**Donald Hoffman**

**Department of Cognitive Sciences, UCI**

## Quantum Cognitive Science

Cognitive Science builds computational models of mental processes that occur in, e.g., learning, memory, language and perception. These computational models are, at present, exclusively classical, i.e., they do not exploit the quantum computational resources of *superposition* and *entanglement* . The reason is historical accident: most cognitive scientists happen to know only about classical computation. In this talk I present a brief introduction to quantum bits, quantum gates, quantum teleportation and quantum computation. I review some striking results. (1) Quantum computation can break RSA encryption. (2) Certain quantum searches are faster than classical. (3) Quantum game theory supplants standard game theory, and introduces strategies that resolve the prisoner's dilemma. (4) Quantum mutants outcompete classical players in evolutionary games, and drive them to extinction. (5) For many problems, quantum algorithms provide superpolynomial speedup over classical. The era of Classical Cognitive Science must draw to a close. Henceforth, any computational model within Cognitive Science that fails to exploit superposition or entanglement must give empirical evidence or theoretical reasons for the omission.