

CURRICULUM VITAE

Stephan Haas

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Education

- Ph.D. Physics, National High Magnetic Field Laboratory (1995).
Thesis title: *Dynamic Properties of Strongly Correlated Fermionic Systems*.
Thesis advisor: Elbio Dagotto.
- Vordiplom Physics, Technische Universität Berlin, Germany (1989).

Employment

- Professor, Department of Physics and Astronomy, University of Southern California (2006 - present).
- Vice Dean for Research, College of Letters, Arts and Sciences, University of Southern California (2010 - 2012).
- Director of Graduate Studies, Department of Physics and Astronomy, University of Southern California (2006 - 2010).
- Associate Professor, Department of Physics and Astronomy, University of Southern California (2002 - 2006).
- Assistant Professor, Department of Physics and Astronomy, University of Southern California (1998 - 2002).

- Postdoctoral Research Associate, Theoretische Physik, ETH Zürich (1995-1998).
- Graduate Assistant, Department of Physics, National High Magnetic Field Laboratory and Supercomputer Computations Research Institute, Florida State University (1990-1995).

Current Research Interests

- Strongly Correlated Electrons: microscopic models and phenomenology of quantum many body systems, quantum-to-classical crossover phenomena, equilibration and thermalization in quantum systems.
- Magnetism: quantum phase transitions, transport, thermodynamics and excitation spectra of low-dimensional antiferromagnets.
- Impurities: disorder effects in superconductors and quantum magnets, impurity induced ordering, novel quantum glass phases.
- Quantum Information Theory: information geometry of quantum phase transitions, analysis of quantum phase transition using fidelity and entanglement measures.
- Adaptive Quantum Design: design of nanoscale devices by numerical optimization of atomic and molecular configurations that enable desired target response functions.

Teaching Experience

- Undergraduate Courses: Conceptual Physics, Physics for the Life Sciences, Calculus Based Physics: Mechanics and Thermodynamics, Electricity and Magnetism.
- Graduate Courses: Thermodynamics and Statistical Physics, Solid State Physics, Methods of Computational Physics, Advanced Solid State Physics.

Grants and Awards

- Grants from the National Science Foundation, the Department of Energy, the Defense Advanced Research Projects Agency, the Office of Naval Research, the Petroleum Research Fund and the Zumberge Foundation.

- University of Southern California: Mellon Award for Excellence in Mentoring, Associates Award for Excellence in Teaching, Office of International Services: Faculty Recognition Award, College of Letters, Arts and Sciences: Raubenheimer Award, College of Letters, Arts and Sciences: General Education Award.
- Graduate Fellowships from the Supercomputer Computations Research Institute at the Florida State University and the Fulbright Foundation.
- Humboldt Foundation: Bessel Award.

Advisement and Outreach Activities

- Principal Investigator of the USC Computational Condensed Matter Research Group.
- Director of Graduate Studies, Department of Physics and Astronomy, USC.
- Organizer of USC Condensed Matter Physics Seminar.
- Organizer of “Physics Instant Update - a Workshop for High School Teachers”.
- Organizer of CALTECH-USC-UCLA Joint Condensed Matter Seminar.
- Judge at California State Science Fair, Lecturer at USC Orientation Faculty Showcase and Summer Bridge Program for Underrepresented Freshmen, USC Liaison to Los Angeles Physics Teachers Association, Member of the USC Thornton School of Music Early Music Ensemble.

Publications

1. *Many Body Localization Transition in Random Quantum Spin Chains with Long-Range Interactions*
S. Haas and S. Kettmann, arXiv:1408.2068.
2. *Phase Diagram of Electron Doped Dichalcogenides*
M. Rsner, S. Haas, T. O. Wehling, arXiv:1404.4295.
3. *Coherent control of non-Markovian photon-resonator dynamics*
A.F.J. Levi, L. Campos Venuti, T. Albash, and S. Haas, to be published in Phys. Rev. A.

4. *Quantification and control of non-Markovian evolution in finite quantum systems via feedback*
N. Chancellor, C. Petri, L. Campos Venuti, A.F.J. Levi, and S. Haas, Phys. Rev. A **89**, 052119 (2014).
5. *Driven dipole oscillations and the lowest energy excitations of strongly interacting lattice bosons in a harmonic trap*
K. He, J. Brown, S. Haas, M. Rigol, Phys. Rev. A **89**, 033634 (2014).
6. *Is The G-Quadruplex an Effective Nanoconductor for Ions?*
V. Ngo, R. di Felice, S. Haas, J. Phys. Chem. B **118**, 854 (2014).
7. *Non-Equilibrium Dynamics Contribute To Ion Selectivity in The KcsA Channel*
V. Ngo, D. Stefanovski, S. Haas, R. Farley, PLOS ONE **9**, e86079 (2014).
8. *Back Action on Neurotransmitters by Receptor Binding Reveals an Optimal Receptor Density Profile*
T. Albash, J.M.C. Bouteiller, T.W. Berger, M. Baudry, S. Haas, J. Comput. Sci. Syst. Biol. **6**, 327 (2013).
9. *Possible nematic order driven by magnetic fluctuations in iron pnictides*
K.W. Song, Y.C. Liang, H. Lim, S. Haas, Phys. Rev. B **88**, 054501 (2013).
10. *Crossover physics in the non-equilibrium dynamics of quenched quantum impurity systems*
R. Vasseur, K. Trinh, S. Haas, H. Saleur, Phys. Rev. Lett. **110**, 240601 (2013).
11. *Non-Markovian equilibration controlled by symmetry breaking*
N. Chancellor, C. Petri, S. Haas, Phys. Rev. B **87**, 184302 (2013).
12. *Scalable universal holonomic quantum computation realized with an adiabatic quantum data bus and potential implementation using superconducting flux qubits*
N. Chancellor and S. Haas, Phys. Rev. A **87**, 042321 (2013).
13. *Equilibration times in clean and noisy systems*
L. Campos Venuti, S. Yeshwanth and S. Haas, Phys. Rev. A **87**, 032108 (2013).
14. *Bond disorder in even-leg Heisenberg ladders*
K. Trinh and S. Haas, Phys. Rev. B **87**, 075137 (2013).
15. *Excitonic Instabilities and Insulating States in Bilayer Graphene*
K.W. Song, Y.C. Liang, and S. Haas, Phys. Rev. B **86**, 205418 (2012).
16. *Using the J_1 - J_2 quantum spin chain as an adiabatic quantum data bus*
N. Chancellor and S. Haas, New J. Phys. **14**, 095025 (2012).

