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—*David Brunskill*

MIT Artificial Intelligence Laboratory

The Artificial Intelligence Laboratory at the Massachusetts Institute of Technology (MIT) was founded in 1959 by **Marvin Minsky** (1927–) and **John McCarthy** (1927–), two young professors who would later become highly renowned in the **artificial intelligence** (AI) field. The lab continues to exist, with the stated objective to "understand human intelligence at all levels, including reasoning, perception, language, development, learning...and to build useful artifacts based on intelligence." Academic surveys in the United States consistently rank the MIT AI lab as first in its class, followed by the AI labs at Stanford and Carnegie Mellon University.

The strength of the MIT AI lab arose from its willingness to face "grand challenge" problems at every stage of its history. Some important ideas that would later become incorporated into the mainstream of **computer science** were actual MIT AI lab projects. This is the case, for example, with bit-mapped displays, computer algebra programs, the **Connection Machine** architecture, and **operating systems** research. Such undertakings, despite their thin connection to cognitive science, were started at the lab because they pertained to the frontiers of knowledge, and AI has always been at the frontier of computer science.

There is no other AI laboratory as legendary as the one at MIT, and no other that has produced so many world-class researchers in the field. There are even songs composed by former students, always ready to poke fun at the LISP tradition of the lab:

Sung to the tune of "Alice's Restaurant" by Arlo Guthrie.

You can hack anything you want on MIT LISP machines
You can hack anything you want on MIT LISP machines
Walk right in and begin to hack
Just push your stuff right onto the stack
You can hack anything you want on MIT LISP machines
(But don't forget to fix the bug...on MIT LISP machines!)

LISP and LISP machines figure high in the list of accomplishments of the AI Lab at MIT (see box). John McCarthy developed the first versions of the language, and other variants, such as Scheme, were also designed there. The first LISP machines were built at the lab and were especially developed to speed up the language and make more ambitious applications possible. Two companies spun off from MIT to market LISP machines, the most important being Symbolics, which was founded in the early 1980s, but faltered 10 years later.

The MIT AI Lab has been traditionally strong in **robotics** and **computer vision**. Members of the lab take pride in having developed methods for finding the shape of objects from video images and the microworld approach to AI. In this setting, a robotic hand could be directed, using natural language commands, to place or remove blocks from a pile of objects. This was a dramatic achievement for a vision and robotic system in the 1970s.

Currently, the MIT lab pioneers a different approach to AI that has been called *nouvelle AI.* Rodney Brooks (1954–), the director of the lab, has developed a new methodology for building intelligent systems, which consists not in trying to emulate human intelligence first but lower and more specialized "intelligences," such as those of insects. Brooks builds robots and lets them move in a real environment. This is the "situated" and "embodied" approach to AI. Only by letting the program have a body and move in the real world, that is, only by letting the program control a robot, is

there an immediate feedback to the researcher on the adequacy of his theories. In Brooks's *subsumtion architecture*, intelligence consists in developing reactive layers of **software** that build on each other. A walking machine, for example, can learn to move its legs in coordination, and then the next software layer can take care of handling rough terrain. Intelligence, under the *nouvelle* AI approach, is not a zero-sum problem; there are many shades of intelligence and a robot that can navigate in an office already exhibits some of them.

Inspired by the situated approach to robotics, many of the current projects have to do with walking machines and humanoids. The Cog project in particular has received much attention from the media. Cog is half a humanoid, from the waist up, capable of recognizing objects, grasping them, and reacting to new situations. The idea behind Cog is that "humanoid intelligence requires humanoid interaction with the world." The robot has led to many new ideas about visual maps and saccadic movements that could not have been obtained from a software simulation.

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—Raúl Rojas

MIT Media Laboratory

The MIT Media Laboratory is a research and academic facility at the Massachusetts Institute of Technology (MIT) committed to the development of innovative media technologies. Founded in 1985 by Nicholas Negroponte (1943–) and Jerome Wiesner (1915–94) of MIT, the Media Lab is a renowned think tank sponsored by several international corporations. Over 100 projects are being pursued in such diverse areas as video, holography, cognitive computing, human–machine **interfaces**, electronic music, and graphic design.

Negroponte himself studied at MIT, where he specialized in the emerging field of **computer-aided design** (CAD) during his graduate studies. After joining the MIT faculty in 1966, he founded the Architecture Machine Group in 1968, a combination of lab and brainstorming pool that attempted to approach the human–machine interface problem in a new way. Later in 1980, Negroponte was involved for one term as founding chairman of the **International Federation of Information Processing** "Computers in Everyday Life" program. Negroponte started the Media Lab with Wiesner, who was president of MIT until 1980 and was also a former scientific advisor of U.S. presidents John F. Kennedy (1917–63) and Lyndon Johnson (1908–73). One of Wiesner's own areas of research was human–machine communication. After his presidential tenure at MIT, he devoted his work to the application of new technologies in the arts and media.

The educational wing of the Media Lab offers graduate degrees through its Media Arts and Sciences Program and undergraduates can participate in project-oriented courses. Media Arts and Sciences is conceived of as a multidiscipline field at MIT: The humanities, communications, and **computer science** merge in an academic program in which the core is the development and creative implementation of breakthrough technologies for human–machine interaction.

Digital Life, one of the three central divisions of the lab, is concerned with the interconnection of humans, objects, and **bits** in an online world. News in the Future is another research consortium and serves as a forum for the Media Lab and its sponsors, exploring new technologies for journalism. The News in the Future group concentrates not only on the analysis of news consumers, but also on interface design, data management, and on improving the efficiency of news production.

One of the most exciting areas of research at the Media Lab is the Things That Think consortium, originally initiated by Negroponte. In his book *Being Digital,* Negroponte prophesizes the end of atomized information. He proclaims the era of physical objects to be over and the future to be one of bits. Physical information requires an enormous organizational