other clubs, the "dues" are totally tax deductable. The Museum can do right in the long run, doesn't really have to make its deadlines. But right now, I hope that you will agree with me, that it would be a good idea to get out of DEC and moved into Museum Wharf. To do this, it will take money. I don't have a salary; but I'm going to give the maximum that I can this year -- and still take a tax deduction, (I'm giving one-third of my income). Now I don't expect this of anyone else. **But as a member of the Board of Directors, I hope that you would be one of the people commemorated on the "brass plaque -- or equivalent".**

I would really like to spend some time with you and your associates at Lexidata and Fred Adler if you want to discuss any aspects of the Museum in more detail and why I feel it is a significant investment in the future, not the past. The current museum is an excellent setting for this and the new location, assuming you help us, will be even more accessible to all.

Basically, we need your help. I'd like to proceed in a way to obtain it. **What you say?**

Sincerely,

Gordon Bell

GB13.3

I wrote this letter in response to the following probe:

"If we invested money in the future rather than the past, then what?"

Each time I invest "in the past" -- it has future payoff.

When I left DEC and went to Carnegie in 1966, Allen Newell and I collected materials and objects from the past machines to build theories. This resulted in a book entitled, Computer Structures, that influenced at least two generations of computer architects. I can remember inventing the concepts of the DEC Unibus and general registers by building an encompassing theory of past structures. The overall goals of the VAX grew out of a knowledge of the past. When I returned to Digital in 1972, I knew the truth of the statement: "Those who forget history are doomed to repeat it." I now see the semicomputer companies repeating history as they build microcomputers. We pay dearly for their education.

One of my main goals at Digital was to build an engineering group who stayed at the cutting edge. This required understanding other views, including history. I started close associations with Universities (who fundamentally teach history), then put together the book, Computer Engineering, a ready-reference to Digital's computer evolution, and finally helped establish the computer museum right in the middle of an engineering/marketing area of DEC. Although The Computer Museum itself is leaving, I hope that DEC keeps their own collection of historic machines on display.

I am not alone in this approach. After Fred Brooks led the software team on the IBM 360, he generalized his experience in The Mythical Man Month, a required book for many engineering students. It is a classic on the nature of organizations and work, especially with regard to large software developments. Neither Fred Brooks or I market books as history, but rather as fundamental understanding.

THe Computer Museum is constructed to help understand the evolution of computing. Computer Generations, marking technological time, are the main organizing principle. Each generation's new technologies, startup companies, and new products are listed and displayed. At the beginning of the third generation, over 100 minicomputer startups are recorded--with at most, 7 winners. Now the fourth shows a similar pattern for micro-based companies. Analyzing winners, losers, and also-rans provides some insight on what is happening today. I've written an analysis of this phenomena which I'd happily make available to anyone.

Everytime I visit the museum, I get insight relevant to a current problem. A month ago while looking at the Honeywell 116, a very early IC machine, ideas jelled about board size, pins and function. Just last week I observed that nearly all of the micros repeated, for the third time, the time worn memory management evolution path that began in 1960 with Atlas, which we followed with the DECSYSTEM 10 in the 60's, and then again with minis in the early 70's.

I'm not the only one that learns, a dozen high school students came to an esoteric lecture on coding in the nineteen thirties given by Donald Davies of England's National Physical Laboratory. Asked if they got anything from it; they replied that they were going to use some of the ideas on setting secure codes for the school's computer. I continue to get statements from my friends in the U. K. when we tour the galleries together about how the Science Museum turned them on to science and technology. And now I see it at The Computer Museum: Just last week four very bright kids from a New Hampshire prep school spent three hours trying to find out everything they could about computers.

Andy Van Dam, Professor of Computer Science at Brown illustrated the importance of learning from the past in a wonderful two hour lecture composed of about 20 films on computer graphics. Twice he noted how viewing these historic films had moved him and others to action. I'll even conjecture that if these films of a mouse controlled computer from the early sixties had been shown more widely, then this kind of human interface would have evolved more rapidly. One of DEC's CAD managers sat by me and remarked that the modern work is better, but NOT that much better considering 20 years has gone by. But no place has existed where the objects, films and programs of the past were available. <u>The Computer Museum</u> provides this <u>for the present and future generation of engineers, programmers, artists, and hackers who will make history.</u>

In the fall of 1970, when The Computer Museum took its first non-DEC donation, we decided it was necessary to be industry-wide and international. IBM invests a great deal in preserving its own history, but their excellent multi-million dollar presentation at 590 Madison Avenue exhibit claims they built the first stored program computer (the SSEC -- and they omit Eckert and Mauchly or Wilkes to whom the international community give the credit). <u>The Computer Museum provides the story of all the companies and all nationalities, not just the big ones, but the wide range of people, ideas and companies that made the world's most exciting industrial adventure.</u>

GB13.9

Museum's are the ultimate in the future: they provide immortality of all kinds. Look at baseball club owners supporting the Hall of Fame as well as training camps, or the Corning Glass Museum next to the Steuben factory which millions have visited. The PDP-1 playing spacewar in Museum elevates it to its appropriate fame as the first computer game. Lawyers come there and prove that all the war game ideas existed in 1961-2: this keeps many games in the public domain--and you with more companies to venture in. At The Computer Museum: the Apollo computer that went to the moon, the Altair (the first home computer with a company now hardly in existence), MIT's Whirlwind, and the display of the Noyce patent for the integrated circuit, all pay homage to seminal efforts. The Computer Museum provides stature to a 100 billion dollar industry, surely we can afford it?

To make the Museum more contemporary as we move to Boston and address a wider audience, a major exhibition on the computer and the image is being planned by a young Phd astrophysicist who's the computer section curator at The Science Museum. It will let the public and specialized or non-technical computer professionals into some of the "secrets" of computer graphics in the big machines behind animation, landsat analysis and real time simulation. The Museum will bring to the public a view inside the industry to help de-mystify it and improve what is called computer literacy.

It's not an either/or choice between supporting the past and future. Tradeoffs between supporting, understanding, and preservation at the Museum versus many other lines on a corporate P&L such as engineering, marketing, PR, sales, library, personnel, corporate relations or the line that buys all the memorabilia to make everyone feel good for an instant. (It may be fitting that the four battery operated clocks given to me while at DEC have now stopped.) Or on a personal level between investments, tax shelters, luxury consumer items, or other giving.

The Computer Museum is the most comprehensive source for materials on any historic aspect of computing. Primary source materials are provided for television, magazine articles, books and scholarly research. The staff work hard to provide the correct information and new insights about evolution of the industry seem to be added daily.

In a fiercely competitive world, The Museum is something we can do together and point to with pride. Everyday visitors enjoy and learn from the exhibits and more companies are supporting it with artifacts and money. Thus, it's the best hobby I've had. Given the infinity of displays, archives and research it needs, there's plenty of room for everyone to have it as a hobby too. Les Hogan, Fairchild's former president got all the material for a major display on the chip.

With proper support, the Computer Museum will be added to the list of great science and technology museums that every scientist and engineer must visit... along with the non-technical public. It will also greatly enhance Boston as a technology center.

The Computer Museum is a pleasant club; friends meet there -- including machines and people -- and enjoy companionship while learning. Bill Gates, the 28-year old founder and technical leader of Microsoft supports it along with about 1000 others from Gene Amdahl to Konrad Zuse. You may have different tastes but its a club to me and a number of others where we meet sociably and unlike other clubs, the "dues" are totally tax deductable. The Museum can do right in the long run, doesn't really have to make its deadlines. But right now, I hope that you will agree with me, that it would be a good idea to get it moved into Museum Wharf.

I hope I have your support to make this world class museum even better.

Gordon Bell
11/26/83

7 April 1983

Dianna Humphrey
Research Scientist
Control Data Corporation
5500 Interstate North Parkway
Suite 520
Atlanta, Georgia 30328

Dear Dianna Humphrey:

The place we visited was at North Bay, I don't recall the name of the installation. The purpose of the visit was to see one of the last AN/FSQ7's in operation prior to decommissioning. A more important purpose was to select artifacts which will be given to the museum. This display should constitute a major display.

You're right, a curator should never make the mistake I made in the article. As a result of your pointing this out, I've decided to give up my title as curator. I will continue to worry about critical artifacts, the collection, taxonomy and collection policy for the museum, but without title.

The Annals of the History of Computing is published quarterly by AFIPS Press, 1815 North Lynn Street, Arlington Va 22209, and can be subscribed to like any journal. If you're a member of an AFIPS constituent society the price is $18, and if not $25. Individual copies are available through them too.

Enclosed is some information, including one of its quarterly reports, on the Computer Museum. A listing of the artifacts will be published in a future issue of the Report. I hope you'll consider joining.

Sorry for the error.

Sincerely,

Gordon Bell
Vice President, Engineering

GB5.6

THE COMPUTER MUSEUM MEMBER'S FIRST FIELD TRIP TO NORTH BAY AN/FSQ7 SAGE SITE AND TO THE CANADIAN NATIONAL MUSEUM OF SCIENCE AND TECHNOLGY

Gordon Bell

Curator, The Computer Museum

10 October 1982

The first Computer Museum members' Field Trip just returned from a spectacular trip to North Bay Canada visiting the SAGE AN/FSQ7 computer prior to its decommissioning this winter, having been operational since 1962. The "Q7", once known as Whirlwind II, grew out of the Whirlwind project, initially started as an aircraft simulator. Becoming a prototype for air defense, this technology in turn formed the basis of modern air traffic control! (Lesson: what you get may not be what you start for when project aims are high.)

Seventeen museum members made the trip via chartered DECair, including Bob Crago from IBM, one of the key designers; Kent Redmond and Tom Smith, historians stet. writing the SAGE story; Henry Tropp, who is writing an article for the Annals of the History of Computing; and Richard Soloman who photographed and videotaped as part of an MIT Project on the History of Computing. The flying and trip arrangements were flawless. We left Friday noon, 8 October, from Bedford, Mass. for North Bay, arrived and visited the "hole" where we were completely briefed by members of the staff and original installation team, had dinner with the Canadian Air Force leaders, including the Commanding NORAD General (U.S.), flew on to Ottawa where we spent the night prior to visiting the National Museum of Science and Technology and returned Saturday afternoon.

THE Q7

Bob Everett's paper on the Sage computer was published in '57, and the machine was operational in Canada in '62. The machine created many patents as by-products, including perhaps the first associative store (using a drum). The machine is duplexed with a warm standby (I mean warm since the duplexed machine uses about 1 Megawatt of power to heat 55,000 tubes, 175,000 diodes and 13,000 transistors in 7,000 plugins!). The 6 microsecond, 32-bit word machine has 4 X 64K x 32-bit core memories and about the same memory in 12- 10.7" diameter, 2900 rpm drums, 6 of which are for secondary memory. There is no use of interrupts and i/o is done in an elegant fashion by loading/unloading parallel tracks of the drums with the external world completely in parallel with computing. That is, the i/o state becomes part of the computer's memory state. A single i/o channel is then used to move a drum track to and from the primary core memory.

The main i/o is a scan and height radar that tracks targets and finds their altitude. The operator's radar consoles plot the terrain and targets according to operator switch requests. The computer sends information to be plotted on 20" round Hughes Charactron (vector and alpha gun) tubes or displayed on small alphanumeric storage tubes for supplementary information. Communication lines connect neighboring air defense sectors and the overall command. The operating system of 1 Mword is stored on 728 tape drives and the drums.

The computer logic is stored in many open bays 15' to 30' long, each of which have a bay of voltage marginal check switches on the left side, followed by up to a maximum of 15 panels. The vertical panels are about 7' high by 2' wide and hold about 20 plug-in logic units. The separate right and left half of the arithmetic units are about 30' each or about 2' per bit. Two sets of the AMD 2901 Four-bit Microprocessor Slice would be an overkill for this 32 bit function today. The machine does vector (of length 2) arithmetic to handle the co-ordinate operations. The room with one cpu, drum, memory is about 50' x 150', and the two cpu consoles, tapes, card i/o. printer room is about 25' x 50'. The several dozen radar consoles are in a very large room.

UNDERGROUND SITE

The enormity of the machine was dwarfed by the underground building which encloses it. The building hollowed out of stone by hardrock miners is 600' beneath the surface, and connected by a 6000' tunnel which can be sealed off in seconds if there are very large, atmospheric disturbances. The building is about 150,000 square feet and has 10 standby 100 Kw generators and an air conditioner that can operate closed loop into an underground pond.

COST AND RELIABILITY

The machine and software cost about $25M in 62 and the site about $25M. The facility costs several million to operate per year, including about $1M to IBM including 10 people. Three people are needed to maintain the software. Initially, one hundred people were used to install the machine and set up its maintainence. When you count the radar, planes, etc. and operational costs, the computer cost is almost an incidental.

The reliability is fantastic! With ONE COMPUTER, AVAILABILITY IS 99.83% and with DUPLEX OPERATION, AVAILABILITY IS 99.97%. Having wondered why such an obsolete computer (somewhere between an 11/44 and 11/70) would be still used, it was clear: the reliability and the overwhelming fixed costs for radar, airplanes, etc. There's a parity bit. Marginal checking and incredibly conservative design were the key. Each week they regularly replace 300 tubes and an additional 5 tubes that are showing signs of deterioration.

Even though the program is about 1Mword, written in assembly language and Jovial, the key here is the aging and the fact that the program is NOT interrupt driven. The program simply cycles through the job queue every few seconds in a round robin fashion. This is an excellent example of superb software engineering with an incredibly simple overall structure since it is non-parallel, all the bugs that an interrupt driven system would have had are avoided. Users identify overload by the lengthened cycle time. The high reliability demonstrates learning curves as applied to reliability. This obvious notion just occurred to me: since all the software I see is always changing, it doesn't reach ultra-high reliability.

REPLACEMENT

Hughes has installed a new computer that occupies less space than the computer console.

BOTTOM LINE

I doubt if any of the existing personal computers that operate today will either operate or can be found in 20 years, simply because technology will have changed so much in performance and reliability as to make them uneconomical at the personal level. How many of us still repair and use our 10 year old HP35's? Furthermore, all the floppies will have worn out and we'll be glad to be rid of them.

VISIT TO THE NATIONAL MUSEUM OF SCIENCE AND TECHNOLOGY

Although relatively short on space for computing, the 5,000 square feet is still larger than what the Smithsonian allocates. Ted Paull, the section curator has put together an excellent exhibit on computation. They are archiving relevant Canadian artifacts including the FP6000, a circa '60 machine which could timeshare, and was until recently the basis for the ICL products. In addition videotapes, lots of terminals,and animated displays are used to teach about computing principles and history. A very elaborated, animated soup making machine is used to show analogies to computers (recipe/program, ingredients/data, store/memory, chopping,etc/processing, etc.).

The use of computers within the museum was well ahead of any museum I've seen, probably because the staff is small and willing to take risks. Also, the museum is new and not entrenched with traditional museum personnel who themselves may be museum pieces. The museum is run by a VAX-11/750 which sits in an open computation center within the museum, showing what a computer center is like. About 50 terminals are distributed through the Museum. The user applications include: the usual games, Eliza, questions answering, map generation to find your way through the museum, and descriptions of artifacts and technology A visitor can fill out a form on line to comment on the museum... something all museums should have. The administrative applications run by staff include: word processing, administrative reports, scheduling tours, and a large archive accessed by the Database program, Datatrieve. Their goal was originally to not have papers, typewriters or card files except in the exhibits.

As an extra treat, the original director, Dr. David Baird was there visiting and gave us a talk on how he got it together in a short time. He was a professor before being their first museum director, which explains why the museum is so good. He's now building a new museum of Palentology and says he will aim even higher to automate and self learn via computers.

ARCHIVING THE Q7 AND ITS RELATIONSHIP TO THE MUSEUM

I don't think we can do justice to the SAGE story and am delighted that Bob Everett is doing the videotape with various people including the historians, Redmond and Smith who're writing the history, as a follow-on to the Whirlwind story. I would like to encourage MITRE and IBM to decide who's going to be responsible for archiving the history of the project in toto, including saving many relevant artifacts. I will assume we will not take on this very large burden. However, I'd like to get some kind of commitment from Bob and IBM before we finally decide what to do precisely!

Basically, I think it's a worthwhile machine to go after for the Computer Museum because of its completeness into an integrated application. This is a classic, and it has so many historical firsts vis a vis real time, etc. Also there's the obvious relation to Whirlwind.

Here's what I think The Computer Museum should archive:

1. A set of logic schematics.
2. Theory of Programming (the reference manual which has instruction times, their operation, i/o, etc.)

2a. Any other overview documents that help define the system, especially the consoles and radar programming.

2b. I'd like to look at how big the whole set of Theory of... manuals would be. These would be enormously useful to future scholars in understanding precisely where things fit in such a large scale system. Afterall, this about the largest system ever built by that time.

