MAY 2001

CORE 2.2

A PUBLICATION OF THE COMPUTER MUSEUM HISTORY CENTER
WWW.COMPUTERHISTORY.ORG

A TRIBUTE TO MUSEUM FELLOW

TOM KILBURN

A FISCAL YEAR OF CHANGE

At the end of June, the Museum will end another fiscal year. Time has flown as we've grown and changed in so many ways. I hope that each of you have already become strong supporters in every aspect of our growth, including our annual campaign–it's so critical to our operation. And there's still time to help us meet the financial demands of this year's programs!

Let's take a short walk together around the Museum, and see what's been happening. With a goal of becoming operational in 2005, getting the programs, organization, and most importantly, the people in place is essential.

The architectural and exhibit design teams have begun the schematic design phase of our new building. This is a particularly exciting time to be engaged as we seriously think through the relationships of architecture, event space, exhibits, storage, and visitor experience. And speaking of related plans, have you seen some of the "facelift" changes in the Visible Storage Exhibit Area, or the plans for the interim office and storage space we'll be using until the new building opens?

People make the Museum succeed—Board, staff, volunteers, and the public. Please welcome to our Board of Trustees Sally Abel (Fenwick and West LLP) and David Emerson (Cooley Godward LLP). The legal expertise of these two new members is truly welcome in our fast-paced organization and is already being put to good use.

At the staff level, Curator Dag Spicer left in March after five years of service with the Museum. He's taking a well deserved rest before deciding what to do next. His dedication, expertise, and smiling face will be sorely missed, although I feel he will be part of our future in some way. We have focused key recruiting efforts on building a new curatorial staff for the years ahead. Charlie Pfefferkorn—a great resource and long-time volunteer—has been contracted to help during this transition.

In other departments, Camilla Neve joined as a development associate to support the growing expectations of our fundraising team. We also have two NASA interns working on staff: Amy Bodine is finishing her internship as a collections and web services intern, and Jessica Huynh is the new web services intern. For current staff openings, see www.computerhistory.org/jobs.

The number of volunteers has been growing, and they participate in every way imaginable. If you've been by recently, you may have noticed that the great docents we have are much more visible. Ed Thelen does many of our regular public tours on Wednesdays and Fridays, and the entire group has won the hearts of groups like the Stanford Alumni that recently visited. This is just a hint of our future docent program that will be evolving over the next several months.

You can probably tell that we're very proud of where we are at the close of this fiscal year. In addition to the above:

Events—Two exciting events, the Xerox Alto retrospective and DECWORLD 2001, cap off our wonderful spring lecture series. Karen Mathews gives an account on page 11 of current Museum operations and events.

Visible Storage Exhibit Area—The staff and volunteers have worked hard to give the middle bay a new "look and feel." For example, if you haven't seen the new exhibit "Innovation 101," you are in for a treat.

Collections—As word spreads, our collection grows, which emphasizes our need for space and staff to take care of the new items.

Interim plans—In order to grow and operate until the opening of our permanent home, we must accommodate increasing warehouse and people space. We are moving forward with a temporary structure that will allow us to build our operation and manage a dynamic collection process.

This is a particularly important time for the Museum. We are growing in programs, people, and facilities, but we are also vulnerable to the economic downturn and changes that result. We could not have achieved what we have already without the generous support of so many Museum friends. But to grow, we've got to expand and mature in so many ways. Fortunately, your support makes all the difference, and I encourage you to contribute to our annual campaign as generously as you can. You'll hear more about our capital campaign in the future.

Finally, I hope you are enjoying the diverse and important programs that are available. We are on the steep slope of growth to build a new cultural institution that celebrates computing history, and many of you have been part of that rise. Help bring others into the circle of Museum friends.

JOHN C TOOLE
EXECUTIVE DIRECTOR & CEO

CORE 2.2
May 2001
A publication of The Computer Museum History Center

MISSION
TO PRESERVE AND PRESENT FOR POSTERITY THE ARTIFACTS AND STORIES OF THE INFORMATION AGE

VISION
TO EXPLORE THE COMPUTING REVOLUTION AND ITS IMPACT ON THE HUMAN EXPERIENCE

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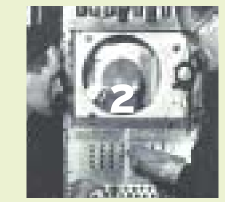
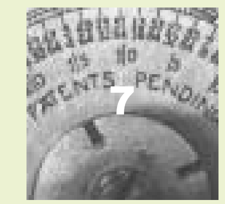
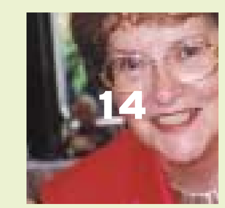
The Museum seeks technical articles from our readers. Article submission guidelines can be located at www.computerhistory.org/core, or contact Editor Karyn Wolfe at core@computerhistory.org.







IN THIS ISSUE

A TRIBUTE TO

TOM KILBURN

1921-2001

BRIAN NAPPER AND HILARY KAHN

Tom Kilburn TCMHC photo #102621798

Tom Kilburn, who died on January 17, 2001 at the age of 79, spent his lifetime at the forefront of the computing revolution that he himself helped to start. By co-inventing the first effective electronic storage (memory), and then leading the design and development of five major computer systems, he kept England's University of Manchester at the center of the "second industrial revolution" for a 25-year period.

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The UK's University of Manchester, which Tom Kilburn helped keep at the center of the computing revolution for 25 years

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Freddie Williams led the effort to use cathode ray tubes (CRTs) in the 40s to solve the need for memory.

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Geoff Tootill in front of the rebuilt Baby machine at the Museum of Science and Industry in Manchester

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Freddie Williams (right) and Tom Kilburn in front of the Mark 1 console in 1949

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While working for Williams, Kilburn and Tootill built the Baby to demonstrate the viability of CRTs for storage (memory). It worked successfully for the first time on June 21, 1948, becoming the world's first functioning stored program electronic computer.

Kilburn was born in 1921 and educated in Dewsbury, Yorkshire, England. In 1940 he went to Cambridge University to read Mathematics. Upon graduating with first-class honors in 1942, he chose to enlist in the military for unspecified key war work. He was sent on a six-week intensive electronics course and then to the Telecommunications Research Establishment (TRE), where he joined a group led by F. C. (Freddie) Williams. This group concentrated on troubleshooting problems in radar and other electronic circuitry for groups both inside and outside TRE.

