Media Laboratory

If anything can be certain about the future, it is that the influence of digital technology will continue to profoundly change how we express ourselves, communicate with each other, and perceive and interact with our world. Yet, despite our increased dependency on them, these technologies are still at an early stage of their evolution, often crude, unwieldy, impersonal, and poorly matched to our human needs.

Moving these digital technologies along to their next phase of development is key to the Media Lab's mission. Toward this goal, over the past year the lab announced Simplicity, a design-oriented program that goes beyond looking at ways to remove buttons, slim down screens, and shrink interfaces to fit into the palms of our hands. It is a radical reexamination of ways to break free from the intimidating complexity of today's technologies and the frustration of information overload. Following this same theme, in May the lab hosted a one-day symposium, "Designing Bits & Pieces," where more than 600 attendees learned about the lab's new CELab, focused on consumer electronics. The CELab will conduct research in such areas as innovative materials and design/fabrication methods; technologies for delivering wireless, parasitic, and self-generated power; next-generation sensors, actuators, and designs; and cooperative wireless communications.

This past year, the Media Lab also expanded its research boundaries into the area of biomechantronics, with the addition of a new research group, headed by Hugh Herr, formerly from the Harvard–MIT Division of Health Sciences and Technology. Herr's research program is focused on advanced human rehabilitation, robotic mechanisms that promise to become extensions of the human body, offering the promise of a new generation of "smart" prostheses.

Through all these initiatives, the lab seeks to enhance our relationship with technology, helping to create a world where the human-computer interface consistently makes sense, fulfills the soul, and keeps us coming back for more.

Research Achievements

Here is a sampling of AY2004 Media Laboratory research accomplishments:

- A *nanoscale biomolecule detection device* that combines the high sensitivity of traditional fluorescent labeling with the lower-cost and faster turnaround time of "label-free" methods. Each device could conceivably be manufactured for a few dollars, making it possible for use in widespread tests to determine the effectiveness of a new drug or to quickly find unwanted toxins in real time.
- *Serendipity,* a mobile phone application that uses Bluetooth RF protocol to help users identify people with similar interests who are in their immediate physical vicinity, helping them to meet people they don't know but probably should.

- *Nanopearls,* electronic building blocks at the nanoscale level, which can be strung together like amino acids, opening up the possibility for a new era of nanofabrication for electronics.
- *SARS: Think Ahead,* a flexible, decision-making computer modeling tool for public health agencies. This tool will help to present complex information in ways that make clear the potential effect of enacting—and perhaps more importantly, not enacting—proposed policies.
- *Ripley*, a sensor-rich conversational robot that—at least to a limited degree—can interact with people using grounded, spoken language. Ripley is not programmed with scripted speech but rather learns the meaning of words, much as a young child does.
- *GOOSE,* a goal-oriented search engine that uses commonsense reasoning to adapt to the user's style of inquiry, rather than vice versa.
- *Affective Learning Companions* that will act as intelligent tutors, virtual peers, or a group of virtual friends to help facilitate learning, creativity, and motivation.
- *Memory Glasses,* a wearable memory aid that provides "pop-up" subliminal cues below the wearer's threshold of awareness.
- *AntiGroupWare,* a software system to improve the outcome of group decision making by providing a way for participants to express dissenting opinions anonymously, bypassing the pitfalls of conforming to an authority figure or peer pressure.
- *Second Messenger,* a system that augments fact-to-face interactions by using a combination of voice-recognition technology and automated semantic analysis to display a real-time text summary.
- *Collaborative (viral) communication schemes* that use bandwidth and energy far more efficiently than traditional point-to-point wireless technology.
- *Topobo,* an easy-to-assemble robotic construction kit that records and plays back physical motion. Just as children can learn about static structures by playing with blocks, they can learn about dynamic structures by playing with Topobo.
- *Smart architectural surfaces* constructed with a metal framework into which users snap any number of "smart tiles," each of which is equipped with a wireless computer, camera, speaker, microphone, and sensors. These tiles can talk to one another and act individually or in a unified fashion, creating an entire ecosystem of inexpensive and easily scalable devices.
- *Synthetic skin for social robots,* which is capable of detecting pressure and location while still retaining the look and feel of soft skin. Currently, this research is being used to create a new set of tactile hands for *Leonardo,* an engaging social robot that interacts with and responds to humans.

Exhibitions and Performances

Smart City: Cars in the 21st Century, on display in the Wolk Gallery of the School of Architecture and Planning from June to September 2004, gave us a preview of the "car of the future." The exhibition highlighted an ongoing collaboration between the lab's Smart Cities research group, architect Frank Gehry, and lab sponsor General Motors. It highlighted the lab's ongoing work on reinventing automobiles—creating cars that are or will become adaptable, wheeled robots that are continually learning—and teaching their drivers about the city they inhabit.

The Computer Clubhouse, cofounded by LEGO Papert associate professor Mitchel Resnick, celebrated its 10th anniversary at the Boston Museum of Science in November 2003. Over the past decade, the Clubhouse project has grown from a single after-school center for teens in inner-city Boston to a network of 87 Clubhouses worldwide. Today, Clubhouses in 17 countries serve more than 20,000 youths from low-income communities.

In July 2003, the Media Lab hosted RoBallet, a dance and technology workshop for children aged 9–12. During the two weeks that the children were at the lab, they experimented with both dance and technology to learn how programming can enrich their creative expression. It was led by professor emeritus Seymour Papert; Jacques D'Amboise, former principal dancer in the New York City Ballet and founder of the National Dance Institute; and David Cavallo, director of the lab's Future of Learning research group.

