

The Computer Museum

# NEWS

SPECIAL  
EDITION

May / June 1990

## The Walk-Through Computer Opens

**The Walk-Through Computer™ (WTC)—the only exhibit of its kind in the world—opens June 23, 1990, at The Computer Museum. This giant (5,300 square feet) \$1.2 million exhibit features an authentic, two-story working model of a desktop computer enlarged to 50 times normal size.**

Find Map Inside, Fold in Front Page Then Walk Through The Walk-Through Computer

Approaching the exhibit on the 6th floor, you see a giant **MONITOR** displaying a nine by twelve foot image of a map. WTC's **WORLD TRAVELER** software program lets you try out the giant computer by finding the shortest driving route between any two cities in eight regions of the world.

Descending the stairs, you see a huge 25 foot **KEYBOARD**. Press one of its ten operational function keys to select a continent. A cutaway view shows the key making contact with wires underneath, completing an electrical connection that tells the computer which key has been pressed.

The 40 inch diameter functional **TRACKBALL** is used to locate the cities. Rolling the ball guides the cursor on the giant monitor. As you watch the cursor move across the map to the city of your choice, click on the trackball button to select that city. After clicking on another city, the program traces out the shortest land route between them and provides views of sights along the way. You will also see lights flash down a cable connecting the trackball to the computer's central processing unit.

Introductory panels demonstrate how computers handle different kinds of information and change it into electronic signals. Written information is illustrated with a keyboard, sound information with a microphone, and visual information with a television camera.

You then walk through the **MOTHERBOARD**, the printed circuit board that holds the computer's components. The first plug-in unit is the **VIDEO BOARD** controller that extends up through the ceiling. The pictures of places along the route come off the disk onto the video board where they are processed for display. The pictures leave the board, pulsing along the cable to the monitor and back again.

Cutaway views show the motherboard with its pattern of wires, insulating sections, power and ground planes. The data and information wires are illuminated and picked out in copper on the board. Pulsing lights in the floor simulate the flow of data throughout the computer.



▲ Executive Director Oliver Strimpel invites you to walk through The Walk-Through Computer (shown here under construction in April).

The **CENTRAL PROCESSING UNIT (CPU)** (or chip) is the computer's control center. It carries out all the instructions written by the programmer and stored in memory. Everything you see happening on the board is controlled by the CPU. Based on the Intel 486™, the CPU houses a viewport showing the chip's surface blown up 50 times. A computer animated "flight" down over the surface of the working chip brings the individual conducting lines into focus, magnified hundreds of times. This view is based on video taken through a scanning electron microscope.

Under ribbon cables for the floppy and hard disks, you find the system **CLOCK** with a cutaway view of the oscillating quartz crystal, which serves as a metronome for the other components. Lighting effects throughout the motherboard's surface simulate the clock's pulses, keeping all activities synchronized.

The random access **MEMORY (RAM)** chips stand four feet high. You can examine the circuitry at different magnifications via viewports that graphically illustrate how blocks of data are

stored and fetched from individual memory cells.

At the far end of the motherboard is a 15 foot **HARD DISK** drive. A cutaway view shows the spinning platters and read-write heads moving back and forth across the disk surfaces. Peer through a viewport to go for a computer animated "ride" on a read-write head as it flies over the disk's surface like a jet hurtling above a desert.

Leaving the motherboard, you can watch a lighthearted multimedia video show in the **SOFTWARE THEATER** which explains how computer software drives the hardware. The show features an animated character who takes you by the hand on a journey from the world of human intentions to programming instructions and the pulses of electricity that drive a computer.

Six **LEARNING STATIONS** across from the Software Theater let you explore topics of special interest. You can write a computer program or even design your own computer.

# Sponsors of The Walk-Through Computer

The Computer Museum would like to recognize the generous support of the exhibit's sponsors, without whom the exhibit would not have been possible. The total cost of The Walk-Through Computer is \$1.2 million. Support has come in the form of cash donations and donations of equipment and professional services.

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## Why The Walk-Through Computer?

The rapid emergence of the computer as a central tool in society has left many people without a basic understanding of computers. While exhibits at The Computer Museum and other institutions have addressed computer history and applications, no public institution has tackled one of the most important questions of all—"How do computers work?"—in a way that overcomes the fear and inadequacy many people feel about understanding technology.

We hope The Walk-Through Computer will help meet this need. It tries to answer these basic questions: How does a computer work? How does it store information? What is a software program? What does the inside of a computer look like? What do its components do and how do they work together?

Visitors will find out how a computer works by walking inside a giant model of one, where they can see how the different parts work together to perform a typical task.

In addition, The Software Theater introduces visitors via a humorous three-screen video to the subject of software, and a rich array of further information is available for those who seek it through interactive, computer-based learning stations. In addition, educational materials on The Walk-Through Computer will help prepare educators and students prior to their visit. A video and book are also planned.