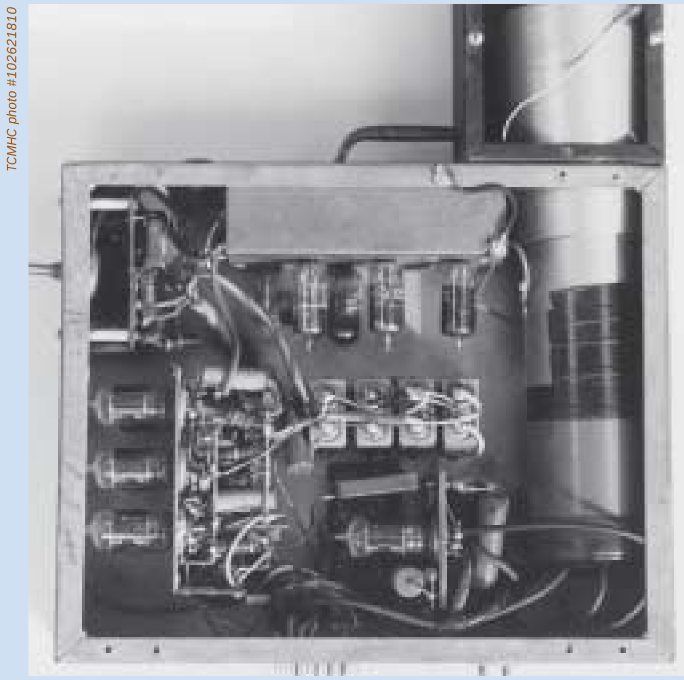
By the end of the war, Williams had an international reputation and Kilburn had become an accomplished electronics engineer. In the summer of 1946, having seen ENIAC, Williams became aware that the lack of a suitable storage mechanism was holding up the development of electronic computers, and decided to investigate the possibility of using cathode ray tubes (CRTs) to solve the problem. Work elsewhere in the world at that time was investigating the use of mercury delay lines to solve the storage problem, and RCA was working on yet another device, the Selectron tube, for the US flagship IAS machine being developed under John von Neumann.

Williams returned to the University of Manchester in December 1946 as Professor of Electro-technics (soon renamed Electrical Engineering). He chose Kilburn to come with him on secondment (loan) from TRE to work full time on the CRT project. Kilburn spent 1947 tackling the problem and building prototypes to prove the viability of CRT storage, ending up with a 2048 bit store on a standard radar CRT. In December 1947, he wrote a definitive report on the mechanism. However, he knew that the most effective proof of the mechanism would be to use CRTs in a computer. So, with the help of G. C. (Geoff) Tootill, he designed and built a small computer incorporating the CRT store. This computer—the Baby—had a store size of 32 words, consisted of some 650 valves (vacuum tubes), was 16 feet long, and weighed half a ton. It worked successfully for the first time on June 21, 1948 and so became the world's first functioning stored program electronic computer.

A program was loaded into the Baby's memory using hand keys and then the stored program was executed. This program, which calculated the highest factor of a number—and which Kilburn admitted was probably the only complete program he ever wrote—was an early example of computer software. The CRT storage system pioneered by Kilburn and Williams was used around the world by computer systems as an alternative to mercury delay line stores until the mid 1950s, when both were supplanted by core memory. The Selectron design of RCA could not be made to work, and the IAS machine and its clones resorted to "Williams Tube" storage, as it became known, until the JOHNNIAC was able to use a much-modified design in 1953.


TCMHC photo #102621797 (P1746)

The Williams Tube cathode ray tube memory system pioneered by Kilburn and Williams was used around the world by computer systems as an alternative to mercury delay line stores until the mid 1950s, when both were supplanted by core memory.


TCMHC photo #102621810

Inside the Williams Tube

At the University of Manchester, Tom Kilburn led further developments based on the Baby. By October 1949, a full-sized machine (the Manchester Mark 1) was operating. This machine was the prototype of the Ferranti Mark 1 that Ferranti Ltd. released in February 1951 as the world's first commercial computer. The machine had a fast random access magnetic drum and instruction modification registers added to it. So by 1949, the Manchester team had effectively added two more "primitives" [basic capabilities] to the five of the classic von Neumann computer model: the two-level store (memory) and the index register. The two-level store used CRTs as the main store (nowadays RAM) and the drum as the secondary store (nowadays the hard disc). In other early machines that did not have index registers, every instruction that referred to an address not known before the program was loaded–for example to access an array element–had to be physically altered in store each time before it was obeyed.


© Computer Science Department, University of Manchester. Used by permission.

Tom Kilburn (right) at the console of the Ferranti Mark 1

In 1951 Kilburn took over the active management of the computer group within Williams' department at the University of Manchester. Work started on two new pioneering computers, the Transistor Computer (that first worked in 1953) to experiment with using transistors instead of vacuum tubes, and MEG (1954), which provided floating-point arithmetic. These were amongst the very earliest, if not the earliest, machines of their class. The more experimental Transistor Computer was manufactured by Metropolitan Vickers as the MV950 (first delivered 1956), and MEG, now with core memory, was manufactured as the Ferranti Mercury (1957). Nineteen Mercurys were sold, providing a major computing resource for the UK scientific community. Meanwhile the software wing of the computer group set up a large computing service on the department's Ferranti Mark 1. This service was used by many other universities, industrial firms, and government organizations. R.A. (Tony) Brooker ably led the software side starting in 1951 and in 1954 produced his first high-level language, the Mark 1 Autocode.


TCMHC photo #102621827

The Ferranti Mercury (MEG)

TONY BROOKER'S MARK 1 AUTOCODE

A suitable instruction sequence for evaluating the sum of squares of v1, v2, . . . v100.

```
     n1 = 1
     v101 = 0
2    v102 = vn1 x vn1
     v101 = v101 + v102
     n1 = n1 + 1
j2,  100 >= n1
```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An emotional moment on the day the Manchester Atlas was finally switched off. Tom Kilburn is seated at the machine and (we believe) the people behind him are singing Auld Lang Syne!

In 1956 Tom Kilburn and his team started to look at the design of a machine that would be far larger and, with transistors and core memory now available, much faster. It was called MUSE (for microSEcond) and aimed at a speed of 1 million instructions per second. This was 1,000 times faster than the Mark 1 that was still running the computer service. The innovation required to achieve this speed, and then to deal effectively with the implications of it, was massive. This included a long list of new features that made the jump from the basic designs of the early 1950s to the sophisticated mainframes of the middle 1960s, including the key advance of multiprogramming. Although two similar projects in the US with a similar timescale (LARC and the IBM STRETCH) were proceeding, little practical help was to be gained from their progress. And of course the massive improvement in power necessitated an explosion in software requirements as well—a large operating system and (given the number of languages appearing by the early sixties) a large coordinated compiler suite.

