

Thomas A. Maier

R&D Staff
Nano Theory Institute
Center for Nanophase Materials Sciences
Oak Ridge National Laboratory
(865) 574-3597
maier@ornl.gov



Education

University of Regensburg, Germany	Physics	Masters, <i>Highest Honors</i> , 1997
University of Regensburg, Germany	Physics	Ph.D., <i>Summa Cum Laude</i> , 2001
University of Cincinnati, OH, USA	Physics	PostDoctoral Fellow, 2001-2003

Research Interests

Primary objectives focus on the theoretical study of strongly correlated electron systems on a fundamental level and the many phenomena occurring in these materials. Examples include superconductivity, magnetism, phase separation and the rich phenomenology occurring in low dimensional systems. Thomas Maier's research has concentrated on the development and application of quantum cluster theories, in particular the Dynamical Cluster Approximation, a non-perturbative multi-scale many-body technique that treats the effects of correlations within a cluster of atoms explicitly, while approximating correlations beyond the cluster in a mean-field. Recent projects include studies of Hubbard and similar models to gain insight in the pairing interaction and the effects of disorder and inhomogeneities in cuprate superconductors, to study the enhancement of superconductivity in multi-layers composed of under- and overdoped cuprates, and to understand the gap structure and neutron scattering response in the iron-pnictide superconductors.

Professional Experience

2010–present	Senior Research staff, Computer Science and Mathematics Division and Center for Nanophase Materials Sciences, Oak Ridge National Laboratory
2005–2010	Research staff, Computer Science and Mathematics Division and Center for Nanophase Materials Sciences, Oak Ridge National Laboratory
2003–2005	Wigner Fellow, Computer Science and Mathematics Division, Oak Ridge National Laboratory

Professional and Synergistic Activities

1998–pres.	Member: American Physical Society and German Physical Society
2005–pres.	Proposal reviewer: National Science Foundation, Department of Energy and Research Council of Canada
2001–pres.	Journal reviewer: APS Journals, Nature Physics, IOP Publishing, Journal of the Physical Society of Japan
2011–pres.	Editor for ISRN Condensed Matter Physics Journal, Hindawi Publishing Corporation

Honors and Awards

2008	ACM Gordon Bell prize for peak performance
2003	Wigner Fellowship, Oak Ridge National Laboratory
2001	W.C. Röntgen prize for successful young scientists
2001	OBAG Kulturpreis, award for outstanding dissertation

Selected Peer-Reviewed Publications (Author of more than 65 articles in refereed journals and books):

- "Coexistence of strong nematic and superconducting correlations in a two-dimensional Hubbard model", S.-Q. Su and T. Maier, *Phys. Rev. B* **84**, (2011).
- "Pair structure and the pairing interaction in a bilayer Hubbard model for unconventional superconductivity", T. Maier and D. Scalapino, *Phys. Rev. B* **84**, 180513(R) (2011).
- "Neutron Scattering Studies of spin excitations in hole-doped Ba_{0.67}K_{0.33}Fe₂As₂ superconductor", C. Zhang, M. Wang, H. Luo, M. Wang, M. Liu, J. Zhao, D. L. Abernathy, T. A. Maier, K. Marty, M. D. Lumsden, S. Chi, S. Chang, J. A. Rodriguez-Rivera, J. W. Lynn, T. Xiang, J. Hu, and P. Dai, *Sci Rep-Uk* **1**, 1 (2011).
- "Evolution of the Superconducting State of Fe-Based Compounds with Doping", S. Maiti, M. M. Korshunov, T. A. Maier, P. J. Hirschfeld, and A. V. Chubukov, *Phys. Rev. Lett.* **107**, 147002 (2011).

