

Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Quantum Control and Entanglement in a Chemical Compass

GIAN GIACOMO GUERRESCHI, JIANMING CAI, HANS J. BRIEGEL, University of Innsbruck, Institute for Quantum Optics and Quantum Information (IQOQI) of the Austrian Academy of Science — The radical-pair mechanism is one of the two main hypotheses to explain the navigability of animals in weak magnetic fields, enabling, e.g., birds to see Earth's magnetic field. It also plays an essential role in spin chemistry. Here, we show how quantum control can be used to either enhance or reduce the performance of such a chemical compass, providing a new route to further study the radical-pair mechanism and its applications. We study the role of radical-pair entanglement in this mechanism, and demonstrate its intriguing connections with the magnetic-field sensitivity of the compass. Beyond their immediate application to the radical-pair mechanism, these results also demonstrate how state-of-the-art quantum technologies could potentially be used to probe and control biological functions.

Gian Giacomo Guerreschi
University of Innsbruck, Institute for Quantum Optics and
Quantum Information (IQOQI) of the Austrian Academy of Science

Date submitted: 07 Dec 2010

Electronic form version 1.4