

Abstract for an Invited Paper  
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### **Role of motive forces for the spin torque transfer for nano-structures<sup>1</sup>**

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Despite an announced imminent commercial realization of spin transfer random access memory (SPRAM) the current theory evolved from that of Slonczewski [1,2] does not conserve energy. Barnes and Maekawa [3] have shown, in order correct this defect, forces which originate from the spin rather than the charge of an electron must be accounted for, this leading to the concept of spin-motive-forces (smf) which must appear in Faraday's law and which significantly modifies the theory for spin-valves and domain wall devices [4]. A multi-channel theory in which these smf's redirect the spin currents will be described. In nano-structures it is now well known that the Kondo effect is reflected by conductance peaks. In essence, the spin degrees of freedom are used to enhance conduction. In a system with nano-magnets and a Coulomb blockade [5] the similar spin channels can be the only means of effective conduction. This results in a smf which lasts for minutes and an enormous magneto-resistance [5]. This implies the possibility of "single electron memory" in which the magnetic state is switched by a single electron.

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