

# A Half-Century's Progress And a Look Ahead

BY IVAN BERGER

**T**HE IDEA OF ARTIFICIAL intelligence goes back millennia, at least to the ancient Greeks. But the phrase itself first surfaced 50 years ago, around the time of Dartmouth College's Summer Workshop on Artificial Intelligence, in Hanover, N.H. To celebrate the anniversary, the May/June edition of the IEEE Computer Society's *Intelligent Systems* magazine is a special issue devoted to the workshop (referred to as the first AI project), the field's development since then, and AI researchers' visions for the next 50 years.

The original proposal for the workshop (by John McCarthy of Dartmouth, Marvin L. Minsky of Harvard University, Nathaniel Rochester of IBM, and Claude Shannon of Bell Telephone Laboratories) "was awfully prescient about directions to go in, and what should be done, but didn't always guess the right ways to get there," says IEEE Affiliate Member James Hendler, *Intelligent Systems*' editor in chief and a professor of computer science at the University of Maryland, in College Park. "In some directions we have achieved far more than they expected because of the unbelievable growth in computing power."

In the 1950s, computers were the size of an office, and access was slow and limited. Now there is probably more computing power in one office than the world's biggest computers had back then.

"Still, the proposal's authors identified some of the really hard problems, like how we do so much with the relatively small computers in our heads—which remains among the main mysteries today," Hendler continues. "The surprise is not that the computer beat Kasparov, but that Kasparov can sometimes beat the computer."

In this special issue, such difficulties are discussed by Oliver Selfridge, an IEEE affiliate member who was at the Dartmouth meeting. He is often credited with creating the field of machine learning (probably now the biggest subset of AI).

But though past history and present progress will get some coverage, the issue's focus will be mainly on AI's future, Hendler says.

"For example, [Fellow] Raj Reddy, of Carnegie Mellon University [in Pittsburgh], writes on how bringing AI out into society to help the ills of the world is starting to pay back some of the support the world has given to our field," Hendler continues. "Luc Steel, a European researcher, discusses nouveau AI, approaching language understanding from a new, evolutionary perspective." These are supplemented by about a half-dozen more feature articles and a number of shorter items, including contributions on AI and its future in China, Europe, and Japan.

**LOFTY GOALS** The field of AI originally had three goals, according to Hendler:

- Getting computers to do things that humans perceive as intelligent, such as beating the world's chess champion (which happened in 1997) and having robots operate on their own (as they did in the Deep Space 1 probe and the Mars Rover).
- Modeling of humans and what they do—which gave rise to the field of cognitive science.
- Building computer systems that will be better at assisting humans. This is being done currently by every-

day applications such as search engines, grammar checkers, and tax-preparation software, all of which were projects in AI labs 15 to 20 years ago.

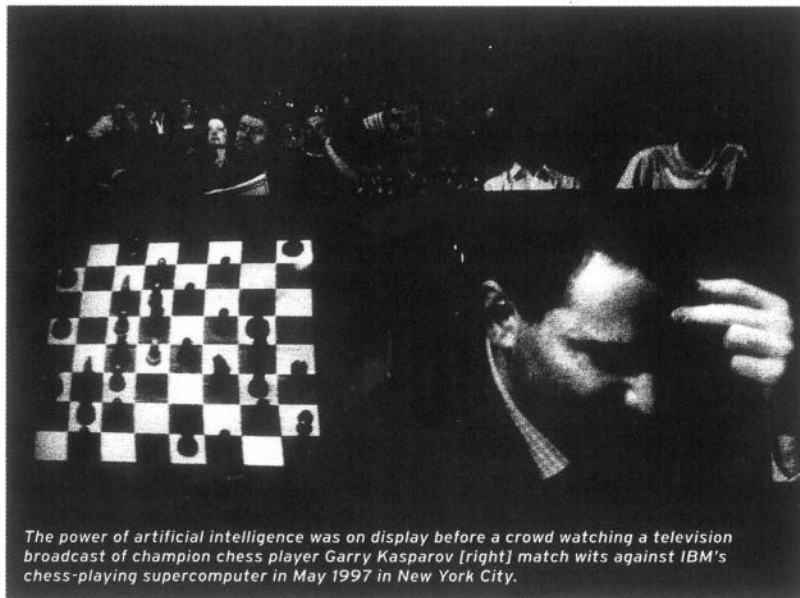
"There is still much that we have not achieved," Hendler says. "Artificial intelligence is basically the science of what intelligence is, what it means to be intelligent. And while we've obviously made progress, we need to go back and reassess the science in light of the incredible progress we've made. We seem to have devoted embarrassingly little effort to these fundamental questions."

Despite having achieved what Hendler calls "super-human capabilities" in various ways, such as in data storage and retrieval, researchers have not yet matched human capabilities in other areas, he says.

"We can fly faster than birds but not outmaneuver them with current technologies," he notes.

In their prospectus for that original Dartmouth workshop, the authors wrote: "We think that a significant advance can be made in one or more [artificial intelligence] problems if a carefully selected group of scientists works on it together for a summer." They were right—and still more significant advances came from scientists working on it together for the ensuing 50 years.

Yet there are still advances to be made and problems to be solved. Has a half-century's hindsight made the researchers writing in the May/June issue of *Intelligent Systems* as prescient as those who created the workshop 50 years ago? Time—and research—will tell. ●



The power of artificial intelligence was on display before a crowd watching a television broadcast of champion chess player Garry Kasparov [right] match wits against IBM's chess-playing supercomputer in May 1997 in New York City.

Hendler takes special pride in the issue's section on "IEEE Intelligent Systems—10 to Watch," which names the top 10 AI researchers who received their Ph.D.s in the past few years. The 10 were nominated as worth watching by top AI researchers and selected by a committee of senior members of the magazine's advisory board. The issue features papers by nine of them. An "In Memoriam" article is included for the 10th researcher, Push Singh of MIT, who died in February.

"It's about time someone recognized how good these people are, all very promising young scientists in all areas of AI," Hendler says. (For the top-10 list and additional information, see <http://www.tinyurl.com/p8fss>.)