

Adrian E. Feiguin
CURRICULUM VITA

Personal Data

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DATE OF BIRTH	April 30th, 1971
PLACE OF BIRTH	Rosario, Argentina
CITIZENSHIP	Argentinean
IMMIGRATION STATUS	U.S. Resident
MARITAL STATUS	Married

Education

DEGREES

- **Ph.D. in Physics.**

Facultad de Ciencias Exactas e Ingeniería. Universidad Nacional de Rosario (Argentina)
Doctoral Thesis: "Numerical studies of electronic and magnetic systems in low dimensions"
April 2000.

- **MS in Physics.**

Facultad de Ciencias Exactas e Ingeniería. Universidad Nacional de Rosario (Argentina)
Master Thesis: "Spin-Peierls dimerization and frustration in two-dimensional antiferromagnets"
August 1994.

SCHOLARSHIPS AND AWARDS

- 2005 - Ramon y Cajal Fellowship from the Government of Spain.
- 1999 - Postdoctoral Scholarship from Fundacion Antorchas, Argentina.
- 1994 - Doctoral Scholarship from the National Research Council of Argentina. (CONICET)

Research Interests:

My research focuses on the computational study of strongly correlated problems in Condensed Matter. My expertise covers a variety of techniques, such as the Density Matrix Renormalization Group (DMRG), Exact Diagonalization, Quantum Monte Carlo, as well as analytical approaches.

My interests cover a wide range of fields, with publications in all these areas:

- Ultracold atomic gases in optical lattices.
- Decoherence in quantum systems.
- Electronic and spin transport in Mesoscopic Systems.
- High Temperature Superconductors.
- Transition Metal Oxides.
- Quantum Magnetism in low dimensions.
- Exotic quantum phases of matter and topological order, including the Fractional Quantum Hall Effect.

Research Positions

2007-present Research Associate at the University of Maryland, College Park. Also affiliated to Microsoft Research.

2005-2007 Postdoctoral Researcher at Microsoft Research, Station Q. California Nano Systems Institute, University of California, Santa Barbara.

2002-2005 Postdoctoral Researcher at the University of California, Irvine. Irvine, California (USA).
Advisor: Prof. Steve White.

2000-2002 Postdoctoral Researcher at the National High Magnetic Field Laboratory, Florida State University. Tallahassee, Florida (USA).
Advisor: Prof. Elbio Dagotto.

1995-2000 Fellow of the National Research Council of Argentina (CONICET)
Advisor: Prof. H. Ceccatto.

Teaching Positions

Spring 2004 Lecturer, Department of Physics and Astronomy, University of California at Irvine. Computational Physics for senior undergraduates.
<http://eee.uci.edu/04s/47520/>

1998-1999 Lecturer at the School of Engineering and Exact Sciences, Universidad Nacional de Rosario (Argentina). Condensed Matter I and Numerical Analysis.
Duties: Designing, administering, and grading exams. Teaching seminar and lab.

1995-1998 Teaching Assistant at the School of Engineering and Exact Sciences, Universidad Nacional de Rosario (Argentina). Condensed Matter I, and Numerical Analysis.

Duties: Designing, administering, and grading exams. Teaching seminar and lab. Built and administered the computer lab network, designed the lab lectures, taught programming in Fortran and C, and the first course on the Linux operating system for Physics students.

1994-1996 Teaching Assistant at the School of Engineering and Exact Sciences, Universidad Nacional de Rosario (Argentina). Physics III (Electricity and Magnetism).

Duties: Designing, administering, and grading exams. Teaching lab.

1993-1995 Teaching assistant at the School of Biochemistry and Pharmacy, Universidad Nacional de Rosario (Argentina). Physics I and II.

Duties: Administering, and grading exams. Teaching lab.

Educational and Scientific Software

- **ALPS DMRG Project** The ALPS project (Algorithms and Libraries for Physics Simulations) is an open source effort aiming at providing high-end simulation codes for strongly correlated quantum mechanical systems as well as C++ libraries for simplifying the development of such code. ALPS strives to increase software reuse in the physics community. I contributed the Density Matrix Renormalization Group code for simulating low-dimensional strongly correlated systems.

- **SciGraphica** (<http://scigraphica.sourceforge.net>) An application for scientific graphics and data analysis. It features spreadsheets and interactive plots in a user-friendly graphic interface. It has been programmed from scratch using C and the GTK and GtkExtra toolkits. The spreadsheets evaluate expressions in Python, and the plots generate publication quality PostScript output. It has a native file format in XML and it is enhanced under GNOME. The project is open-source and continuously augmented in functionality by many users throughout the world. It is becoming very popular in the scientific community, and it is included in most of the Linux/BSD distributions. Moreover, SciGraphica is being used at places like Siemens, and Nasa (see for instance, the Shuttle Radar Topography Mission at <http://www.jpl.nasa.gov/srtm/>), and for ocean modeling (<http://www.mi.uib.no/BOM/>)

Invited talks and Presentations

June 2008 “Spin-incoherent behavior in one-dimensional interacting systems”. California Institute of technology.