17. *Demonstration of Jarzynski's equality in open quantum systems using a stepwise pulling protocol*
V. Ngo and S. Haas, Phys. Rev. E **86**, 031127 (2012).
18. *Strain-Induced Quantum Hall States in Graphene*
Y. Chang, T. Albash, and S. Haas, Phys. Rev. B **86**, 125402 (2012).
19. *Bose glass and Mott glass of quasiparticles in a doped quantum magnet*
R. Yu, L. Yin, N.S. Sullivan, J. S. Xia, C. Huan, A. Paduan-Filho, N.F. Oliveira Jr., S. Haas, A. Steppke, C.F. Miclea, F. Weickert, R. Movshovich, E.-D. Mun, V.S. Zapf, T. Roscilde, Nature **489**, 7416 (2012).
20. *Correlations in quantum spin ladders with site and bond dilution*
K. Trinh, S. Haas, R. Yu, and T. Roscilde, Phys. Rev. B **85**, 035134 (2012).
21. *Entanglement and its evolution after a quench in the presence of an energy current*
A. Das, S. Garnerone, and S. Haas, Phys. Rev. A **84**, 052317 (2011).
22. *Mechano-chemical pathways to H₂O and CO₂ splitting*
M.H. Vedadi and S. Haas, Appl. Phys. Lett. **99**, 154105 (2011).
23. *Visualization of nano-plasmons in graphene*
H.P. Dahal, R.A. Muniz, S. Haas, M.J. Graf, A.V. Balatsky, Phil. Mag. DOI:10.1080/14786435.2011.611827 (2011).
24. *Quantum liquids move to a higher dimension*
T. Albash and S. Haas, Physics **4**, 62 (2011).
25. *Propagation of disturbances in degenerate quantum systems*
N. Chancellor and S. Haas, Phys. Rev. B **84**, 035130 (2011).
26. *Defect Induced Resonances and Magnetic Patterns in Graphene*
Y.C. Chang and S. Haas, Phys. Rev. B **83**, 085406 (2011).
27. *Statistical properties of random matrix product states*
S. Garnerone, T.R. de Oliveira, S. Haas, and P. Zanardi, Phys. Rev. A **82**, 052312 (2010).
28. *Magnetic Bose-glass phases of coupled antiferromagnetic dimers with site dilution*
R. Yu, O. Nohadani, S. Haas, and T. Roscilde, Phys. Rev. B **82**, 134437 (2010).
29. *Local quenches in frustrated quantum spin chains: Global versus subsystem equilibration*
M. Diez, N. Chancellor, S. Haas, L. Campos Venuti, P. Zanardi, Phys. Rev. A **82**, 032113 (2010).

30. *Impurity-assisted nanoscale localization of plasmonic excitations in graphene*
R. A. Muniz, H. P. Dahal, A. V. Balatsky, and S. Haas, Phys. Rev. B **82**, 081411 (2010).
31. *Phase diagram of magnetization reversal processes in nanorings*
W. Zhang and S. Haas, Phys. Rev. B **81**, 064433 (2010).
32. *How to turn a topological insulator into a superconductor*
N. Bray-Ali and S. Haas, Physics **3**, 11 (2010).
33. *Universal phase diagram of disordered bosons from a doped quantum magnet*
R. Yu, S. Haas and T. Roscilde, Euro. Phys. Lett. **89**, 10009 (2010).
34. *Topological order following a quantum quench*
D.I. Tsomokos, A. Hamma, W. Zhang, R. Fazio and S. Haas, Phys. Rev. A **80**, 060302 (2009).
35. *Topological order in paired states of fermions in two dimensions with breaking of parity and time-reversal symmetries*
N. Bray-Ali, L. Ding and S. Haas, Phys. Rev. B **80**, 180504 (2009).
36. *Fidelity and superconductivity in two-dimensional t - J models*
M. Rigol, B. S. Shastry and S. Haas, Phys. Rev. B **80**, 094529 (2009).
37. *Revealing Novel Quantum Phases in Quantum Antiferromagnets on Random Lattices*
R. Yu, T. Roscilde, and S. Haas, Condensed Matter Physics **12**, 519 (2009).
38. *Adaptation and Performance of the Cartesian Coordinates Fast Multipole Method for Nanomagnetic Simulations*
W. Zhang and S. Haas, Journal of Magnetism and Magnetic Materials **321**, 3687 (2009).
39. *Plasmonic excitations in tight-binding nanostructures*
R. Muniz, S. Haas, A.F.J. Levi, and I. Grigorenko, Phys. Rev. B **80**, 045413 (2009).
40. *Scaling of the fidelity susceptibility in a disordered quantum spin chain*
N. T. Jacobson, S. Garnerone, S. Haas, and P. Zanardi, Phys. Rev. B **79**, 184427 (2009).
41. *Electron-phonon bound states and impurity band formation in quantum wells*
B.P.W. de Oliveira and S. Haas, Phys. Rev. B **79**, 155102 (2009).