3. Representative logic bays which have the large array of marginal check switches on the left (facing the bay). Here, I'd like the mag tape control (about 6 + 1 bays) or 12 feet. Alternatively, I'd like two, sawed off sets of bays: switches+logic and 2 logic together... about 4'.
4. 1-713 card reader, 1-723 card punch, 1-718 printer, 1-728 mag tape unit. Here, the idea is that we are moving lots and we might as well take the opportunity to move all this at once rather than later.
5. A 64K core stack in its cabinet (about3 x3 x 8). Not the electronics. This was about the largest stack built and came directly from the large memory work of the tx0 design (used to test it).
6. Spare plugboards (get all they have up to 50 with any wires they have). These are to sell them in the store.
7. 100 Spare plugin units to sell in the store.
8. 2 drums without cabinet. We'll have to sit it somewhere. This is a spare to eventually trade.
9. 2 sets of Sage Radar consoles (I think there are 3 types). One set is for trading.
10. Main CPU console. I talked to Ted Paul about this. This is the left part of the console that has lights and switches to access the registers of the machine. It has a phone in it, and its the half that you stand up to and there's a little lip forming a table.
11. Photographs of the machine as you look down the aisles, in

the console room and in the radar console room (batteries of radar consoles with people at them).

12. Block diagram of the system with the various parameters on it, showing the duplexed machines.
13. A scale model of the machine. I'd give anything for theirs which would come out of the plexi underground model. Let's try to get this now from them or Mitre. Maybe Mitre can do this with IBM.
14. Site diagram showing the tunnels, hole and building. Photographs of the site door, tunnel, above ground.
15. Patents coming out of SAGE. This is something we'll have to ask MITRE for.
16. An overview of the use of the whole system including the operating system. This is an excellent vehicle to understand real time computing of the earliest kind. It also argues for simple program structures.

The museum would display the console for now and probably the core together near the Whirlwind core. The documents and diagrams are essential for understanding and making the display and for eventual understanding in many years.

THE OTTAWA MUSEUM AND US

COMPUTER USE

This was truly impressive. Ted and his staff have done a great job and have shown us that computers can be used to really run a museum. I haven't seen any museum this far along. This is the right way to do the job. I think a museum should have NO typewriters or file cabinets outside unless they're part of the historical displays. Ultimately, videodisks have to be available to illustrate the whole world if one wants to probe deeper into a subject (eg. a computer). I'd like to provide an exchange service for video tapes and disks dealing with computing. Also, I liked many of his photographs and displays. I'd also like to see us think about building these so as to get history without errors and to show the agreed upon significant events. Getting the errors out of exhibits and showing the relevant events is a terribly hard and tedious project... and it's impossible to do it in very many places. History should not be too geographically dependent.

EXHIBITS

In addition, the 5000 feet of the exhibit is really put together well. I liked the long blurbs and photographs that went with the history. There were logic lab booths that demonstrated adders, ands, etc. I didn't care for the videotape or the talking dummies of pythagoras and ?.

LOGIC TRAINERS AND US

I think we ought to get some logic trainers (either the big faced modules that DEC made for the army, or the logic labs, or possibly even the original set of lab modules) to show how the logic functions are performed. I can argue that logic training was important and we would simply show various forms. We would put a trainer on the wall together with some circuits that could be tested there by anyone who wanted to do it. My tendency would be to put the trainer under glass with some wires leading outside to non-destructable switches. Here, show: AND, NAND, NOT, NOR, OR, an ADDER of 1 or 2 stages, a counter of several bits that advances one anytime anyone does an experiment. This could all be wired up in a single logic lab! If we got some trainers by others, including ones that Ed Fredkin's brother's company made, we could show some impressive stuff, with very little work. The Fredkin/Minsky Muse was initially done this way. Of course, we would put them behind glass and simply allow push buttons in the same way that people operate calculators. This is for next summer and for the students, so we ought to start collecting.

PEOPLE TO GIVE LECTURES AT THE COMPUTER MUSEUM
CGB (GKB 841118; with CGB strike through *updates 020821*)

COMPUTER SYSTEMS

Historical

R M Block
Bauuw
Manchester Machines: Tom Kilburn, Lavington
Nixdorf and German Computers
Early Computers: Brian Randell
An Wang
Early BTL: Gene Felker
Early IBM: Haddad?

Calculators

Early calculators and slide rules: Delhar or Wheatland
Bomar
HP
Sharpe
TI

PCs

Apple: Jobs, Markula, Wozniak, Rosing,
Atari: Forest Mims
BBC Computer:
Commodore: Jack Trammiel, or Chuck Peddle
IBM PC: ~~Don Estridge~~, Bocca Raton
IMSAI
MITS Altair: Bill Roberts
Osborne
Sinclair (Sir Clive)

Palms

Palm, Handspring, Jerry Kaplan
Philadelphia company…

Workstations

Apollo *Poduska*
SUN (*Joy, Bechtolsheim, and McNealy)*
Viatron- Bennett
Xerox: Lampson, Taylor, Thacker
Lisp Machines: Noftsker, Greenblatt,
The Wang WPS
The first IBM MT/ST

Minis (*Note my list of 100 minis…)*

Digital: Olsen, Strecker
DG: ~~Burkhardt~~, DeCastro
IBM
HP
Prime
SAAB or Datasaab
SDS/XDS Palevsky

Tandem

<u>Mainframes</u>
IBM
Amdahl
Honeywell/GE/Multics/
Univac/Eckert
Burroughs/Barton
NCR/???

<u>Supers</u>
Cray
Thornton
Norris
Thorndike/ETA/Lincoln

NEC: Kobayashi
Hitachi
Fujitsu
Illiac IV: Slotnick, Kuck
TI ASC: Cragon
Burton Smith

<u>Other Computing</u>
Cellular Automata: Fredkin
Cellular Automata: Steve Wolfram
Macro Modules: Clark and Molnar (we want to get a collection)

FPS: Norm Winginstaad

<u>Robotics</u>
SRI Charlie Rosen; *Rosensheim, etc.*

SEMICONDUCTORS/LOGIC
The transisor: schockley, bardeen, brattain
The ic: Noyce, hoerni, Jack Kilby
Mead and Conway
Silicon Compilers: Doerr, Mead, Dave Johannsen
New ECAD including Prabhu Goel et al for Verilog

Fairchild: Les Hogan, Gene Kleiner
IBM Erich Bloch
Intel/Hoff and ? of Japan
Motorola/68K
Mostek/rams
MOS Technology: 6502 and Chuck Peddle
Parametron: Goto (also Lisp machine)

OTHER COMPONENTS (EG. DISKS, CRT'S)
<u>A/D</u>
Analogic: Bernard Gordon
Analog Devices: Ray Stata

Disks
Al Hoagland
Floppies, Winis Al Shughart

Memories
RCA: Rajman
Early designs: Wang, Forrester, IBM book author Pughe, IBM core inventor

Printing
Irwin Tomash

Other Peripherals
L C Hobbs

Communications
Modems- the Carterfone case
Packet Switching / DARPA Net: Kahn, Roberts, Kleinrock, Frank Heart
Packet Switching British PO: Donald Davies
LANs: Bob Metcalfe

LANGUAGES, DATABASES, EDITIORS, OPERATING SYSTEM

Algol

Dijkstra

Perlis

ADA: Icbidah

APL: Iverson

Basic: Kemmeny and Kurtz, Bill Gates, Microsoft First Micros Basic

C: Ritchie

C++:Grady Booch

C#

Java

Scripting languages:

Cobol: Hopper, Sammet

Fortran: John Backus

LISP: McCarthy

LOGO: Papert

Smalltalk, *Parcplace, Squeak*: Adele Goldberg, *Kay*

Wirth: PL/360, Algol W, Pascal, Modula

Visicalc: Dan Bricklin, Software Arts

    Excel:

    Word etc.

Lotus 1-2-3: Mitch Kapor

EMACS: Stahlman

Gnu tools: Stahlman

Operating Systems

Timesharing: Corbato, McCarthy, Fredkin, Beranek, Boillen (CTSS, Multics)

UNIX: Richie, Thompson

    GNU/LINUX: Stahlman and Linus Torvald

OS 360: Brooks

Tops 10/20, TENEX: Pete Hurley

    OS/8 & RT11 as predecessors to CP/M and MDOS

Gary Kildall, CP/M and PL/M

    MAC OS's

    Xerox stuff, inc

Real Time Operating Systems: VMS, RSX, Dave Cutler

    Windows

    NT: Cutler

Dynabook: Alan Kay

Network (CODASYL) Database: Bachman

Relational Databases: Ted Codd; *Gray*

    Informix

    DB2

    Tandem

    Oracle

DRAFT FROM 7/81

THE DIGITAL COMPUTER MUSEUM

date: 1990

from: The Director's Office

After more than a decade of operation, the Digital Computer Museum encompasses the entire information processing family tree with a complementary program, document, photograph and film library. (see fig. l) Housed in a 120,000 square foot building, historic artifacts of computing, video- and audio-presentations by the engineers and programmers working on historic machines, examples of benchmark computer applications, and a library of relevant books, manuals, photographs, and programs are on display and available for reseach purposes. Classrooms, viewing rooms, and a computer data-base system provides resources for resident scholars, short-term seminars, and lecture series.

The collections have been built up from gifts from industry, universities, government agencies, and individuals. All materials more than 15 years old are considered for the collection. This formula is also The Annals of Computing History to verify collectable materials. The artifact collection started in 1973, grew to more than 500 pieces in 1981, is currently at 5,000 and continues to grow. The film and photo library was inaugerated in 1981 and is now the pre-eminent historic resource collection. The book and program library were opened in full scale on moving to the present site in 1987, although collections began in 1981. The site has sufficient space to expand to double or triple its 120,000 square foot facility.

The Digital Computer Museum is unique. It cannot be likened to Science Museums that emphasize visitor numbers by attraction exhibits, for example the live Muppet show was the outstanding draw of the last decade at Science Museums that then hope the public will also look at serious exhibits. Nor can it be likened to industry-related museums that allow specific companies to outfit exhibits that fundamentally become self-advertisements. Nor can it be likened to experiential museums that attract children and parents to find out and experiment for themselves. The Digital Computer Museum is most like a well-developed natural history museum, where collections are classified to show entire branches of the plant and animal kingdom and whole societies. The collection of the Digital Computer Museum tells the story of the "natural" history of information processing, pieces are added to the story not for their intrinsic value but because they have a place in that history. Because this is such a large field, the

Museum like the great Museums of the late-nineteenth century virtually requires an ark to hold its population.

AUDIENCE: The audience is drawn from three levels.

The primary audience is the serious connoiseur of computing history. Exhibits, library facilities, serminars, lectures, and a visiting scholar program are geared to their needs. While their numbers are not large, their participation is absolutely essential to maintaining predominance in the field. A visiting scholar program provides one way for some of the pioneers of computing, computer historians, and computer artists and musicians to be in residence and add to the richness of the environment.

The secondary audience includes all people who want or need some understanding of the evolution of computing. This includes most computer scientists, programmers, and engineers as well as other professionals employed in, or being trained for the computer industry. Special seminaras, lectures, half-day and one-day programs provide over-views of the historic evolution of computing. Members of the IEEE, AFIPS, and other professional organizations, customers of Digital and other computer companies, and retirees from the computer field are attracted to exhibits, the library, and the Museum's special programs and facilities.

The tertiary audience is made up of families of the first two groups, museum goers, and others who want to find out what the museum is all about. No attempt is made to amuse or attract this audience via low-level fun and games. But, experience shows that these people come and learn from quality exhibits.

SELECTION OF A PERMANENT SITE

Because Digital Equipment Corporation had the foresight to fund the establishment of the Museum, in 1981 they had the unique opportunity to benefit from planning a site for its long-term home.

A Museum building, itself, has very special needs: large exhibit halls with controlled lighting, theater type areas, and facilities for the public are important considerations.

Considering audience factors, four different sites were evaluated: Marlboro, Maynard, the Bedford/128 area, and central Boston/Cambridge.
From the point of view of what was known in 1981, the best sites seemed to be Maynard or near the Bedford 128 location. The wild

card affecting these sites is clearly the availability of a building.

Figure 2 shows the weighting of the site selection criteria, and some scenarios affecting location.

FIG. 2 SITE SELECTION CRITERIA

	Relative Weight		Marlboro	Maynard	Bedford	Boston	Other
AUDIENCE							
DIGITAL							
Primary	5	15	20	10	5	__	
Secondary	4	12	12	16	4	__	
Tertiary	2	4	8	6	2	__	
NON-DIGITAL							
Primary	5	5	10	15	20	__	
Secondary	2	2	4	6	8	__	
Tertiary	1	1	2	3	4	__	
SUMS			37	56	56	43	

FOUR SCENARIOS

Marlboro: Although it was known that the audience would have to be attracted to the site, the Marlboro campus facility of Digital was selected. A special museum building was erected on the site, tied into corporate displays in MR-2 and the use of public spaces in MR-1 and 3, especially after hours. With guest facilities for resident scholars and with on-site classes given by WPI and Northeastern, Marlboro became a center for computer history.

Maynard: , the Marlboro campus facility of Digital was selected. A special museum building was erected on the site, tied into corporate displays in MR-2 and the use of public spaces in MR-1 and 3, especially after hours. With guest facilities for resident scholars and with on-site classes given by WPI and Northeastern, Marlboro became a center for computer history.

Maynard: Two scenarios seemed appropriated: (1) The "Mill" centralized Digital's continued interest/support of the independent Museum, housing it adajcent to Corporate

Headquarters, and Engineering. (2) A proper Museum was built in down-town Maynard providing life to the town and its redeveloped center and mall.

Bedford: Site and facility are independent. A site was developed (1) adjacent to Digital's Educational Services facility, (2) near the National Historic Park, (3) on Route 128, based on the following kind of facility, (1) an old shopping center, (2) new building, (3) reclaiming Lincoln Labs, or (4) something else. It became a center of activities for the large number of computer people within a half-hour of the Museum.

Boston: Much to everyone's surprise, the Digital Computer Museum was given a building in Boston. The following two choices seem to represent the polar possibilities: (1) The site is a well-kept secret, about like the glass flowers, and it is a peaceful oasis for computer buffs. (2) Along with the Aquarium the Museum has become one of the chief attractions in the downtown area although we have not comprimised any historic standards.

Fig. 1: The Collections

```
           Period that the exhibit covers:
        Craft    Mechanical  Electro-mec   Electronic  Transistor
IC
            1600     1810        1900          1950        1960
1970

AUTOMATA----------------------------------------------------------
--------- including robotics

CONTROLS---------------------------------------------------------- - -
-
including water clocks and governors

MEMORIES----------------------------------------------------------
---------
including books and magnetics

LINKS & SWITCHES
------------------------------------------------
including telephony anraphy

TRANSDUCERS
---------------------------------------------------------
including typewriters and printers

CALCULA      --------------------------------------------------- -
- - -
Including analog and digital calculators

DIGITAL COMPUTERS
-------------------------------
including processors
```


```
AUTOMATA----------------------------------------------------------
--------- including robotics
```

11/30/81 Mon 13:58:55

THE DIGITAL COMPUTER MUSEUM

from The Director's Office

Dateline 1990

After more than a decade of operation, the Digital Computer Museum's collections encompass the entire information processing family. It has evolved to be similar to a well-developed natural history museum, where collections are classified to show entire branches of the plant and animal kingdom and whole societies. The collection of the Digital Computer Museum tells the story of the "natural" history of information processing with exhibits. Because information processing is such a large field, the Museum, like the great Museums of the late-nineteenth century, virtually requires an ark to house all its specimens. In cooperation with the archival projects of the Charles Babbage Institute, the Museum serves the scholar in researching topics in the history of computing.

This monumental achievement can be credited to a well thought out plan and policy articulated in early 1982. The clear identification of the audience, selection of a permanent location and building site, and conceptualization of an interpretive program for the collections provided the necessary direction for communicating the goals and ideas for the future.

Dateline 11/30/81

PROJECTED AUDIENCE

The audience is comprised of three parts. One group is the serious connoisseur of computing history. Exhibits, library facilities, seminars, lectures, and a visiting scholar program are geared to their needs. While their numbers are not large, their participation is absolutely essential to maintaining preeminence in the field. A visiting scholar program provides one way for some of the pioneers of computing, computer historians, and computer artists and musicians to be in residence and add to the richness of the environment.

Another group includes all people who want some understanding of the evolution of computing. Most computer scientists, programmers, engineers and professionals employed in, or being trained for the computer industry belong to this group. Special seminars, lectures, half-day and one-day programs provide overviews of the historic evolution of computing. Members of the IEEE, AFIPS, and other professional organizations, and retirees from the computer field are attracted to exhibits, the library, and the Museum's special programs and facilities.

The third group consists of families of the first two groups, museum goers, and others who are curious about the museum. Experience has shown that these people come and learn from quality exhibits. The Museum's exhibits are designed to communicate the history of computing and not to engage visitors in amusements.

LOCATION

Comparison of four different locations within Greater Boston suggest varying opportunities for the Museum.

Marlboro, in the building in which the Museum started: A pattern of visitors that evolved was never disrupted by moving the Museums location. The location on Route 495, close to the Massachusetts Turnpike, and within an hour of Boston, is isolated from other cultural or educational facilities. The site itself is outside of town and accessible only by automobile. Thus, the facilities must be developed to attract the visitor who will make a special trip and invest a half day in the trip.

Maynard, the home base of Digital Equipment Corporation and the "mini computer" capital of the world: The town is not on any main route, but within 45 minutes of most of the "computer engineering" community of Boston. All sites would be in a "downtown" with some bus transportation.

Route 128, the "high tech" nucleus of the sixties: 128 is the center of the computer community within Boston, and accessible to the interstate highway system. A number of building sites would be possible in the vicinity.

Boston or Cambridge, the center for the cultural institutions. While most students and tourists are confined to these settings with a large number of competing cultural institutions.

