



## The Computer Museum

# NEWS

*"Many people think virtual reality is like being taken for a motorcycle ride. But in this virtual world, you are in command."*

—Edith Ackerman, MIT Media Laboratory

Members Only  
Saturdays: May-June  
10:30AM-12:30PM



*Virtual world programmed on a 486 50MHz PC, donated by Digital Equipment Corporation, with WorldToolKit Virtual Reality Development software from Sense8, and a Beachtron Three-D audio card from Crystal River Engineering.*

**M**useum visitors can explore the microscopic world of cell biology, using virtual reality (VR) technology, April 9-June 30, 1994. From 2-5pm daily, visitors can don a head-mounted display and enter a virtual world to build a human cell, blown up millions of times life size. During school vacation week, April 16-24, the virtual world will be open 10:30am-12:30pm and 2-5pm.

Tickets for the head-mounted display, which are limited, are free to members and available to the public at \$3.00/person first-come, first-serve, starting at 10am, for that day only. Non-ticketed visitors can watch live demonstrations and view the virtual world on a large monitor nearby.

With partial support from the National Science Foundation, the Museum has been carrying out research on the effectiveness of virtual reality as a tool for informal learning. "While much has been written on the educational potential of VR, little research has been done on it as a tool in informal science education," said Hyman H. Field of the National Science Foundation. An NSF Small Grant for Exploratory Research has enabled the Museum to test if visitors' understanding of the human cell is improved by "walking into" this basic biological building block and studying it in an interactive, three-

## Is Virtual Reality a Learning Tool? See For Yourself

dimensional virtual environment versus two-dimensional graphics.

For testing, VR was defined as having three qualities: 1) It is fully interactive, i.e., objects in the world react to your interaction with them; 2) you move and interact with it naturally using sensors tracking your head and hand movements; 3) the world is immersive via a head-mounted display using goggles and headphones.

### An Inaccessible World Opens

Visitors can use a hand-tracker to manipulate objects in the virtual world. Touching a (computer-generated) girl's head, arm or stomach, the visitor is flown inside a room containing an empty six-foot neuron, muscle or intestinal cell. The cell is surrounded by organelles (the different elements of a cell), explained with animations and sound effects. When visitors place the right organelles in the cell, an animation shows the cell in action.

"This immersive environment is the most interesting I've ever seen," said Edith Ackerman, a study advisor, who designs learning environments with Seymour Papert. "In addition to exploring an inaccessible world, as you build the cell, it responds. That's powerful."

"The challenge was to build a world that wasn't a shooting game, but was educational and gripping," said project co-investigators David Greschler and Eben Gay. To make the cell more accessible and alive, three-D sound effects are used.

Pilot research showed that while visitors found it exciting to enter a virtual world and move things around, they often became so involved with the novelty of the interaction, they lost track of learning about the cell. "I felt as if I were in

another place and time," said a Boston University student. "When I took off the helmet, I half expected the objects to be there," agreed graphic artist Chuck Eichten. "I see the educational potential, but the technology is still so clumsy that I missed the point. You have to think too much about moving around."

### Bridge to Learning

What engaged visitors most was how real the micro-world seemed. Having a cell to build, they wanted to stay there and take control. "VR could be a wonderful bridge to learning for young people," noted one visitor. Almost all the teenagers in the pilot survey said they would like to use VR in their classes.

Using the pilot results, the Museum enhanced the system, adding a "VR tutorial" to familiarize visitors with the technology, sound effects and visual cues to make the world more responsive, and audio explaining the activity and cell structure.

Formal testing involved a random sample of 600 visitors, interviewed before and after the half-hour experiment about their understanding of the cell and their enthusiasm for cell biology. One-third explored the world in a fully interactive way with head-mounted display and sensors; one-third engaged the world using a joystick to move about a two-dimensional screen; one-third watched a video on a big screen without control over the presentation. The Museum is assessing the differences in learning among the groups. For the results—available this summer—e-mail [computer\\_info@tcm.org](mailto:computer_info@tcm.org) with *request* in the subject line and *send help instructions* as the body of the message.