The Walk-Through Computer will appeal both to families with small children who may know little about computers and to computer-knowledgeable visitors intrigued by the exhibit's spectacular character and authenticity. Visitors will be able to select the depth and detail at which they explore the exhibit.

The Walk-Through Computer is the first of four major new exhibits we plan for the future. The others are: Milestones of a Revolution, The Computer Discovery Center (a joint project with The Boston Computer Society), and The Networked Society. They will span the evolution, applications, and impact of computing, and will be rich in hands-on experiences.

I thank everyone—the exhibit's sponsors and advisors, volunteers, and staff who worked so hard to make The Walk-Through Computer possible.

I invite you all to come to the Museum and take a walk through The Walk-Through Computer.

*Oliver Strimpel*

Dr. Oliver Strimpel

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Executive Director Oliver Strimpel thought that The Walk-Through Computer would be the most exciting way to answer the question: "How does a computer work?"



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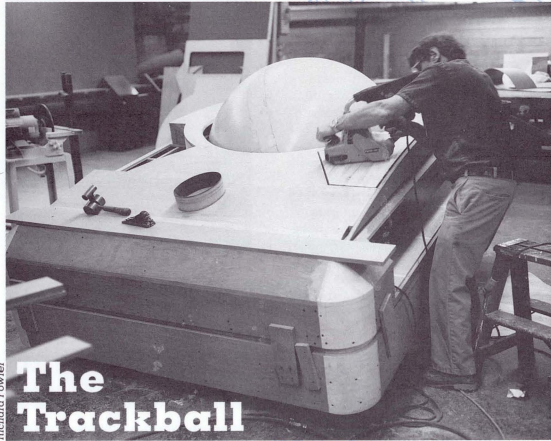
## The Software Theater

How do you simulate something as ethereal as software, when it looks one way to a human programmer and another to a computer?

To a programmer, software is a series of words, English-like instructions. But to the computer, it is electronic signals or voltage changes. Another problem was showing people that computers are not inherently intelligent, but only follow the instructions in a computer program.

To overcome any anxiety visitors might have about the subject, it was decided to create a humorous conversation between a knowledgeable cartoon character and two human computer users. The six-minute multimedia show in the Software Theater combines the use of computer animation to create the cartoon character and video footage of real humans to explain how computer programs are written and translated into instructions the computer can follow and carry out.

One screen shows a visitor using the computer. Another shows what is on the monitor from the World Traveler program. The center screen shows the animated characters, video footage taken on the actual motherboard, other computer animation, and images designed to help viewers understand how a computer program works.



Richard Fowler

## The Trackball

F.W. Dixon Company display carpenter Daniel Rivera sands one of the buttons on the giant trackball

Imagine the problems that might arise when pushing a mouse big as a bumper car around a giant pad! A stationary trackball seemed the best choice for the hand device that moves the cursor across the screen.

A huge (9'x6'x5') simulation was constructed and linked to a much smaller functioning trackball hidden inside the power supply. Normally a trackball rests on one inch diameter bearings which produce pulses letting the computer know how much the ball has moved. The giant trackball works just like a real one, resting on three large bearings. A system of wheels, light emitting diodes, and detectors generates an electrical signal. Since the giant trackball does not have its own microprocessor, the signal is sent to the real trackball in the power supply. This trackball analyzes the signal and sends it to the small computer that runs the World Traveler program.

Exhibit staff rolled the huge ball back and forth for hours, experimenting with its weight so it would feel and act like a small roller ball.

Through a viewport, you can see the roller ball, wheels, light-emitting and photo diodes. As you move the ball, you will see via a simulation how lights shoot down the cable connecting it to the computer while a pointing arrow moves across the map on the screen.

## What Makes World Traveler Run?

The giant computer's World Traveler route-finding application actually runs on a Macintosh II computer hidden in the giant model of the power supply. This computer takes the visitor's inputs from the giant trackball and keyboard, calculates the best path, and projects the results on the giant screen.

Another computer, a Digital Equipment Corporation Microvax minicomputer, coordinates lighting and special effects to simulate the flow of data throughout the computer. You can press one of ten fully operational keys to make selections. The keys are controlled by sponges that act like springs. Connectors send input to the exhibit software. A cutaway view shows the key making contact with a grid of wires underneath. Each time the key is pressed, lights shoot down the cable that connects it to the computer. Lighting effects show the CPU "running" the application as it checks the keyboard's input, fetching route data and images from the hard disk, and sending display information to the video board.



Please Select A Continent By Pressing On A Function Key

This map introduces the World Traveler demonstration program which invites visitors to choose starting and destination points from among more than 300 cities in eight regions of the world.