42. *Magnetic and metallic state at intermediate Hubbard U coupling in multiorbital models for undoped iron pnictides*
R. Yu, K.T. Trinh, A. Moreo, M. Daghofer, J. A. Riera, S. Haas, and E. Dagotto, Phys. Rev. B **79**, 104510 (2009).
43. *Fidelity in topological quantum phases of matter*
S. Garnerone, D. Abasto, S. Haas, and P. Zanardi, Phys. Rev. A **79**, 032302 (2009).
44. *Effects of Strong Correlations and Disorder in d -Wave Superconductors*
M. Rigol, B.S. Shastry, and S. Haas, Phys. Rev. B **79**, 052502 (2009).
45. *Quantum fluctuations in small lasers*
K. Roy-Choudhury, S. Haas, and A.F.J. Levi, Phys. Rev. Lett. **102**, 053902 (2009).
46. *Fidelity Approach to the Disordered Quantum XY Model*
S. Garnerone, N.T. Jacobson, S. Haas, and P. Zanardi, Phys. Rev. Lett. **102**, 057205 (2009).
47. *Formation of collective excitations in quasi-one-dimensional metallic nanostructures: size and density dependence*
A. Cassidy, I. Grigorenko, and S. Haas, Phys. Rev. B **77**, 245404 (2008).
48. *Subarea law of entanglement in nodal fermionic systems*
L. Ding, N. Bray-Ali, R. Yu, and S. Haas, Phys. Rev. Lett. **100**, 215701 (2008).
49. *Entanglement, fidelity, and topological entropy in a quantum phase transition to topological order*
A. Hamma, W. Zhang, S. Haas, and D. A. Lidar, Phys. Rev. B **77**, 155111 (2008).
50. *Scaling Analysis and Application: Phase Diagram of Magnetic Nanorings and Elliptical Particles*
W. Zhang, R. Singh, N. Bray-Ali, and S. Haas, Phys. Rev. B **77**, 144428 (2008).
51. *Entanglement entropy in the two-dimensional random transverse field Ising model*
R. Yu, H. Saleur, and S. Haas, Phys. Rev. B **77**, 140402 (2008).
52. *Optimal control of electromagnetic field using metallic nanoclusters*
I. Grigorenko, S. Haas, A.V. Balatsky, and A.F.J. Levi, New J. Phys. **10**, 043017 (2008).
53. *Field induced disordered-local-moment phase in site-diluted spin-gap antiferromagnets*
R. Yu, T. Roscilde, and S. Haas, New J. Phys. **10**, 013034 (2008).

54. *Generalized cuprate gap symmetry and higher d-wave harmonics: Effects of correlation length, doping, temperature, and impurity scattering*
D. Parker, S. Haas, and A.V. Balatsky, Phys. Rev. B **76**, 104503 (2007).
55. *Quantum glass phases in the disordered Bose-Hubbard model*
P. Sengupta and S. Haas, Phys. Rev. Lett. **99**, 050403 (2007).
56. *Mott glass in site-diluted $S=1$ antiferromagnets with single-ion anisotropy*
T. Roscilde and S. Haas, Phys. Rev. Lett. **99**, 047205 (2007).
57. *Disorder-enhanced phase coherence in trapped bosons on optical lattices*
P. Sengupta, A. Raghavan, and S. Haas, New J. Phys. **9**, 103 (2007).
58. *T_1^{-1} peak near T_c in unconventional Bardeen-Cooper-Schrieffer superconductors*
D. Parker and S. Haas, Phys. Rev. B **75**, 052501 (2007).
59. *Electromagnetic response of broken-symmetry nano-scale clusters*
I. Grigorenko, S. Haas, and A.F.J. Levi, Phys. Rev. Lett. **97**, 036806 (2006).
60. *Scaling Behavior of Entanglement in Two- and Three-Dimensional Free Fermions*
W. Li, L. Ding, R. Yu, T. Roscilde, and S. Haas, Phys. Rev. B **74**, 073103 (2006).
61. *Quantum disorder and Griffiths singularities in bond-diluted two-dimensional Heisenberg antiferromagnets*
R. Yu, T. Roscilde, and S. Haas, Phys. Rev. B **73**, 064406 (2006).
62. *Synthesis of Electron Transmission in Nanoscale Semiconductor Devices*
P. Schmidt, S. Haas, and A.F.J. Levi, Appl. Phys. Lett. **88**, 013502 (2006).
63. *Bose-Glass Phases in Disordered Quantum Magnets*
O. Nohadani, S. Wessel, and S. Haas, Phys. Rev. Lett. **95**, 227201 (2005).
64. *Quantum localization in bilayer Heisenberg antiferromagnets with site dilution*
T. Roscilde and S. Haas, Phys. Rev. Lett. **95**, 207206 (2005).
65. *Synthesis for semiconductor device design*
J. Thalken, S. Haas, and A.F.J. Levi, J. Appl. Phys. **98**, 044508 (2005).
66. *Quantum Phase Transitions in Coupled Dimer Compounds*
O. Nohadani, S. Wessel, and S. Haas, Phys. Rev. B **72**, 024440 (2005).
67. *Quantum percolation in two-dimensional antiferromagnets*
R. Yu, T. Roscilde, and S. Haas, Phys. Rev. Lett. **94**, 197204 (2005).