Ferranti formally joined the MUSE project in 1959 and the machine was renamed Atlas. The first Atlas started working (at the University) in late 1962. During the 1960s Atlas was the jewel of the UK and European computer industries, and was for a short time arguably the most powerful machine in the world, and (for a longer time) the most sophisticated. Perhaps the most important features of Atlas that were unique to Manchester were virtual memory and Brooker's Compiler Compiler.

Atlas innovations included:

- interrupts, pipelining, interleaved storage, autonomous transfers
- extracodes, read-only memory (for key supervisor routines and extracodes)
- virtual memory (one-level store, paging, associative store)
- virtual computer for user program, (pseudo) parallel processes within a program
- large operating system (distributed over ROM, RAM, drums, tape)
- multiprogramming, spooling, job scheduling, simple file store
- interface between user, computing service and operating system (O/S)
- provision of a homogeneous set of compilers (using the Compiler Compiler), and their integration with the O/S
- new languages Atlas Autocode and the Compiler Compiler

Photo by John Francis 1969, used by permission

This Atlas, "Titan" was situated in the mathematical laboratory and was the main Cambridge University computer during the late 60s.

The final machine built under Kilburn's active leadership was MU5 (1972). The main focus of MU5 was to provide an architecture geared to the efficient coding and running of programs written in high-level languages. Unlike all the previous Manchester machines, MU5 was not turned directly into a manufactured computer, but the architecture of the successful ICL 2900 series incorporated many features developed for MU5.

Obviously Tom Kilburn did not do all this work on his own! In the later years the university-based team that he led with focus and vision contributed greatly. Ferranti personnel also contributed in important ways to the production of the machines. In the early years Kilburn leaned a lot on Williams' experience, enterprise, and leadership, but from the spring of 1947 and on, Kilburn himself provided the main technical and innovative driving force and, together with Tootill, physically built the CRT store and the Baby. He also did the bulk of the design of the Manchester Mark 1. By 1951, Kilburn was actively leading the computer group and continued to maintain a firm grip on the details of central computer design for the next 20 years. He was much less active on the software side, but he still had to manage both the software development and the continuous development of the computer service, which made a significant contribution to the funding of new research, as indeed did the 80 or so patents to which he was party.

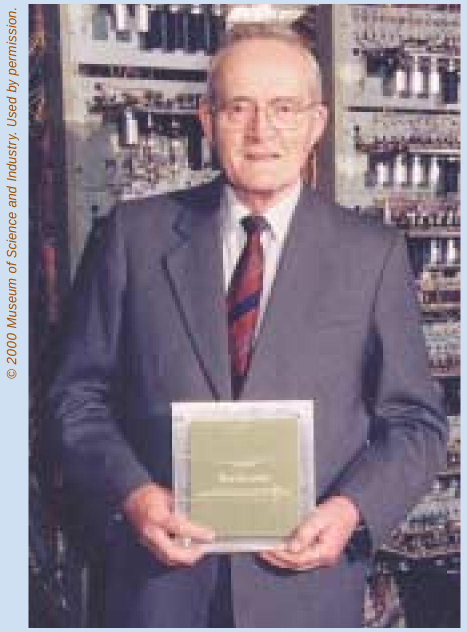
In 1964 Kilburn made a major contribution to the academic life of the UK by founding the first Computer Science department, sizeable from the start, and distinguished from other departments that followed by its high hardware content.

In general, Kilburn's computers were great technical rather than commercial successes. Like STRETCH—of which only a dozen systems were sold—Kilburn's contributions to ideas and techniques advanced the computer industry toward more commercially successful machines. Tom was quite happy about this. He was a modest man and a true gentleman, for whom technical achievement meant far more than financial gain. He was, however, a very firm believer in his own work, and aware of the relevance of money to help fund further research. Importantly, he was also aware of the value of his contributions to the British economy by fending off US dominance in the UK computer industry.

Kilburn was appointed professor of computer engineering in 1960 and in 1964 became professor of computer science. He was elected a Fellow of the Royal Society (FRS) in 1965 and appointed as a Commander of the British Empire (CBE) in 1973. Honors from around the world recognized his pioneering work. These included the first ever John Player Award of the BCS (1973), the Computer Pioneer Award from the IEEE (1982), and the Eckert-Mauchly award from ACM-IEEE (1984).

Tom Kilburn started a quiet retirement in 1981, but in 1998 was persuaded to play a major role in the celebration of the 50th anniversary of the birth of the Baby. This included advising the British Computer Society (BCS) Computer Conservation Society on the building of a working replica of the Baby, now installed in the Museum of Science and Industry in Manchester. His final honor was to be made a Fellow of The Computer Museum History Center and his last professional act, in November 2000, the week before going into hospital, was recording an acceptance speech in front of the working replica.

Tom Kilburn is survived by a son and a daughter. ■



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Tom Kilburn accepting the award designating him a Fellow of The Computer Museum History Center in November 2000

Dr Brian Napper was a lecturer in the Department of Computer Science, University of Manchester for over 30 years. His research interests were in the area of compiler technology, including in particular, the Revised Compiler-Compiler. After retiring in 1997, he took over the development of the web site http://www.computer50.org, devoted to the history of early computer development at Manchester. His e-mail address is brian.napper@cs.man.ac.uk.

Professor Hilary Kahn has also been on the academic staff of the Department of Computer Science, University of Manchester for over 30 years. Her research interests include the application of modeling in engineering and in large system integration, and the use of advanced software engineering techniques to support hardware and system design. She planned the 50th Anniversary celebrations that took place in June 1998 to commemorate the first successful operation of the Baby machine, and acts as curator for the historical collection held in the Department. Her e-mail address is hilary.kahn@cs.man.ac.uk.

FROM THE PHOTO COLLECTION: CAPTURING HISTORY

CHRIS GARCIA

To photograph truthfully and effectively is to see beneath the surfaces and record the qualities of nature and humanity that live or are latent in all things.

-Ansel Adams

As Ansel Adams suggested, photographs are unique tools. Photos capture moments in time, unusual perspectives, human reactions, as well as facts and details. They not only explore the subject, but also portray context. Because of this, the Museum actively collects and uses photographs in fulfilling its mission of preserving and presenting the artifacts and stories of the information age.

The 10 photos shown here are drawn from the Museum's collection of over 5,000 images. They illustrate the complexity of computing history and show how an object and its context can be appreciated through different lenses. We hope you will find these photos interesting and informative.

Individuals and companies, as well as professional and amateur photographers, have donated much of the material in the archive. This variety of sources and reasons for photographing brings to mind another of Adams' observations that "there are always two people in every picture: the photographer and the viewer." Why a photo was taken can often be as revealing as what the photo shows and how it was taken. Thus, the images in our archive not only document the content of the information age, they also document the cultural assumptions, aspirations, and motives of those who have been watching it and remarking upon it. Even today, our reactions to these photos reveal the assumptions that we make about the past.

