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Zamboni force in pumping of angular momentum from electron to nuclear spins via the Overhauser effect MICHAEL STOPA, AMIR YACOBY, JACOB KRICH, Harvard University — We identify a feedback mechanism between the electron states in a two-electron double quantum dot and the difference between the nuclear spin polarization in the two dots, which we term the "Zamboni force." The Overhauser interaction is known to cause angular momentum transfer, spin flip-flops, between electrons and nuclei in GaAs-AlGaAs heterostructures. In double quantum dots, transport and pumping experiments have been performed to study the evolution of nuclear spin polarization in response to certain electronic transitions. We show that, in flipping from singlet (S) to triplet (T+), "flopping" of the nuclear spin can occur in the left dot, the right dot or in the barrier depending on the composition of the singlet state. Assuming a composite nuclear spin for each the left dot, the right dot and the barrier, we numerically integrate the Schrödinger equation to study the gate voltage sweep through the S-T+ anti-crossing point. We show that the (nuclear) effective magnetic field gradient tends to produce spin flips in the dot with the weaker field and thereby constitutes a force toward nuclear spin equilibration.

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