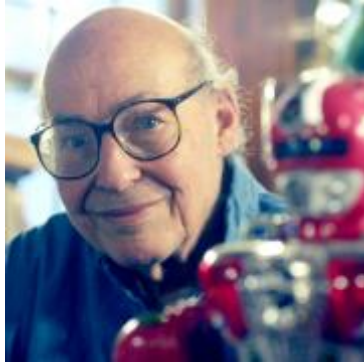# Marvin L. Minsky (1927–2016) Scientist and inventor was a visionary founder of AI

By [Patrick Winston](#)   March 16, 2016

In 1950, Alan Turing argued that there was no convincing reason to doubt that computers could be intelligent. Then, in the late 1950s, Marvin Minsky, John McCarthy, Herbert Simon, and Allen Newell started the work that led everyone to think of them as the founders of the field of Artificial Intelligence. Marvin Minsky, the last of the founders, died on January 24, 2016. Minsky championed the idea that computers would someday think like we think and surpass us. He had no patience with those who doubted that computers could be intelligent at a human level or beyond. In the early days, there were many doubters, and were it not for Minsky's determined advocacy, the field of AI might have foundered.

Minsky was born in New York City in 1927. After serving in the United States Navy in World War II, he earned a BA in Mathematics from Harvard, followed by a PhD in Mathematics from Princeton. At Harvard, he impressed the mathematician Andrew Gleason by proving fixed point theorems in topology. While at Princeton, he built a learning machine, demonstrating his passion for invention and building.

When Minsky finished his PhD work, John von Neumann, Norbert Wiener, and Claude Shannon all recommended him for appointment as Junior Fellow at Harvard. As a Junior Fellow, frustrated by conven- tional microscopy, he invented the confocal scanning microscope so he could examine thick, light-scattering neural tissue.

In the late 1950s, with McCarthy, he founded a group that became MIT's Artificial Intelligence Labora- tory. Always knowing what to do next, in 1961 Minsky wrote "Steps toward Artificial Intelligence," a call to arms for a generation of researchers eager to contribute to the new field.

Students and staff flocked to Minsky's laboratory to meet the challenge of understanding intelligence and endowing computers with it. They all wanted to benefit from Minsky's wisdom and to enjoy his in- sights, lightning-fast analyses, and clever jokes. They all understood they were part of an exciting scientific revolution.

Minsky's laboratory was an egalitarian utopia. He didn't care or even seem to note what you looked like, what your gender was, how young or old you were, or whether your status was undergraduate freshman or senior professor. He cared only about your ideas and what you could do.

Minsky often met with students at his home. Multiple pianos reminded us that Minsky was a musical prodigy, with an amazing ability to improvise fugues. Impish repartee reminded us that he was not just a genius, he was a fun genius.

Minsky's attention span was short. Whenever I explained an idea to him, he would guess what it was after a few sentences. Once I suggested that if we ever developed really intelligent machines, we should do a lot of simulation before we turned them loose in our world to be sure they weren't dangerous. "Oh," he said, "and we're the simulation?" guessing the end of my not-yet-complete joke. "It isn't going very well, is it?" he continued.

In Minsky's laboratory, students and staff built pioneering robots as well as revolutionary programs. Minsky himself invented a fourteen-degree-of-freedom arm. He argued that space exploration and nuclear- material processing all would be simpler with manipulators driven locally by computers or remotely by human operators. He foresaw that microsurgery would be done by surgeons using telepresence systems.

In the late 1960s, Minsky and Seymour Papert worked on the mathematics of perceptrons—simple neu- ral nets—and showed what they could and could not do, raising the sophistication of research on neurally- inspired mechanisms to a new level. Minsky and Papert continued their collaboration into the 1970s and early 1980s, synergistically bringing together Minsky's computational ideas with Papert's understanding of developmental psychology to develop theories of intelligence and radical approaches to early education.

In the mid 1970s, Minsky introduced *Frames*, a way of representing entities and situations as sets of slots, often filled by default values embedded in a class hierarchy. He also developed the idea of *K-lines*, short for *knowledge lines*, to address questions about how information is represented, stored, retrieved, and used. He argued that K-lines help us solve new problems by putting us back into mental states much like those we were in when we thought about similar problems before.

In 1985, Frames, K-lines, and many other ideas came together in Minsky's book, *The Society of Mind*. He wrote that intelligence emerges from the cooperative behavior of myriad agents, none of which is in- telligent. Then, in 2006, Minsky published *The*

Emotion Machine, a book about intelligence, creativity, emotion, consciousness, and common sense. Multiplicity is a dominant theme. He noted that words like *intelligence* are "suitcase words," because they are like big suitcases into which you can stuff anything. Each is a label for a collection of concepts, not just one. He believed that if you have only one way to think about something, you have no recourse when you get stuck. He wrote that our resourceful intelligence arises from many ways of thinking, on many levels, exploiting many ways of representing knowledge.

Overall, Minsky's talks, papers, and books are like diamond mines. Many of the diamonds therein will take decades to cut and polish. That is why Minsky's contributions will continue to inspire researchers for decades to come.

An edited version of this obituary will appear in Nature.