CODA: AN ALLIANCE OF HUMAN AND MACHINE

Ever since Watson won at *Jeopardy!*, people have been asking the research scientists who designed the machine if they'd like to try to pass the so-called Turing test. That's an exercise suggested by computing pioneer Alan Turing in his 1950 paper "Computing Machinery and Intelligence," where he raised the question: "Can machines think?" He suggested that to test whether a machine can think, a human judge should have a written conversation via computer screen and keyboard with another human and a computer. If the judge couldn't tell the human from the machine based on their responses, the machine would have passed the test.[1] With this test, Turing set a standard for measuring the capabilities of machines that has not yet been met.

While the IBM researchers are intrigued by the Turing test, they have no plans to prepare Watson to take it. A Turing test would merely show how good Watson is at imitating human beings and our quirks and social conventions. Instead, they want to concentrate on further developing

the machine so it can become an expert, trusted advisor to humans, such as the oncologists at Memorial Sloan-Kettering Cancer Center. They do not foresee a situation where machines would play the same cognitive role in the universe as humans do. Instead, they can be helpers. Machine cognition and human cognition are complementary. We have different strengths and weaknesses. The opportunity here is not to replicate human cognition but to use computers to help us reason over human-created data—our communications, our documents, our images, and our designs.

Dr. Larry Norton at Memorial Sloan-Kettering agrees. While he embraces the expanded role of cognitive computing in health care, he believes that even as medical decision making becomes ever more scientific, it will also remain a creative activity. "I envision situations where myself, the patient, the computer, my nurse, and my graduate fellow are all in the examination room interacting with one another," Larry says. "Arriving at a good medical decision is an act of artistic improvisation—just as it is with a great piece of music." In his free time, he plays vibraphone in jazz groups.

With every major advance in computing that IBM has produced over its more than one-hundred-year history, questions have been raised about the effect on human beings. In a memo to IBM managers on April 25, 1960, CEO Thomas Watson Jr. addressed head-on the issue of "thinking machines." He wrote: "Computers will never rob man of his initiative or replace the need for his creative thinking. By freeing man from the more menial or repetitive

forms of thinking, computers will actually increase the opportunities for the full use of human reason. Only human beings can think imaginatively and creatively in the fullest sense of these words."

Watson wrote those lines just a few years before IBM launched System/360, a revolutionary family of mainframe computers that transformed the computer industry. System/360 included many firsts. The machines had new kinds of processors, memory devices, and storage. It also marked the first time that software was offered that could run on a variety of computers, not just one, which ultimately gave rise to the independent software industry. But IBM's executives and engineers had no idea at the time that the technology breakthroughs in the System/360 would create a path that would ultimately lead to the personal computer, the Internet, and mobile communications. And so it is today, at the dawn of the era of cognitive systems. We know that big shifts are coming. Yet it's impossible to fully imagine the impact they will have on computing, business, and society.

But this we do know: by working in concert, humans and cognitive systems have the potential to dramatically improve and accelerate outcomes that matter to us and to make life on earth more sustainable. This alliance of human and machine offers the promise of progress on a massive scale. Creating these systems will require breakthroughs and reinvention at every level of technology, from the way we build chips to what we think of as an application. That's a lot of work to do. So let's get to it.