Each location has its inherent attractions and difficulties. The critical decision point is the availability of a building with appropriate financing to make the Museum happen.

MUSEUM BUILDING

A Museum building has very special needs:

At least 120,000 square feet

60,000 square feet of exhibit halls with controlled lighting, temperature and humidity control, divided into at least ten different units ranging in size from 3,000 to 10,000 square feet, and including a theater for about 300 people, small meeting rooms and theaters for 12-100; space for a library,

store; restaurant; workshops for exhibit development; and facilities to allow for a flow of the public.

Parking for cars and buses.

Issues regarding MR-2 (using the present building)

Legal/financial. Two alternatives were considered. 1) Immediate acceptance of the entire building as a gift that would require raising a matching one-third from others for its renovation/endowment (as required by IRS regulations for public foundations). The Museum would lease back portions of the building to Digital or DECUS with their gradual withdrawal by 1989. 2) The separation of the building into three condominiums, each of two floors, to be given to the Museum in three stages: 1983; 1986 and 1989 at which time the Museum owned the entire building. At the time of the acquisition of each portion of the property one-third matching donations of $1.2, $1.5, and $2 million were attracted and divided equally between exhibit renovation and endowment.

Space. The configuration of the building and its associated property into a Museum poses the following issues:

Cost-effectiveness: if the expense to transform it into a Museum would be greater than building anew or looking for another site.

Appropriate timing of major spaces during the 10 year development period.

Establishment of free visitor flow throughout the space to encourage viewing many exhibitions, while maintaining use of part of the building for the other tenants.

Integration and use of computers and technology for interpretation and control of the Museum itself.

INTERPRETIVE PROGRAM

The draft catalog (attached) lists all the artifacts according to one taxonomy. Other classification concepts are useful in building exhibits. The two in conjunction are designed to provide a rich interpretive experience. For example, the first major exhibit, the Pioneer Computer Timeline, is actually based on one of the major chapters of the catalog and features two of the more significant artifacts of the collection: the Whirlwind and the Atanasoff-Berry Computer. The ideas for further exhibitions are listed below.

Interactive computing: The TX-0, PDP-1, PDP-11/45 and other machines capable of running and demonstrating interactive programs.

Super computers: Texas Instruments’s ASC, Control Data's 6600, IBM's Stretch, University of Illinois's ILLIAC IV, etc. -- standing as sculpture with associated films, photos and other interpretive materials.

Personal computing: From the LINC, LGP-30, to Altos, ATARIS, etc. with the potential for user interaction.

Evolution of card programmed processing from a working Jacquard loom to a l950's card room and inclusive of other examples.

Robotics from deVaucauson's automata through the evolution of industrial robots with demonstrations.

Memory devices, tracing the read-only and write-only memory devices through such use as player pianos to current read/write devices.

Computer ancestors in the craft generation, between 1600 and 1800, providing a feeling for the whole technological context of the era.

Computing in the transistor generation during the sixties.

Computer graphics, arts, and music exhibits with permanent listening galleries, halls for changing exhibitions and laboratory demonstrations.

Computing in space -- on-board computers and what they do.

Mechanical calculating -- from the Pascaline to Lehmer's number sieves, with opportunities to operate the calculators.

Games and gambling -- playing with numbers in simple early games, the totalisator machines of the 30s, classic chess programs and other games of skill and chance.

Developing appropriate levels of interpretation through signage and/or a/v materials, and communicating a direction and flow to the exhibit space without a personal tour guide is critical in the development of the exhibition program. The standardized text panels and catalog entries provide scholarly documentation that needs to be supplemented with interpretive story lines. Video equipment and comfortable seating is needed to allow the use of the films that are being developed.

December 20, 1980 - OPERATIONS COMMITTEE APPROVED THE CHARTER OF THE DIGITAL COMPUTER MUSEUM

Preserve artifacts relating to the history of computing;

Carry on a lecture and educational program;

Loan artifacts and consult on exhibits;

Prepare exhibitions and arrange tours;

Provide a resource on computer history;

Develop and sell museum-related products;

Make the Museum a center of interest and activity; and

Investigate non-profit status.

August 18, 1981 - OPERATIONS COMMITTEE MINUTES

The Operations committee approved the proposal to establish the museum as a public non-profit corporation. Our intent is to support the museum on a continuing, stable basis and to treat it the same way as other important programs of the Corporation.

****

Presented: "Why can the Digital Computer Museum be Number One?"

Today: We are number one in quantity and quality of computer exhibits.

DIGITAL COMPUTER MUSEUM STATUS 5/24/82

PIONEER COMPUTER EXHIBITS IN MUSUEMS AROUND THE WORLD

<u>Museum</u>	<u>Date</u> <u>&</u> <u>Machine</u>
Science Museum, London	1840s Babbage Analytical Engine
replica Smithsonian	(partial)
piece, Boston Museum of Science	
prototype adder + teletype, DCM	**1939 Bell Labs Relay Calculator**
replica, Deutsches Museum	1941 Zuse, Z3
drum + breadboard, DCM	**1940 Atanasoff-Berry Calculator**
pulley for bedstead, DCM	**1943 Colossus**
Harvard, IBM	1944 Harvard Mark I
Smithsonian, DCM	**1946 ENIAC**
DCM (loan from Science Museum)	**1949 EDSAC**
	1949 EDVAC
Manchester Univ., DCM	**1949 Manchester Mark I**
Smithsonian, DCM	**1950 Whirlwind**
Smithsonian	1951 IAS Computer
Science Museum, London	1950 Pilot ACE

DCM = Digital Computer Museum

DIGITAL COMPUTER MUSEUM STATUS 5/24/82

ARTIFACTS ON DISPLAY AT THE DIGITAL COMPUTER MUSEUM

*** = WORTH A TRIP
PDP-1 operational with Spacewar
IBM 7030 "The Stretch"
TX-0, first transistor computer
Apollo Guidance Computer
LINC, first personal computer
Enigma, WWII cipher machines

** = WORTH A DETOUR
Bendix G-15
CDC 6600, Serial Number 1
LGP-30
PDP-8
Harold Cohen murals and "turtle"
Powers-Samas card system
Hollerith 1890 census machine (replica)
Texas Instruments ASC
Jacquard Loom Mechanism
Thomas arithmometer
Tinker Toy Computer
Napier's Bones
CDC 160A
Williams tube memory

NUMBERS AND SOURCE OF CATALOGUED ARTIFACTS

(Many computer systems have a large number of separate artifacts that, in fact, can be exhibited or loaned and treated as separate items. In this listing they are treated as one. The entirety of Whirlwind is one item, and a single transistor with its own serial number is also one item.)

	Number	Different Donors	Artifact
	21	14	Computers
	57	21	Computer components
	39	21	Computer options
	52	28	Memories
	57	23	Calculators
	..	48	Photographs and documents
TOTAL	226	*	

* From approximately 150 different donors.

DIGITAL COMPUTER MUSEUM STATUS 5/24/82

December 23, 1981 - APPLICATION SUBMITTED TO IRS

March 1, 1982, advanced ruling approved, with final determination on June 26, 1984.

Determination will be primarily based on:

DIVERSIFIED BOARD OF DIRECTORS

ONE-THIRD OF THE SUPPORT FROM THE PUBLIC

ACCESSIBILITY BY THE PUBLIC

DIGITAL COMPUTER MUSEUM STATUS 5/24/82

INITIAL BOARD OF DIRECTORS

Term	
1984	Charles Bachman, Cullinane Associates
1985	C. Gordon Bell, Digital Equipment Corporation
1984	Gwen Bell, Digital Computer Museum
1985	Harvey Cragon, Texas Instruments
1985	Robert Everett, MITRE Corporation
1986	C. Lester Hogan, Fairchild Camera and Instrument
1986	Ted Johnson, Digital Equipment Corporation
1984	Andrew C. Knowles, Digital Equipment Corporation
1986	John Lacey, Control Data Corporation
1986	Pat McGovern, Computerworld
1985	George Michael, Lawrence Livermore National Laboratories
1984	Robert Noyce, Intel
1985	Kenneth H. Olsen, Digital Equipment Corporation
1986	Brian Randell, University of Newcastle
1986	Edward A. Schwartz, Digital Equipment Corporation
1984	Michael Spock, Boston Children's Museum
1985	Erwin Tomash, Dataproducts and Charles Babbage Institute
1984	Senator Paul E. Tsongas

DIGITAL COMPUTER MUSEUM STATUS 5/24/82

1982-1983 FUNDRAISING

Raise $250,000 to match Digital's FY83 and FY84 budgeted contribution of $500,000 for the FY83 and FY84.

Numbers	Category		Return
50	Corporate Founders @ $2500		$125,000
300	Individual Founders @ $250		75,000
400	Corporate Members @ $125	50,000	
1000	Members @ $25		25,000
	TOTAL		275,000

STRATEGIES

DIRECT MAIL
- 2250 Letters April, 1982-(rec'd 40,300 by May 20)
- 4500 Letters & Reports, June, 1982
- 6000 Letters & Brochures, September, 1982
- 6000 Followups October, 1982

BROCHURE DISTRIBUTION

PERSONALIZED CORPORATE CAMPAIGN

SPECIAL GRANT APPLICATIONS

DIGITAL COMPUTER MUSEUM STATUS 5/24/82

1982 FUNDRAISING PLAN

MAIL CAMPAIGN	Projected returns		
APRIL - 2,250 Letters (750 inside DEC)	200-400	$30,000 -	$50,000
JUNE - 4,500 Reports + letters (repeat mailing + list of Annals of Computing History & Digital Press Computer History Book purchasers)	250-400	35,000 -	50,000
SEPT - 6,000 Brochures + letters (repeat mailing + Museum - developed list)	300-600	40,000 -	55,000
OCT - 6,000 followups	300-600	25,000 -	55,000

BROCHURE DISTRIBUTION
In the lobby & at conferences such as DECUS and SIGGRAPH.

JUNE - DECEMBER	200	5,000 -	10,000

PERSONALIZED TARGETTED CORPORATE CAMPAIGN
Including special packet of reference materials and some presentations.

JUNE - DECEMBER

40 Corporations	100,000	
100 Corporate Annual members	12,500	
50 Individual Founders	12,500	
TOTALS - Stated goal	260,000	340,000

FUNDRAISING WILDCARDS

Mail support for inserts or other promotion from:
- DECUS
- ComputerWorld

Large scale grants ($50,000 or more) from:
- AFIPS HISTORY COMMITTEE
- NATIONAL SCIENCE FOUNDATION

DIGITAL COMPUTER MUSEUM STATUS 5/24/82

EXPENSES	FY 83	FY 84
Labor (including overhead)	165 (20)	210 (25)
Exhibits and Programs	125 (20)	95 (35)
Store	20	30
Archives and Publications	65	70
Other	25 (20)	30 (20)
Total	410 (60)	435 (75)

INCOME	FY 83	FY 84
Digital Equipment Corp	250 (60)	250 (80)
Founders	200	45
Membership	65	145
Store/interest/functions	35	50
	545 (60)	475 (80)
Surplus	145	20

() Contributions by Digital through the cost center but not necessary to account to IRS.

DIGITAL COMPUTER MUSEUM STATUS 5/24/82

STAFF ANALYSIS

FUNCTIONS	FY 79 & 80	FY 81 & 82	FY 83
DIRECTOR	GORDON BELL	GWEN BELL-------------------	
ADMINISTRATOR	MARY JANE F.	GWEN BELL -------------------	
SECRETARIAL SUPPORT	MARY JANE------------SUE HUNT-------------		
CURATOR	GORDON BELL--------GWEN BELL--------------		
EXHIBIT COORDINATOR	GWEN BELL-----JAMIE PARKER -----------------		
PROGRAM COORDINATOR	GWEN BELL-----JAMIE PARKER--CHRIS RUDOMIN--		
COMPUTER MAINTENANCE		JAY MCLEMAN---------	
ARCHIVIST	GORDON BELL----GWEN BELL--TRINKAUS-RANDALL		
PUBLICATIONS	GORDON BELL---GWEN BELL -------------------		
FUNDRAISING	GORDON BELL---------GWEN BELL-------------		
MUSEUM STORE			CHRIS RUDOMIN---
TOUR GUIDES	GORDON BELL--- 4 STAFF + 20 VOLUNTEERS------		
LEGAL COUNSEL			JIM DAVIS-----

DIGITAL COMPUTER MUSEUM STATUS 5/24/82

COMPARATIVE STATISTICS

MUSEUM	OPERATING BUDGET*	ATTENDANCE	SPACE IN SQUARE FEET Exhibits	Total
Museum of Science Boston, est. 1830	4,000,000	900,000	113,000	279,000
Corning Glass Museum established 1951	3,163,000**	550,000	20,000	40,000
Museum of Science & Technology, Ottawa established 1966	4,200,000	700,000	112,000	140,000
Lawrence Hall of Science Berkeley, est 1968	3,000,000	285,000	30,000	117,000
MIT Museum established 1980	294,000**	4,500	11,000	26,000
Digital Computer Museum FY 82	250,000**	10,000	4,000	5,000
FY 83	400,000**		8,000	10,000

* Exclusive of capital funds and acquisitions.

** Exclusive of a number of overhead expenses given "in kind" including rent and maintenance.

SPACE ANALYSIS

SHARED SPACE	
(in lobbies and cafeteria)	4,000 square feet
Pioneer Computer Timeline	
TX-O	
Super Computers	
CREATED SPACE	
Archives 9/1/82	800 square feet
PRIME SPACE (rentable)	
Offices (1/82)	500 square feet
Four Generation Gallery (6/82)	2,000 square feet
Offices (9/82)	500 square feet
Interactive Computing	2,500 square feet
TOTAL	10,300 square feet

FUTURE SPACE NEEDS FY 1985-1986

Primary and Secondary Memories	2,500 square feet
Card computing	2,500 square feet
Archives	1,000 square feet
Analog computing	1,000 square feet
AN/FSQ-7 & other military computers	1,000 square feet
	8,000 square feet

POLICIES

* Preserve the history of computing.
"You must feel like the Director of the Museum of Natural History when he started to collect bones."
Jan Adkins, National Geographic

* Expand "oral" history via lectures and seminars by computer pioneers:
"There is no history, only biography."
Andy Knowles

* Make the machines themselves focal points:
"Well-engineered machines speak eloquently of their own elegance. Museum designers can't equal them."
Frank Oppenheimer, Director
The Exploratorium, San Francisco

* Interpret exhibits for the computer community:
"Hey, this Museum is for us big kids."
George Michael
Lawrence Livermore Laboratories

* Involve the primary audience:
"The Museum does not have to convince the computer community to support the museum because its artists are worthy; they <u>are</u> the artists."
Harold Cohen
Creator of the Museum's murals

STRATEGIES

1979 Built first exhibits; Held first lecture.

1980 Formed collections and exhibit policies;
Opened for viewing by appointment.

1981 Organized the public non-profit foundation.

1982 Open to the public from 1-6 Sunday
through Friday.

Raise $125,000 from the "public."

Establish archives.

Start a research program.

1983 Obtain accreditation from American Association of Museums.

Plan an endowment program.

DIGITAL COMPUTER MUSEUM STATUS 5/24/82

EXPENSES	FY 83	FY 84	
Labor (including overhead)		165 (20)	210 (25)
Lectures - 6 per year		25	30
Exhibits (one new gallery)		80 (20)	40 (35)
Store	20	30	
Publications (inc. fundraising)		30	40
Archives (start up)		35	30
Office Staff Support (legal, accounting, travel, etc.)		45 (20)	55 (20)
Total	400 (60)	455 (80)	

INCOME			
Digital Equipment Corp		250 (60)	250 (80)
Founders	200	45	
Membership	65	145	
Store/interest/functions		35	50
	545 (60)	475 (80)	
Surplus	145	20	

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	TOTAL		275,000

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BROCHURE DISTRIBUTION

PERSONALIZED CORPORATE CAMPAIGN

SPECIAL GRANT APPLICATIONS

DIGITAL COMPUTER MUSEUM STATUS 5/24/82

<u>THE INTERNET</u>
Arpanet, etc.
HTML
MOSAIC & Apache
Etc.

ALGORITHMS
Bentley
FFT: Cooley and Tukey
R W Hamming
Knuth
Traub
Wilkinson

APPLICATIONS, Etc.
<u>AI</u>
Feigenbaum
McDermott
Dendral: Lederberg
Macsyma: Moses, Wolfram
Newell
Simon
McCarthy
Minsky: LISP
Roger Shank

<u>Business</u>
Banking: B of A, and ERMA at SRI
Banking: Citicorp John Reed ATM

<u>CAD/CAM</u>
Doug Ross: APT
Applicon: Fontaine Richardson
ComputerVision:

<u>Games</u>
Pong: Noland Bushnell
Spacewar Russell, Graetz, Kotok, Sampson
Rocky's Boots
….

<u>Graphics:</u>
Bill Atkinson: MacPaint
James Blinn: JPL; Microsoft
Jim Clark, Silicon Graphics
Pixar: Ed Catmul, Alvey Ray Smith
Evans and Sutherland
Dean Winkler and John Sanborn
Alvey Ray Smith, Lucas
Don Lynn ?
Mandelbrot

Martin Newell
Graphics keeper: Steve Levy's Film and Photo Collection (we need!)
Graphic Wonder: Negroponte
NYIT Alexander Shure (historical)
Steve Benton ?

