V viewpoints

 William Aspray

Computer Museum Series
Great Computing Museums of the World, Part One

The first of a two-part series highlighting several of the world's museums dedicated to preserving, exhibiting, and elucidating computing history.

SOME OF THE science and technology museums around the world are devoted to science discovery—to teaching their visitors, especially children, about the principles of science and technology. Other science and technology museums are more focused on the history and cultural significance of particular scientific discoveries and technological inventions. Some museums include a blend of the two functions.

This is the first installment of a two-part *Communications* series featuring five of world's greatest computing museums. These museums have been chosen for their contributions to the history and culture mission, though most of them have some elements of the science discovery mission as well. There are perhaps hundreds of small and not-so-small museums around the world either devoted entirely to computing or at least having significant computing exhibits. The five museums highlighted in this series have been selected because of the large size of their exhibits, the importance and quality of the artifacts shown, and the quality of their interpretations.

An exhibit is not simply a collection of artifacts; it includes signage and other accompanying information (films, lectures, guided tours) that help to interpret the artifacts and set them in context. Each of the exhibits described in this series is the result of years of human labor in preparation: design-

The Computer History Museum exhibit "Mastering the Game: A History of Computer Chess."

ing the exhibit, selecting and securing exactly the right artifacts, and giving them the right interpretation. This work has been carried out by some of the best historians of science and technology, who work in these museums collecting artifacts and the associated information and documentation about them, answering queries from all kinds of people about their collections and about the science and its history, undertaking scholarly research, preparing educational materials, and doing much more. The exhibits are only one facet of what these museums do.

The museums featured in this issue are the Computer History Museum, located in Mountain View, CA, and the Heinz Nixdorf Forum in Paderborn, Germany. We hope you enjoy the accounts of these museums and that these stories will whet your appetite to explore the museums' Web sites and to visit the museums in person.

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The Computer History Museum
Len Shustek

For most of the 10,000 years of recorded history, there were no computers. We are privileged to be living through the brief transitional period: from now

Highlights of the Computer History Museum collection
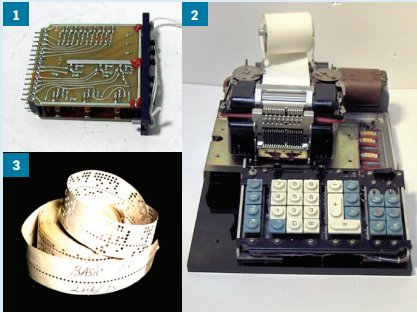
1. *CDC 6600 transfer board, serial number 1:* The CDC 6600 was a Control Data Corporation mainframe computer designed by legendary computer architect Seymour Cray. It is considered the first successful supercomputer, and was the world's fastest computer from 1964 to 1969.

2. *Busicom calculator prototype:* The first device to use the first microprocessor, the Intel 4004 from 1971.

3. *Altair BASIC paper tape:* An original tape of the BASIC language interpreter written by Bill Gates for the Altair 8800 computer, and signed by him.

4. *Apollo Guidance Computer:* The computer which, with less computing power than a typical digital watch, guided the Apollo lunar module through its descent to the moon's surface in 1969.

5. *SAGE:* A huge and amazingly reliable air defense computer built in the 1950s out of 51,000 vacuum tubes and located in an underground concrete bunker.

6. *John Backus interview:* Videotape and transcript of a long interview with Fortran pioneer John Backus, made the year before he died.

7. *Apple Lisa ephemera:* Button, hat, t-shirt, and poster for the 1983 release of the graphics-oriented Lisa computer.
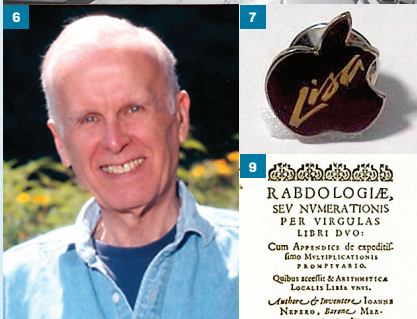
8. *Johnniac:* Built in 1954 and named for John von Neumann, this was one of 17 custom-built machines inspired by his design, and is the only complete one that has survived.

9. *Rabdologia:* An original copy of Napier's 1617 book on calculating methods, including a description of his eponymous "bones."

