Rogerio de Sousa

Curriculum Vitae

Place of birth: Belo Horizonte, Brazil
Citizenship: Brazilian

Address

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Education

Aug. 2003 Ph.D. in Physics, University of Maryland at College Park (GPA=4.0)
Title: *Spin relaxation and manipulation of localized states in semiconductors: Considerations for solid state quantum computer architectures*
Thesis advisor: Prof. Sankar Das Sarma

Aug. 1998 M.S. in Physics, State University of Campinas (Unicamp), Brazil
Title: *Hole dynamics versus magnetic order in clusters of the t-J model*
Thesis advisor: Prof. Guillermo G. Cabrera

Dec. 1996 B.S. in physics, State University of Campinas (Unicamp), Brazil
Scientific advisors: Profs. Guillermo G. Cabrera and Hugo H. Torriani

Employment

Jul. 2007 –	Asst. Professor, Dept. of Physics, U. of Victoria, B.C., Canada
Jul. 2006 – Jul. 2007	Postdoctoral Fellow, Dept. of Physics, U.C. Berkeley Supervisor: Prof. Joel Moore
Sep. 2003 – Jul. 2006	Postdoctoral Fellow, Dept. of Chemistry, U.C. Berkeley Supervisor: Prof. K. Birgitta Whaley
Aug. 1998 – Aug. 2003	Teaching Asst. and Graduate Research Asst., Dept. of Physics and Condensed Matter Theory Center, Univ. of Maryland, College Park
Jan. 1997 – Aug. 1998	CNPq M.S. fellow and university teaching assistant State University of Campinas, Brazil

Areas of research experience: Condensed matter theory

- Theory of magnetic and electric excitations in multiferroic compounds
- Theory of spin manipulation, relaxation, and coherence control in semiconductors: Applications to spintronics, magnetic resonance, and spin-based quantum computation
- Noise and fluctuations in superconductors, semiconductors, and metallic nanostructures
- Implementations of solid state quantum computers based on semiconductor and superconductor nanostructures
- Electron states/spin-orbit interaction in quantum dots

Teaching experience

- Designed and taught a series of lectures entitled *Stochastic theory of decoherence* in the Whaley group meetings, Berkeley Quantum Computation and Information center, Spring 2005.
- Designed and taught a set of guest lectures in *Quantum Physics I-II* throughout Spring 2000–Spring 2003 as a substitute for Prof. Sankar Das Sarma, Univ. of Maryland.
- Teaching assistant for *Experimental Physics III* (Electromagnetic waves, optics and modern physics). PHYS375, Univ. of Maryland, Fall 2001, directed by Prof. C.C. Chang. Designed and taught introductory lectures, guided students, graded reports and exams.
- Teaching assistant for *Fundamentals of Physics I* (Mechanics, heat, sound). PHYS121, Univ. of Maryland, Fall 1999, course taught by Profs. T.R. Kirkpatrick and Y.S. Kim. Taught laboratory and discussion sessions, graded exams.
- Teaching assistant for *General Physics Laboratory* (Vibration, Waves, Heat, Electricity and Magnetism). PHYS262A, Univ. of Maryland, Spring 1999, directed by Prof. D. Boyd. Taught laboratory sessions, graded exams.
- Teaching assistant for *General Physics* (Vibration, Waves, Heat, Electricity and Magnetism). PHYS262, Univ. of Maryland, Fall 1998, directed by Dr. M.C. Wittmann. Taught tutorial sessions designed by the physics education group, graded exams.
- Teaching assistant for *Physics III* (Electricity and magnetism). Universidade Estadual de Campinas, Brazil, Aug.–Dec. 1997, directed by Prof. M.A.P. Lima. Taught problem solving sessions, designed and graded quizzes and exams.

Grants

- **Nonequilibrium effects in nanostructures: Applications to solid state quantum computation and spintronics**, PI. Approved by the Natural Sciences and Engineering Research Council of Canada (Discovery grant, individual).
- **Quantum Logic Demonstrations with Donor Electron Spin Qubits in Silicon**, co-PI. Proposed and designed the theory section. Approved by the U.S. Army Research Office, May 2006-May 2010. PI: T. Schenkel.

Refereeing of scientific journals

- Referee of the journals Physical Review Letters, Physical Review A, Physical Review B, Journal of Chemical Physics, European Physical Journal B, and Journal of Physics: Condensed Matter.

Professional Memberships

- Member of the American Physical Society.

Research presentations at seminars and conferences

2007

- *Theory of electrical control of spin waves in multiferroic materials*, APS March Meeting 2007, Denver, March 7th.
- *Noise and Decoherence in Nanostructures: Microscopic Origin and Control*, condensed matter physics seminar at Michigan State University, invited by Prof. Mark Dickman, February 12th.
- *Electron spin coherence as a probe of magnetic noise at the semiconductor surface*, **Invited talk** at the 37th Winter Colloquium on The Physics of Quantum Electronics, Snowbird, Utah, January 5th.

