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2009 : February 2009 - Emerging Research Fronts : Stuart Lindsay

EMERGING RESEARCH FRONTS - 2009

February 2009



Stuart Lindsay talks with ScienceWatch.com and answers a few questions about this month's Emerging Research Front Paper in the field of Materials Science.



Article: A bond-fluctuation mechanism for stochastic switching in wired molecules

Authors: Ramachandran, GK;Hopson, TJ;Rawlett, AM;Nagahara, LA; Primak, A;Lindsay, SM
 Journal: SCIENCE, 300 (5624): 1413-1416 MAY 30 2003
 Addresses: Arizona State Univ, Dept Phys & Astron, Tempe, AZ 85287 USA.
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 USA, Res Lab, Aberdeen Proving Ground, MD 21005 USA.
 (addresses have been truncated.)

SW: Why do you think your paper is highly cited?

Molecule-to-metal bonds are important in many areas of electronics, and the paper describes fluctuations in these types of contacts.

SW: Does it describe a new discovery, methodology, or synthesis of knowledge?

Up to the time of the paper, it was assumed that fluctuations in the molecule itself caused switching. In the paper we showed that for gold contacts, fluctuations in the bond itself also matter.

SW: Would you summarize the significance of your paper in layman's terms?

Electrical contacts between a molecule and a gold metal contact will spontaneously "break" and reform, causing the contact to flicker on and off. The molecule does not usually leave the surface completely, so the contact tends to "switch on" again after a while. This places an intrinsic limit on attempts to make molecular electronic devices with these kinds of contact.

"Our interest was (and still is) in building molecular photovoltaic devices for energy conversion."

SW: How did you become involved in this research and were any particular problems encountered along the way?

Our interest was (and still is) in building molecular photovoltaic devices for energy conversion.

SW: Where do you see your research leading in the future?

We are now using single-molecule electronic measurements to develop a new way of sequencing DNA. The switching phenomenon opens a new way to make measurements of tunneling through DNA base-pairs, though the final real device will not use gold contacts for obvious reasons!

SW: Do you foresee any social or political implications for your research?

Robust single molecule electronic devices might play a role in lowering the cost and extending the reach of medical diagnostics.

Stuart Lindsay

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Keywords: molecule-to-metal bonds, gold contacts, electrical contacts, molecular photovoltaic devices, energy conversion, single-molecule electronic measurements, sequencing DNA, medical diagnostics .

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