May 2008 “Spin-incoherent behavior in one-dimensional interacting systems”. University of California, Santa Barbara.

May 2008 “Density Matrix Renormalization Group Study of Incompressible Fractional Quantum Hall States”. University of California, Santa Cruz.

- Sept 2007** “Incompressible Fractional Quantum Hall states in the second Landau level”. University of Maryland, College Park.
- Dec 2006** “Density Matrix Renormalization Group study of Fractional Quantum Hall states”. Kavli Institute for Theoretical Physics.
- Mar 2005** “On adaptive time-dependent DMRG based on Runge-Kutta methods”. Invited speaker at the March 2005 Meeting of the APS, Los Angeles.
- Feb 2005** “Simulating quantum systems with the time-dependent density matrix renormalization group”. Oregon State University, Corvallis, Oregon.
- Feb 2005** “Simulating quantum systems with the time-dependent density matrix renormalization group”. Virginia Commonwealth University, Richmond, Virginia.
- Nov 2004** “Simulating quantum systems with the time-dependent density matrix renormalization group”, Quantum Lunch Seminar at the Quantum Information Research Institute. Los Alamos National Laboratory.
- Oct 2004** “Recent developments and applications of the time-dependent density matrix renormalization group”, second CSULA/USC mini-workshop on numerical and experimental studies in condensed matter physics. California State University, L.A.
- Mar 2003** “Real time evolution using the density matrix renormalization group”, Condensed Matter group seminar, University of Southern California.
- Jan 2003** “Application of the density matrix renormalization group to strongly correlated electron problems”, Physics Department Colloquium, California State University, Los Angeles.

Participation in Conferences:

- 2008 - Quantum Magnetism 2008. University of Minnesota.
- 2007 - Moments and multiplets in Mott materials. Kavli Institute for Theoretical Physics, UC Santa Barbara, USA.
- 2007 - 46th Summer program at the Aspen Center for Physics: Topological Quantum Computation. Aspen, USA.
- 2007 - Fourth International School and Conference on Spintronics and Quantum Information Technology (SPINTECH IV). Maui, Hawaii, USA.
- 2007 - Strongly Correlated Phases in Condensed Matter and Degenerate Atomic Systems. Kavli Institute for Theoretical Physics, UC Santa Barbara, USA.
- 2007 - APS March Meeting, Denver, USA.
- 2006 - Fractional Quantum Hall Effect and topological phases of matter. Station Q Fall meeting. Kavli Institute for Theoretical Physics, UC Santa Barbara, USA.
- 2006 - Topological phases and quantum computation. Workshop and conference. Kavli Institute for Theoretical Physics, UC Santa Barbara, USA.

- 2006 - APS March Meeting, Baltimore, USA.
- 2005 - APS March Meeting, Los Angeles, USA.
- 2004 - APS March Meeting, Montreal, Canada.
- 2003 - APS March Meeting, Austin, USA.
- 2002 - APS March Meeting, Indianapolis, USA.
- 2001 - APS March Meeting, Seattle, USA.
- 1998 - X Workshop on Open Problems in Strongly Correlated Electron Systems. International Centre for Theoretical Physics (ICTP), Trieste, Italy.
- 1996 - Workshop on Strong Electron Correlation. International Centre for Theoretical Physics (ICTP), Trieste, Italy.

Professional Society Activities

- Active member of the American Physical Society.
- Regular referee of manuscripts for Physical Review Letters and Physical Review B and A.
- Referee of manuscripts for Modern Physics Letters B.
- Referee of manuscripts for J. Phys. A: Math. Gen.

Scientific Publications (600+ citations; h-index:8)