68. *Entanglement and factorized ground states in two-dimensional quantum antiferromagnets*
T. Roscilde, P. Verrucchi, A. Fubini, S. Haas, and V. Tognetti, Phys. Rev. Lett. **94**, 147208 (2005).
69. *Triplet superconductivity in the skutterudite PrOs₄Sb₁₂*
K. Maki, S. Haas, D. Parker, H. Won, K. Izawa, and Y. Matsuda, Eur. Phys. Lett. **68**, 720 (2004).
70. *Studying quantum spin systems through entanglement estimators*
T. Roscilde, P. Verrucchi, A. Fubini, S. Haas, and V. Tognetti, Phys. Rev. Lett. **93**, 167203 (2004).
71. *Adaptive Design of Excitonic Absorption in Broken-Symmetry Quantum Wells*
J. Thalken, W. Li, S. Haas, and A.F.J. Levi, Appl. Phys. Lett. **85**, 121 (2004).
72. *Anisotropy-Induced Ordering in the Quantum J₁-J₂ Antiferromagnet*
T. Roscilde, A. Feiguin, A. L. Chernyshev, S. Liu, and S. Haas, Phys. Rev. Lett. **93**, 017203 (2004).
73. *Universal scaling at field-induced magnetic phase transitions*
O. Nohadani, S. Wessel, B. Normand, and S. Haas, Phys. Rev. B **69**, 220402 (2004).
74. *Adaptive Quantum Design of Atomic Clusters*
Jason Thalken, Yu Chen, A.F.J. Levi, and S. Haas, Phys. Rev. B **69**, 195410 (2004).
75. *Upper Critical Field and Fulde-Ferrell-Larkin-Ovchinnikov State in CeCoIn₅*
H. Won, K. Maki, S. Haas, N. Oelscher, F. Weickert, and P. Gegenwart, Phys. Rev. B **69**, 180504 (2004).
76. *Aperiodic Nano-Photonic Design*
Ioan L. Gheorma, Stephan Haas, and A.F.J. Levi, J. Appl. Phys. **95**, 1420 (2004).
77. *Quasiparticle spectrum of the hybrid s+g-wave superconductors YNi₂B₂C and LuNi₂B₂C*
K. Maki, H. Won, and S. Haas, Phys. Rev. B **69**, 012502 (2004).
78. *Reply to Comment on "Theory of c-axis Josephson tunneling in d_{x²-y²}-wave superconductors"*
K. Maki and S. Haas, Phys. Rev. B **68**, 226502 (2003).
79. *Adaptive Design of Nano-Scale Dielectric Structures for Photonics*
Y. Chen, R. Yu, W. Li, O. Nohadani, S. Haas, and A.F.J. Levi, J. Appl. Phys. **94**, 6065 (2003).

80. *Quantum Antiferromagnetism in Quasicrystals*
S. Wessel, A. Jagannathan, and S. Haas, Phys. Rev. Lett. **90**, 177205 (2003).
81. *Theory of c-axis Josephson tunneling in $d_{x^2-y^2}$ -wave superconductors*
K. Maki and S. Haas, Phys. Rev. B **67**, 020510(R)(2003).
82. *Redistribution of Spectral Weight in Spin-1/2-Doped Haldane Chains*
S. Wessel and S. Haas, Phys. Rev. B **65**, 132402 (2002).
83. *Anisotropic s-wave superconductivity in MgB_2*
S. Haas and K. Maki, Phys. Rev. B **65**, 020502(R) (2002).
84. *Field-Induced Magnetic Order in Quantum Spin Liquids*
S. Wessel, M. Olshanii, and S. Haas, Phys. Rev. Lett. **87**, 206407 (2001).
85. *Phase Diagram and Thermodynamic Properties of the Square Lattice of Antiferromagnetic Spin-1/2 Triangles in $La_4Cu_3MoO_{12}$*
S. Wessel and S. Haas, Phys. Rev. B **63**, 140403 (2001).
86. *Order by Disorder from Non-Magnetic Impurities in a Two-Dimensional Quantum Spin Liquid*
S. Wessel, B. Normand, M. Sigrist, and S. Haas, Phys. Rev. Lett. **86**, 1086 (2001).
87. *Dynamical Properties of Spin-Orbital Chains in a Magnetic Field*
W. Yu and S. Haas, Phys. Rev. B **63**, 24423 (2001).
88. *Impurity Bound States and Symmetry of the Superconducting Order Parameter in Sr_2RuO_4*
K. Maki and S. Haas, Phys. Rev. B **62**, R11969 (2000).
89. *Quasi-Particle Bound States around Impurities in $d_{x^2-y^2}$ -wave Superconductors*
S. Haas and K. Maki, Phys. Rev. Lett. **85**, 2172 (2000).
90. *Paramagnetic Reentrance Effect in NS Proximity Cylinders*
K. Maki and S. Haas, Phys. Lett. A **272**, 271 (2000).
91. *Magnetic Field Induced Ordering in Quasi-One-Dimensional Quantum Magnets*
S. Wessel and S. Haas, Eur. Phys. J. B **16**, 393 (2000).
92. *Excitation Spectra of Structurally Dimerized and Spin-Peierls Chains in a Magnetic Field*
W. Yu and S. Haas, Phys. Rev. B **62**, 344 (2000).

93. *Three-Dimensional Ordering in Weakly Coupled Antiferromagnetic Ladders and Chains*
S. Wessel and S. Haas, Phys. Rev. B **62**, 316 (2000).
94. *Excitation Spectra and Thermodynamical Response of Segmented Heisenberg Spin Chains*
S. Wessel and S. Haas, Phys. Rev. B **61**, 15262 (2000).
95. *Generalization of the Luttinger Theorem for Fermionic Ladder Systems*
P. Gagliardini, S. Haas, and T. M. Rice, Phys. Rev. B **58**, 9603 (1998).
96. *Evolution of the Low-Energy Excitation Spectrum from the Pure Hubbard Ladder to the $SO(5)$ Ladder: A Numerical Study*
D. Duffy, S. Haas, and E. Kim, Phys. Rev. B **58**, 5932 (1998).
97. *Spectral Analysis of Correlated One-Dimensional Systems with Impurities*
S. Haas, Phys. Rev. Lett. **80**, 4052 (1998).
98. *Lightly Doped t - J Three-Leg Ladders - an Analog for the Underdoped Cuprates*
T.M. Rice, S. Haas, M. Sigrist, and F.C. Zhang, Phys. Rev. B. **56**, 14655 (1997).
99. *Dynamical Properties of the Spin-Peierls Compound α' - NaV_2O_5*
D. Augier, D. Poilblanc, S. Haas, A. Delia and E. Dagotto, Phys. Rev. B **56**, R5732 (1997) (RC).
100. *Extended Gapless Regions in Disordered $d_{x^2-y^2}$ -Wave Superconductors*
S. Haas, A. V. Balatsky, M. Sigrist, and T. M. Rice, Phys. Rev. B **56**, 5108 (1997).
101. *Hole Doping Evolution of the Quasiparticle Band in Models of Strongly Correlated Electrons for the High- T_c Cuprates*
D. Duffy, A. Nazarenko, S. Haas, A. Moreo, J. Riera, and E. Dagotto, Phys. Rev. B **56**, 5597 (1997).
102. *Spectral Functions of One-Dimensional Models of Correlated Electrons*
J. Favand, S. Haas, K. Penc, F. Mila, and E. Dagotto, Phys. Rev. B **55**, R4859 (1997) (RC).
103. *Low-Energy Properties of Antiferromagnetic Spin-1/2 Heisenberg Ladders with an Odd Number of Legs*
B. Frischmuth, S. Haas, G. Sierra, and T. M. Rice, Phys. Rev. B **55**, R3340 (1997) (RC).
104. *Spin and Charge Texture around Impurities in the CuO_2 Planes*
S. Haas, F.C. Zhang, F. Mila, and T. M. Rice, Phys. Rev. Lett. **77**, 3021 (1996).