Collaboration within MIT

The Media Laboratory continues to vigorously engage in collaborations within MIT. These collaborations are in the form of joint academic appointments, teaching efforts, and research programs. Some 30 percent of the graduate students supported by the lab and directly supervised by Media Arts and Sciences (MAS) faculty are from departments other than MAS. As in years past, the lab engaged approximately 280 undergraduates through the Undergraduate Research Opportunities Program, and approximately 30 students enrolled in the alternative freshman program, which completed its fourth year.

Media Lab Europe

In 2003, Media Lab Europe (MLE) welcomed Simon Jones as its new managing director. Jones came to MLE from the University of Bath, where he served as dean of engineering and design. A significant figure in the European technology landscape, Jones is a research leader in microelectronics systems design. In May, MLE brought together Seymour Papert, Media Lab professor emeritus, with other experts from throughout the world, to explore the impact of technology on learning. Organized in conjunction with Ireland's hosting of the European Union presidency (January–June 2004), related activities included a conference, "New Futures for Learning in a Digital Age," cosponsored by the Irish government; a Media Lab Europe open house; and a

symposium, "ICT in Education: Incremental Progress or Fundamental Change?" In January, MLE and Trinity College Dublin were awarded the 2004 02 Digital Media Innovation Award for their Personal Investigator project.

AOL Time-Warner became a Media Lab Europe partner community in 2004, joining existing partners AIB Group, Ericsson, Essilor, Fondazione Ugo Bordoni, Intel, Orange, Portuguese Science Foundation, and the Scottish Highlands and Islands Enterprise Board.

Sponsors

During FY2004, funding for the Media Lab's research programs saw a larger portion of support coming from directed research sponsorships and a resurgence of corporate support from Asia.

Research Sponsors

In FY2004 the Media Lab submitted approximately 55 proposals for new and continuing directed research projects. Thirty-two of these proposals remain under consideration, and 12 have resulted in awards. Over 90 percent of the proposals submitted were in response to government solicitations (NSF, DARPA, VA, and NIH), with additional, limited interest in directed sponsorship from foundations and nongovernmental sources. The proposals ranged in size from $12K to $25M, spanning one to five years; grants that were awarded ranged from $400K to $1.96M, with an average award of $200K per year for three years.

Corporate Research Partners

In July 2003, Samsung Electronics Co., Ltd., became a corporate research partner of the Media Lab and celebrated with a special exhibition and event in Seoul, Korea.

Consortium Sponsors

Three companies joined the lab's Things That Think consortium: Alps Electronic Co., Ltd; Brother Industries, Ltd; and LG Electronics, Inc., which joined at the "consortium research" level. This allows the company to have an employee-in-residence at the Media Lab. Existing sponsor Ricoh Co., Ltd., also increased its support to the consortium research level.

Special Funds

Eight corporate sponsors—BT, INCAE, LEGO, MasterCard, Motorola, Nortel Networks, Samsung, and Telmex—funded student fellows. Additional sponsors included the family and friends of the late Steven R. Holtzman, who established an endowed fellowship in his memory; and Media Lab Europe. The following were named fellows during FY2004:

BT	Dan Chak, Brian Chow, Jamie Cooley, Raffi Krikorian, and Jason Nawyn
INCAE	Juan Carlos Barahona
Steven R. Holtzman Fellowship for Digital Expression	James Dai
LEGO	Hayes Raffle, Michael Smith-Welch, and Claudia Urrea
MasterCard	Leonardo Bonanni, Ben Fry, James Patten, Kristina Shampan'er, and Dimitris Vyzovitis
Media Lab Europe	Barbara Barry, Ari Benbasat, Erik Blankinship, Nathan Eagle, Elisabeth Sylvan, and Diana Young
Motorola	Ryan Chin, Jeff Halbig, Mat Laibowitz, Natalia Marmasse, Akshay Mohan, and Amanda Parkes
Nortel Networks	Aggelos Bletsas
Samsung	Wei Chai, Sam Hill, Ashwani Kumar, Josh Lifton, and James Jung-Hoon Seo
Telmex	Victor Adán, Ernesto Arroyo, José Espinosa, Carla Gómez Monroy, Emmanuel Munguía Tapia, Hugo Solís, and Larissa Welti Santos

Human Resources/Administration

Several new staff members were welcomed to the Media Lab in AY2004. These included Tom Sadtler, who joined the lab as associate director, marketing and sponsor development; Robert Fadel, who came from MIT's Administrative Services Organization to become the lab's director of finance; Paula Aguilera, the lab's new multimedia services coordinator; and Liz Doherty, who assumed the position of project coordinator for the Lifelong Kindergarten group. Deborah Cohen, who had served as director of Communications and Sponsor Relations, transferred to the School of Engineering.

Support staff appointments included Tracy Daniels and Tamara Hearn. In addition, Cynthia Wilkes transferred from the School of Architecture and Planning.

In Memoriam

In closing, it is with great sadness that we must report on the loss of one of the Media Laboratory's founding members, Stephen Benton, inventor of the white-light transmission "rainbow" hologram. Professor Benton, who held the E. Rudge and Nancy Allen professorship of media arts and sciences, changed the world of 3-D imaging, giving us a more artistic, accurate, and beautiful window on reality. He, with members of his Spatial Imaging research group, pioneered production of the world's highest quality, full-color holograms; created the world's first real-time, interactive holographic video system; and superimposed a haptic interface on a holographic image so that the user can literally touch and carve changes in a 3-D image. His untimely death at age 61

has caused a great sense of loss throughout the lab, the entire MIT community, and the world.

Walter Bender
Executive Director
Senior Research Scientist

More information about the Media Laboratory can be found on the web at http://www.media.mit.edu.

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Media Lab Europe is the Media Lab's European Research Partner.