<u>Laboratory</u>
Wes Clark

<u>Music</u>
Chowning, Mathews, Vercoe, UC/SD ?, Pierce

<u>Real</u> <u>time</u>
Sage Forrester, Everett, Crago
Sabre   Max Hopper

<u>Space</u>
Dave Scott, Astronaut
Space Shuttle Person

<u>Speech and Pattern Recognition</u>
Kurzweil Reading Machine
Ken Stevens
Raj Reddy
K S Fu
Rosenfeld

<u>Scientific</u> <u>Computing</u>
Ken Wilson, Cornell
Richard Fineman, Cal Tech

<u>Testing</u>
Alex D'Arbeloff

<u>Typography</u>
Knuth
Mike Parker, Bit Stream
Interleaf
    Warnock & Geschke

<u>Weapons</u> <u>Design</u>
Edward Teller

PROFESSIONAL ORGANIZATIONS

PUBLICATIONS
Auerbach
Datamation
Computerworld: McGovern
Byte: Carl Helmers
UNIX: Yates and testing services

BOOKS

Hackers: Steve Levy
    Dreams: Waldrop
Fire In the Valley
Turing: Hodges
First Fortran Books: McCracken
Edmund Berkely
Wilkes, Wheeler and Gill

FUNDING
AR&D: Doriot
Kleiner, Perkins, etc.
    West coast firms

<u>Government</u>
ARPA/DARPA
DOE
NSF

Digital Computer Museum

First Annual Report

Although the idea for the Digital Computer Museum was a vision of Ken Olsen and then Gordon Bell for a number of years, funding by DEC did not bring results until last year. The first Computer Pioneer lecture by Maurice Wilkes on September 24, 1979 marked the completion of phase zero. The response from the September event was so positive that it triggered staffing the Museum and permanent establishment. At the end of the first year, we have accomplished the following:

* A format for building exhibits was established;
* Literature and documentation was developed; and
* A lecture and event series was started.

This document has three parts. The first section relates the historical reasons for the Digital Computer Museum and outlines the general scope of the program. The second section expands on the current status and plans for fiscal 1981. The third section outlines ideas for the future growth and development of the Museum.

I. WHY THE "DIGITAL COMPUTER MUSEUM"

Several unrelated events and decisions all worked in the direction of Digital Equipment Corporation developing the Digital Computer Museum. Ken Olsen took it upon himself to preserve and store Whirlwind , TX-Ø and early DEC equipment in a warehouse facility. Gordon began a collection of early calculators and logic devices and wanted to continue and expand his interest in the taxonomy of computers. A consultant/curator was hired and came up with a report of other museums. Her activity was shortlived because the approach was to do a computer museum for the public -- looking costly and not very sophisticated and was further doomed by an industry depression. Both Ken and Gordon went to other computer exhibits and were extraordinarily disappointed that the Smithsonian was not making an effort to appropriately classify and organize its material; fascinated by the IBM wall (now in a warehouse) but considered that its emphasis on the interaction of social events and computing was not the story to be told; impressed with the solid display at the Museum of Science in London; totally dismayed that the computer exhibit at Boston's Science Museum was only a superficial display ad for Honeywell; and delighted that the Boston Children's Museum could teach computing (hence DEC supported this effort.)

These events led to both Ken and Gordon to conclude that a Digital Computer Museum was needed. Ken's goal, to create a place to preserve machines so that computer scientists, engineers, and programmers can see the antiques that they had worked on as little as ten years ago, and Gordon's goal, to create an understandable taxonomy of all computers and related computing devices, are complementary.

The role of the Museum is to make sure that significant artifacts are kept. Having the original or a copy (eg. Guatelli made replica of Babbage's Difference Engine) that appear in various museums), is necessary in order to distinguish a museum from a special library. As a hardware oriented company, the preservation of artifacts and documentation of significant software is appropriate. Unfortunately, many parts of early machines have already disappeared and a few good photographs are available. Hence, the Museum will collect what is available and try to insure that good portraits are taken of classic machines. (One of the dreams for the Museum is to have life sized holograms of the machines so that one could in effect walk through them. Failing this, then projecting life sized photographs provides an alternative.)

The priorities for the Digital Computer Museum are to exhibit real time, scientific and interactive computing, with a limit of 50% of the exhibits directly pertaining to Digital Equipment Corporation. Eventually all items will be identified within a taxonomic structure of pre-computer and computer generations in order that the viewer can understand the evolution of computers. The first step has been taken in this direction with the production of a PDP-tree poster.

These goals have been discussed informally with some eminent computer historians and explained to others in seeking their cooperation. The first newsletter, attached, shows a listing of people and institutions that have contributed thus far. We have found enthusiasm for our efforts and have generally been plummetted forward by positive feedback, obtaining many hours of free services from both inside and outside DEC. Thus, like most Museums, our budget, is magnified by the gifts of time and artifacts.

II. PRESENT STATUS

The Digital Computer Museum, was sanctioned by the Operations Committee of the company a year ago. January 1, 1980 the Museum staff was in place. Gordon Bell, Keeper provides direction for the program, and through Mary Jane Forbes, Administrator, the Secretariat for the Operation. Gwen Bell, Assistant Keeper, provides day to day direction on a full-time, volunteer basis. Jamie Parker, Coordinator, is the only salaried member of the Museum Staff. The security and building group at Marlboro provide their services as needed under the direction of Joe Savignano and Dave Yates. As landlord, Joel Schwartz's support and assistance in direction setting has been essential. While we pay for warehousing space, the Museum space itself carries no charge since it is the lobby and balcony of a beautifully designed Vincent Kling building (constructed for RCA). Individuals who have contributed to specific exhibits are acknowledged below. An advisory committee representing various cooperating groups within DEC, eg., Industrial Design, Digital Press, Public Relations, etc., meets occasionally to review progress.

The activities can be categorized into five areas: archives, exhibits, events, products, and public relations. Each are discussed separately, and then related corporate activities reviewed.

Archives.

* Cataloging and storage. During the summer of 1979, all the artifacts in the warehouse were photographed and cataloged. The system is being kept up to date, with the ability to track artifacts. The database is not yet computerized -- a task that we would like to accomplish in fiscal 1981.

* Exhibit directory. A directory of all exhibits as of September 24, 1979, is on the VAX system and can be queried by Museum visitors.

* Video and audio tapes. Video tapes of all lectures in the computer pioneer series will be made. The video tapes of the first lecture by Maurice Wilkes are now available. Gordon also plans to start to make audio tapes of informal discussions with people who worked on the early machines. Other video and audio tapes by computer pioneers will be acquired as they become available.

Exhibits.

* Whirlwind. This exhibit of the memory, a register and other parts is being supplemented with some photographs, and the publication of a DEC Press book by Redmond and Smith on Whirlwind.

* TX-0. The TX-0, replicating its appearance at MIT in the 1950s, has been installed by John McKenzie, the technician who maintained the machine at MIT (now retired) and

Stanley Schultz. A group of TX-0 alumni are getting together to discuss improving the display and perhaps getting the machine to run.

* Calculators. New cases were purchased for the calculators and this exhibit, essentially complete, will continue to be improved. We are looking for the Anita -- the first electric calculator. Gwen is now working on a poster of the generations of pre-computer calculating devices and writing a A/V user activated slide talk to explain their evolution. This should be complete by September 1980. The project may also result in a small picture book.

* Office of the Past. Mary Jane Forbes has put together an exhibit (in a closet) of the office circa 1910. This will be completed prior to September, 1980.

* Logic Devices. Three cases are used to exhibit the four generations of logic devices. These are explained in a user activated slide talk given by Gordon Bell. This exhibit will grow as we get more early artifacts from critical early machines.

* Memory. Three cases show the four generations of primary memory devices. In addition, a large disk and a transparent RK05 are exhibited. A secondary memory devices exhibit and a user-activated slide-talk are in the planning stage.

* Analog computers. An analog computer is displayed simply give the visitor an idea of what these were like. This exhibit should be developed.

* PDP Family of Computers. A poster of the family tree of the PDP computers has been completed and is available. This family tree will be used with all displays of DEC machines to identify their relations with the other machines. Specifically, PDP-1 is running with the original Space War program. Stan Schultz has taken this as his project and is now putting joy sticks on the machine. He also sees to it that the Classic 8 runs with non-interactive demonstration programs. An 11/20 is on the floor along with the original hand-done artwork for one of its modules. The other mainframe machines are represented by consoles, documentation, and photographs. The LINC is the first of DEC's personal laboratory computers on display. The LINC-8, PDP-12, and a working MINC are complemented by a user-activated slide talk introduced by Dick Clayton, The basis for this comes from two films -- one made by National Educational Television and the other by the DEC LDP group. Peggy Sullivan has been coordinating these efforts.

* Computer Art. An exhibit of four lithographs by Harold Cohen, University of California-San Diego, is displayed on the first floor. We have agreed with the artist, who uses a PDP-11 to create artwork by artificial intelligence, that he will paint a mural for the museum totally covering

one of the balcony walls. We will document the making of the mural for a user-activated exhibit. See events for more information on this project.

* Computer Music. We have been in contact with Barry Vercoe of MIT and John Chowning of Stanford. Barry Vercoe has agreed to compose a piece of music specifically for the museum space, probably making use of the computing capability of the VAX. John Chowning composed music on the PDP-1 and we are in touch with him to gain access to this. These projects will probably come to fruition in fiscal 82.

Events.

* Sept. 24, 1979. Luncheon opening by the Operations Committee of Digital Equipment Corporation.

* Sept. 24, 1979. Computer Pioneers, Lecture 1, Maurice Wilkes and the EDSAC.

* April 5, 1980. VAX five-year birthday party celebration. All of the people who brought VAX into the world came to a celebration, each bringing a VAX artifact to contribute to the Museum.

* May 8, 1980. Computer Pioneers, Lecture 2, George Stibitz and the Bell Labs Relay Computer. (A mailing list of 200 people outside of DEC has been developed. About 50 of these people are in the Boston/Amherst area and are being invited to the lecture.) The newsletter format will be used to announce these public lectures.

* Sept. 22, 1980. Museum dinner for the Board of Directors of the Corporation introducing them to the museum.

* Sept. 23, 1980. Opening, lecture - demonstration. Mural by Harold Cohen. Jamie Parker is coordinating this event to bring in people from the "art" and "museum" as well as the "computer" world.

* Employee family open houses to be coordinated with the entire Marlboro facility through Joel Schwartz.

* Future events: Computer Pioneer Lectures -- Forrester coordinated with publication of DEC Press book on Whirlwind by Redmond and Smith; then Atanasoff, Eckert, and Burks will be asked; Board meeting of the Charles Babbage Institute.

Products.

The Museum is planning on having a small "store" of appropriate products. In addition, we will do a number of things that will be free. (First the free items.)

* Buttons with the core memory symbol to replace the visitor badge for people coming to the Museum.

* Newsletter. Number 1 is attached to this document. We distribute internally by EMS, and via hard copy to those without EMS access and to our outside list. The newsletter will keep people up to date on our progress and be issued occasionally as the need is felt.

* PDP Family Tree poster.

* Products for sale.

  - Pre-computer Generations poster. (This is now being designed and should also be ready for September.)

  - History books from DEC Press. The Press has an allocation of two books per year on computer history. These will be on sale along with the Bell/Mudge/Mcnamara book on the DEC Computers.

  - Other books, such as Eames, Computer Perspectives, Harvard University Press.

  - Simple Calculating Devices. We are talking to the SEE Corporation about selling their reproductions of the Pascal Adder and Napier's Bones.

* Products on Display. The Annals of Computing History and Charles Babbage Institute Newsletter will be displayed with appropriate order forms for those

Public Relations and Museum Visitors.

Our strategy has been to slowly open the Museum. DEC-related groups and visiting computer scientists have begun to find the Museum and go through it on their own. There would seem to be an opportunity to cooperate with both DECUS and the educational groups to insure that the facility and the archives are accessible and used.

We have provided special tours for classes from both MIT and Harvard, as well as several local high school groups. Unescorted high-school groups can and have wrecked havoc in the Museum -- the PDP-1 groaned for a week until Stan Schultz could come and fix it. In the present state of exhibits, the viewer needs to have an appreciation for the delicacy of what might look like an indestructible machine.

A guest book is on the desk for visitors to sign.

Relations with other institutions.

Although we can't take on the world, we want to keep abreast of what is happening so that we can allocate our time and efforts appropriately.

* Support for other exhibits. Corporate Contributions give computers to support museums including a computer for the Boston Symphony Orchestra for it's 100th anniversary next year, a PDP-8 to the Canadian Science Museum in Ottawa, and a PDP-8 and a plane from the first core memory on Whirlwind to the British Science Museum. We forward parts to the Smithsonian when they take them (Whirlwind core memory and display that Mitre put together). Requests for artifacts from our archives may be made directly to the Museum or go through Corporate gifts. We hope to loan artifacts and displays to both DEC sites and other institutions.

* Ken supports Charles Babbage Institute and we cooperate with them in our complementary interests, although we have requested the Corporation to fund the Digital Computer Museum instead of CBI given the limited supply of money.

* We did not take on any of the Codasyl archives because it is open ended and feel that others should take on this responsibility; similarly, we did not contribute to archiving the Mauchley papers because we feel that Univac and the Penn. must do this. We would undoubtedly support something which would be otherwise dropped.

* The Museum staff visited the IBM warehouses April 17th.

* Gwen is going to the opening of the Computer Exhibit in Ottawa, April 30, and will visit the Children's Museum in Washington the first week of June. She hopes to develop cooperation so that we might "sell" each other's products learn from each other's displays, and look at feasibility of joint, display design and generation.

* Gwen and Jamie will attend the American Museum Association meeting in Boston in mid June. They plan to invite Museum people from scientific museums to see the Digital Computer Museum and will attend appropriate seminars.

III. FUTURE GROWTH AND DEVELOPMENT

We are trying to build a system to archive, build displays, slide talks, etc. so that the museum will grow and develop. Two new avenues appear to be appropriate -- the Museum will fund people who want to put up appropriate displays and we will formalize a small outside group of advisors who are known as computer pioneers and historians. On the first, we have written to Professor Cohen at Harvard, Professor Randell at Newcastle, and Professor Wulf at CMU suggesting that one of their computer science students might propose to do an exhibit for the Museum. The TX-0 alumni group might also come up with some ideas for displays. On the second, a small outside group of advisors might be able to help the Museum acquire artifacts outside of DEC and in accomplishing our goal of becoming the computer museum for computer professionals.

On our own, funded at the present level, we are confident of an exciting and growing future and are ending this document with a short list of a few of the exhibits focussing on real time, scientific and interactive computing and its predecessors.

Ideas for future displays.

* Scale dioramas of the development of card tabulating and computing;
* Other pre-computer artifacts (eg. Network analyzer);
* I/O Equipment, and communications equipment;
* Secondary Memory, including recording techniques;
* Integrated Circuits- getting artifacts from TI and Intel
* Important computers: Cray's machines, 360/370, Amdahl, Intel, Manchester, BTL, Penn. MIT and others;
* First Generation computer photo gallery;
* Multiprocessors, multicomputer and network structures--including CMU's;
* Computing in laboratories before computers;
* Miscellaneous application displays (eg. power control, air traffic control, EKG's, trains, process control);
* A Programming Languages display;
* On the importance of algorithms;
* Important systems (eg. UNIX/MULTICS, FORTRAN, COBOL, APL); and
* Robots (including automatons).

Attachment: First Newsletter
Brochure

GB1.S13.27

Gordon Bell, Keeper Gordon Bell

Gwen Bell, Assistant Keeper Gwen Bell

Out of a Closet: The Early Years of The Computer * Museum

Gordon Bell

5 May 2011

MSR-TR-2011-44

Microsoft Research Silicon Valley Laboratory
Microsoft Corporation
One Microsoft Way
Redmond, WA 98052

* is either null or "History" recognizing the transformation of "The Computer Museum" to the "Computer History Museum."

Out of a Closet: The Early Years of The Computer * Museum

Gordon Bell

Microsoft Research, Silicon Valley Laboratory

Mountain View, CA

Abstract. The 2011 opening at the Computer History Museum of the world's largest and most complete physical and cyber exhibit of computing history marks the sixth stage of a public museum's evolution, which began in 1975 with a closet-sized exhibit in a Digital Equipment Corporation building, migrating to The Computer Museum, Boston. It now lives in an 119,000 square foot public home in Silicon Valley. This chance/luck driven evolution of an institution is due to the dedication and leadership of a few people who persuaded hundreds of others that the endeavor was worthwhile and needed their support. Gwen Bell, The Computer Museum's founding director, and Len Shustek, the founding chairman of the Computer History Museum were committed to its success! Behind nearly every artifact, exhibit, and pioneering effort is a story that the museum is dedicated to understand and tell. This is the story leading to the Computer History Museum.