10. *IBM card sorter:* A model 080 punched card sorter from 1925. Although over 10,000 were made, few have survived.
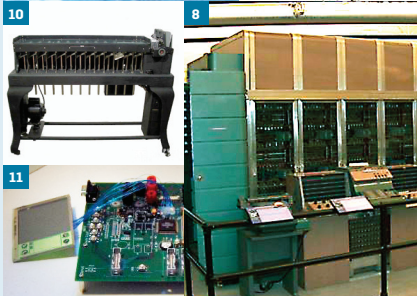
11. *Palm Pilot prototype:* the engineering model of the first highly successful personal digital assistant.

To search the online catalog, see http://www.computerhistory.org/collections/search/

To view historic videos and recent lecture events, see http://www.youtube.com/computerhistory

on, and forever more, computers will be an intimate and inseparable part of our life and work. The engines of the 19th century industrial revolution were amplifiers for our physical bodies. The computers of the 20th century information revolution are amplifiers for our minds.

Viewed from 1,000 years from now, the 50 years that elapsed from the invention of the computer to its ubiquitous use will seem like a point in time. We owe it to ourselves as current participants, and to future generations as our beneficiaries, to document and explain how the information revolution came to be.

This perspective motivates the mission of the Computer History Museum (CHM; http://www.computer-history.org): "To preserve and present for posterity the artifacts and stories of the information age." Therefore, the Computer History Museum is an evolving institution with three primary initiatives:

Collecting. At the core of CHM is the computing collection, which was started 30 years ago in Boston, MA, by Gordon and Gwen Bell within Digital Equipment Corporation. It then became part of The Computer Museum, a public museum in Boston, and when that institution closed in 1999 the collection became part of CHM. This ever-growing repository, whose catalog is online, now has about 70,000 objects in six categories:

▸ Physical artifacts: from microscopic chips to room-sized mainframes;

▸ Software: source code, executable code, and documentation for systems and applications, both in original formats and converted to modern digital formats;

▸ Documents: 30 million pages of primary reference material useful for the technical, business, and social history of computing, much of which is unpublished or near-print;

▸ Photographs: tens of thousands of prints, negatives, and digital images of items, locations, and people related to the history of computing

▸ Moving images: films and videos stored on many kinds of media, most of which have been converted to digital format; and

▸ Oral histories: interviews of computing pioneers, most done using

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high-quality video and subsequently transcribed and edited. It is critical that we collect the first-person stories of our pioneers while we still can.

Educational Activities. Expanding the public presence of the museum is the current highest priority. This includes:

▸ Exhibits: There are about a dozen physical and online exhibits currently on display, such as "The Silicon Engine," "Mastering the Game: A History of Computer Chess," "The Babbage Engine," and "Visible Storage". The physical exhibits are open to the public four days a week. A major 25,000 square foot signature exhibition on computing history is scheduled to open later this year, in conjunction with a comprehensive Web-based version that will also provide digitized access to related objects from the deep collection.

▸ Programs: A public lecture series that attracts over 300 attendees is held each month and is available afterward on the Web. A black-tie Fellows Awards ceremony to honor outstanding computing pioneers is held yearly. An annual award-winning magazine (*CORE*) is published as well as commemorative booklets that highlight important computing milestones.

▸ Restorations: Historical computer systems, both hardware and software, are selectively restored and demonstrated. A restoration of an IBM 1620 and a DEC PDP-1 have been completed; restorations currently under way include an IBM 1401 system (complete with card equipment, printer, and tape drives), and the world's first disk drive,

the RAMAC 350. The restored systems are on exhibit and are demonstrated by trained volunteer docents.

Research Activities. The CHM wishes to become an important part of the academic research community on computing history, but it has only taken small steps so far: organizing topical conferences and workshops, collecting oral histories, and publishing papers and articles.

The CHM scope (and collection) is international, but the museum's physical presence is in the heart of Silicon Valley in California. The CHM owns a 120,000 square foot modern building on seven acres—lots of free parking is a real asset here!—in a prominent location in Mountain View. The CHM also owns a 25,000 square foot warehouse 20 minutes away, where most of the 90% of the collection that is not on exhibit at any particular time is stored in climate-controlled conditions and is available to researchers.

The Computer History Museum is a work in progress. We like to think of ourselves as a startup with a 30-year history. We welcome the opportunity to work with people and organizations that resonate with our mission and our goals. For more information, see www.computerhistory.org.

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The Heinz Nixdorf MuseumsForum
Norbert Ryksa

The Heinz Nixdorf MuseumsForum (HNF; www.hnf.de) in Paderborn, Germany, is the world's largest computer museum. The museum, which is also an established conference center, showcases the history of information technology—beginning with cuneiform writing and going right through to the latest developments in robotics, artificial intelligence, and ubiquitous computing.