105. *Photoemission Spectra in t - J Ladders with Two Legs*
S. Haas and E. Dagotto, Phys. Rev. B **54**, R3718 (1996) (RC).
106. *Predictions for Neutron Scattering and Photoemission Experiments on CuGeO_3*
S. Haas and E. Dagotto, Phys. Rev. B **52**, R14396 (1995) (RC).
107. *Magnetic Raman Scattering in Two-Dimensional Spin-1/2 Heisenberg Antiferromagnets: Spectral Shape Anomaly and Magnetostrictive Effects*
F. Nori, R. Merlin, S. Haas, A. W. Sandvik, and E. Dagotto, Phys. Rev. Lett. **75**, 553 (1995).
108. *Antiferromagnetically Induced Photoemission Band in the Cuprates*
S. Haas, A. Moreo, and E. Dagotto, Phys. Rev. Lett. **74**, 4281 (1995).
109. *Quasiparticle Dispersion of the t - J and Hubbard Models*
A. Moreo, S. Haas, and E. Dagotto, Phys. Rev. B **51**, 12045 (1995) (RC).
110. *Photoemission Spectra of $\text{Sr}_2\text{CuO}_2\text{Cl}_2$: A Theoretical Analysis*
A. Nazarenko, K. J. E. Vos, S. Haas, E. Dagotto, and R. J. Gooding, Phys. Rev. B **51**, 8676 (1995) (RC).
111. *Doping Dependence of the Fermi Surface in the $t - J$ Model*
S. Haas, Phys. Rev. B **51**, 11748 (1995).
112. *Liaison between Superconductivity and Phase Separation*
S. Haas, E. Dagotto, A. Nazarenko, and J. Riera, Phys. Rev. B **51**, 5989 (1995).
113. *Random Exchange Disorder in the Spin-1/2 XXZ Chain*
S. Haas, J. Riera, and E. Dagotto, Phys. Rev. B **48**, 13174 (1993) (RC).
114. *Dynamical Properties of Antiferromagnetic Heisenberg Spin Chains*
S. Haas, J. Riera, and E. Dagotto, Phys. Rev. B **48**, 3281 (1993).
115. *Isolated Ferromagnetic Bonds in the Two-Dimensional Spin-1/2 Heisenberg Antiferromagnet*
S. Haas *et al.*, Phys. Rev. B **46**, 3135 (1992).

Conference Papers, Book Chapters, Lecture Notes

1. *Switching Mechanism in Ferromagnetic Nanorings*
W. Zhang and S. Haas, Handbook of Nanophysics, 40-1, CRC Press, Taylor & Francis (2010).

2. *Bottom-up approach to high-temperature superconductivity*
H. Won, S. Haas, and K. Maki, Phys. Stat. Sol. B **244**, 4371 (2007).
3. *Anatomy of Gossamer superconductivity*
S. Haas, K. Maki, T. Dahm, and P. Thalmeier, Curr. Appl. Phys. **7**, 64 (2007).
4. *Resonance impurity scattering in superconductivity in PrOs₄Sb₁₂*
D. Parker, S. Haas, and K. Maki, Phys. Stat. Sol. B **243**, 3999 (2006).
5. *BCS theory of unconventional superconductivity in PrOs₄Sb₁₂*
D. Parker, S. Haas, and K. Maki, Physica B **378-380**, 902 (2006).
6. *New world of Gossamer superconductivity*
K. Maki, S. Haas, D. Parker, B. Dora and A. Virosztek, Phys. Stat. Sol. (c) **3**, No. 9, 3156 (2006).
7. *Gossamer superconductivity, new paradigm?*
H. Won, S. Haas, K. Maki, D. Parker, B. Dora, and A. Virosztek, Phys. Stat. Sol. (b) **243**, 37 (2006).
8. *Bose-Einstein Condensation vs. Localization of Bosonic Quasiparticles in Disordered Weakly-Coupled Dimer Antiferromagnets*
T. Roscilde and S. Haas, J. Phys. B: At. Mol. Opt. Phys. **39**, S153 (2006).
9. *Quantum phase transition in spin systems studied through entanglement estimators*
A. Fubini, S. Haas, T. Roscilde, V. Tognetti, and P. Verucchi Open Systems & Information Dynamics **13**, 445 (2006).
10. *Perspectives on Nodal Superconductors*
K. Maki, S. Haas, D. Parker, and H. Won, Chin. J. Phys. **43**, 1 (2005).
11. *High- T_c Cuprate Superconductivity in a Nutshell*
H. Won, S. Haas, D. Parker, and K. Maki, Phys. Stat. Sol. (b) **242**, 363 (2005).
12. *Upper Critical Field and Fulde-Ferrell-Larkin-Ovchinnikov State in CeCoIn₅*
H. Won, S. Haas, and K. Maki, J. of Magnetism and Magnetic Matter **272**, 191 (2004).
13. *Aspects of Nodal Superconductivity*
H. Won, D. Parker, S. Haas, and K. Maki, Current Appl. Phys. **4**, 523 (2004).
14. *Pressure- and field-induced magnetic quantum phase transition in TlCuCl₃*
B. Normand, M. Matsumoto, O. Nohadani, S. Wessel, T.M. Rice, and M. Sgrist, J. Phys.: Cond. Matt. **16**, S867 (2004).

