Curriculum Vitae
Gonzalo Alvarez
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Professional Preparation

2004 Ph. D. in Physics. Florida State University, USA.
1999 M. S. in Physics. U. of Montevideo, Uruguay.
1996 B S. in Physics. U. of Montevideo, Uruguay.

Appointments

2018 - present. Senior Research and Development Staff, Oak Ridge National Laboratory.
2006 - 2018. Research and Development Staff Scientist, Oak Ridge National Laboratory.
2004 - 2006. Wigner Fellow at Oak Ridge National Laboratory.
2000 - 2004. Research Assistant. Florida State University.
1996 - 2000. Research Assistant. U. of Montevideo. Uruguay.

Research Interests and Expertise

The overarching goal of my research is the theoretical and computational study of strongly correlated electron systems, and the understanding of the complexity that emerges from these systems. My current interest is to understand theoretically collective phenomena at the electronic level, using the density matrix renormalization group algorithm and other *methods that do not rely on uncontrolled approximations but that can systematically converge to the exact answer,* and where the error made can be estimated. I am interested in three aspects: the real time evolution in electron transport, the temperature dependence of electronic properties in nanostructures, and the dynamical response functions in strongly correlated systems. Collective phenomena at the electronic level are at the heart of the current scientific and technological interest in many materials. Strongly correlated materials show unusual, often technologically useful, electronic and magnetic properties, such as metal-insulator transitions or half metalicity. The term "correlated" refers to the way electrons behave in these materials, which precludes relying on simple one-electron approximations. My research interests also include high energy lattice gauge theory, which connects well to condensed matter theory.

I have over ten years experience in programming C++ using templates and virtual inheritance, and have developed the DMRG++ computer program from scratch at ORNL, and the `PsimagLite` codebase inspired in T. Schulthess's `psimag` software. I am familiar with HPC systems, and with the use of hdf5, BLAS, LAPACK, and the `pthreads` library. It is imperative that we release our computer programs with a free and open source license, maintain said programs, be open to contributions, and provide input decks and other details so that we make every effort to aid other researchers in reproducing our published numerical results.

Synergistic Activities

1. Member APS. Within APS, membership to these two groups: APS Topical Group on Magnetism and its Applications (GMAG), and APS Division of Condensed Matter Physics (DCMP)
2. LDRD award Bringing the DMRG++ Scientific Application to Exascale, (2018).
3. Recipient of a DOE Early Career award from 2011 to 2016 titled "Diagonalization Solvers for the Research of Collective Electronic Phenomena in Nanoscience"

4. Invited speaker at the 2014 March Meeting of the APS, Denver, Colorado, USA, under the Research and Opportunities at the DOE Nanoscaled Science and Research Centers Session, my talk was titled "Computing Correlated Electrons: Roadmap and Roadblocks."
5. Reviewer for Physical Review Letters, and the Physical Reviews B and E.
6. Developer and maintainer of computational codes, including DMRG++, for CNMS users and for the scientific community at large.
7. Close collaborator of distinguished Prof. Elbio Dagotto, University of Tennessee.