oscillator. Extensions to other cases are underway. In the first instance we anticipate that increasing the environment size will increase the participation and effectiveness of overlapping resonances in decoherence control.

Acknowledgments: This work was supported by NSERC and by the Centre for Quantum Information and Quantum Control, University of Toronto.

---

[1] M. Shapiro and P. Brumer, *Principles of the Quantum Control of Molecular Processes*, Wiley, New York, 2003.

[2] S. A. Rice and M. Zhao, *Optical Control of Molecular Dynamics*, Wiley, New York, 2000.

[3] E. Joos, H. D. Zeh, C. Kiefer, D. Guilini, J. Kupsch and L. O. Stamatescu, *Decoherence and the Appearance of a Classical World in Quantum Theory,* 2^{nd} ed., .Springer, Berlin, 2003.

[4] M. Schlosshauer, *Decoherence and the Quantum-to-Classical Transition*, Springer, Berlin, 2007.

[5] See, e.g. P. Nuernberger, G. Vogt, T. Brixner, G. Gerber, PhysChemChemPhys 9, 2470 (2007) for a general review. For some specific examples see K. Hoki and P. Brumer, Phys. Rev. Lett. 95, 168305 (2005); M. Spanner, I. Franco and P. Brumer, Phys. Rev. A 80, 053402 (2009).

[6] M. A. Nielsen and I. L. Chuang,*Quantum Computation and Quantum Information*, Cambridge University Press, Cambridge, 2000.

[7] L. Viola and S. Lloyd, Phys. Rev. A **58**, 2733 (1998); L. Viola, E. Knill, and S. Lloyd, Phys. Rev. Lett. **82**, 2417 (1999).

[8] D. A. Lidar, I. L. Chuang, and K. B. Whaley, Phys. Rev. Lett. **81**, 2594 (1998).

[9] W. H. Zurek, S. Habib and J. P. Paz, Phys. Rev. Lett. **70**, 1187 (1993).

[10] W. H. Zurek, Prog. Theor. Phys. **89**, 281 (1993).

[11] A. Pattanayak and P. Brumer, Phys. Rev. Lett. **79**, 4131 (1997).

[12] P. S. Christopher, M. Shapiro, and P. Brumer, J. Chem. Phys. **123**, 064313 (2005); **124**, 184107 (2006); **125**, 124310 (2006); D. Gerbasi, A. S. Sanz, P. S. Christopher, M. Shapiro and P. Brumer, *ibid.* **126**, 124307 (2007).

[13] E.g., Ph. Jacquod and C. Petitjean, Adv. Phys. 58, 67 (2009).

[14] See, for example, "The Spin-Boson Problem: From Energy Transfer to Quantum Computing", Chemical Physics, Vol. 296, Issues 2-3 (2004)