The ghostly neon swirl nearly stumped the judges when they first looked at this illustration. Biologist and judge Michael Reddy says that a cognitive computer is “the last thing on Earth” he would have guessed that the image represented at first glance. Inspired by the neural architecture of a macaque, it is the wiring diagram for a new kind of computer that, by some definitions, may soon be able to think.

Over the past 2 years, IBM’s cognitive computing group in San Jose, California, has made great strides toward designing a computer that can detect patterns, plan responses, and learn from its mistakes, says Emmett McQuinn, a hardware engineer at IBM who designed the image. In 2011, the company demonstrated a new kind of computer chip, based on neural circuitry, that combines memory and computational processing for nimbler problem-solving in areas where traditional computers fall short, such as pattern recognition. Then, the company used data from studies of macaque brains to see how those “neurons” should link up, and simulated neural networks with billions of neurons and trillions of axons and synapses.

The first step in creating an illustration to communicate the new wiring system was to reduce trillions and billions of data points to less overwhelming numbers. Even roughly 4000 nodes and 300,000 connections was challenging to get on a single page, McQuinn says. “Fortunately, nature has already thought of this.” First, he clustered and colored the nodes based on the 77 different functional regions that neuroscientists have identified in the macaque brain. Then, after many draft layouts, he found a circular arrangement that pleased him.

“They took something that we know works fantastically efficiently in nature—the circuitry of the brain—and applied that geometry to computing. Then, they found an elegant and beautiful way to display it," judge Thomas Wagner says.
Illustration

Science 339 (6119), 512-513.
DOI: 10.1126/science.339.6119.512

http://science.sciencemag.org/content/339/6119/512

http://science.sciencemag.org/content/sci/339/6119/509.full

http://www.sciencemag.org/help/reprints-and-permissions

Terms of Service