

Memristor

Past, Present, and Future

A two hours lecture with

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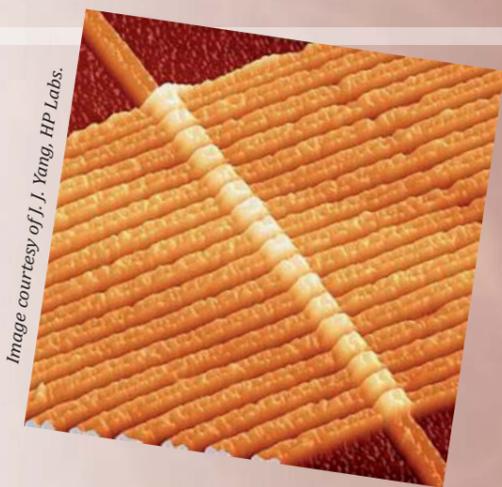


Image courtesy of L. J. Yang, HP Labs.

The 2008 Hewlett-Packard publication of the memristor in *NATURE* has produced immense worldwide interests from both industry and academia.

This seminar presents a prehistory of the memristor and provides answers to the following Frequently Asked Questions:

What is a memristor?

How was it discovered?

Why is it called the 4th circuit element?

How can the memristor store information without batteries?

What are biological memristors?

Why are brains made of memristors?

How does the memristor enable learning and intelligence?



IEEE TRANSACTIONS ON CIRCUIT THEORY, VOL. CT-18, NO. 5, SEPTEMBER 1971

Memristor—The Missing Circuit Element

LEON O. CHUA, SENIOR MEMBER, IEEE

Abstract—A new two-terminal circuit element—called the memristor—characterized by a relationship between the charge $q(t) \equiv \int_{-\infty}^t i(r) dr$ and the flux-linkage $\psi(t) \equiv \int_{-\infty}^t v(r) dr$ is introduced as the fourth basic circuit element. An electromagnetic field interpretation of this relationship in terms of a quasi-static expansion of Maxwell's equations is presented. Many circuit-theoretic properties of memristors are derived. It is shown that this element exhibits some peculiar behavior different from that exhibited by resistors, inductors, or capacitors. These properties lead to a number of unique applications which cannot be realized with RLC networks alone.



Although a physical memristor device without internal power supply has not yet been demonstrated, experimental laboratory models have been built with the help of active circuit elements connected to demonstrate the properties and potential applications of memristors.

Times, April 30, 2008.

By R. Collin Johnson

THIS PAPER presents the long-sought after memristor – the “missing link” in electronic circuit theory – has been invented by Hewlett-Packard Fellow R. Stanley Williams at HP Labs (Palo Alto, Calif.). Memristors – the fourth passive component type after resistors, capacitors and inductors – were postulated in a seminal 1971 paper in the IEEE Transactions on Circuit Theory by Professor Leon Chua at the University of California (Berkeley), but their first realization was just announced today by HP. [...]

Realizations for memristor and its three basic realizations. (a) $i-q$ curve. (b) Memristor basic realization 1: $i-q$ curve. (c) Memristor basic realization 2: $v-i$ curve. (d) Memristor basic realization 3: $M-C$ mutator terminated by C .

CORIA – Salle de Conférence
Monday

March 14, 2011

at 2:30 pm
Site du Madrillet – Saint-Etienne du Rouvray