If you have photos that document computing history, please contact media@computerhistory.org or call me, Chris Garcia, at +1 650 604 2572. I would be delighted to speak with you about making a donation of your personal photos to our permanent photographic archive.

Exploring the details of artifacts communicates a better understanding of items. This image of a late 19th century circular slide rule gives an excellent view of the merits and failings of contemporary slide rules. The slide shown is designed to be used for geometric calculations, and from this close-up view, we can see the numbers clearly, but users at the time would have had trouble making accurate calculations because the numbers were uncomfortably close and difficult to distinguish.

Gilson Circular Slide Rule (c. 1900),

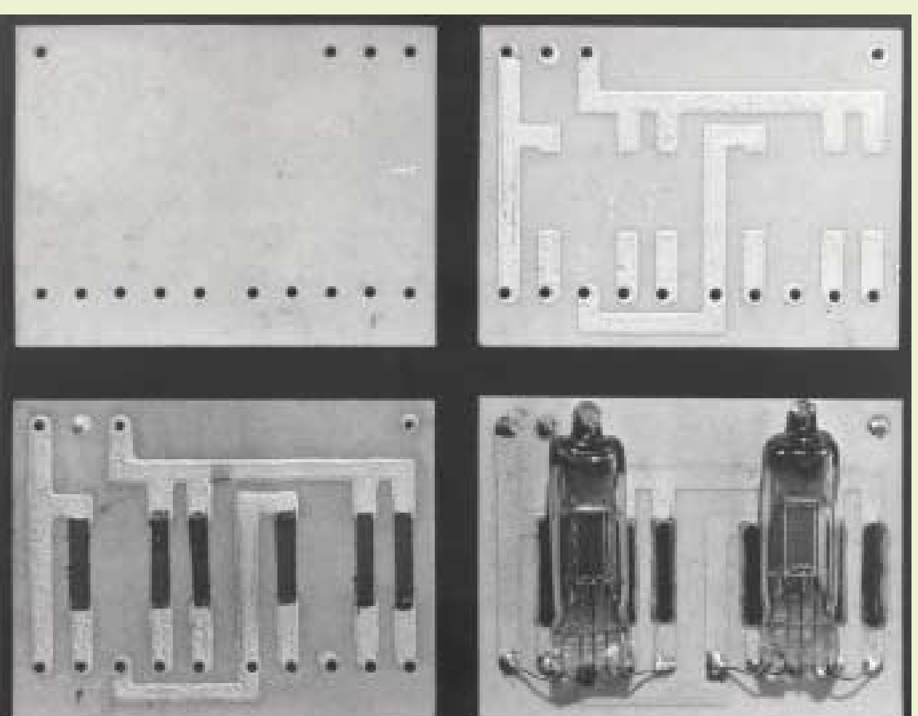
photo by D. Bromfield, TCMHC photo #102624000 (P4455)

Museums often excel at **recreating atmospheres that existed in earlier times** for exhibits. Here, we see an insurance office at the turn of the 20th century. On the right, Walter Wright, the first actuary in New England, uses the Arithmeter, a cylindrical slide rule employed frequently by the insurance industry to compute life expectancy. The second gentleman appears to be working with a book of tables, and we can also see an early typewriter as well as a planimeter, used for measuring distances on maps, on the back wall.

Insurance Office (c. 1890),
TCMHC photo #102621823 (P4445)

Although few people have the privilege of **being present when history is made**, photographers have recorded moments such as the completion of the trans-continental railroad, the Hindenburg explosion, or outstanding portraiture such as produced by master photographer Yousf Karsh. This photo shows the UNIVAC 1 computer predicting that Eisenhower would win the 1952 presidential election, and portrays subtle clues to the atmosphere of the moment. A young Walter Cronkite examines a printout by UNIVAC 1 while J. Presper Eckert interprets the results. This photo captures a major milestone in the shifting public perception of computers. For a few years before IBM became synonymous with computers, UNIVAC was a generic term for a computer, just as Kleenex is for tissue or Band-Aid for a wound dressing.

UNIVAC 1 predicts Eisenhower Election Victory (1952), *TCMHC photo #102621909 (P2000)*

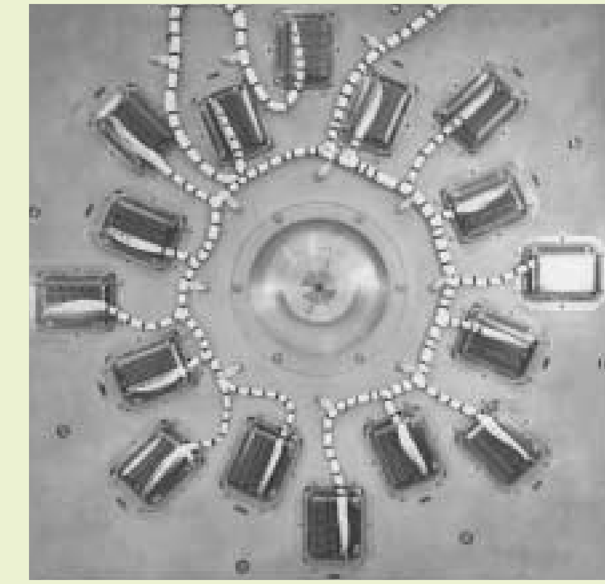


Photos can help to **document manufacturing processes**. This photo demonstrates the four successive steps in making a printed circuit board during the1950s: cutting, firing, and shrinking the boards; applying circuit wiring; adding resistors; and finally, completing the package by applying the miniature tubes. Taken by the National Bureau of Standards, this photo gives us a visual account of the techniques used in this historical process.

Making a printed circuit element (c. 1950s),
National Bureau of Standards
TCMHC photo #102622814 (P1893)