Introduction

The Computer History Museum's opening of the *R|Evolution: The First 2000 Years of Computing* exhibit on 10 January 2011is the beginning of a new era for the Computer History Museum in realizing its mission: *"To preserve and present for posterity the artifacts and stories of the information age"*. The exhibit marks the sixth stage in the 35-year evolution of the museum, which began in a converted coat closet in Massachusetts and now lives in a beautiful 119,000 square foot public facility plus its 25,000 square foot climate controlled offsite artifact storage facility in California. A new computer class emerges about every 10 years, based on exponential hardware improvements and algorithm discoveries. The evolution of this world class collection, exhibition, and interpretation museum for computing, started in the early 1970s as a spin-out of The Computer Museum, Boston. This gestation time is far longer than for new computers and most company plans! The high rate of change coming from Moore's Law necessitates a sampling rate for collecting history of at least every year or two in order to capture the significant events in real time. Waiting 30 years to collect what will clearly be discarded and forgotten fails! This migration story1 of the museum from east to west and accelerating progress reflects the geographic shifts and exponential advances of computing itself, from mainframes to minicomputers to personal computing devices, and the eventual embedding of computers into everything.

The story of the museum's evolution began with Ken Olsen and me as collectors and supporters, and Dr. Gwen Bell's dedicated 20-year odyssey as the first director. We were all strongly motivated by the fact that no institution was seriously collecting computing artifacts for study, exhibition, and posterity. Our aspiration was not only to do the job, but to do it first and be the best.

Gwen established a classification taxonomy and acquisition criteria for the artifacts to be collected, and started building exhibits. She organized a series of lectures to capture the stories of key pioneers and pioneering efforts, which were published in the newly established *The Computer Museum Report* (TCM, 1980-1998). Fundamentally, she established all of the principles and practices that have remained, *almost* unchanged for the museum's first 30 years! Despite funding challenges and endless debates over what the institution should be and where it should be located, Gwen simply refused to let it die. She remained active until her 1998 illness prevented further involvement, by which time the museum was securely ensconced in Silicon Valley.

In 1995 Dr. Len Shustek picked up the baton with equal energy and commitment, and five years later added substantial support from his new wife, Donna Dubinsky. The progress of the museum was not only geographical, but also one of scale and vision. Nearly every dimension of support and activity increased significantly, including collecting, fundraising, and computer restorations.

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[1] Celebrating Brian Randell's 75th birthday. Professor Brian Randell has been a long-time friend and advisor to the museums, starting as the first Chairman of the Collections and Exhibits Committee. Brian first argued to preserve and display advertisements and ephemera as a significant source for historical understanding and audience recollection.

[1]Ken Olsen, Gwen Bell, and Len Shustek are the story's heroes. Gardner Hendrie served in many ways, including initiating the oral histories process and collection. Bill Gates has been a 25 year supporter starting in Marlboro through funding *R|Evolution*. I'm afraid to name the many friends that were pillars of support for fear of omission. You know who you are. I thank the hundreds of members whom I don't know and who support and serve the institution; you amaze me with your dedication.

After 15 years, The Computer Museum in New England owned half of a building, as well as its critical collection of artifacts and pioneer stories. After another 15 years, the Computer History Museum in Silicon Valley has assets of over $70 million that includes an endowment, two wholly owned permanent buildings, and a major new exhibition featuring 3,200 objects, photographs and videos selected from its collection numbering over 75,000 items.

This accelerating progress is reflective of the maturity and scale of the industry, sensitivity to geographic locations, and most importantly, motivating contributing individuals[2] . The progress is also a reflection of a museum's basic tenet —"learn from its past[3]!"

This article is about the first stages of the museum's evolution to become the Computer History Museum. It is no doubt a story similar to other world-class museums. It takes time, if for no other reason than the need to accumulate the critical "Mona Lisas" that make visits compelling and support worthwhile.

Timeline: A 35 year Quest for Overnight Success

"Chance Favors the Prepared Mind" – Pasteur

The museum's six evolutionary stages of growth were accomplished by having the right, or "lucky," conditions for the inter-stage transitions over its 35+ year history, each characterized by a new location:

I. Concept and seed: Collectors and Preservers (distant past-1975)
II. Alpha: The Museum-in-a-Closet Project, Digital Equipment Corporation (1975)
III. Beta: The Digital Computer Museum, Digital Equipment Corporation (1979-1984)
IV. Going Public I: The Computer Museum, Boston (1984-1999)
V. Acquisition and Spinout: Boston Museum of Science July 1999; and
The Computer Museum History Center, Moffett Field, CA (1995-2000)
VI. Going Public II: The Computer History Museum, Mountain View, CA (2000- 2011)

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[2] My own view is that support decreases with distance from the creation of the objects: (1) founding creators from engineering, marketing, sales, etc.; (2) academic computing researchers including historians; (3) bankers aka VCs, PR, accounting, legal, etc.; (4) users; (5) local governments who benefit; and (6) communities and museum goers.
[3] CHM has learned from nearly every aspect of TCM, especially conservative fiscal management. Learning is through the continuity of long term board membership that include the heuristics for wide-scale public support.

I. Concept and seed: Collectors and Preservers

My own quest for a historical collection began in 1968 when Allen Newell and I wrote *Computer Structures* (Bell & Newell, 1971), which established a Linnaean-type functional taxonomy called PMS for the important information processing components[4] and more importantly the list and framework of critical artifacts to collect! Concurrently, Digital Equipment Corporation President Ken Olsen and Bob Everett, his former boss at MIT who led the Whirlwind computer project and was the President of MITRE, were pursuing the preservation of Whirlwind (which had the first core memory[5]) and the Lincoln Laboratory TX-0 (an early transistorized computer).

II. Alpha: A Computer Museum Exhibit in a Closet

In 1975 the so-called "Museum Project" opened an exhibit showing logic and memory elements from different generations and companies, with a booklet and my "talking" 35 mm slide presentation, that was housed in a converted coat closet in the lobby of Digital's ML-12 building in Maynard Massachusetts.

Having taken these baby steps to collect, explain, and exhibit computing, our expectations rose to the point that we thought we could actually create a first-rate public museum of computing. As an occasional visitor to Washington D.C., I concluded that such a museum was then outside the Smithsonian's charter. It was unlikely to mount the effort until it was too late, and the "Mona Lisas" would be gone. At that time they treated computing as a part of mathematics, whose curator was on a long sabbatical. By contrast, I was inspired by the Deutsches Museum, Munich (founded 1903) and the Science Museum, London[6] (established in 1857) where artifacts included many "first" machines, and the original plans of legendary computer pioneer Charles Babbage.

Friends at IBM supported our efforts to build a museum, although they were skeptical of our dream of creating an Information Museum in Washington similar to the Air and Space Museum. IBM appreciated

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[4] The PMS taxonomy is based on analyzing computer systems in terms of their Processors, Memories, and Switches and classifies computer components and information processing systems according to their function. This was described in the 1982 Digital Computer Museum Report TCM. (1980-1998).

[5] Ken was the project engineer for MTC, the MIT Memory Test Computer, which was used to test the first core memory of 1,024 16-bit words.

[6] At the opening in Boston, a viewer claimed it was the first US technology museum up to European standards. The relationship with the Science Museum began with a 1979 PDP-8 gift. We hired its curator, Dr. Oliver Strimpel in 1984 to help curate and build the museum. Oliver remained active, including being its Director, until 1998.

history. In 1971 they created a beautiful Eames-designed History Wall in the IBM World Trade building[7]. They introduced us to Roberto Guatelli, the model maker who had constructed the replicas of calculators and Hollerith's machines for that exhibit. We visited their climate-controlled artifact storage warehouse in Elmsford, New York that housed their pre-computer collection, which included one of the few priceless Pascaline calculators outside of France, Hollerith's first card data processing systems, and many classic IBM computers.

There were two important outcomes of this period. First, we found interest and support for a public museum from academicians such as Prof. I Bernard Cohen of Harvard and Prof. Brian Randell of the University of Newcastle, and from companies, some of which also donated key artifacts.   Second, we realized there was no one else with the energy, vision, and commitment to take on the challenge. We were determined to create a public museum to preserve computing history.

III. Beta: The Digital Computer Museum at Marlboro Massachusetts:

In 1978, Gwen Bell joined the effort as a full time volunteer director to create a public museum in the Vincent Kling-designed, Madison Avenue-style, 6,000 square feet MR-2 Tower Building lobby in Marlboro, Massachusetts . The spacious lobby was ideal for exhibits, but little else! I adopted the affected title "Keeper" from the Science Museum, but I soon dropped it because nobody in the US knew what it meant. The nascent museum had access to Digital's departments for Advertising and PR, Finance, Legal, and especially the Industrial Design department that was part of the engineering organization I headed. The museum's budget for operations and exhibits was $100K, $190K, $220K, and $295K for the fiscal years from 1980 to 1983[8]. Staff, with interns history of technology programs, peaked at 8.

The Marlboro Lectures

On September 24, 1979, computer pioneer Maurice Wilkes opened The Digital Computer Museum (TDCM) with a talk on the programming of the Cambridge University EDSAC. His was the first of 15 talks by the innovators who had created the pioneering computers (see Table 1). Many of the talks were videotaped and all were publicized with a commemorative poster—a convention that has remained unchanged for over 30 years!

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[7]Described in *Computer Perspectives* (Eames, 1973, updated 1990).
[8] CPI 1984:2011 = 1:2.6

Table 1. Pioneers and Pioneer Computer Lectures at Marlboro

Maurice Wilkes: The Design and Use of EDSAC; Sept. 24th, 1979
George Stibitz The Development, Design and Use of the Bell Labs Relay Calculators; May 8th, 1980
Jay Forrester: The Design Environment and Innovations of Project Whirlwind; June 2nd, 1980
John Vincent Atanasoff: The Forces the Led to the Design of the Atanasoff-Berry Electronic Computer; November 11th, 1980
Konrad Zuse: Designing and Developing the Z1-Z4; March 4th, 1981
James Wilkinson: The Design and Use of the Pilot Ace; April 14th, 1981
John Brainerd: Development of the ENIAC Project; June 25th, 1981
David Edwards: The Evolution of the Early Manchester Machines; September 9th, 1981
Tommy H. Flowers: Design and Use of Colossus; October 15th, 1981
Arthur Burks: The Origin of the Stored Program; February 18th, 1982
Harry Huskey: From Pilot Ace to G-15; November 18th; 1982
Grace Hopper: The Harvard Mark I; April 14th, 1983
Donald Davies: Early History of Cipher Machines; April 24th, 1983
Robert V.D. Campbell on the Harvard Mark I-IV; October 23rd, 1983
J. Presper Eckert: ENIAC's 40th Birthday; February 13th, 1986 (at Boston)

There were a total of 45 lectures at Marlboro, including talks by Gene Amdahl about his WISC computer, Robert O. Evans on the IBM System\360, and Wes Clark and Charlie Molnar on LINC as the first personal computer. Maurice Wilkes wrote a play for the museum, "Pray Mr. Babbage," which was performed on December 10, 1982.

The relationship with John Vincent Atanasoff was an interesting outcome of his November 11, 1980 lecture on "The Forces the Led to the Design of the Atanasoff-Berry Electronic Computer" (Atanasoff, 1980). Atanasoff was a significant contributor to the invention of the computer by his first use of electronics, direct binary arithmetic, and methods of storing information in a recirculating capacitor memory. But his more significant contribution was to help invalidate the ENIAC patent, which placed the recipe for stored program computers in the public domain. His videotaped lecture is one of the most interesting stories in the archives, demonstrating the ability and necessity of video to capture critical history by providing insight into personalities. Atanasoff and I enjoyed a long friendship, and I encouraged him to write his story for the *IEEE Annals of* the History of Computing (Atanasoff, 1984). This may have led to an article and a book by Alice and Arthur Burks, and to the reconstruction of the ABC (Atanasoff-Berry Computer), directed by John Gustafson at the Dept. of Energy's Ames Laboratory. The reconstructed ABC is currently on long-term loan from Iowa State University and is part of the museum's R|Evolution exhibit. I consider the ABC reconstruction, one of the Mona Lisas.

The Collection and the Exhibits

In the beginning, almost everything in the collection was exhibited. The opening exhibits, with about 225 artifacts included: Whirlwind and the first core memory, TX-0, Calculators, Office of the Past, three cases each of Logic and Memory devices, Analog Computation, several DEC computers including an operational computer room being used by Digital, and Harold Cohen's Aaron[9] Paint System for generating computer art. Over a hundred pre-computing artifacts came from the Bell personal collection, which we began in 1975 with an early "Millionaire" calculator because we anticipated having a computer museum and the need for such objects. Objects ranged from a WWII Enigma cipher machine to a set of Napier's Bones[10] from about 1700. The layout of the exhibits is shown in Figure 1.

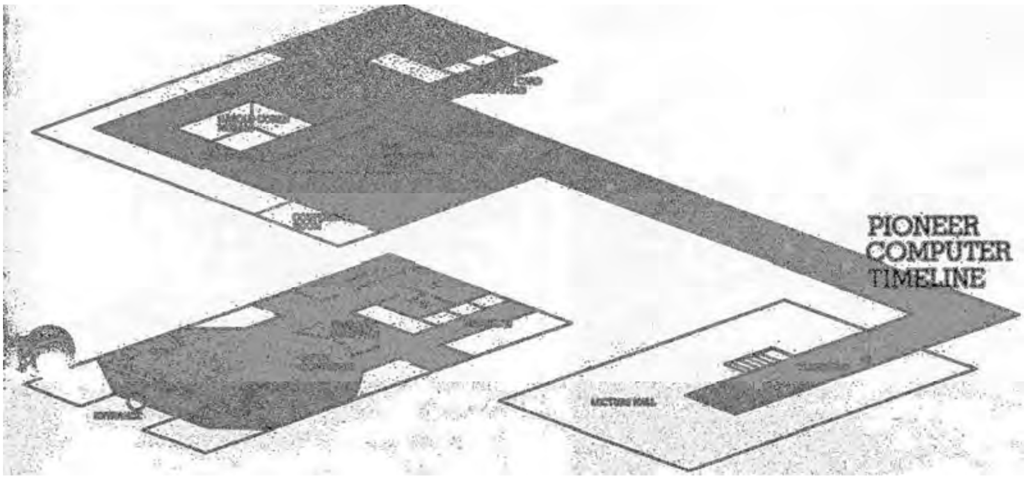

Figure 1. Layout of the Digital Computer Museum, Marlboro, MA at its 1979 opening from The Museum Report. The Lecture Hall was shared with Digital, who used it as their cafeteria. The museum was tucked into nooks, crannies, and all the otherwise unusable spaces.

The exhibits (documented in the television show, Computer Chronicles in 1983) were created using the centuries-old, well lit, artifact, label, photo format—unchanged in any way through 2011! The Marlboro exhibits also included several videos, a PDP-1 running Spacewar!, a PDP-11 for running Lunar-Lander, the Lincoln Laboratory TX-0l and a local VAX computer terminal to provide a guide to the exhibits. DEC's Industrial Designers used modular display cases and components that enabled the museum to become operational within its first year on a small budget. Unlike most subsequent exhibits, several of the early

[9] A gift to the museum. In the 1970s I had provided Harold with a genuine PDP-11, after his PDP-11 "knock-off" computer had fallen from a truck, just prior to a European art gallery exhibition.
[10] The collection contained about 400 pre-computing artifacts and 500 books. See (Bell, 2011)

machines were were actually working, and visitors could interact with them. A small focus group of 12-year olds reviewed the exhibits prior to the opening!

Thomas Hoving's book "King of Confessors" (Hoving, 1981) describes an art museum director's search for rare and exotic artifacts. As we acquired artifacts and lusted over others on our acquisition list, we began to identify with museum directors' feelings about their collections. One of the first and most prized artifacts came from friends at Lawrence Livermore National Laboratory: the decommissioned CDC 6600 Serial # 1. TI's ASC followed, and the growing supercomputer collection soon attracted one of the few IBM Stretch machines. We began to understand that another important value of collecting "key artifacts" is that they attract other artifacts. No one likes to be excluded from immortality! The collection is the result of a directed, proactive effort—not a reactive one. Left open-loop, it is easy to miss new classes while passively accumulating a massive collection received from donors that just consumes warehouse space. A selective and proactive policy was easy to support when the museum was small. With a larger community, almost every artifact is a treasure—at least to someone, but usually not to computing or its history.

The museum's entire collection is listed in the TCM 1983 Summer Report according to the PMS classification. It included:

D/Data-operators i.e. calculators and analog calculating devices: abaci, slide rules, printed tables, sectors and other navigational instruments, the Lehmer Number Sieves, a Hollerith system replica, Napier's Bones, a Pascaline replica, Danny Hillis's Tinker Toy Computer;

D/Data-operation components: data-operation components: arithmetic units, logic circuitry, a valve (vacuum tube) from Manchester Mark I;

T/Transducers: telegraphy equipment, typewriters (subsequently discontinued), light pen, plotters;

M/Memories: Atanasoff capacitor store drum, core memories, delay lines, drums, handbooks, player piano disk, tapes, Williams tube.

C/Computers : Brigham Young University's video of the Stretch in operation, Bendix G-15, Burroughs ILLIAC IV (supercomputer), CDC 160 and 6600, Data General Nova, DEC PDP-1,5,7, 8, 11 (3 models), and 12, Fairchild Symbol that used the first dual in-line integrated circuit, Honeywell ARPA IMP, IBM 1130, 1620, 7030 (Stretch), and 360/195 console, Librascope LGP-30, Lincoln Laboratory LINC and TX-0, MITS Altair, MIT Whirlwind, NASA Apollo Guidance Computer, Philco 212, Raytheon Polaris Guidance Computer, Remington Rand Solid State 80, Siemens 2002, Sperry Univac NTDS (designed by Seymour Cray), Texas Instrument Advanced Scientific Computer, Viatron System 21, and Xerox Alto. Working computers included the restored TX-0 and Marlboro's VAX computer installation.