1. "Transport properties and Kondo correlations in nanostructures: the time-dependent DMRG method applied to quantum dots coupled to Wilson chains"
Luis G.G.V. Dias da Silva, F. Heidrich-Meisner, A. E. Feiguin, C. A. Busser, G. B. Martins, E. V. Anda, and E. Dagotto
Submitted to Phys. rev. B
2. "Spin polarization of the $\nu = 5/2$ quantum Hall state"
A. E. Feiguin, E. Rezayi, Kun Yang, C. Nayak, S. Das Sarma.
Submitted to Phys. Rev. Lett.
3. "Decoherence dynamics of a single spin versus spin ensemble"
V.V. Dobrovitski, A.E. Feiguin, D.D. Awschalom, R. Hanson.
Accepted for publication on Phys. Rev. B (2008)
4. "Ground-state reference systems for expanding correlated fermions in one dimension"
F. Heidrich-Meisner, M. Rigol, A. Muramatsu, A. E. Feiguin, and E. Dagotto
Accepted for publication on Phys. Rev. B (2008)
5. "Collective states of interacting anyons in topological quantum liquids"
S. Trebst, E. Ardonne, A. E. Feiguin, D. A. Huse, A. W. W. Ludwig, M. Troyer
Submitted to Phys. Rev. Lett.
6. "Dynamics of a single spin interacting with an adjustable spin bath"
R. Hanson, V.V. Dobrovitski, A.E. Feiguin, O. Gywat and D.D. Awschalom
Science 18 April 2008 320: 352-355. Published on-line at Science DOI: 10.1126/science.1155400 (March 2008).
7. "Excitons in the one-dimensional Hubbard model: a real-time study"
K.A. Al-Hassanieh, F. Reboredo, A.E. Feiguin, I.Gonzalez, and E. Dagotto
Phys. Rev. Lett. **100**, 166403 (2008)
8. "Spin polaron in the $J_1 - J_2$ Heisenberg model"
I.J. Hamad, A.E. Trumper, A.E. Feiguin, L.O Manuel
Phys. Rev. B **77**, 014410 (2008). arXiv:0710.5720
9. "Pairing states of a polarized Fermi gas trapped in a one-dimensional optical lattice"
A. E. Feiguin, F. Heidrich-Meisner
Phys. Rev. B **76**, 220508(R) (2007). Preprint: arXiv:0707.4172
10. "Density Matrix Renormalization Group study of incompressible fractional quantum Hall states"
A. E. Feiguin, E. Rezayi, C. Nayak, S. Das Sarma
Phys. Rev. Lett. **100**, 166803 (2008) arXiv:0706.4469
11. "Transport through quantum dots: A combined DMRG and cluster-embedding study"
F. Heidrich-Meisner, G.B. Martins, K.A. Al-Hassanieh, A.E. Feiguin, G. Chiappe, E.V. Anda, E. Dagotto
Submitted to New Journal of Physics. arXiv:0705.1801

12. “Probing the pairing symmetry and pair charge stiffness of doped $t - J$ ladders”
A. E. Feiguin, S. R. White, D. J. Scalapino, and I. Affleck
Submitted to Phys. Rev. Lett. cond-mat/0612636
13. “Interacting anyons in topological quantum fluids: The golden chain”
A. E. Feiguin, S. Trebst, A. W. W. Ludwig, M. Troyer, A. Kitaev, Z. Wang, and M. Freedman
Phys. Rev. Lett. **98**, 160409 (2007), cond-mat/0612341
14. “Universal emergence of the one-third plateau in the magnetization process of frustrated quantum spin- S chains”
F. Heidrich-Meisner, I. A. Sergienko, A. E. Feiguin, and E. Dagotto.
Phys. Rev. B **75**, 064413 (2007), cond-mat/0609555
15. “Cooper-pair transport through a Hubbard chain sandwiched between two superconductors: Density matrix renormalization group calculations”
A. E. Feiguin, Steven R. White, and D.J. Scalapino
Phys. Rev. B. **75**, 024505 (2007), cond-mat/0611297
16. “Adaptive time-dependent density-matrix renormalization-group technique for calculating the conductance of strongly correlated nanostructures”
K. A. Al-Hassanieh, A. E. Feiguin, J. A. Riera, C. A. Büsser, and E. Dagotto
Phys. Rev. B **73**, 195304 (2006)
17. “Finite-temperature density matrix renormalization using an enlarged Hilbert space”
A. E. Feiguin and S. R. White
Phys. Rev. B **72**, 220401 (2005)
18. “Time-step targeting methods for real-time dynamics using the density matrix renormalization group”
A. E. Feiguin and S. R. White
Phys. Rev. B **72**, 020404 (2005)
19. “Real time evolution using the density matrix renormalization group”
Steven R. White and Adrian E. Feiguin
Phys. Rev. Lett. **93**, 076401 (2004) (**50 citations**)
20. “Anisotropy-induced ordering in the quantum $J_1 - J_2$ antiferromagnet”
T. Roscilde, A. E. Feiguin, A. L. Chernyshev, S. Liu, and S. Haas
Phys. Rev. Lett. **93**, 017503 (2004)
21. “Unveiling New Magnetic Phases of Undoped and Doped Manganites”
T. Hotta, M. Moraghebi, A. Feiguin, A. Moreo, S. Yunoki, and E. Dagotto
Phys. Rev. Lett. **90**, 247203 (2003) (**23 citations**)
22. “The spectral function for Mott insulating surfaces”
L. O. Manuel, C. J. Gazza, A. E. Feiguin and A. E. Trumper
J. Phys.: Condens. Matter **15** 2435-2440 (2003).