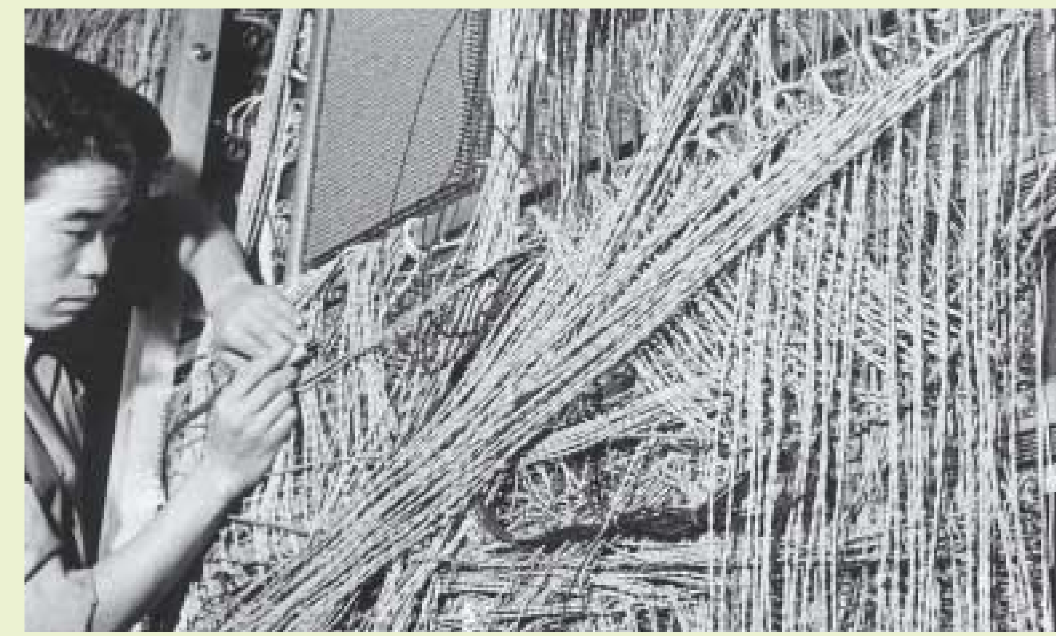
Capturing the beauty of historic artifacts has been a favorite activity of photographers. For instance, renowned New York City fashion photographer Todd Eberle created an XX-page photo art essay for WIRED magazine drawing primarily from items in the Museum collection. In this picture, an unknown photographer chose the arrangement of the wiring connecting to heads on the drum memory unit of the Librascope General Precision Model 30 (LGP-30) as a point of focus because of its aesthetic qualities. The machine, often seen in early years at universities and smaller companies, used a magnetic drum with a capacity of 4096 thirty-two-bit words.

Librascope General Precision Model 30 (LGP-30)
Drum Memory Unit (c. 1960)
TCMHC photo #102621820 (P1631)



The people and the tasks they performed are windows to the inside stories of what it meant to live and work in the technological past. The ETL Mark IV-A was Japan's first transistorized computer and here we see a young man wiring the backplane by hand, a laborious task required for most early machines. Note the tunnel diode memory (left) and the plated-wire memory (upper right) as well as the miles of wiring.

Backplane wiring of the ETL Mark IV-A (1959),
TCMHC photo #102623913 (P1195)



Photographs help us to **remember machines that no longer physically exist**. This photo of an artist's rendering of the ERA 1103A, an early commercially successful scientific computer, is a good record of the size and scope of the system. Images of complete systems such as this were used by companies in deciding which systems to purchase and now for exhibit design and by prop makers as a way to produce good replicas for film and television.

Remington Rand Engineering Research Associates 1103A (1954)
© The Charles Babbage Institute, Used by Permission

Recording institutional history is important. Many institutions were critical to the development of computer technology, and the Museum itself is also an institution whose history needs to be recorded. Here is a photo of a Museum anniversary dinner that includes key developers of critical technology who were also contributors to the creation and growth of the Museum. The conversation includes DEC founder and CEO Ken Olsen (center), who, along with Robert Everett, helped ensure the Museum's acquisition of MIT's Whirlwind; Gwen Bell (left), founding president of the Museum; and George Michael (right), a physicist at Lawrence Livermore National Labs dating back to the days of the UNIVAC I. George has helped the Museum collect several supercomputers and also served on the Museum board for several years.

The Computer Museum Anniversary Dinner conversation between Ken Olsen, Gwen Bell, and George Michael (May 11, 1983)
photo by Carolyn Sweeney, © 1983 TCMHC photo #102621821 (P5010)

Depictions of people using computers are less abundant than photos of the machines themselves. The language BASIC (Beginners All-Purpose Symbolic Instruction Code) was developed as a way to allow Dartmouth students to use the GE 235 based time-sharing system. The BASIC language proved to be easy enough to allow elementary school students the opportunity to learn it, like the one shown here struggling with his program. BASIC proved a versatile language, migrating from mainframes to the PDP-11 based time-sharing systems to early personal computers.

Student using Teletype to code in BASIC (c. 1970),
TCMHC photo #102627494 (P1036)

Photos can **demonstrate various technologies that developed concurrently with computing**. For instance, many devices were developed to allow users to communicate with computers. This Computek graphics tablet allowed a user to use a stylus to draw pictures that were presented on a CRT display. The technology allowed for the development of new applications in medicine and the arts.

Computek Graphics Tablet (1968),
TCMHC photo #102627488 (P4522)

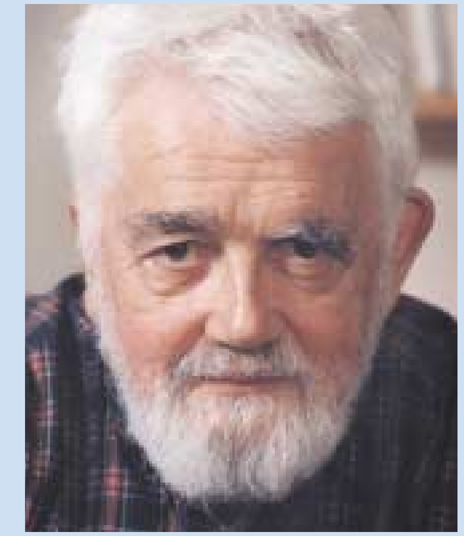
Chris Garcia is Historical Collections Coordinator at The Computer Museum History Center

REPORT ON MUSEUM ACTIVITIES

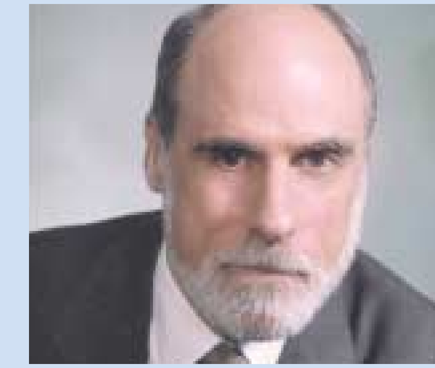
KAREN MATHEWS

Karen Mathews is Executive Vice President at The Computer Museum History Center

The Computer Museum History Center has begun taking dramatic steps forward to ensure the success of our long-range plan to open a landmark museum facility by the year 2005. We are supporting an increased level of outreach and activity with new staff; we are creating more events (lectures and other celebrations); and we are developing informational materials to tell our changing story in an effective and meaningful way–from publications to exhibits and even building design. Here are some specific activities and happenings since the last issue of CORE. I hope you can see how much progress we are making and why we are very excited.



Museum Fellow John McCarthy reminisced about the origins of artificial intelligence in a lecture on March 8.