The multimedia journey through time takes visitors through 5,000 years of history, starting with the origins of numbers and writing in Mesopotamia in 3000 B.C. and covering the entire cultural history of writing, calculating, and communications. Alongside typewriters and calculating machines, the exhibition shows punched card systems, a fully functioning automatic telephone exchange system from the 1950s, components from the earliest computer (which filled a whole room), over 700 pocket calculators, and the first PCs. Work environments from different centuries are also staged in the exhibition.

The exhibition highlights include fully functioning replicas of the Leibniz calculating machine and the Hollerith tabulating machine, a Thomas Arithmometer dating from 1850, a Jacquard loom operated with punched tape, components of the ENIAC from

The Heinz Nixdorf MuseumsForum in Paderborn, Germany.

The Chess Turk, the world's most famous automaton, at the Heinz Nixdorf MuseumsForum.

1945, the on-board computer from the Gemini space capsule, the Apple 1, a LEGO Turing machine, and Europe's largest collection of cipher machines. One of the current attractions at HNF is the world's most famous automaton: Wolfgang von Kempelen's chess playing machine, the Chess Turk, which dates from the 18th century.

The exhibition was updated in 2004 with the addition of new themes such as robotics and artificial intelligence, mobile communications, and digitization. The new galleries present the latest information technology themes in an interactive, multimedia exhibit. Visitors can try their skills at old and new computer games, test advanced man-machine interfaces, and experiment with the latest applications and products from research and industry in the showroom. A multimedia scenario presents 150 pioneers of computer history from 1940–2009. Along with conventional museum formats, HNF has chosen to use a range of interactive multimedia applications and videos: approximately 100 special interactive multimedia application developments and video installations introduce visitors to the functions of the objects that are on display as well as to the life stories of famous historical figures.

Themes relating to the present and the future are also presented in HNF's Software Theatre, which offers virtual tours through cyberspace. Visitors can test the latest computer applications and software developments at the Digital Workbench. The games booths offer educational games and games of skill and strategy for guests to try out.

In 2005, the HNF marked the 40th anniversary of Moore's Law by presenting a huge illuminated "chip pagoda" demonstrating the continuous minimization of the chip surface area over the years in 20 stages. The individual levels of the pagoda consist of illuminated plexiglass panes and the display is lit by some 3,500 LEDs.

In 2007, the HNF opened the world's first gallery on software and computer science (informatics). A black cube is decorated on its "shell" with early instances of computer programs and 13 small "miracle chambers of computer science." These provide concrete three-dimensional examples of ostensibly abstract topics: Russian nested dolls are used to explain the method of recursion, while a tin of English luncheon meat demonstrates the origins of the term "spam," and toy robots illustrate an important software application area.

HNF has compiled a varied educational museum program to motivate children and young people to take an active approach to the exhibits and their history. At workshops children can, for example, build robots, encrypt messages or learn how to 'make' paper. Teachers and pupils are given numerous ideas for study content. Besides a guided tour of the permanent exhibition, special tours can be booked on such topics as arithmetic, writing, inventors and entrepreneurs, women's work in information technology, and cryptology.

Special HNF events focus on people in the information age. Numerous presentations, discussions, conferences and workshops deal with current concerns in today's information society and information technology. A quarterly newsletter on HNF activities is published in two languages and distributed free of charge.

Alongside the permanent exhibition, the museum has two additional areas that cater to an ambitious special exhibition program, such as focusing on historical slot machines or the world of computer games.

The HNF's "Computer.Medicine" exhibition, designed to provide a broad overview of the computer's importance in present-day medicine and featuring many exhibits on loan from abroad, proved to be the most successful exhibition in the history of the HNF, attracting more than 93,000 visitors. The exhibition is currently being shown in Vienna (until mid-April) on the occasion of the 100th anniversary of the opening of the Austrian Technology Museum.

Until the end of February, the HNF in cooperation with the MIT Museum is presenting the exhibition "Codes and Clowns: Claude Shannon, The Juggling Scientist," which will showcase Claude Shannon's scientific work as well as his famous toy collection. The selection of Shannon's inventions range from the highly practical to the downright useless and the presentation sets Shannon's inventions in the context of his biography and the history of information technology, shedding light on the relevant scientific relationships and implications. The exhibits are on loan from the MIT Museum in Boston, MA, the first time they have been on display a different location.

The Forum part of the HNF organizes over 800 events every year, ranging from scientific congresses to popular lecture series, senior's IT workshops, and business fairs. C

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