15. *Impurity Bound States in the Pseudogap Phase of High- T_c Cuprates*
D. Parker, K. Maki, and S. Haas, Acta Phys. Pol. B **34**, 583 (2003).
16. *Effects of Andreev Scattering on the Tunneling Conductance in Superconducting MgB_2*
K. Maki, R. Gerami, and S. Haas, J. Phys. Chem. Solids **63**, 1501 (2002).
17. *A Model of Anisotropic s-Wave Superconductivity for MgB_2*
K. Maki and S. Haas, book chapter in "Superconducting Magnesium Diboride - Studies of High-Temperature Superconductors" edited by. A. Narlikar, Nova Publishers, Commack N.Y.. (2001).
18. *Properties of Anisotropic s-wave Superconductivity in MgB_2*
Y. Chen, S. Haas, and K. Maki, Current Appl. Phys. **1**, 333 (2001).
19. *Paramagnetic Response of NS Proximity Cylinders*
S. Haas and K. Maki, Physica C **341**, 2667 (2000).
20. *Magnetic Field Induced 1D to 3D Transition in Spin-1/2 Antiferromagnetic 2-Leg Ladders*
S. Haas and M. Sigrist, in "Physical Phenomena at High Magnetic Fields III", edited by J.R. Schrieffer, L. Gorkov, and Z. Fisk, p. 545, World Scientific, Singapore (1999).
21. *From the Hubbard to the $SO(5)$ Ladder*
D. Duffy, S. Haas, and E. Kim, in "Physical Phenomena at High Magnetic Fields III", edited by J.R. Schrieffer, L. Gorkov, and Z. Fisk, p. 536, World Scientific, Singapore (1999).
22. *Phase Diagram of Three-Leg Ladders at Strong Coupling along the Rungs*
M.Y. Kagan, S. Haas, and T.M.Rice, Physica C **317-318**, 185 (1999).
23. *Real Space Pairing Theories of Superconductivity : Influence of Hole Doping*
E. Dagotto, D. Duffy, A. Nazarenko, S. Haas, A. Moreo, and J. Riera, Physica C **282-287**, 1729 (1997).
24. *Evolution of the Quasiparticle Band with Doping in Models of Strongly Correlated Electrons for the High- T_c Cuprates*
A. Moreo, D. Duffy, A. Nazarenko, S. Haas, J. Riera, and E. Dagotto, Physica C **282-287**, 1867 (1997).
25. *Localized States and Chiral Spin Texture around Impurities in $La_2Cu_{1-x}Li_xO_4$*
S. Haas, Z. Physik B **103**, 157 (1997).

26. *Photoemission Bands in Systems of Strongly Correlated Electrons*
S. Haas in *Strongly Correlated Magnetic and Superconducting Systems*, Lecture Notes in Physics Vol. 478, Springer (1997).
27. *Superconductivity in the Cuprates as a Consequence of Antiferromagnetism and a Large Hole Density of States*
A. Nazarenko, A. Moreo, S. Haas, and E. Dagotto, *J. Supercond.* **9**, No. 4, 379 (1996).
28. *Influence of Long-Range Interactions on Superconductivity and Phase Separation*
S. Haas, E. Dagotto, and A. Nazarenko, *J. Supercond.* **8**, No. 5, 657 (1995).
29. *Quasiparticle Dispersion of $Sr_2CuO_2Cl_2$*
A. Nazarenko, K.J.E. Vos, S. Haas, E. Dagotto, and R.J. Gooding, *J. Supercond.* **8**, No. 5, 671 (1995).
30. *Shadow Bands in Models of Correlated Electrons*
A. Moreo, S. Haas, and E. Dagotto, *J. Supercond.* **8**, No. 4, 475 (1995).
31. *A Simple Theory for the Cuprates: The Antiferromagnetic van Hove Scenario*
E. Dagotto, A. Nazarenko, A. Moreo, S. Haas, and M. Boninsegni, *J. Supercond.* **8**, No. 4, 483 (1995).
32. *Study of ARPES Data and d-Wave Superconductivity using Electronic Models in Two Dimensions*
A. Moreo, A. Nazarenko, S. Haas, A. Sandvik, and E. Dagotto, *J. Phys. Chem. Solids* **56**, No. 12, 1645 (1995).
33. *Raman Spectra of Two-Dimensional Spin-1/2 Heisenberg Antiferromagnets*
S. Haas, E. Dagotto, J. Riera, R. Merlin and F.Nori, *J. Appl. Phys.* **75**, 6340 (1994).
34. *Magnetic Properties of an Isolated Ferromagnetic Bond Embedded in Heisenberg Antiferromagnets*
S.T. Ting, S. Haas, and J.E. Crow, *J. Appl. Phys.* **75**, 6748 (1994).
35. *Magnetic Properties of an Isolated Missing Link in the Anisotropic Two-Dimensional Heisenberg Antiferromagnet*
S. Haas, *J. Appl. Phys.* **73**, 6642 (1993).