Museum Fellow Vint Cerf discussed the past and future Internet in a lecture on April 18.

Len Shustek, John Toole, Vint Cerf, Dave House, and Karen Mathews (left to right) after Cerf's lecture at a reception in the Visible Storage Exhibit Area

The Xerox Alto will be the subject of a lecture by Butler Lampson and Chuck Thacker on June 4.

LECTURES PRESENT THE INVENTORS' PERSPECTIVES ON IMPORTANT INNOVATIONS

John McCarthy, Museum Fellow and Professor Emeritus, Stanford University, entertained about 180 people on March 8, 2001 with the "Origins of Artificial Intelligence," a personal retrospective from a founder of the field. McCarthy told the story of how a proposal—by Marvin Minsky, Nathaniel Rochester, Claude Shannon, and John McCarthy—was made for a Dartmouth working group on artificial intelligence to be held in the summer of 1956. It was hoped that the workshop would bring in new ideas and make substantial progress on the AI problem. The proposal to the Rockefeller Foundation, available as http://www.formal.stanford.edu/jmc/history/dartmouth.html, was apparently the first appearance of the phrase "artificial intelligence."

On April 18, Museum Fellow and Internet pioneer Vint Cerf lectured to an audience of over 300 people about "The Internet: 21st Century Tidal Wave." Cerf presented fascinating insights into the Internet's current scale and growth rates, new applications that the Internet is being adapted to support, the appearance of Internet-enabled appliances, and the need for a new version of Internet Protocol to allow the Net to grow well beyond its current size. He also outlined the Interplanetary Internet effort now underway at the Jet Propulsion Laboratory in Pasadena, California.

Our next lecture presentation, "Xerox Alto: A Personal Retrospective," by two of the Alto designers, Butler Lampson and Chuck Thacker, takes place at Moffett Field on June 4 at 6:00 PM. The revolutionary Xerox Alto was an important attempt in the early 1970s to create a "personal-sized" device that was powerful enough to handle serious applications. Further details can be found on our website.

As always, Museum lectures are captured on videotape for the permanent archives, and we are moving to make transcripts and videotape copies of these lectures available to those who can't attend in person. In order to create videos for outside distribution, the Museum seeks a sponsor/partner for the post-production process. If you can help either with services or with sponsorship, please write to me at mathews@computerhistory.org or call +1 650 604 2568.

REPORT ON MUSEUM ACTIVITIES

CONTINUED

APPRECIATION FOR OUR SUPPORTERS

Ike Nassi and Ronee Nassi invited Core Supporters (annual supporters at the $1,000 level and higher) into their home for a special party on April 22. Everyone enjoyed hearing inside stories about the Museum's progress, including updates on the selection process for the architect being chosen to design the Museum's new building and preliminary information on plans for the Museum's new identity.

As our fiscal year draws to a close, the Development team is working day and night in an effort to reach our goals for the Annual Fund—the support that makes our innovative programs possible. Although donations to the Annual Fund are higher than last year, we also have a much more challenging goal. A fiscal year-end campaign is now underway to raise the needed funds that are so important to preserve our past, celebrate our present, and plan for the future. Please know that we treasure your participation and support—we are building this Museum together.

Michael Plitkins recently donated the Vixen Osborne and many other items from his personal collection to TCMHC.

COLLECTION CONTINUES TO GROW

Recent donations to the collection include an Encore Multimax and a Cray Y-MP EL (1992) from the Naval Postgraduate school; an 8080-based Homebrew PC (1980), from Robert Belleville; and the personal collection of Michael Plitkins of Tellme, which includes an IBM Tube Logic Trainer, early Apple products (such as a Lisa 1 prototype and the GLM or "Great Little Machine"), a Pixar Image Computer, a Symbolics machine, an Osborne Vixen, various English 8-bit micros, two Mindset computers, a Canon cat and many more items.

When asked how he began collecting, Michael replied, "I started collecting when I was a kid and didn't know it. I was using Apple and Commodore machines, and pretty much anything else I could get my hands on, and decided that there was a lot of really neat equipment out there with some very unique designs. Many years later I discovered that people were just relegating much of this old technology to trash heaps and that seemed wrong. So I started buying equipment when interesting things became available." Michael got most things working whenever he could, but eventually ran out of space and time. "It all comes down to preservation and passing along old knowledge," he said. "Acorn machines, Transputers... many people have never even heard of these wonderful things, and they deserve to be preserved so people can see how they worked."

Visit the Visible Storage Exhibit Area soon to see some of these new acquisitions on display!

VOLUNTEERS AND STAFF TRANSFORM MUSEUM EXHIBIT SPACE

It took an amazing amount of focus and energy over the course of five Saturday work parties, but volunteers and staff have succeeded in replacing the ceiling tile throughout the entire Visible Storage Exhibit Area—no small feat.

In addition, a large portion of the PC collection on display has now been placed on shelves, and plans are underway to significantly upgrade the exhibits in the rest of the "middle bay."

These projects are just some of several site improvements planned to enhance the Museum's main exhibit space.

Progress is visible in the Museum's second warehouse building also, with major consolidation, racking and document processing improvements in recent weeks.

Everyone here is excited to see these changes in the main buildings housing our collections especially in the areas where tours and most Museum receptions take place. It's thrilling to work together with you, our volunteers, to accomplish so much together.

NEW EXHIBITS MAKING GREAT STRIDES

One of the behind-the-scenes committees working toward the Museum's future world-class building and exhibit space is the Exhibit Committee, headed by Trustee Gardner Hendrie. Calling upon the talents of volunteers, trustees and staff, this committee has researched, debated, and explored many ideas on how best to portray aspects of computing history. Discussions have centered around the inventors' stories, personal computers, networking, software, processing technology, storage and super-computing, as well as analyses of the effects of computers on society, the industry's grand failures, and more. The work of this committee is essential to the Museum's architecture and exhibit design firms as we go through the new building design process.

MUSEUM COLLABORATES WITH INTEL'S SCIENCE & ENGINEERING FAIR

Each year, Intel Corporation sponsors a science fair to honor the achievements of secondary students from around the world. More than 1,200 students from over 40 countries participate in the International Science and Engineering Fair (ISEF). This year, Intel ISEF took place at San Jose's Convention Center from May 6-11, and featured a special lobby exhibit entitled "Innovation 101," developed in collaboration with The Computer Museum History Center. The exhibit highlighted Silicon Valley computing industry pioneers, and the Museum provided photographs of the innovators and artifacts that demonstrate their accomplishments. Staff members Kirsten Tashev, Dag Spicer, Chris Garcia, and Eleanor Dickman coordinated the content research, acquisition of display items, and text development for the multi-dimensional exhibit panels. After ISEF, "Innovation 101" will be relocated to Museum's Visible Storage Exhibit Area. In addition to the pleasure of productive collaboration, the experience was a good exercise for Museum staff as the process of exhibit development is explored and prototyped. ■

COME TO DECWORLD 2001!

