evolutionary water from the Cro-Magnon cave painters to Quentin Tarantino,

A few decades ago, know-it-alls like Ken Jennings seemed to be the model of human intelligence. They aced exams. They had dozens of facts at their fingertips. In one quiz show that predated *Jeopardy, College Bowl*, teams of the brainiest students would battle one another for the honor of their universities. Later in life, people turned to them in boardrooms, university halls, and cocktail parties for answers. Public education has been designed, in large part, to equip millions with a ready supply of factual answers. But if Watson can top them, what is this kind of intelligence worth?

Physical strength has suffered a similar downgrade. Not so long ago, a man with superhuman strength played a valuable role in society. He was a formidable soldier. When villagers needed boulders moved or metal bent, he got the call. After the invention of steam engines and hydraulic pumps, however, archetypal strongmen were shunted to jobs outside the productive economy. They turned to bending metal in circuses or playing noseguard on Sunday afternoons. For many of us, physical strength, once so vital, has become little more than a fashion statement. Modern males now display muscles as mating attire, much the way peacocks fan their otherwise useless feathers.

It would be all too easy to dismiss human foes of the IBM machine as cognitive versions of circus strongmen: trivia wunderkinds. But from the very beginning, Ferrucci saw that the game required far more than the simple regurgitation of facts. It involved strategy, decision making, pattern recognition, and a knack for nuance in the language of the clues. As the computer grew from a whimsical idea into a *Jeopardy* behemoth, it underwent an entire education, triumphing in some areas, floundering in others. Its struggles, whether in untangling language or grappling with abstract ideas, highlighted the areas in which humans maintain an edge. It is in the story of Watson's development that we catch a glimpse of the future of human as well as machine intelligence.

The secret is wrapped up in the nature of knowledge itself. What is it? For humans, knowledge is an entire universe, a welter of sensations and memories, desires, facts, skills, songs and images, words, hopes, fears, and regrets, not to mention love. But for those hoping to build intelligent machines, it has to be simpler. Broadly speaking, it falls into three categories: sensory input, ideas, and symbols. Consider the color blue. Sensory perception is the raw material of knowledge. It's something that computers and people alike can perceive, each in their own fashion. Now think of the word "sky." Those three letters are a symbol for the biggest piece of blue in our world. Computers can handle such symbols. They can find references to "sky" in documents and, when programmed, correlate it with others, such as "blue," "clouds," and "heaven." A computer can master both sensory data and symbols. It can count, categorize, search, and store them. But how about this snippet from Lord Byron: "Friendship is love without his wings." That sentence represents the third realm of knowledge: ideas. How can a machine make sense of them? In these early years of the twenty-first century, ideas remain the dominion of people—and the frontier for thinking machines.

David Ferrucci's mission was to explore that frontier. Like many in his profession, Ferrucci grew up watching *Star Trek* on television. The characters on the show, humans and pointy-eared Vulcans alike, spoke to their computer as if it were one of them. No formatting was necessary, no key words, no programming language. They spoke English. The computer understood the meaning and context of the questions. It consulted vast databases and came back with an immediate answer. True, it might not produce original ideas. But it was an extravagantly well-informed shipmate. That was the computer Ferrucci wanted to build.

As he served the last drops of his wine, Ferrucci was talking about the world he was busy creating, one in which people and their machines often appeared to switch roles. He didn't know, he said, whether engineers would ever be able to "create a sentient being." But when he looked at his fellow humans through the eyes of a computer scientist, he saw patterns of behaviors that often appeared to be

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