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Nano-mechanical relay device using multi-walled nanotubes as linear bearings VIKRAM DESHPANDE, HSIN-YING CHIU, HENK POSTMA, MARC BOCKRATH, Applied Physics, California Institute of Technology — Electrical breakdown of free-standing multi-walled carbon nanotube (MWNT) devices leads to gaps ∼3-20 nm, which are insulating at low biases. By applying sufficient voltage (∼5-10 V) the inner shells extend due to electrostatic attraction and the gaps close, restoring a non- zero conductance. This demonstrates that the low-friction sliding between shells of a MWNT can be utilized to create a nano-mechanical relay. The observed threshold voltages along with approximate models for the capacitance between the nanotube segments yield a typical electrostatic actuation force ∼0.5 nN. We will compare our observed actuation forces to the expected inner-shell retraction force based on the constant-force spring model of Cumings and Zettl [1]. Finally, recent data indicates that the low conductance state can be restored via the application of a gate voltage, enabling the reversible operation of the device. We will discuss our latest results and interpretations. [1] Cumings, J. & Zettl, A., *Science* **289**, 602-604 (2000)

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