2006

- *Quantum logic demonstrations with donor electron spin qubits in silicon*, **Invited talk** at the ARO/NSA quantum computing program review, joint with T.S. Schenkel and S.A. Lyon, August 15th.

- *Charge noise in single electron tunneling devices*, colloquium at D-Wave Systems, Vancouver, B.C., Canada, May 23rd.

- *Theory of virtual bound states at the nanoscale: Charge noise in single electron tunneling devices and how to control and detect an impurity spin using a spin polarized current*, Physics and Astronomy specialized seminar at the University of Victoria, B.C., Canada, May 19th.

- *Coherence control of charge and spin in nanostructures*, Physics and Astronomy department colloquium at the University of Victoria, B.C., Canada, May 18th.

- *Ohmic and step noise from a single trapping center hybridized with a Fermi sea*, APS March Meeting 2006, Baltimore, March 14th.

- *Quantum control and robust quantum information*, **Invited talk** at the APS March Meeting 2006 given by Prof. K.B. Whaley about joint research with R. de Sousa, J. Zhang, and M. Möttönen. Baltimore, March 14th.

- *Coherence control of solid state quantum bits*, **Invited talk** at the 36th Winter Colloquium on The Physics of Quantum Electronics, Snowbird, Utah, January 3rd.

2005

- *Electron spin coherence in semiconductor quantum computation: Silicon vs. Gallium Arsenide,* Berkeley Nanosciences and Nanoengineering Institute seminar, invited by Prof. Eicke R. Weber, September 30th.

- *Ohmic and step noise from a single trapping center hybridized with a Fermi sea,* Condensed matter special seminar, Dept. of Physics, U.C. Berkeley, invited by Prof. J. Moore, June 16th.

- *Electron spin decoherence due to interaction with nuclear spins: Mechanisms and control,* Schottky seminar at the Walter Schottky Institute, Technische Universität München, Germany, invited by Prof. Jonathan Finley, May 3rd. Condensed Matter Theory seminar at Universität Regensburg, invited by Prof. Jaroslav Fabian, May 12th.

- *Controlling decoherence due to nuclear spins in III-V compounds: Which price do we pay?* APS March Meeting 2005, Los Angeles, California, March 25th.

2004

- *Stochastic theory of localized spin coherence in semiconductors,* Lehrstuhlseminar at Ludwig-Maximilians-Univertät München, Germany, invited by Dr. Frank K. Wilhelm, June 29th. Ringberg Castle Workshop, July 7th, invited by Prof. Ignacio Cirac.

- *Silicon quantum computation based on magnetic dipolar coupling,* APS March Meeting 2004, Montreal, Canada, March 26th.

- *Gate control of spin dynamics in III-V semiconductor quantum dots,* APS March Meeting 2004, Montreal, Canada, March 24th.

- *Coherence and fidelity in solid state spin quantum computation,* **Plenary talk** at the APS March Meeting 2004, given by Prof. Sankar Das Sarma about joint research with Rogerio de Sousa and Xuedong Hu. Montreal, Canada, March 23rd.

2003

- *Spin coherence and control of localized electron states in semiconductors,* abstract selected for an oral presentation at the conference Solid State Quantum Information Processing, Amsterdam, Netherlands, December 17th.

- *Spin Relaxation and Manipulation of Localized States in Semiconductors: Considerations for Solid State Quantum Computer Architectures,* U.C. Berkeley Quantum Computation and Information Seminar, invited by Prof. K.B. Whaley, September 16th.

- *Manipulação e tempo de coerência de spins em semicondutores,* presented at several Brazilian universities: UFMG (June 27th), UFF (June 30th), UFRJ (July 1st), LNLS (July 8th), UFRGS (July 10th).

- *Spin echoes and coherence for quantum computation,* Statistical Physics and Biophysics seminar, invited by Prof. M.E. Fisher at the Institute for physical science and technology, Univ. of Maryland, College Park. April 1st.

- *Spin echoes and spin coherence for solid-state quantum computers,* Univ. of California Berkeley, invited by Prof. K. Birgitta Whaley, March 13th; Laboratory for Physical Sciences, invited by Dr. Bruce Kane, March 11th; Univ. of Wisconsin Madison, invited by Prof. Susan Coppersmith, February 11th.

- *Theory of nuclear induced spectral diffusion: Spin decoherence of donors in Si and GaAs quantum dots,* APS march meeting, Austin, TX.

Publications

222 total citations as of 04/19/06 (ISI Web of Knowledge). Most cited papers noted below.