# Can a Huge Model Act Like a Real Computer?

Building this exhibit presented many challenges. For example, how do you show the way a computer works when some of its parts, like the disk drive and chip's circuitry, are sealed inside packages, and the electricity pulsing through the components is invisible?

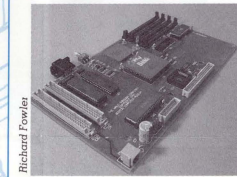
It was impractical simply to build a giant desktop computer that worked. A typical desktop draws 100 watts of electricity at \$.10 per hour, but a computer blown up 50 times might draw 250 kilowatts, costing as much as \$25,000 per hour! Also, a giant desktop, if it could be built, would run at least 50 times more slowly than a normal sized one.

Since no layout for an existing computer allowed enough room for visitors to walk around inside it when magnified 50 times, the Museum decided to design and fabricate its own computer prototype with the aid of a consortium of computer companies. Computer architects first sketched an outline of a design for the prototype of a 6"x10"x1/16" working "motherboard." The compo-

nents had to be presented in logical order while allowing visitors to walk around them. That outline was then translated into a schematic showing how the wires would interconnect the parts. The major interconnection paths (buses) had to be visible so lighting and special effects could simulate them. This model became the basis for the exhibit, and makes it highly authentic.

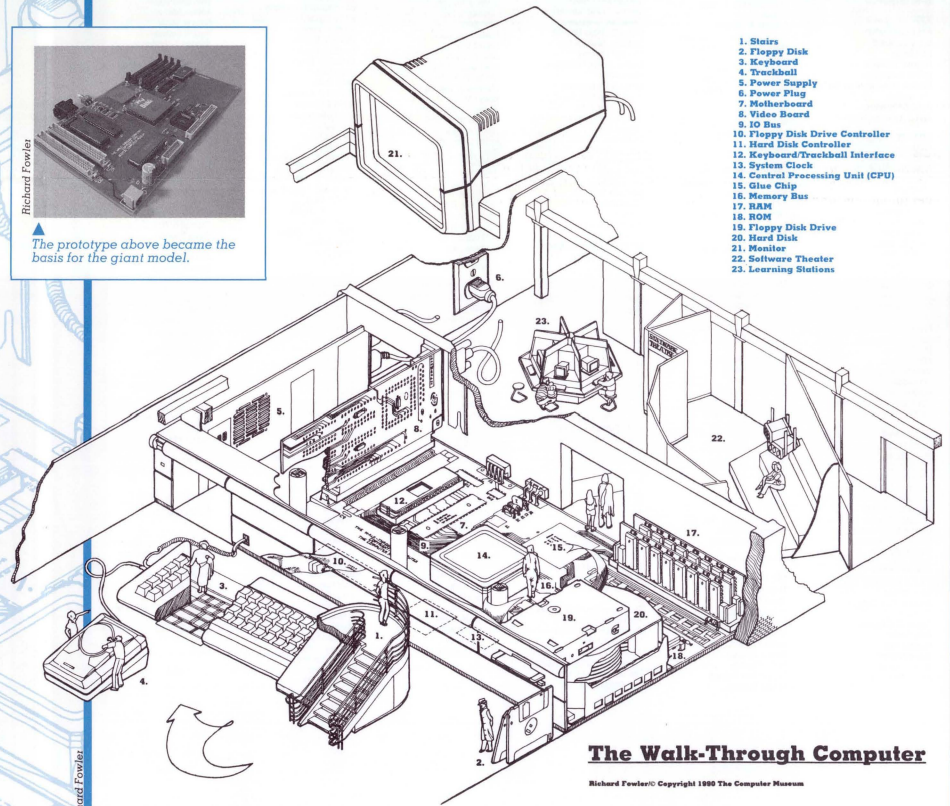
Visitors literally walk through the motherboard, following a path around the giant components. A special material was found resembling the color and feel of a typical motherboard's translucent surface.

In a real computer, the electrical switches go on and off at millions of times per second. In the motherboard simulation, the Museum used special lighting to simulate the flow of electricity, slowed down by millions of times per second. The lights simulate signals on the data and address wires. These signals show how the central processor communicates with the other parts of the system.



Richard Fowler

The prototype above became the basis for the giant model.



1. Slats
2. Floppy Disk
3. Keyboard
4. Trackball
5. Power Supply
6. Power Plug
7. Motherboard
8. Video Board
9. IO Bus
10. Floppy Disk Drive Controller
11. Hard Disk Controller
12. Keyboard/Trackball Interface
13. System Clock
14. Central Processing Unit (CPU)
15. Glue Chip
16. Memory Bus
17. RAM
18. ROM
19. Floppy Disk Drive
20. Hard Disk
21. Monitor
22. Software Theater
23. Learning Stations

## The Walk-Through Computer

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