WHAT MADE DIGITAL GREAT

Saturday, June 16, 2001

9:30am - 10:00pm

DAY
The Computer Museum
History Center
Mountain View, California, USA

EVENING
Santa Clara Marriott
Santa Clara, California, USA

$125 per person
(to cover lunch, dinner, and snacks)

Space is limited and reservations are required.

For conference information and to register, contact:

DECWORLD 2001
The Computer Museum History Center
Building T12-A
Moffett Field, CA 94035, USA
+1 650 604 2579
decworld@computerhistory.org
www.computerhistory.org/decworld

The purposes of this special one-day conference are:

1) to have fun

2) to bring together people who took part in the rise of Digital Equipment Corporation in order to hear and contribute stories that will become part of the Museum's permanent archive of the history of computing, and

3) to share Digital's greatness with non-Digital people who would like to understand the unique social phenomenon that was Digital Equipment Corporation.

90-minute audience-interactive panels will cover three "eras:" from start-up, to product lines, to Fortune 1000 presence and taking on IBM. Leading the panel sessions will be Digital alumni with Gordon Bell, Len Bosack, Ed Kramer, Jack Smith, Richie Lary, Grant Saviers, Julius Marcus, Bob Supnik, and YOU (see the website for an updated list of panelists).

Memorabilia contributed by attendees will be on display, and roving recorders will document stories for Museum archives. A reception will be held in the Museum's exhibit area where many DEC artifacts will be on display among hundreds of other computing artifacts. An evening banquet and keynote with Ed Schein and Win Hindle will wrap up the event.

INTERNET HISTORY BUFF: JAKE FEINLER

ELEANOR DICKMAN

Jake was convinced of the importance of preserving the history of the Internet and salvaged anything that could describe how the Internet had evolved. In one case, she remembers literally scooping a huge pile of "trash" off the floor at midnight to keep the janitors from hauling it away.

An avowed Internet enthusiast and early participant, Elizabeth "Jake" Feinler came to The Computer Museum History Center (TCMHC) with two garages full of Internet documents collected over the years and encouraged Founding President Gwen Bell and Curator Dag Spicer to expand the Museum's horizons to include Internet history. Then she volunteered to help develop a system for organizing the Museum's document collection and has been donating her time ever since!

Jake tells her story with a wicked sense of humor. Take, for example, how she got her nickname: "When I was born, double names were popular. My real name is Elizabeth Jocelyn Feinler, and my family was going to call me Betty Jo to match my sister's name, Mary Lou. Only two at the time, my sister's version of Betty Jo sounded like *Baby Jake*. I always say, *Thank goodness they dropped the 'Baby.'*"

A West Virginia native with an academic background in biochemistry (an undergraduate degree from West Liberty State College, and graduate study at Purdue University), Jake has honed her skills as an information scientist on a variety of projects over the years. Early on at Chemical Abstracts Service in Columbus, Ohio, she served as assistant editor on one of the biggest information projects in the world at the time: indexing the world's chemical compounds back almost 100 years. Then she came to California where she headed up the Information Research Department at SRI International. "There were no big computerized search services at that time, so one had to search the big abstract services for information, and run down the articles the hard way." She assisted with such projects as the Handbook of Psychopharmacology and the Chemical Process Economics Handbook. Once, she even "helped save some baby walruses by finding the composition of walrus milk!"

Jake was working on a large handbook project for the NASA Skylabs program when she decided she needed computer power to do the job. "It was then," she recalls, "that I discovered a group of people (mostly with beards and wild hair, wearing Birkenstocks, and looking like unmade beds) up on the second floor of SRI, totally engrossed in staring at television sets and rolling little devices around on a table." This was Douglas Engelbart's Augmentation Research Center (ARC) group, and the "little device" was his invention, the mouse.

Jake joined ARC in 1972, and in 1973 became principal investigator for the Network Information Center under contract to the Defense Advanced Research Projects Agency (DARPA), and the Defense Communications Agency (DCA). Her group managed the Internet Naming Registry, and was responsible for coming up with the current Internet host-naming scheme of dot com, dot org, dot edu, and dot gov. Jake then went on to become center director for the Network Information Systems Center at SRI. After she left SRI, in 1989, she worked as a network requirements manager and helped develop guidelines for managing the NASA web for NASA Ames Research Center.

Over the years, Jake was convinced of the importance of preserving the history of the Internet and salvaged anything that could describe how the Internet had evolved. In one case, she remembers literally scooping a huge pile of "trash" off the floor at midnight to keep the janitors from hauling it away. To Jake, "the evolution of the Internet and of computers are intertwined and cannot be separated, and the story of how they both evolved is one well worth preserving." While at NASA, she learned that a computer history museum was being established, and was delighted to find in TCMHC a "match" for all the material she had collected.

Now a volunteer and a member of the TCMHC Volunteer Steering Committee, Jake considers the Museum to be similar to a Silicon Valley start-up. She likes being involved with the "exciting challenges of any start-up, and it is fun to be included in the excitement and enthusiasm of the staff, board, and donors as they try to pull off this gigantic undertaking." She also "enjoys the social aspects of helping to host events, meeting old friends, and hearing computer giants tell tales of how it was. And, of course, the camaraderie with the other volunteers and staff."

Jake feels that The Computer Museum History Center has an important educational and cultural contribution to make. She remembers reading many years ago the book, The Soul of a New Machine, and being thrilled by the Who, What, Where, When, and Why of it. She says, "The Computer Museum History Center will preserve the core of Silicon Valley history and will thrill countless 'newbies' with the story of computers and the Internet and their impact on society."

Even though she insists she is "a perennial beginner at most hobbies," Jake pursues a variety of interests in addition to volunteering at the Museum. She says, "I dabble at watercolors (badly), help a friend write books on Celtic quilting (I've never made a quilt), and collect pincushions" (a collection her friends started for her when she said she was tired of sticking pins into a tomato.) She recently adopted a Siberian Husky who likes to retreat with her to her cabin in the woods. She's an opera "ring head" about to experience her fourth full production of Wagner's Der Ring des Nibelungen when the new production opens in Seattle. She likes nature travel to places like Australia and Antarctica, and her ultimate goal is to "free my right brain before it atrophies." Meanwhile, The Computer Museum History Center is delighted to be the beneficiary of Jake's love of information about the Internet and the creativity she brings to her work at the Museum! ■

Eleanor Dickman is Vice President of Development & Public Relations at The Computer Museum History Center

CURRENT STAFF AND VOLUNTEER OPENINGS

The Computer Museum History Center offers a unique chance to help build a world-class Museum that will preserve and present information age artifacts and stories for generations to come.