- “d-wave pairing from spin fluctuations in the $K_xFe_{2-y}Se_2$ superconductors“, T.A. Maier, S. Graser, P.J. Hirschfeld and D.J. Scalapino, *Phys. Rev. B* **83**, 100515(R) (2011).
- “Inelastic neutron and x-ray scattering as probes of the sign structure of the superconducting gap in iron pnictides“, T.A. Maier, S. Graser, P.J. Hirschfeld, D.J. Scalapino, *Phys. Rev. B* **83**, 220505(R) (2011)
- “Dynamic Cluster Quantum Monte Carlo Simulations of a Two-Dimensional Hubbard Model with Stripelike Charge-Density-Wave Modulations: Interplay between Inhomogeneities and the Superconducting State“, T. A. Maier, G. Alvarez, M. Summers, T. C. Schulthess, , *Phys. Rev. Lett.* **104**, 247001 (2010).
- “Near-degeneracy of several pairing channels in multiorbital models for the Fe-pnictides“, S. Graser, T.A. Maier, P.J. Hirschfeld, D.J. Scalapino, *New J. Phys.* **11**, 025016 (2009).
- “Enhanced Superconductivity in Superlattices of high-Tc cuprates“, S. Okamoto and T.A. Maier, *Phys. Rev. Lett.* **101**, 156401 (2008).
- “Theory of neutron scattering as a probe of the Fe-pnictide superconducting gap“, T.A. Maier and D.J. Scalapino, *Phys. Rev. B* **78**, 020514(R) (2008).
- “Dynamics of the Pairing Interaction in the Hubbard and t-J Models of High-Temperature Superconductors“, T.A. Maier, D. Poilblanc and D.J. Scalapino, *Phys. Rev. Lett.* **100**, 237001 (2008).
- “Structure of the Pairing Interaction in the Two-Dimensional Hubbard Model“, T.A. Maier, M.S. Jarrell, and D.J. Scalapino, *Phys. Rev. Lett.* **96**, 047005 (2006).
- “Systematic study of D-wave superconductivity in the 2D repulsive Hubbard model“, T.A. Maier, M. Jarrell, T.C. Schulthess, P.R.C. Kent, J.B. White, *Phys. Rev. Lett.* **95**, 237001 (2005).
- “Quantum Cluster Theories“, Th. A. Maier, M. Jarrell, T. Pruschke and M. Hettler, *Rev. Mod. Phys.* **77**, 1027 (2005).
- “Kinetic energy driven pairing in the cuprates“, Th. A. Maier, M. Jarrell, A. Macridin, and C. Slezak, *Phys. Rev. Lett.* **92**, 027005 (2004).
- “A Quantum Monte Carlo algorithm for nonlocal corrections to the Dynamical Mean Field Approximation“, M. Jarrell, Th. Maier, C. Huscroft and S. Moukouri, *Phys. Rev. B* **64**, 195130 (2001).
- “Phase Diagram of the Hubbard Model: Beyond the Dynamical Mean Field“, M. Jarrell, Th. Maier, M. H. Hettler and A. N. Tahvildarzedah, *Eur. Phys. Lett.* **56**, 563 (2001).
- “d-wave Superconductivity in the Hubbard Model“, Th. Maier, M. Jarrell, Th. Pruschke and J. Keller, *Phys. Rev. Lett.* **85**, 1524 (2000).
- “A Non-Crossing Approximation for the Study of Intersite Correlations“, Th. Maier, M. Jarrell, Th. Pruschke and J. Keller, *Eur. Phys. J. B* **13**, 613 (2000).

Collaborations Outside ORNL During Past Five Years:

O.K. Anderson, MPI Stuttgart, Germany, Z. Bai, Univ. of Calif., Davis, H.-P. Cheng, Univ. of Florida, A. Chubukov, Univ. of Wisconsin, Madison, S. Graser, Univ. of Augsburg, Germany, M. Hettler, Forschungszentrum Karlsruhe, Germany, P.J. Hirschfeld, Univ. of Florida, M. Jarrell, Louisiana State Univ., O. Jepsen, MPI Stuttgart, Germany, A. Macridin, Univ. of Cincinnati, J. Moreno, Louisiana State Univ., B. Moritz, Stanford Inst. for Mat. and Energy Sciences, D. Poilblanc, CNRS France, T. Pruschke, Univ. of Göttingen, Germany, T. Saha-Dasgupta, Kolkata, India, S. Savrasov, Univ. of Calif., Davis, G.A. Sawatzky, Univ. of Brit. Columbia, Canada, D.J. Scalapino, Univ. of Calif., Santa Barbara, R.T. Scalettar, Univ. of Calif., Davis, T.C. Schulthess, ETH and CSCS Switzerland, K. Tomko, Ohio Supercomp. Center., X. Wang, Nanjing Univ. China.

Graduate and Postdoc Advisors:

Graduate Advisor: Prof. T. Pruschke (University of Regensburg)
 PostDoctoral Advisor: Prof. M. Jarrell (University of Cincinnati)