10 Things You Didn't Know About Memristors

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Abstract

This talk clarifies and demystifies numerous ambiguities, misconceptions, and erroneous statements concerning *memristors*. Some fundamental circuit-theoretic-properties that will be proved include:

- ***all non-volatile*** resistive switching memories are *continuum*, *aka* *analog*, *memories.*
- *Non-volatile* memristors do *not* have DC V-I curves
- Non-volatile memristors may be used as *resistive switches*, or *synapses*.

This talk presents a new fundamental and general *theorem* which asserts that *all non-volatile* resistive switching memories, *aka* memristors, must exhibit a *flat power-off plot (POP),* regardless of the device's internal material and structure.

The *flat POP signature* of non-volatility is essential for understanding and explaining practically all heretofore inexplicable empirical phenomena, such as why the *conductance* of ***all*** non-volatile memristors, including RRAM, Phase Change Memory, Ferro-electric Memory, Atomic Switch, etc., can be tuned continuously over a continuum range by applying voltage, or current, ***pulses*** of ***amplitude A*** and ***width w,*** provided ***A*** and ***w*** is greater than some positive constant K. In particular, this theorem implies that one can switch faster (smaller ***w***) by increasing the pulse height ***A,*** independent of the device structure, or material. Numerous other widely observed but yet unexplained phenomena can also be easily explained. But most important, it can predict outcomes of *gedanken* experiments and help resolve future paradoxes involving *non-volatile memristors*.