Other artifacts that were acquired before the move to Boston include: a Kurzweil Reading Machine for the blind, a Norden Bombsight, SRI's Shakey Robot, parts of a SAGE computer installation from a field trip to North Bay, Canada, prior to the acquisition, and a wonderful calculator and computer collection from the University of Illinois.

Visitors from DEC, Data General, and other New England companies in the Greater Boston area encircled by Routes 128 and 495 came to see the exhibits, attend the lectures, and offer advice. A museum logo, the 3-wire, co-incident core memory plane pattern, was created and served until 1995 when it was replaced as part of a comprehensive rebranding effort with a globe of 1s and 0s. Books[11], memorabilia, postcards, 35 mm. slides for historians, and posters plus ties, belts, scarves, etc. were sold in the "store."

The Computer Museum sponsored a two-day symposium in May 1983 at Marlboro on collecting and archiving. Attendees included historians Martin Campbell-Kelly, Ithel de Sola Pool, Jean Sammet, and Mike Williams as described in the Fall 1983 Report. Jean Sammet and I emphasized the need for taxonomic structures in collecting and there was total agreement for the need to preserve all films, especially the commercial ones showing operational system, even though they lacked academic reviews. I commented: "Let's only deal with the producer/storer problem, not the consumer problem (i.e. control of their purpose as the degree of authenticity). The Los Alamos tapes and the Museum lecture tapes were a valuable addition to the collections; in the first case the people were in a group and defending their turf and in the second they starred on their own. This basic "star" format is a mainstay with anniversary celebrations where everyone is brought together to tell their stories. Historian Mike Williams of the University of Calgary said, "Looking at a cannibalized piece of the ENIAC, like the one at the museum, doesn't do much for me. Why not just videotape everything and throw the junk out?" Twenty years later, when the web was established, I made a similar unsuccessful proposal as a Computer History Museum Trustee — that CHM should exist as a cyber-only museum with no exhibits other than a "visible storage" area. Having the *R|Evolution exhibit* on line will establish CHM as an important resource of historical information to complement Wikipedia's unparalleled encyclopedic content. By 2015 I would hope to see at least a factor of 10 difference between visitor time spent in the physical as compared to the cyber exhibits. Unfortunately, to do this will require a commitment to making the timeline somewhat complete as opposed to an exhibit of interesting mostly sculptural artifacts.

[11] Digital Press published two history books: Redmond and Smith, *Whirlwind*, and Sterns *From ENIAC to UNIVAC.*

The Founding Principles: Then and Now

The inaugural 1982 Digital Computer Museum Report claimed that "It is the world's only institution dedicated to the industry-wide preservation of information processing devices and documentation. It interprets computer history through exhibits, publications, videotapes, lectures, educational programs, excursions, and special events." The report described the museum's five principles, which *have remained essentially unchanged for 30 years*[12]:

1. Historical preservation. "To that end, the P,M,S notation forms the basis of the taxonomy determining the extent of the kingdom of computing and providing guidelines for exhibits." *This provides a means of classifying **all** of computing: Class (i.e. P,M,S, K, T, L…C), order, family, genus, and species.*
   "You must feel like the Director of the Museum of Natural History when he started to collect bones." Jan Adkins, National Geographic
2. A lecture series for the computing pioneers and contributors to record their stories. "Thus, we are giving the podium to people who can give first-hand biographies of machines, programs and languages they have known."
   "There is no history, only biography." Andy Knowles
3. "The focal point of the Museum is the machines themselves." We agreed with Frank Oppenheimer who created the Exploratorium in San Francisco: "Well-engineered machines speak eloquently of their own elegance. Museum designers can't equal them."
4. A main "audience of computer scientists, programmers, history buffs, and those with a curiosity about computer evolution"
   "Hey, this Museum is for us big kids." George Michael, Lawrence Livermore Laboratories
5. "Broad-based involvement by maintaining a working relationship between the enthusiastic volunteers, donors of artifacts, patrons, students, scholars and a staff that can keep stirring the soup."
   "The Museum does not have to convince the computer community to support the museum because its artists are worthy; they are the artists." Harold Cohen Creator of the Museum's murals

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[12] In 1993 TCM's scope was explicitly extended to include a significant public educational function, which I thought potentially diminished its collection function. This change to "address a new and wider market" may have contributed to the decline in Boston that needed to focus on visitor attendance. However, the need for broad local support was necessary as the center of gravity of computing moved West. The extended charter did allow the museum to survive longer until its lucky move to Silicon Valley. Oliver Strempel believes "It was clear that operating expenses of the Museum Wharf site needed many strands, including earned revenue, which collections do not raise in significant amounts. Local support is always a backbone for any institution, even one with an international mission and reputation, and for that one needs to reach out to multiple audiences. Indeed, there would have been no reason to move into the Museum Wharf location if there had not been an education component. Much more cost effective would have been a Route 128/495 site."

The interaction of the parts was given in The Computer Museum Report, Summer 1983 (see Figure 2).

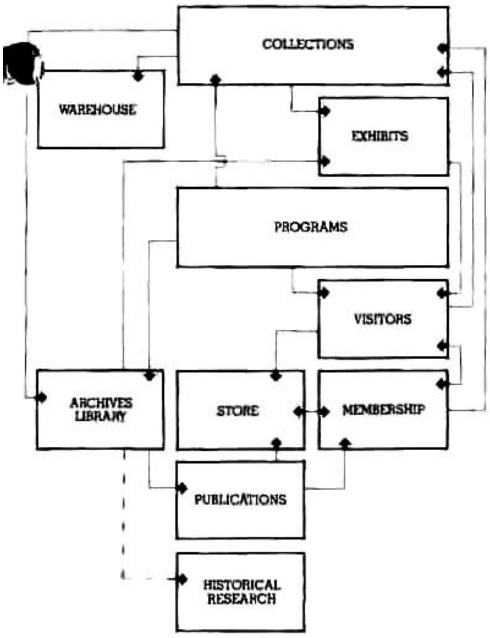

Figure 2 from The Computer Museum Report shows the growth from collections, to exhibits and programs that attract visitors, to access for research, to publications. Note the absence of a public education component.

Preparing to Go Public: The First Board

In late 1982 the museum became a public non-profit corporation called "The Computer Museum." The 18 member board consisted of six people from DEC and: Charlie Bachman, inventor of the Integrated Data Store, one of the first databases; Harvey Cragon, responsible for the TI Advanced Scientific Computer; Bob Everett, CEO of MITRE Corp.; Les Hogan, CEO, Fairchild; John Lacey, CDC; Pat McGovern, founder, ComputerWorld; George Michael, Livermore Computer Scientist; Bob Noyce, the inventor of the IC and Intel founder; computer scientist and historian Brian Randell of the University of Newcastle; Mike Spock, Founder and Director of the Boston Children's Museum; Erwin Tomash of the Babbage Institute; and Massachusetts Senator Paul Tsongas. Some IBMers, including Erich Bloch eventually became board members. It was Erich who convinced me that while The Digital Computer Museum name was clever, it might inhibit support from other companies, so we dropped "Digital." (One of the museum's interns suggested instead that Digital Equipment Corporation should change its name—a suggestion that Ken Olsen vetoed.)

During this period the notion of "Computer Generations" crystallized, and I extended it backward in time to include Four Pre-Computer generations. A poster was created *and sold* to describe events in the timelines (DCM, 1980): PC 4, manual 1600-1800; PC 3, mechanical 1800-1890; PC 2, electro-mechanical 1890-1830; and PC 1, electronic 1930-1945. These timelines were an essential guide for collecting. The Computer Generations I used then were given in a 1975 “Closet Museum” brochure: vacuum tubes, transistors, integrated circuits, and large-scale integrated circuits. My “Theory of Computer Generations” about the birth and death of computer classes (G. Bell, 2008) was stimulated by these attempts to understand how new kinds of computers come into existence and evolve to form industries based on hardware technology and the problems they solve. A new generation that occurs every 10 years also consists of a new software platform, networks, interfaces, applications and markets, resulting in the creation of an industry. Examples include personal computers, the web, smart phones, and tablets for reading.

The experience in Marlboro taught us about the collection process[13], how to preserve and exhibit artifacts from circuits to supercomputers[14], the importance of capturing the progress of technology through first-person lectures, how to operate as a public museum with a board, and the necessity of quarterly.

As the Marlboro facility started to outgrow its space, it became clear that the museum needed to move to a more public location to attract a wider, urban audience. Concurrently, Mike Spock announced that the Transportation Museum that shared a building with The Boston Children’s Museum was closing. Like the two previous museum locations, moving the museum to Boston was another serendipitous event (see Figure 3).

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[13] The collection policy was proactive: know, seek and obtain the “first”, mainstream, last, and interesting failures in each class. Collecting can also be a matter of luck. As the museum became better known, donors wishing to clear out a basement or garage could find it more easily.

[14] Unfortunately, the strong classification was dropped when it came to CHM: Computers, Memory/Storage, Processing, I/O, Transducers, Links, Switching, Networks, and especially Control (software) are not used. Thus a strong notion of a Linnaean-type of classification is not present at CHM and items usually revert to either a generic name e.g., “cable” or their industry trade name e.g., Ethernet!

Figure 3. Photograph of The Computer Museum, Boston at Museum Wharf c1983. The museum occupied the two top floors, a first floor entry, store, and the large elevator entryway visible at left.

For a technology museum, artifacts and archived stories are its balance sheet, and public support resulting from the mission and attendance make up the profit and loss. The experience at Marlboro focused on creating a sound Balance Sheet, and DEC supplied most of the seed capital and nearly all of the operating funds for the P&L! The museum achieved non-profit 501(c)(3) status, providing tax-deductibility for financial support, artifact donations, and memberships.

IV. Going Public I: The Computer Museum in Boston

On May 11, 1984 The Computer Museum (TCM) a preview opening for founding members took place at Boston's Museum Wharf with Bob Noyce's talk on "The Origin of the Integrated Circuit" (Noyce, 1984). The public opening occurred on November 13, 1984. Exhibits included a logic and memory timeline, Whirlwind, a 30' section of the SAGE Computer, its 64K word core memory and Air Defense Consoles, an IBM 1401 Computer Room from about 1965, Univac I, Seymour Cray's Computers, and a Graphics Gallery entitled "The Computer and the Image." The latter included the original, canonical "teapot" that served as a benchmark for graphics rendering. A layout of the exhibit is shown in Figure 4.

The museum's budgets in Boston for fiscal years 1983 and 1984 were $410K and $435K, respectively. The initial staff was 18, including the 8 that worked on exhibits. Attendance reached 135,000 annually, driven by the timeliness and relevance of major exhibits including: The Early Personal Computer

Collection Contest[15] (1986), Smart Machines (1987), Pocket Calculators (1987), The Walk-Through Computer (1990, 1995), Milestones of Computing (1990), The Networked Planet (1994), Kid's Software (1996), and The Virtual FishTank (1998). Exhibits like The Walkthrough Computer served as a stage for video creation (How Computers Work, 1990). In 1997, TCM and the ACM, which was celebrating its 50th anniversary, produced two 50-minute videos utilizing the museum's artifacts and archives. They are now part of CHM's YouTube channel (TCM, 1997).

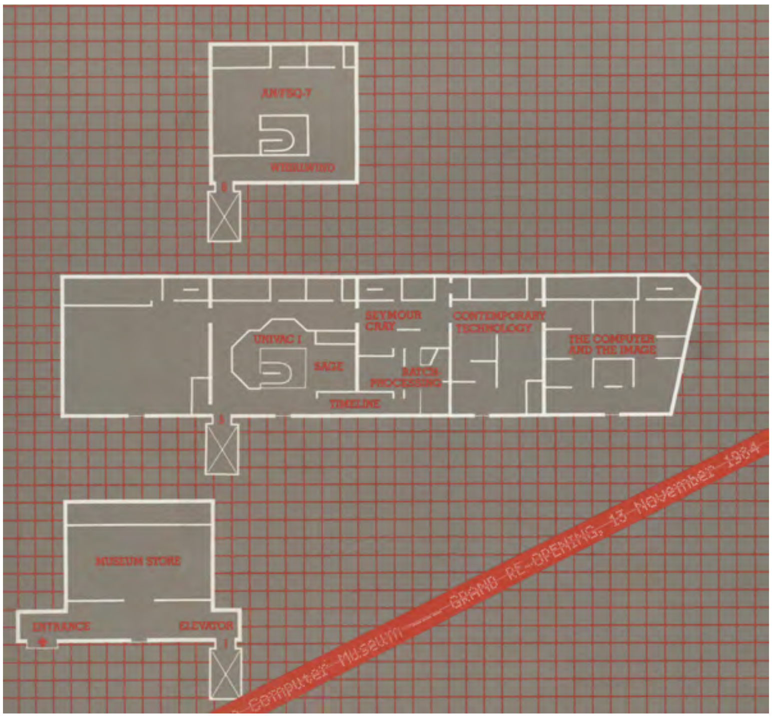

Figure 4. Layout of The Computer Museum, Boston at the opening in 1984. Exhibits occupied about utilizing 11,000 sq. ft. of the total 55,000 sq. ft. area on the two top floors on Museum Wharf.

The museum operated for 15 years, until July 1999. During this time, many key artifacts were collected from the supercomputer, 10 mainframe, 100 minicomputer and hundreds of personal computer companies and their users, who were often anxious to find a good home for their obsolete computers rather than consigning them to trash. One of the most valuable artifacts and a "Mona Lisa" came from the Los Angeles Museum of Science in a serendipitous fashion. Willis Ware, a principal at the RAND Corporation in Santa Monica CA, discovered that their beloved JOHNNIAC Computer, one of the few inspired by von Neumann at the Institute for Advanced Study, was being discarded by the museum and

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[15] In 1986 ComputerWorld sponsored a contest to acquire early PCs that resulted in 500 artifacts marking the beginning of the PC generation.

was awaiting a trip to the dump. Willis called Gwen, and TCM acquired a computer which is now a national treasure. That museum had violated one of the most important tenets of institutional support: never get caught by the donor discarding his precious artifact! De-accession is a tricky business that must be done carefully.

Other activities evolved, including the use of the collection for prior art research in patent litigation. An operational PDP-1 displaying one of the first computer games, Spacewar!, is still used for this purpose. In 1988 Gwen created The East Coast-West Coast competitive Computer Bowl, that ran through 1995 and garnered wide support. A gallery and book, Wizards and their Wonders featuring prominent people of computing was also used to recognize and gain support (Morgan and Bachrach, 1997).

In 1993 the mission expanded to include education, resulting in the creation of The Computer Clubhouse for teens in collaboration with Mitch Resnick of the MIT Media Lab. From 1990-95, a significant part of the museum's funding was directed to major new exhibitions. Most of the financial support for new exhibits came from Silicon Valley firms, reflecting the industry's new central location. Overhead from exhibit creation was used to defray operating costs.

What had started out as a museum focused on history and collecting had now expanded to become a public computer education institution. This philosophy posited the museum as a "third wave" focused on education and historical collection[16]. However, given the public focus on education, the need for a "back room" collection of artifacts diminished, along with the interest and understanding of the importance of collecting and preserving.

[16] Oliver Strempel noted: "The exhibits were effective manifestations of this philosophy. For example Smart Machines included The Robot Theater, a stage packed full of key robot artifacts, including Shakey, The Stanford Arm, Unimate I, an early industrial arm from Raj Reddy's lab at CMU, and the 1984 Mars Rover prototype from JPL. The functioning and purpose of these artifacts was explained in a video, and synchronized lighting and robot movements helped pinpoint the robot being featured in the video. Other exhibits in the gallery explained concepts of AI and robotics with interactive exhibits. A similar approach was adopted in The Computer and the Image with early computer graphics artifacts and ground-breaking animation from BYU, NYIT, Lucasfilm, and Lawrence Livermore Labs. The Milestones of a Revolution exhibit placed representative artifacts of each era in a contemporary setting, and explained the innovations they embodied in text, graphics, and interactive demonstrations."

By 1998, most of the exhibit support was coming from hardware and software companies outside of the Boston area and artifact collecting in Boston was nil. Gwen outlined the dilemma that even though computer manufacturing had left New England, there was significant support from the city, state, and Boston companies. In a late 1997 memo to the executive committee, Gwen wrote:

> "From almost the beginning, The Computer Museum has been marginal in its location on Museum Wharf. The site never lived up to the "industry standard" of refinement or pizzazz. Efforts to provide a "visionary future" had no serious backers. In 1987, the mission was re-worked to focus on education; collections and history took a back seat. From 1990-95, the Museum was in reasonable shape via a series of successful industry-funded computer-focused exhibitions. Spending little money on the collections/history allowed the funds from those supporters to go to the public facility. Today, with no major computer-focused exhibit that is well funded, and without the marginal extra resources brought from those who support the history component, the Boston facility is struggling from month to month, with no respite in sight."

Interest in: where did computers come from, how do they work, and what do they do had been satisfied. In essence, market demand was inadequate to support the high cost of exhibit development to show the future or build extremely interactive exhibits like the museum's 1998 Virtual FishTank.

A Silicon Valley Division Or What?

In late 1994, Len Shustek called me.