23. “Stripes induced by orbital ordering in layered manganites”
T. Hotta, A. Feiguin, and E. Dagotto
Phys. Rev. Lett. **86**, 4922 (2001). (**26 citations**)
24. “ Resistivity of mixed-phase manganites”
M. Mayr, A. Moreo, Jose A. Verges, J. Arispe, A. Feiguin, and E. Dagotto,
Phys. Rev. Lett. **86**, 135 (2001). (**120+ citations**)
25. “Doped stripes in models for the cuprates emerging from the one-hole properties of the insulator”
G. Martins, C. Gazza, J. C. Xavier, A. Feiguin, and E. Dagotto,
Phys. Rev. Lett. **84**, 5844 (2000). (**39 citations**)
26. “Giant cluster coexistence in doped manganites and other compounds”
A. Moreo, M. Mayr, A. Feiguin, S. Yunoki and E. Dagotto,
Phys. Rev. Lett. **84**, 5568 (2000). (**190+ citations**)
27. “Influence of finite Hund rules and charge transfer on properties of Haldane systems”
A.E.Feiguin, L.Arrachea, and A.A.Aligia.
Phys. Rev. **B 59**, 9916 (1999).
28. “Numerical study of the incommensurate phase in spin-Peierls systems”
A.E.Feiguin, J.Riera, A.Dobry, and H.A.Ceccatto.
Phys. Rev **B 56**, 14607 (1997). (**31 citations**)
29. “The Hubbard model on a non-bipartite lattice: A slave-boson study”
A.E.Feiguin, C.J.Gazza, A.E.Trumper, H.A.Ceccatto.
J.Phys:Condensed Matter, **9**, L27 (1996).
30. “Spin stiffness of frustrated Heisenberg antiferromagnets: Finite size scaling”
A.E.Feiguin, C.J.Gazza, A.E.Trumper, H.A.Ceccatto.
Phys. Rev. **B 52**, 15043 (1995).
31. “Spin-Peierls dimerization and frustration in two-dimensional antiferromagnets”
A.E.Feiguin, C.J.Gazza, A.E.Trumper, and H.A.Ceccatto.
J.Phys.:Condensed Matter **6**, L503 (1994).

IN PREPARATION:

1. ”Kondo correlations and transport in single and triple quantum dots with damped lead hoppings: a tDMRG study”
L.D. Da Silva, F. heidrich-Meisner, A. E. Feiguin, and E. Dagotto
2. “Dielectric breakdown of a Mott insulator: I-V characteristics and properties of the insulating state”
K. A. Al-Hassanieh, A. E. Feiguin, and E. Dagotto

ARTICLES IN COLLECTIONS:

1. "Finite-size scaling analysis of spin correlations and fluctuations of two quantum dots in a T-shape geometry"
F. Heidrich-Meisner, G.B. Martins, K.A. Al-Hassanieh, A.E. Feiguin, E. Dagotto
Physica B **403**, 1544 (2008). Proceedings of SCES 2007.
2. "The ALPS project release 1.3: open source software for strongly correlated systems"
A.F. Albuquerque, et al. *Journal of Magnetism and Magnetic Materials*, **310**, 1187 (2007)
3. "Theory of manganites: the key role of phase segregation"
E. Dagotto, A. Feiguin and A. Moreo
Published as part of the book "Open problems in strongly correlated electron systems",
NATO Science Series: B Physics

BOOKS AND CHAPTERS IN BOOKS

1. "Monte Carlo simulations and application to Manganite models". Chapter written in collaboration with Elbio Dagotto and G. Alvarez as part of the book "Nanoscale Phase Separation and Colossal Magnetoresistance. The Physics of Manganites and Related Compounds", Springer Series in Solid-State Sciences , Vol. 136 (2002) Author: Elbio Dagotto

IN THE PRESS:

1. "Physicists discover how fundamental particles lose track of quantum mechanical properties". Physorg, March 2008. <http://www.physorg.com/news124636936.html>
2. "Physicists Show How Fundamental Particles Lose Quantum Mechanical Properties Through Environmental Interactions". AZoNano. <http://www.azonano.com/news.asp?newsID=6086>
3. "The equivalent of a new quantum liquid?". Physorg, May 2004.
<http://www.physorg.com/news97494826.html>

Professional References

1. Prof. Elbio Dagotto.
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Department of Physics, University of California at Santa Barbara.
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Phone: 805-893-2871. E-mail: djs@spock.physics.ucsb.edu
3. Prof. Steven White.
Department of Physics and Astronomy, University of California at Irvine.
4129 Frederick Reines Hall, Irvine, CA 92697-4575.
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