

Abstract Submitted  
for the MAR11 Meeting of  
The American Physical Society

**Stochastic memory: getting memory out of noise**<sup>1</sup> ALEXANDER STOTLAND, MASSIMILIANO DI VENTRA, Department of Physics, University of California–San Diego, La Jolla, California 92093-0319 — Memory circuit elements, namely memristors, memcapacitors and meminductors [1], can store information without the need of a power source. These systems are generally defined in terms of deterministic equations of motion for the state variables that are responsible for memory. However, in real systems noise sources can never be eliminated completely. One would then expect noise to be detrimental for memory. Here, we show that under specific conditions on the noise intensity memory can actually be enhanced. We illustrate this phenomenon using a physical model of a memristor in which the addition of white noise into the state variable equation improves the memory and helps the operation of the system. We discuss under which conditions this effect can be realized experimentally, discuss its implications on existing memory systems discussed in the literature, and also analyze the effects of colored noise.

[1] M. Di Ventra, Y.V. Pershin, L.O. Chua, Circuit elements with memory: memristors, memcapacitors and meminductors, Proc. IEEE 97, 1717 (2009).

<sup>1</sup>Work supported in part by NSF.

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Date submitted: 10 Nov 2010

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