"I want to start a computer museum in Silicon Valley like the one in Boston. How do you start a computer museum?" he asked.

I responded: "I have a deal for you."

We spoke for several hours and outlined a plan that would bifurcate TCM by establishing a new Silicon Valley division called "The Computer Museum History Center" to house the valuable collection, and focus on extending it by collecting semiconductors, storage devices, and personal computers from the artifact-rich Silicon Valley. TCM in Boston could get rid of its collecting charter and the dusty "back room" of artifacts, which Len and Silicon Valley were eager to adopt. TCM could concentrate on exhibits, public access and education. Furthermore, since by now the artifacts were now largely being created in Silicon Valley, collecting them there was both natural and essential. Having a significant number of board members from Silicon Valley certainly increased the odds of the plan being accepted when the question was eventually called. Furthermore, a strong and active Silicon Valley board was essential to implement a new venture in the valley.

Future history was being created in real time at an increasing rate, and the creators and artifacts had to be captured near the source. Technology had moved west, and the museum had to follow it or risk having its collection become irrelevant and, paradoxically, obsolete!

Va. Takeover: The Boston Museum of Science Acquires The Computer Museum

In mid-1999 TCM in Boston was dissolved. The assets relating to science and technology education were acquired by The Boston Museum of Science, since both museums were serving the same science and technology education audience. They were not equals: TCM and the Museum of Science had attendances of 135,000 and 1.9 million annual visitors respectively, operating budgets of 3.4 and 36.5 million dollars, and staffs of 25 and 650 persons. But with collecting out of the way and in California, the two east-coast museum charters were identical, and TCM could just beef up the Science Museum's computer exhibits. Besides, now nearly everyone had a computer, and it was becoming increasingly difficult and very expensive to exhibit constantly evolving new technology that consumers couldn't buy from computer stores.

In any event, TCM could not have continued independently. Significant exhibit and overhead support had come from Silicon Valley, and the new History Center there reduced the eastward flow of funds. The challenge for TCM in Boston would have been to operate independently with just local, government, and company support, in the face of a diminishing computer industry led by Digital's decline. The Boston's museum's Board simply lacked the willingness and ability to continue to fund a computer museum.

When TCM closed it delivered a dowry to The Museum of Science of half the cash from the sale of the Museum Wharf building, a loan of artifacts for an exhibit, the Computer Clubhouse network, and TCM brand that MOS subsequently abandoned. Basically, the TCM board was just weary of fundraising in the competitive museum-rich Boston environment, and the acquisition gave the board a graceful exit. Many of TCM's board and overseers who were not interested in the computer history mission were able to become part of MOS, a more prestigious Boston institution with a larger personal network "net worth".

By March 2009, TCM had been completely assimilated and its history mostly erased. A watered down version of The Virtual FishTank remained, as well as the flagship Computer Clubhouse, the headquarters of the Computer Clubhouse Network. For example, the Museum of Science states on its web site and in press releases:

"Founded in 1993 by the Museum of Science, Boston in collaboration with the MIT Media Lab, the Computer Clubhouse[17] is a creative and safe out-of-school learning environment where young people from under-served communities work with adult mentors to explore their own ideas, build confidence, develop 21st century skills, and find pathways to success through the use of technology."

The cause of the takeover is identical to what we observed in our earliest interaction with the Smithsonian, which is what originally prompted the need for the creation of a computer museum:

> To a science or technology museum, computing is an exhibit.
>
> To a computer museum, everything in the world, besides computers, is a computer peripheral or there to be a part of computing.

Vb. Spinout: TCM History Center Forms in Silicon Valley

In 1995, Shustek proposed:

> *"establishing a world-class academically-oriented Computer History Center focused on technology and its evolutionary development; move TCM collection and expand it; build an artifact rich museum targeted at adults; allow limited, professional access of the entire collection as "visible storage," and a library, seminar series, research projects; and Web availability."(Shustek, 1995*)

The plan was simple: secure a donated site; build a 60,000 square foot dedicated facility; operate primarily from endowment by securing $15 million each for a building and endowment. *Realizing this vision would take 15+ years, and the numbers were bigger, but the result would be worth the wait!* The beauty of *collecting* museums of technology is that they don't need to operate on a schedule—they just have to "hang in", stay alive, and keep on collecting. The Balance Sheet of artifacts just increases over time with an active collecting program.

During 1996, TCM History Center was established, governed by TCMHC's West Coast Board of Overseers and operated by Gwen Bell, Len Shustek, Carol Welsh, Dag Spicer, Karen Mathews and a number of other volunteers. TCM's artifacts began to move to Silicon Valley along with a large stream of new "old" artifacts coming from local valley supporters. On December 2, 1997 five semi-trailers full of TCM's artifacts arrived at a Moffett Field warehouse where Len had convinced NASA to provide free space — our next lucky break. This represented most of the larger artifacts that would be featured in the "Visible Storage" exhibit, (see Figure 5) which was a way to convince supporters that a building was worthwhile and was going to be built. Another exhibit opened at Stanford's William H. Gates Computer

[17] This clause of course is false. Unfortunately or perhaps even more generally, history is often written by the last institution or person standing and their public relations department.

Science Building in November 1997 to further stimulate support. The remaining artifacts arrived in 2000.

Figure 5. Panoramic photo of The Computer Museum's History Center Moffett Field Visible Storage area.

From the beginning, The Computer Museum History Center was required to be financially independent of TCM. Not only did it receive no money from the mother ship in Boston, it was required to pay a “tax” to TCM 25% of the funds it raised in Silicon Valley. But the staff was small, the enthusiasm high, and there were enough successful entrepreneurs who understood that the original collecting mission could not be allowed to die. A campaign to sign up hundreds of “Founding Members” was very successful.

When The Computer Museum History Center was established as a subsidiary, TCM had a 19 member Board of Trustees and 55 member Board of Overseers. Silicon Valley participants included Dave Anderson, Jeff Braun, Lacy Edwards, Peter Hirshberg, Terri Holbrooke, Chuck and Dave House, Christine Hughes, Carver Mead, Ike Nassi, Suhas Patil, Bernard Peuto, Grant Saviers, John Shoch, Len Shustek, Bill Spencer, and me.

In anticipation of TCM’s demise, TCMHC was incorporated as an independent California 501(c)3 non-profit organization on January 15, 1999, temporarily sharing the same trustees as TCM. By the end of the year TCM had been dissolved, and the November 12, 1999 TCMHC board meeting is described in the minutes as “the day of the History Center’s independence.” Trustees not interested in the original history mission resigned, and the board was repopulated with 12 surviving and 7 new trustees: David Anderson, Gordon Bell, Andy Cunningham, Sam Fuller, Gardner Hendrie, Dave House, Peter Hirshberg, Christine Hughes, Steve Kirsch, Isaac Nassi, Suhas Patil, Bernard Peuto, John William Poduska, F. Grant Saviers, John Shoch, Len Shustek and Pierluigi Zappacosta. In February 2000, the museum’s name was changed to the Computer History Museum (CHM), because “TCM” was owned by the Museum of Science and was not available.

Fortunately, the first few years of TCMHC had coincided with the “Internet Bubble,” which allowed it to get commitments of over $50 million for the proposed building and the endowment. With its impressive display of “first” or “one and only” artifacts in the warehouse (arranged as a “Visible Storage” exhibit), an active collecting program, a lecture series, and a project to restore an IBM 1620 computer system, the board had a credible story to use for fundraising.

VI. Going Public II: The Computer History Museum

The museum originally intended to construct a new building on land leased from NASA at Moffett Field as part of a research park being developed. But it soon became apparent that NASA was moving with the speed typical of a federal bureaucracy, so in October 2002 the museum purchased what had been the 119,000 square foot main marketing building of Silicon Graphics Inc., for $25 million (see Figure 6).

Figure 6. Photo of the 119,000 sq. ft. Computer History Museum, 1401 Shoreline, Mountain, View, CA. CHM hosts a 25,000 sq. ft. Revolution timeline of computing history.

Unlike many investments, the museum had been able to "sell high" at the peak of the bubble by getting capital pledges, and "buy low" when the bubble burst making real estate available inexpensively. The move of key artifacts from Moffett Field was completed, and in May 2003 and the museum opened on a limited basis by offering a new "Visible Storage" exhibit, followed by an exhibit on Computer Chess and Artificial Intelligence in 2005. Staff and volunteers proceeded to restore computers, collect, and digitize items, in addition to being enthusiastic and knowledgeable docents.

Software was finally added to the list of classes collected, and we acquired key items, such as the history of FORTRAN including original source code. Paul McJones who hosts Dusty Decks for archiving software, noted:

"similar collections for LISP, ALGOL, and C++. Others have assembled extensive collections on, for example, the Multics and Unix operating systems, PDP-10 systems and applications, and many more. Two of the earliest relational database management systems, Berkeley Ingres and IBM System R, have been preserved but are not yet easily accessible. For the most part, these collections are aimed at a more scholarly audience; I hope they will serve as source materials for future exhibits for a wider audience."

The 1/10/11 opening of the R|Evolution exhibit (see Figure 7) at the Computer History Museum clearly accomplished the 1995 vision. Every parameter of the plan was realized, and done so by more than a factor of two—scope, building, and financial base. In 2011, CHM has over 35,000 physical objects, 5,000+ linear feet of pages, 15,000, photos, 5,500 videos including a number of Pioneer Lectures, 400+ oral history transcripts[18], and 20,000 software objects in a variety of formats. Sadly, with so many artifacts, an exhibit of 1 per cent of the artifacts described in 50-100 word sound bites is a sampling and thin veneer of computing history. The void, selectivity, and rigidity projected from an exhibit of sculptured items is apparent when viewed in what is an infinite cyberspace.

The "Mona Lisas"

Museum visitors often ask, "What is your Mona Lisa?" How can we answer that? What are the defining criteria? Is it the artifact's properties? Its place in history? What it inspired? About two dozen artifacts (shown in italics below) in the CHM's 2011 Revolution Exhibit strike me as possible Mona Lisas (MLs). All of the MLs except three, which are on loan, came as part of The Computer Museum's collection. The MLs validate the early 1970s rationale to collect and capture pioneer stories that were the bedrock of TCM.

My first ML is the Marlboro museum's 18th and 19th century artifacts such as *Napier's Bones*, printed tables with known errata, and the uncommon artifacts previously listed. Although I'm not a fan of replicas because they make no pretext of operating, I include Guatelli's replica of the *Hollerith Card System* used for the 1890 census since it represents the origin of IBM. His *Pascaline* c1647replica is important as the basis of mechanical, stepped wheel calculators that dominated mechanical calculation for two centuries. The *CDC 6600* was a computer that all engineers admire, and the *Enigma* fascinates everyone. Nathan Myhrvold's Science Museum operational reconstruction of the *Babbage Difference Engine No. 2,* on loan to us, is the most impressive artifact anywhere! (6 MLs)

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[18] A program initiated by board member Gardner Hendrie that includes HD Video capture.

MIT's *Whirlwind with the first core memory* and interactive displays, the TX-0 with CRT and *light pen* (a mouse precursor), and subsequent *PDP-1 with Spacewar!* demonstrate the first 15 years of interactivity and the beginning of personal computing and the minicomputer industry. Wes Clark's *LINC (Laboratory Instrument Computer)* qualifies as the first personal computer and stimulated *Digital's PDP-8*, which in turn inspired the creation of 100 minicomputer companies. The museum has over 500 different PCs in its collection, including an *Apple I* that is interesting because of its scarcity; one recently sold for $240,000 to a collector. The 1981 *IBM PC*, like the System/360 before it, succeeded in establishing "the" set of standards that will live for decades . *Xerox PARC's Alto* was the basis of many innovations including user interface designs, word processing, paint systems, software fonts, and especially distributed computing using the *Ethernet* Local Area Network. (7 MLs)

At one point in the exhibit the visitor can view a *1,024 bit core memory plane* from the Whirlwind that dominated primary memory use for two decade and *IBM's RAMAC*, a 5 megabyte disk, the first of its kind. The storage alcove has many other devices that were successes, and many that were not. Unfortunately, the relational database along with many other critical software artifacts is not on display. (2 MLs)

TCM had acquired a few "Cray" computers. Now CHM has virtually every Cray model spanning 40 years, with pride of place going to the *Cray 1*. Of all the computers, Cray's machines most qualify as Mona Lisas based on their aesthetics. The CHM supercomputer exhibit is a David and Goliath Story: the Cray architecture, based on speed at any price, was replaced by clusters of "killer" micros beginning with Caltech's *Cosmic Cube in 1982* and then by subsequent Intel systems. *ENIAC, JOHNNIAC*, and the *UNIVAC* I are all firsts that qualify, along with an *IBM System/360*—the computer with the longest lifeline introduced in 1964. Atanasoff's 1941 *ABC Reconstruction* and Lee *Boysel's 1969 microprocessor* and their stories are unique as firsts, and as patent and myth busters. (7 MLs)

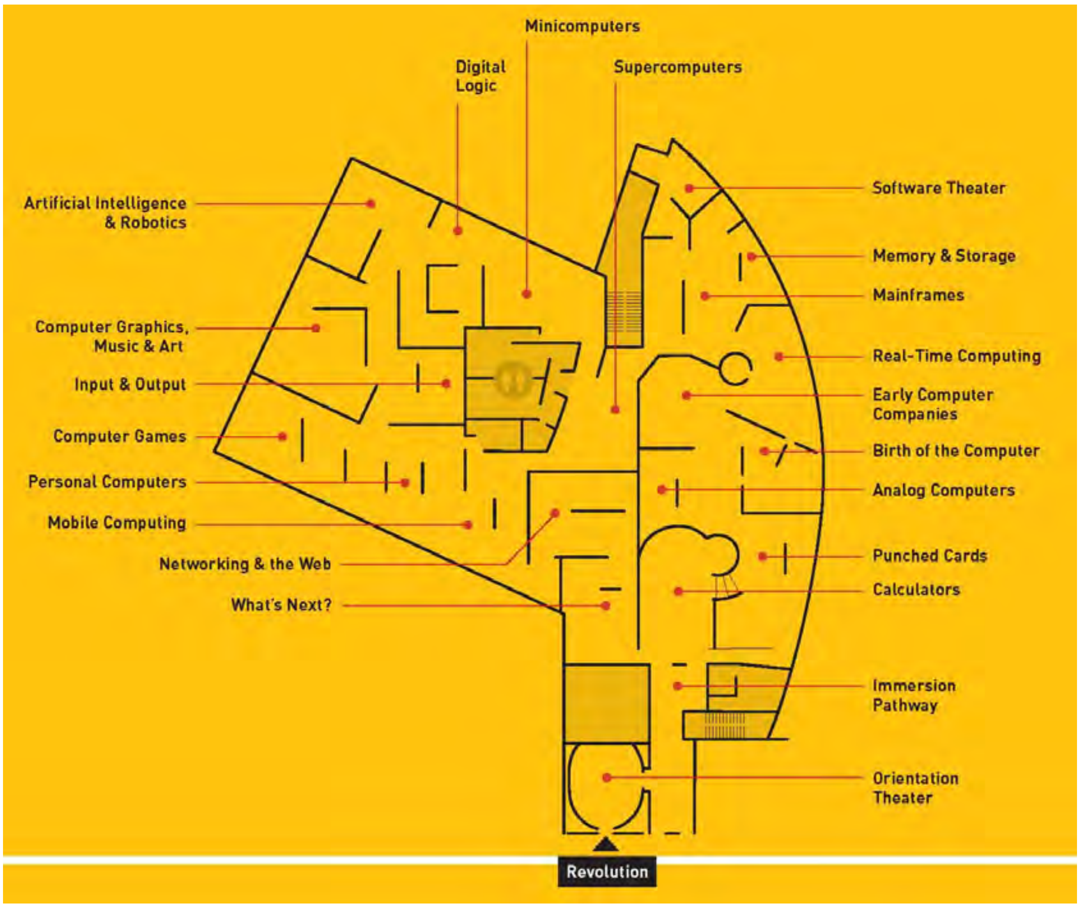

Figure 7 R|evolution: the first 2000 years opened on 10 January 2011. This 25,000 sq. ft. exhibit features 1,200 artifacts, 2,000 photographs, 750 graphic panels with 100,000 words, 5 hours of video, and incorporates 50 oral histories.

The *ARPA IMP* was the seminal computer used for packet switching in the ARPAnet -- the basis of what became the Internet and Worldwide Web (1 ML).

The AI and Robotics Gallery has an assortment of robots, and various computers that led to IBM's *Deep Blue*, which won the world chess championship along with the *Unimate I*, the first industrial robot, SRI's Shakey Mobile Robot, and *Edmund's Berkeley's c1950 Squee* robot to fetch tennis balls. (4 MLs)

Regrettably, I omit that hard to see, hard to describe, essential software from COBOL, FORTRAN, and LISP, various Operating Systems, Bill Gates' BASIC paper tape for the Altair, and on through Visicalc, and the Relational database.

All of these artifacts came as part of The Computer Museum spinout.

Summary

The public opening of the *R|Evolution Exhibit* at the Computer History marked a key achievement in the quest to create a world class, permanent, public institution to collect, exhibit, and understand the artifacts and personal stories of the information age—and to tell these stories to everyone interested. The purpose is permanent preservation, with comprehensive cyber and physical access to all artifacts, exhibits, interviews, lectures, machines, software, etc., as Len Shustek envisioned in 1995 (Shustek, 1995).