Invited Seminars and Colloquia

1. ENS Lyon (July 2014), “Random Quantum Spin Chains with Long-Range Interactions”.
2. Aachen University (July 2014), “Quantum Phase Diagram of the Dichalcogenides”.
3. Dortmund University (July 2014), “Equilibration in Quantum Systems”.
4. Bremen University (May 2014), “Superconductivity in Two-Dimensional Materials”.
5. Jacobs University Bremen (March 2014), “Jarzynski’s Equality, Ion Selectivity and Conduction”.
6. University of California San Diego (May 2013), “Quantum Glasses”.
7. California State University Long Beach (February 2013), “Strain Induced Landau Levels in Graphene”.
8. University of Bremen (February 2013), “Quantum Glasses”.
9. Jacobs University, Bremen (February 2013), “Quantum Glasses”.
10. University of California at Riverside (June 2011), “Equilibration in Closed Quantum Systems”.
11. Los Alamos National Laboratory (May 2011) , “Equilibration in Closed Quantum Systems”.
12. 2010 Workshop on Quantum Information Concepts for Condensed Matter Problems, Dresden (June 2010), “Equilibration in Closed Quantum Systems”.
13. Swiss Federal Institute of Technology (June 2010), “Equilibration in Closed Quantum Systems”.
14. Georgetown University (October 2009), “Adaptive Design of Quantum Devices”.
15. University of California Irvine (April 2009), “Designer Nanoplasmonics - Dielectric Response of Nanoclusters”.
16. MOSIS Integrated Circuit Fabrication Service, Los Angeles (March 2009), “Designer Nanoplasmonics - Dielectric Response of Nanoclusters”.
17. 2009 Workshop on Wave Function Engineering and Coherent Control in Nanostructured Materials, Los Alamos (February 2009), “Designer Nanoplasmonics - Dielectric Response of Nanoclusters”.

18. California State University Los Angeles (October 2008), “Quantum Phase Transitions, Disorder and Percolation”.
19. Workshop on Quantum Critical Phenomena Statics and Dynamics, Toronto (September 2008), “Information Theoretical Measures of Quantum Phase Transitions”.
20. University of Waterloo (May 2008), “Quantum Glass Phases in Diluted Antiferromagnets”.
21. Max Planck Institute for the Physics of Complex Systems, Dresden (June 2008), “Quantum Percolation”.
22. Florida State University (February 2007), “Quantum Phase Transitions, Disorder and Percolation”.
23. Florida State University (February 2007), “Adaptive Quantum Design for Nanotechnology”.
24. University of Florida (February 2007), “Quantum Phase Transitions, Disorder and Percolation”.
25. Los Alamos National Laboratory (January 2007), “Quantum Phase Transitions, Disorder and Percolation”.
26. University of California Santa Cruz (January 2007), “Quantum Phase Transitions, Disorder and Percolation”.
27. Institute for Theoretical Physics, Santa Barbara (October 2006), “Bose Glass in site-diluted quantum antiferromagnets”.
28. National Chung Cheng University, Taiwan (June 2005), “Adaptive Quantum Design for Nanotechnology”.
29. National Chiao Tung University, Taiwan (June 2005), “Adaptive Quantum Design for Nanotechnology”.
30. National Center for Theoretical Sciences, Taiwan (June 2005), “Quantum Percolation in Antiferromagnets”.
31. Academia Sinica, Taiwan (June 2005), “Quantum Percolation in Antiferromagnets”.
32. CalPoly Pomona, Pomona (May 2005), “Adaptive Quantum Design for Nanotechnology”.

33. Calstate Fullerton, Fullerton (April 2005), "Adaptive Quantum Design for Nanotechnology".
34. Korean Institute of Advanced Studies, Seoul (February 2005), "Adaptive Quantum Design for Nanotechnology".
35. The 9th APCTP Winter Workshop on Strongly Correlated Electron Systems, Wonju, Korea (February 2005), "Quantum Percolation in Antiferromagnets".
36. University of California, Berkeley (December 2004), "Quantum Percolation in Antiferromagnets".
37. Jet Propulsion Laboratory (May 2004), "Adaptive Quantum Design for Nanotechnology".
38. California Institute of Technology (April 2004), "Adaptive Quantum Design for Nanotechnology".
39. Institute of Physics, Zagreb, Croatia (July 2003), "Adaptive Quantum Design".
40. University of North Dakota, Grand Forks (March 2003), "Quantum Antiferromagnetism in Quasicrystals".
41. University of Braunschweig, Germany (December 2002), "Quantum Antiferromagnetism in Quasicrystals".
42. Paul Scherrer Institute, Switzerland (December 2002), "Quantum Antiferromagnetism in Quasicrystals".
43. University of Lausanne, Switzerland (December 2002), "Quantum Antiferromagnetism in Quasicrystals".
44. University of Paris, Orsay, France (November 2002), "Field-Induced Magnetic Order in Quantum Spin Liquids".
45. University of Fribourg, Switzerland (November 2002), "Quantum Antiferromagnetism in Quasicrystals".
46. Calstate Los Angeles, Los Angeles (October 2002), "Quantum Antiferromagnetism in Quasicrystals".
47. National High Magnetic Field Laboratory, Tallahassee (October 2002), "Quantum Antiferromagnetism in Quasicrystals".
48. University of Florida, Gainesville (October 2002), "Field-Induced Magnetic Order in Quantum Spin Liquids".