18. Rogerio de Sousa.
Electron spin as a spectrometer of nuclear spin noise and other fluctuations,
refereed book chapter to appear in "Electron spin resonance and related phenomena in low dimensional structures", edited by Marco Fanciulli (Springer-Verlag, Berlin 2007); cond-mat/0610716.

17. T. Schenkel, J.A. Liddle, J. Bokor, A. Persaud, S.J. Park , J. Shangkuan, C.C. Lo, S. Kwon, S.A. Lyon, A.M. Tyryshkin, I.W. Rangelow, Y. Sarov, D.H. Schneider, J. Ager, and R. de Sousa.
Strategies for integration of donor electron spin qubits in silicon,
Microelectronic Engineering **83**, 1814 (2006).

16. Mikko Möttönen, Rogerio de Sousa, Jun Zhang, and K. Birgitta Whaley.
High fidelity one-qubit operations under random telegraph noise,
Phys. Rev. A **73**, 022332 (2006); quant-ph/0508053.

15. T. Schenkel, A. M. Tyryshkin, R. de Sousa, K. B. Whaley, J. Bokor, J. A. Liddle, A. Persaud, J. Shangkuan, I. Chakarov, S. A. Lyon.
Electrical activation and spin coherence of ultra low dose antimony implants in silicon,
Appl. Phys. Lett. **88**, 112101 (2006); cond-mat/0507318.

14. Rogerio de Sousa, K. Birgitta Whaley, Frank K. Wilhelm, and Jan von Delft.
Ohmic and step noise from a single trapping center hybridized with a Fermi sea,
Phys. Rev. Lett. **95**, 247006 (2005); cond-mat/0504149.

13. Neil Shenvi, Rogerio de Sousa, and K. Birgitta Whaley.
Universal Scaling of Hyperfine-Induced Electron Spin Echo Decay,
Phys. Rev. B **71**, 224411 (2005); cond-mat/0502143.

12. W.M. Witzel, Rogerio de Sousa, and S. Das Sarma.
Quantum theory of spectral diffusion induced electron spin decoherence,
Phys. Rev. B **72**, 161306(R) (2005); cond-mat/0501503.

11. S. Das Sarma, Rogerio de Sousa, Xuedong Hu, and Belita Koiller.
Spin quantum computation in silicon nanostructures,
Solid State Commun. **133**, 737 (2005); cond-mat/0411755.

10. Neil Shenvi, Rogerio de Sousa, and K. Birgitta Whaley.
Non-Perturbative Bounds on Hyperfine-Induced Electron Spin Coherence Times,
Phys. Rev. B **71**, 144419 (2005); cond-mat/0406090.

9. Rogerio de Sousa, Neil Shenvi, and K. Birgitta Whaley.
Qubit coherence control in a nuclear spin bath,
Phys. Rev. B **72**, 045330 (2005); cond-mat/0406090.

8. Rogerio de Sousa, J. D. Delgado, and S. Das Sarma.
Silicon quantum computation based on magnetic dipolar coupling,
Phys. Rev. A **70**, 052304 (2004); cond-mat/0311403.

7. Rogerio de Sousa and S. Das Sarma.
Gate control of spin dynamics in III–V semiconductor quantum dots,
Phys. Rev. B **68**, 155330 (2003); cond-mat/0306417. **28 Citations.**

6. Rogerio de Sousa and S. Das Sarma.
Theory of nuclear induced spectral diffusion: Spin decoherence of phosphorus donors in Si and GaAs quantum dots,
Phys. Rev. B **68**, 115322 (2003); cond-mat/0211567. **54 citations.**

5. Rogerio de Sousa and S. Das Sarma.
Electron spin coherence in semiconductors: Considerations for a spin-based solid state quantum computer architecture,
Phys. Rev. B **67**, 033301 (2003); cond-mat/0203101. **47 citations.**

4. X. Hu, Rogerio de Sousa, and S. Das Sarma.
Decoherence and dephasing in spin-based solid state quantum computers,
p. 3 in the book *Foundations of Quantum Mechanics in the light of New Technology*, edited by Y.A. Ono and K. Fujikawa
(World Scientific, Singapore, 2002); cond-mat/0108339.

3. Rogerio de Sousa, X. Hu, and S. Das Sarma.
Effect of an inhomogeneous external magnetic field on a quantum-dot quantum computer,
Phys. Rev. A **64**, 042307 (2001); cond-mat/0103410.

2. X. Hu, Rogerio de Sousa, and S. Das Sarma.
Interplay between zeeman coupling and swap action in spin-based quantum computer models: Error correction in inhomogeneous magnetic fields,
Phys. Rev. Lett. **86**, 918 (2001); cond-mat/0004459. **31 citations.**

1. Rogerio de Sousa and G.G. Cabrera.
Precursory metal-insulator transition in a small cluster of the 't-J' model: Exact analytic results,
cond-mat/0008373.