Each of the five lucky transitions were based on the fortuitous availability of space and capital to operate the museum at the next level [19]. The decline of computing in New England to supply the technology, causing the inability to sustain a high tech museum for museum goers was the final "lucky" bittersweet catalyst that allowed the museum to move to where the "current" action is, in order to focus on the history of the future!   How CHM evolves in the next decades is TBD—stay connected.

Acknowledgements

Gwen Bell, Jim Gemmell, Vicki Rozycki. Dag Spicer, Oliver Strimpel, and Karen Tucker were all critical by fact checking, reviewing and editing this paper. Len's edits were adopted entirely as its latest reviewer.

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[19] At various times, a tired TCM board was on the verge of closing the institution because sustainability is so tiring to a board as it grows large, diverse, and less interested in, or committed to computing and its preservation when the "going gets tough". Technology museums that evolve to be based on having the latest "gadgets" to please an expectant public are especially difficult to operate over a long time frame because of technology half-life.

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Appendices, After-thoughts, and Overviews

The appendices are a collection of after-thoughts and overviews.

Appendix 1. On creating a survivable museum, for capturing the computing revolution.

"Just don't let it die."

These computing museums are like a high tech startup… people, people, people; people product plan; market, product, people.

People, market, product may have been the history. The TAM (total available market) in Boston for people interested in computing after much of the population has computers that were connected to the Internet, and if became just another interesting alternative "thing" to do on a rainy day.

Boards, Trustees, Overseers, Advisors

"Many hands make light work."

This is unclear. Does output vary with size or decline as more people are responsible?

Three Gs[(Glory, Give-Back, Greed) or (Give, Get, or Get-off)] have been mentioned at the motivating and ruling factors for board and advisory board members. My own belief is that in general, motivation varies inversely with distance to the artifacts and people.

People join boards for various reasons. Most all seem to join based on who's on the board independent of their belief about how they can contribute to an institution. The hierarchy:

1. Direct involvement in the creation: founders, engineers, marketing, sales, etc.;
2. Academicians expert historians
3. industries supporting the creation: bankers aka VCs, PR, Marcom, accounting, legal, head hunters;
4. Users;
5. Community, community leaders, and various people with no other place to go

Board Evolution

With the 1984 opening, Bill Poduska, the founder of Apollo Computer, became the Chairman of a board of 24 that included Erich Bloch, former head of manufacturing at IBM and Director of the National Science Foundation; Syd Fernbach, former director of Livermore National Laboratory; Mitch Kapor, Lotus founder; Koji Kobayashi, NEC Chairman; Arthur Molella, Smithsonian; IBM programming technologist, Jean Sammet; and An Wang, founder of Wang Computer. By 1986, the museum had 23 board members, 12 trustees, 500?? members, and 50?? corporate members.

Financial & Management

"Numbers are hard!" --Barbie

At the root is the financial structure and the ability to fund operations and rationalize its service to a community it serves. In Boston, the number of large gifts by individuals and corporations of over one hundred thousand dollars was very limited, with Digital as its main supporter. Companies and several individuals including Bill Gates, Mitch Kapor, and Russell Noftsker gave very large gifts or grants for the construction of the Walk-Though and AI Galleries.

Appendix 2. Artifact Classification: A "Linnaean-like" Structure is Essential. PMS needs to be it!

From the beginning TCM had the understanding of classifications and taxonomies as reported in the first reports. The big three dimensions were: its structure by functional types or PMS; the Computer Classes as they have continued to emerge since the 1960s; and the hardware technological eras that are in essence marked by logic and memory densities and communication links.

The structural rigidity of PMS was essential lost in the move to CHM. For example, two of the most significant dimensions, Transducers and Links were relegated to a renegade committee who couldn't deal with such details as a taxonomy except in the adoption of The Dublin Core[20]. Transducers became ambiguous I/O devices that lost both low and higher levels e.g. photonic devices and software concepts (e.g. User Interface). The museum chose the easy way out by simply adding generic names for links e.g. undersea telegraph or telephone cable, Ethernet, WiFi, Firewire, instead of using a two or three level classification based on links and link technology e.g. cable, fiber, sonic, optic, and radio and structure i.e. connecting computers or other information processing components, or components within a computer. However, in general, they chose to ignore the fact that links and link protocols e.g. undersea cable, Ethernet, GSM, don't exist thereby ruling out the significance of Shannon whose work is about how much information can be transferred on links of varying sizes and error rates. Thus, similarities and differences of how data is transmitted are completely lost.

A museum ultimately needs to impose a Linnaean structure on all the artifacts along the lines of Classes (PMS Component type), Orders, Genera (or Genus), and Specie and even the lower level varieties that would characterize various models.

[20] The Dublin Core provides about a dozen meta-data attributes for a document or object. The important ones, function, technology, generation require a taxonomic or ontological framework.

Finally, software is not classified in the same system as hardware, but is taken to be ethereal and different. Thus it doesn't exist, can't be traded off with a hardware component, or identified by function. While having a fine software structure is possible it flies against the ACM Taxonomy and keywords, plus the many alternative classifications that attempt to group stuff by kind.

Appendix 3. The Bell Book and Calculator aka Pre-Computer Collections

In 1975, Gwen Bell and I began a proactive collecting program by purchasing a 1903, Six digit, Millionaire calculator, rationalizing that a pre-computing collection would be useful and even necessary for eventual exhibits for a comprehensive museum. Furthermore, while it turned out to be a good personal investment, we could not rationalize buying artifacts for the museum because the museum had no money for investing. Our artifacts were purchased from antiquarian instrument dealers, flea markets, and dealers at London's Bermondsey and Portobello Rd. Markets. When the museum opened in Marlboro there were about 80 books, calculators, and navigational instruments.

By 1986 the Bell pre-computing collection contained about 400 artifacts and books. Artifacts included calculating and navigational instruments, a Boxwood Napier's Bones, a Jacquard loom model and silk weavings, two Enigmas, and slide rules. The artifacts and books from this collection were moved to the TCMCHC. This collection turned out to provide a rather complete base of early artifacts that few museums possessed. Early books included Napier's Rabdologiae and Logarithmorum, and Babbage's book on Manufacturing.

Appendix 4. Going Public: The Computer Museum, Boston (1984 -1999)

Gwen described the museum's state, at the opening on Museum Wharf, in The Computer Museum Report of Fall 1984:

> "In our countdown to opening the Museum, I am pleased to have the opportunity via the report to reflect on the evolution of the Museum. Five years ago, I was charged with the task of creating a "computer museum." The only models at that time were IBM's dismantled history wall done by Charles Eames in the sixties,. the small exhibit of historic machines at the Smithsonian, and the interactive and historic collections at the Science Museum in London. None of these could be collected and brought back. And I felt as though I had been told to "Go fetch a rock." Every time I brought an idea back, the feedback was quick: "That's not the rock," or "How did you ever get that-it's just great."
>
> Two and a half years ago on June 10, 1982. The Computer Museum opened its doors for the first time: we had 50 Founders, 200 members and 3,000 square feet of dedicated exhibit space. Our goals were to develop an international collection, create exciting exhibitions, sponsor educational programs, and attract a worldwide membership. On June 24, 1984 at the end of our Founding period, we will boast 504 individuals and corporate Founders. I am glad to extend special thanks to the individuals listed on the front cover and the corporations listed on the back cover helping to found the Museum.

The Second Opening

On Wednesday. November 14. 1984 at 11:00 a.m., the Museum will formally open its doors a second time to the public. This time we will have 16,000 square feet of exhibitions of both historic computers and state-of-the- art interactive displays: another 8,000 square feet of exhibit space and 4,000 square feet for library/study collections will be developed later. As we approach our opening we can be pleased that we have by for the largest exhibition area devoted to computing and information processing at any museum.

Let me give you a brief tour. Going around the comer, the visitor enters the SAGE computer room, Here the major components of the world's largest and longest lived computer simulate their installed environment.

The visitor can "start" the console and see its banks of lights cycle-up. Beside each component, such as the 30-foot-Iong accumulator, today's equivalent chip (or part of a chip) has been placed for comparison. This arrangement reinforces an awareness of decreasing size and power and increasing programming capabilities.

For the history buff. a year-by-year Timeline from 1950 to 1970 shows the fundamental inventions, the major computers, major software developments and benchmark applications.

The CW Communications "See It Then" theater shows films of operational computers starting in the 1920's and ending in the 1960's with the IBM Stretch. The films are complemented by a 1965 IBM 1401 computer room where the visitor can punch cards and an operating PDP-8, the classic (but now very slow) minicomputer.

The evolution of Seymour Cray's work illustrates a single hardware contributor and his philosophy. The story begins with the NTDS-17 that he built for the Navy at UNIVAC in Minneapolis, which Greg Mellen. who is still at Sperry Univac helped the Museum acquire: after that Cray built the Little Character, his first machine at CDC, presented by Control Data Corporation: then to the 6600, Serial Number 1, presented by Lawrence Livermore Laboratories; and finally to components of a Cray 1 presented by the Cray Corporation. We have two videotapes of Seymour Cray: one from Lawrence Livermore Laboratories and another given to us by Joe Clarke, a former employee of CDC who bought a two inch video tape player at a company sale and found on it a tape of Seymour Cray.

The next gallery focuses on chips and their place in the computer revolution and the process of manufacturing computers. The inside of the "black box" is revealed and an important hidden part of the process is illustrated.

This collection of personal computers goes back to the very first one, the 1962 LINC and extends to the latest models. The ring of live machines, each showing off an aspect of its special input/output. include DECTALK, a touch sensitive screen HP 150 and others.

The final gallery is devoted. to "the computer and the image." Here. the visitor will be able to explore image processing by computer such as evaluation of landsat data, and image creation by computer. such as computer- aided. design. Without much trouble, the visitor could spend two hours in this room experimenting and viewing.

The exhibits are only the tip of the iceberg of our collection of artifacts, working machines, software, documentation, photographs and films. The listing in this report represents one year's accumulation and the collection is rapidly growing.

Restoration Projects.

At Marlboro there was one restoration project—getting the TX-0 c1956 operational. Fortunately, John McKenzie who worked on and attended to it at MIT was able to get the machine operating, and on November 13, 1983 its alumni gathered to watch it run programs that we remembered and to tell stories about how we used it. The TX-0 was returned to the Lincoln Laboratory in Bedford, Mass where it resides and is on display.

The CHM had three very large restorations: IBM 1620, DEC PDP-10 and IBM 1401 complete with disks and tapes.

Appendix 5. On Collecting: When to Accept Artifacts or What to accept?

"We can meet the schedule, stay within budget, or deliver the spec. Pick two!" –Dave Cutler

The nice thing about a museum of modern technology is that the schedule can be indeterminate, as long as the artifacts or creators exist. There is no deadline, and the only constraint is you can't run out of money and die! History usually gets better with age as more is revealed and the risks are an artifact gets discarded or inventors die off before we can record or understand their contributions "in their own words." In the latter case, the history has to be acquired from secondary sources. By not chasing all the creators and contributors, the result is that history risks being solely created by the last ones standing. As more museums exist, then competition exists for the first and perhaps only. Staying within budget is another matter and for a public museum, budget determines the schedule and spec. During all of the phases and places of the museum budget has been the constraint. The Museum has generally chosen to limit the specs and hence maintain collections and provide quality exhibits to a limited audience. The result has been a slow, growing museum that has taken 35 year to be discovered as an "overnight success."

In retrospect, the museum was born at exactly the right time: it was young enough to aggressively collect the one-of or pioneer computers and the first-person story versions from the pioneers. Unlike other technological museums, computing evolved rapidly as Bell's Law describes with a completely new computer class being created every decade *and since 2005, every five years*. Thus the museum was able to be an active collector as artifacts are created including being able to capture breadboards and prototypes prior to them being declared salvage. The only risk is that history will somehow claim that a particular artifact or computer science discovery wasn't captured.

Regrets: We just didn't preserve the museum's history

Lectures—didn't videotape every one

The Computer Museum History is only partial. Detailed views of all the past exhibits do not exist.

Was it worth moving to Boston given that the real gain was the collection?

Enumerate what Boston contributed… trained, books, artifacts

Exhibits and Lecture Series

During the 15 years at the Boston site, a number of exhibits were created by getting a substantial amount of external funding from individuals. Mitch Kapor (Lotus Founder) and the Sloan Foundation gave major grants to fund a large scale walk-through computer. Russell Noftsker and his fellow Symbolics Founders funded the Smart Machines Gallery. In fact, the creation of exhibits and the associated collecting turned out to be a source of funding for the museum.

The museum also created a number of ad hoc, temporary exhibits that included the Byte magazines, fractal images "The Colors of Chaos," and the insightful, ComputerWorld cartoonist, Richard Tennant's characterizations of the computer industry.

The lecture series continued with 50 more lectures by 1986, and a breakfast series was introduced that appealed to the Boston business community. In addition, a vigorous business was created utilizing the museum space in the lobbies and among the artifacts for private and corporate affairs including everything from serious seminars to birthday celebrations.

Appendix. Taxonomiies of Calcualtors and Memories

CLASS CALCULA

ORDER	**FAMILY -complexity**	**GENUS -structure**	**SPECIES**
Analog	single part	drawing instruments	protractor, pen etc.
		fixed rule	proportional rules
	2-3 part	gunter rule	gunter rule
		sector	sectors
		slide rule	straignt, circular, spiral, log-log
		level reference	gunnery level
		integrator	mileage reader
	multiple part	drawing instruments	pantograph
		level reference	quadrant, sextant etc
		integrator	planimeter, etc.
	complex	level reference	auto-pilot
		equation solver	harmonic analyzer etc
			tide predictor, etc
	programmable	diff. analyzer	Bush, Hartree
		analog computer	Genl Precision, etc.
Digital	single register	stone, bead	counting table,

			abacus, soroban, etc
		Pascal wheel	Pascal wheel, strip, keyed wheel
	two register	tab indicator	
		keyed wheels	Burroughs
	3-4 register	stepped wheel	Leibniz, arithmometers
			automatic stepped wheel
		rotary	Baldwin, Odhner, Curta, etc.
		motor-driven wh.	Monroe, Friden etc
		battery electronic	"pocket" calcs.
	complex	tabulator	Hollerith census, Powers-Samas
		equation-solver	ABC machine, pocket calculators,
		relay calculators	Bell Labs I
			difference engines
	programmable	relay calculators	Bell Labs II-IV, Z3-4
		analytic engine	Babbage, Harvard MKs
		tabulator	Hollerith, Powers,etc
		plug-board	ENIAC
		battery electronic pocket	

CLASS MEMORY

ORDER -interface	**FAMILY -technology**	**GENUS -structure of access**	**SPECIES**
Non-mech.	Physical state	Fixed-permanent	stone marks, Napiers
		Fixed-erasable	Quipu, beads, abacus
Writable or Readable	Paper	Fixed	
		Linear	scroll
		Cyclic	rolodex
		Random	book
	Mech. stable	Fixed	switches
		Linear	piano roll
		Cyclic	drum, disk
		Random	card
	Chem. stable	Linear	microfilm
		Random	microfiche, videodisc
	Magnetic	Random	rope
	Electric charge	Random	capacitor
	Electronic	Random	diode, semicon. rom

Writable & Readable	Mech. stable	Fixed	calculator registers
		Random	Zuse memory
	Wave storage	Cyclic	mercury, optical, & magneto-strictive
	Electric charge	Cyclic	Atanasoff drum
		Random	Williams tube, capacitor, MOS
	Magnetic flux	Linear	tape, wire
		Linear-cyclic	datacell
		Cyclic	fixed-head disk, drum
		Cyclic-linear	disk
		Random	core, disk
	Electronic stable Fixed	flip/flop, relays,	
			stepping switches
		Random	semiconductor array, relay array
	Chemically stable Linear	photo store	

Entry way to Marlborough MA Digital Equipment Corp Bldg MR 2

Opening Monday 24 September 1979

Moving a PDP-8 into the museum

Jaimie Parket, first employee

Gardner Hendrie at opening

Gwen Bell, Ken Olsen, and George Michael, LLNL (trustee)

Les Hogan, CEO Fairchild or Motorola, Trustee

STORE


Digital
Computer
Museum


DIGITAL COMPUTER MUSEUM
Annals

Maurvice V Wilkes delivering inaugural lecture

Fred Hertrich, Disk Designer as consultant delivering prototype disk

Redmond and Smith, authors of book on Whirlwind

Mr & Mrs.
Gordon Brown

Mrs. Redmond, Kent Redmond, Tom Smith, Gordon Brown
Mrs. Brown

Jay W. Forrester

Tom
Eggers


Perry Crawford   Gordon Brown

Marcia Harrison   Gordon Bell   Harry Shershow

Ken Olsen

Perry Crawford

Susan
Forrester

Kent Redmond Tom Smith

Michael Templeton   Gwen Bell   Marcy Kenah

Chase Duffy

Marcia Kenah

Gordon Bell

Ken Olsen
Perry Crawford

Molly and Mary Jane Forbes

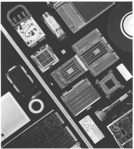
Harvard Historian of Science.
I Bernard Cohen

TI ASC Designer, Harvery Cragon, and Trustee

? and Ed Fredkin

Bernie Gordon and Maurice Wilkes

top 60%
86A



Memories Poster sold in the Museum Store