49. University of Zagreb, Croatia (July 2002), “Anisotropic and Striped Superconductors”.
50. March Meeting of the American Physical Society, Indianapolis (March 2002), “Field-Induced Magnetic Order in Quantum Spin Liquids”.
51. Symposium on Quantum Spin Systems, ISSP Tokyo (March 2002), “Field-Induced New Quantum Phenomena in Magnetic Systems”.
52. Columbia University, New York (February 2002), “Doped Quantum Spin Systems”.
53. University of Paderborn, Germany (January 2002), “Doped Quantum Spin Systems”.
54. University of Bonn, Germany (December 2001), “Doped Quantum Spin Systems”.
55. Calstate Long Beach (October 2001), “Anisotropic s-Wave Superconductivity in Magnesium Diboride”.
56. Summer School on low-dimensional quantum systems, SISSA, Trieste, Italy (July 2001), “Order by Disorder in Quantum Spin Liquids”.
57. University of Zagreb, Croatia (July 2001), “Doped Heisenberg Ladders”.
58. Office of Naval Research Review Meeting, Sedona (February 2001), “Chains, Ladders, and Planes - Interacting Electrons in Low Dimensions”.
59. University of California, Irvine (October 2000), “Order by Disorder from Impurities in Quantum Spin Liquids”.
60. University of California, San Diego (October 2000), “Order by Disorder from Impurities in Quantum Spin Liquids”.
61. Universität Augsburg (July 2000), “Impurities and Magnetic Field Effects in Quantum Spin Liquids”.
62. Workshop on Correlation effects in electronic structure calculation, Trieste (June 2000), “Excitation Spectra and Thermodynamics of Quantum Spin Systems”.
63. Calstate LA (May 2000), “Quantum Spin Liquids in a Magnetic Field”
64. Paul Scherrer Institute (February 1998), “Chains, Ladders, and Planes: Interacting Electrons in Low Dimensions”.
65. Boston University (February 1998), “Chains, Ladders, and Planes: Interacting Electrons in Low Dimensions”.

66. University of Southern California (January 1998), "Chains, Ladders, and Planes: Interacting Electrons in Low Dimensions".
67. National High Magnetic Field Laboratory (January 1998), "Chains, Ladders, and Planes: Interacting Electrons in Low Dimensions".
68. University of Neuchatel (May 1997), "Spectral Functions in Correlated Electron Systems".
69. University of Toulouse (May 1997), "Extended Gapless Regions in Disordered $d_{x^2-y^2}$ -Wave Superconductors".
70. Los Alamos National Laboratory (January 1997), "Spin and Charge Texture around Impurities in the CuO_2 Planes".
71. Max-Planck Institute Stuttgart (December 1996), "Spin and Charge Texture around Impurities in the CuO_2 Planes".
72. Universität Karlsruhe (May 1996), "Photoemission Bands in Systems of Strongly Correlated Electrons".
73. Freie Universität Berlin (February 1996), "Dynamical Response in Systems of Strongly Correlated Electrons".
74. Nagoya University (December 1995), "Dynamical Response in Systems of Strongly Correlated Electrons".
75. University of Tokyo (December 1995), "Dynamical Response in Systems of Strongly Correlated Electrons".
76. IBM Research, Yorktown (December 1994), "Shadow Bands in the Cuprates".
77. University of Georgia, Athens (January 1994), "Heisenberg Antiferromagnets: Dynamics and Raman Scattering".
78. University of Tokyo (January 1994), "Raman Spectra in the Two-Dimensional spin-1/2 Heisenberg Antiferromagnets".
79. Michigan State University, Lansing (November 1993), "Exact Diagonalizations of Spin Systems".
80. University of Michigan, Ann Arbor (November 1993), "Heisenberg Antiferromagnets: Dynamics and Raman Scattering".
81. Oak Ridge National Laboratory, Oak Ridge (September 1993), "Raman Spectra in the Two-Dimensional Spin-1/2 Heisenberg Antiferromagnet".

82. Oak Ridge National Laboratory, Oak Ridge (August 1993), "Random Exchange Disorder in the Spin-1/2 XXZ Chain".
83. Universität Dortmund (June 1993), "Random Exchange Disorder in the Spin-1/2 XXZ Chain".
84. Universität Würzburg (June 1993), "Dynamical Properties of Antiferromagnetic Spin Chains".
85. Max-Planck Institute für Festkörperphysik, Stuttgart (June 1993), "Dynamical Properties of Antiferromagnetic Spin Chains".

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Current Research

I am interested in topics related to nanoscience, quantum magnetism, and unconventional superconductivity. My research group investigates microscopic models of interacting electronic systems, using numerical techniques to study their phase diagrams, thermodynamics and excitation spectra. Recently, we have investigated field-induced phase transitions in quantum spin liquids, developed optimization algorithms to design nanoscale opto-electronic devices, and applied BCS theory to investigate the consequences of unconventional superconductivity in strongly correlated materials. Our work is connected to experiments in the fields of nano-photonics, quantum antiferromagnetism, and high-temperature superconductivity. Our numerical codes include the Stochastic Series Expansion Quantum Monte Carlo, which is based on a series expansion of the operator $\exp(-\beta\hat{H})$, the Dynamical Density Matrix Renormalization Group, which is a powerful technique to extract finite-frequency correlation functions of quasi-1D systems, and Genetic Optimization, which we have implemented on parallel computers to find broken-symmetry configurations that enable target response functions in nanoscale devices.

Quantum Percolation: Percolation is known to occur in a variety of contexts, ranging from blood vessel formation to clusters of atoms deposited on substrate surfaces. A fundamental question which forms the basis of this project is whether the classical picture of permeating networks also applies to systems whose behavior is dominated by strong quantum fluctuations. In this respect, low-dimensional quantum magnets offer an ideal testing ground to investigate the interplay between quantum fluctuations and geometric randomness. We use the Stochastic Series Expansion Quantum Monte Carlo method to investigate quantum phase transitions in the spin-1/2 Heisenberg antiferromagnet on square lattices with inhomogeneous bond dilution. Recently, we demonstrated that quantum fluctuations can be continuously tuned by inhomogeneous bond dilution, eventually leading to the destruction of long-range magnetic order on the percolating cluster.

Adaptive Quantum Design: It is now becoming possible to control the precise spatial positions of atoms and molecules using the experimental techniques now being developed by nanoscience. To utilize these emerging capabilities we are creating new computational tools to assist in the exploration of a potentially vast number of atom configurations and a corresponding enormous range of physical properties. In particular, we are developing adaptive quantum design algorithms to identify the best broken-symmetry spatial configurations of nanoscale building blocks such as atoms and molecules that enable desired target function responses. Recently, we have applied these techniques to tailor the quasiparticle density of states in atomic clusters, to achieve specific transmission profiles in dielectric structures for photonics, and to engineer many-body wave functions in quantum wells which can be used as excitonic modulators.