We are actively seeking qualified, motivated, and talented people for the following positions:

STAFF

- Curator of Exhibits
- Curator of Collections
- Director of Development
- Administrative Assistant
- Vice President of Facilities & Logistics
- Director of Cybermuseum Exhibits

For detailed information about these job opportunities and how to apply, please visit our website at www.computerhistory.org/jobs

VOLUNTEER

- Research & Reference team member
- Office organization & systems support
- Visible Storage Exhibit Area renovation team member
- Website projects including CGI scripting
- DECWORLD 2001 event team
- Fellow Awards 2001 event team

For detailed information about these and other volunteer opportunities, please visit our website at www.computerhistory.org/volunteers or call Karyn Wolfe.

THANKS TO OUR ANNUAL DONORS

We acknowledge with deep appreciation the individuals and organizations that have given generously to the Annual Fund.

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This information is current as of May 01, 2001. Please notify us of any changes to your listing (wolfe@computerhistory.org). Thank you.

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___ 8K ($8,192)

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___ 4K ($4,096)

___ 2K ($2,048)

___ 1K ($1,024)

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___ $500

___ $250

___ $100

___ $35 (student)

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YES, I want to help save computing history. Please process my donation at the level indicated. I look forward to learning more about the programs and activities of The Computer Museum History Center, especially its plans for growth in the coming years.

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Is your name on our list of Annual donors? If so, you are one of a select group of people who appreciates the impact of the computing revolution on our lives today. You also take pride in your own role in ensuring that this history of innovation is preserved for posterity. We are grateful for your generosity and support. And if your name is not on this list, we welcome your contribution and will be delighted to add your name to our roster. You may use the form on this page to join our family of donors. Thank you!

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We gratefully accept direct transfers of securities to our account. Appreciated securities forwarded to our broker should be designated as follows:

FBO: The Computer Museum History Center; DWR Account # 112-014033-072; DTC #015; and sent to Matthew Ives at Morgan Stanley Dean Witter, 245 Lytton Avenue, Suite 200, Palo Alto, CA 94301-1963.

In order to be properly credited for your gift, you must notify us directly when you make the transfer. If you have any questions regarding a transfer of securities, please contact Eleanor Dickman at +1 650 604 2575.

UPCOMING EVENTS

PLEASE RSVP FOR ALL EVENTS AND ACTIVITIES

MON, JUNE 4, 6 PM
XEROX ALTO: A PERSONAL RETROSPECTIVE
Chuck Thacker & Butler Lampson, Microsoft
LOCATION: *NASA Ames Main Auditorium Moffett Field, CA*

SAT, JUNE 16, 9:30 AM – 10:00 PM
DECWORLD 2001
WHAT MADE DIGITAL GREAT
See page 13 for more information.
LOCATION: *Moffett Field & Santa Clara, CA*

MON, SEPTEMBER 17, 6 PM
ORIGINS OF LINUX
Linus Torvalds, Transmeta Corporation
LOCATION AND DATE TO BE CONFIRMED

TUES, OCTOBER 23
FELLOW AWARDS BANQUET
LOCATION: *Fairmont Hotel, San Jose, CA*

THURS, NOVEMBER 8, 6 PM
QUESTIONS ANSWERED
Donald Knuth, Stanford University
LOCATION: *NASA Ames Main Auditorium Moffett Field, CA*

VOLUNTEER OPPORTUNITIES
The Museum tries to match its needs with the skills and interests of its volunteers. See page 15 for current special project openings. Monthly work parties generally occur on the 2nd Saturday of each month (below). For more information, please visit our volunteer web page at www.computerhistory.org/volunteers.

WORK PARTIES
Please RSVP at least 48 hours in advance to Betsy Toole.

Sat, June 9, 9am
Sat, July 14, 9am
Sat, Aug 11, 9am
Sat, Sept 8, 9am

EVENT SUPPORT
The Museum relies on regular volunteer support for events (listed at left). Contact us if you are interested in lending a hand!

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WWW.COMPUTERHISTORY.ORG

Current staff openings are listed on page 15.

MYSTERY ITEMS

FROM THE COLLECTION OF THE COMPUTER MUSEUM HISTORY CENTER

Explained from CORE 2.1

TELEFUNKEN DIODE MATRIX (1965)

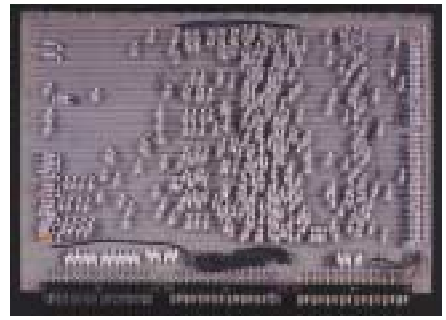
This is a Telefunken microcode diode matrix board. Telefunken was a German firm that began as “Gesellschaft fur drahtlose Telegraphie m.b.h.” (Usually known as “System Telephunken”) in 1903 as a subsidiary of Allgemeine Elektricitats-Gesellschaft (AEG) and Siemens and Halske AG to do work in radio. Among other companies in West Germany (Siemens, Zuse, SEL), Telefunken entered the computer business in the 1950s.

The use of diode matrices for decoding instructions and generating microcode was very common in the pre-IC era and was relatively flexible in that microcode could even be modified in the field by simply adding or subtracting diodes from the matrix.

The use of diode matrices for decoding instruction sets was used as early as 1950 in the MIT Whirlwind computer. Also, the 1956 Royal McBee LGP-30 (Librascope General Precision) computer used 1450 diodes to decode its full instruction set (16). Both the diode matrix and the independent concept of using microcode (Maurice Wilkes) were later used together to produce diode microcode boards like this Telefunken board in 1965.

The use of a diode array to generate microcode would have been very efficient in terms of cost, power, and space. The diodes could perform both AND functions to decode the instruction and OR functions to combine all instructions that gated particular data paths at particular times. The same technique, but using transistors instead of diodes, was used later in microprocessors, including the Data General MicroNova.

Prior to using diode matrixes, instructions were usually implemented in separate sets of electronic circuits.



Telefunken Diode Matrix (1965)

WHAT IS THIS?

THIS ITEM WILL BE EXPLAINED IN THE NEXT ISSUE OF CORE.

Please send your best guess to mystery@computerhistory.org before 07/15/01 along with your name and shipping address. The first three correct entries will each receive a free poster: **COMPUTER CHRONOLOGY – THE EMERGENCE OF THE INFORMATION AGE**

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