

By [Miguel Botezatu](#), Hardware Editor

## [The Missing Link in Electronics: HP's New Circuit Thinks Beyond Ones and Zeros](#)

*The new device is called a memristor and promises to revolutionize computing*

A group of researchers at the Hewlett-Packard facilities announced that they have developed a new circuit element that is alleged to imitate some of the human biological functions. According to the report, the new device is called a memristor and will account for smaller and more rapid computers in the near future. Memristors can be used in high-density computer memory chips that would draw smaller amounts of power as compared to the existing DRAM semiconductors. A memristor is an electrical resistor with memory properties, that comes with additional logic capabilities, which makes it extremely suitable for reprogrammable chips ([field programmable gate arrays](#)). Unlike conventional logical switches (also known as transistors) the memristor can operate with values beyond the standard 0 and 1. Apart from the binary logic, the memristor can understand a wide range of intermediate values and works in a manner similar to the biological synapses. The new circuits are also expected to unlock extra capabilities in the field of artificial intelligence. Memristors are built from tiny particles of titanium dioxide that act like nano-switches. Worldwide researchers have been struggling to achieve molecule-sized titanium switches for more than 10 years now, in order to find a suitable replacement for the existing transistors. The technology comes at a time when transistors are close to reaching their miniaturization limits imposed by the photolithographic techniques. The HP researchers are currently evaluating the new fields of electronics that could take advantage of this revolutionary circuit element. However, the memristors will be adopted only when they reach a production cost suitable for mass-production. "Whether it will be useful for other large scale applications is unclear at this point", said Wolfgang Porod, director for the Center of Nano Science and Technology at the University of Notre Dame. Hewlett-Packard's memristors are the direct competitors of another technological advance called [phase-change memory](#), an IBM and Intel project that is starting to pay off. However, phase-change memory requires large amounts of power to shift the underlying material from amorphous to crystalline state and the other way around. The new circuit element will consume less power as compared to the already existing CPU and memory technologies and, at the same time, it will allow manufacturers to create smaller chips with a longer lifespan.