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Using Local Perturbations To Manipulate and Control Pointer States in Quantum Dot Systems RICHARD AKIS, GIL SPEYER, DAVID FERRY, Arizona State University, ROLAND BRUNNER, University of Leoben, Austria — Recently, scanning gate microscopy (SGM) was used to image scarred wave functions in an open InAs quantum dot[1]. The SGM tip provides a local potential perturbation and imaging is performed by measuring changes in conductance. Scarred wave functions, long associated with quantum chaos, have been shown in open dots to correspond to pointer states[2], eigenstates that survive the decoherence process that occurs via coupling to the environment. Pointer states modulate the conductance, yielding periodic fluctuations and the scars, normally thought unstable, are stabilized by quantum Darwinism [3]. We shall show that, beyond probing, pointer states can be manipulated by local perturbations. Particularly interesting effects occur in coupled quantum dot arrays, where a pointer state localized in one dot can be shifted over into another with a perturbation in a completely different part of the system. These nonlocal effects may perhaps be exploited to give such systems an exotic functionality. [1] A. M. Burke, R. Akis, T. E. Day, Gil Speyer, D. K. Ferry, and B. R. Bennett, Phys. Rev. Lett. 104, 176801 (2010). [2] D. K. Ferry, R. Akis, and J. P. Bird, Phys. Rev. Lett. 104, 176801 (2004). [3] R. Brunner, R. Akis,D. K. Ferry, F. Kuchar,and R. Meisels, Phys. Rev. Lett. 101, 024102 (2008).

David Ferry
Arizona State University

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