

Name: Prof. Dr. W. Hanke

Contact: Institute of Theoretical Physics and Astrophysics,
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Date of birth: July, 8 1943

Education:

1963-1969 Study of Physics at the University of Munich
1970-1972 PhD thesis with Prof. H. Bilz, TU Munich
1972-1974 Postdoc with Prof. W. Kohn (Nobel Laureate) and Prof. L. J. Sham, University of California at San Diego
1974 Research Associate with Prof. W. Kohn, San Diego
1978 Habilitation in Theoretical Physics, University of Stuttgart

Career:

1975-1985 Associate Professor (C3) at the Max-Planck-Institute for Solid-State Research, Stuttgart
since 1980 Visiting Professor at various Universities in the US, Japan, France, etc. (see below)
1985 Professor at the University of Stuttgart
since 1985 Full Professor and Chairholder at the University of Würzburg
2002-2004 Dean of the Faculty of Physics and Astronomy
since 2008 Senior and Research Professor, University of Würzburg
2011 Fellow of the American Physical Society
2016 Honorary Doctoral Degree (PhD), awarded by the Technical University (TU) Graz
2020 Associate Member of the German Excellence-Cluster "Complexity and Topology in Quantum Materials"

Awards (selected):

1972 DFG/USA Research Award
1980/81 Coordinator of first condensed-matter program at the Institute for Theoretical Physics, Santa Barbara
1981 Yale University, Visiting Professor
1981 Yale University, Lecturing Award
1981 University of Paris, Marie-Curie Visiting Professor

1985/86	Visiting Professor, University of California, Irvine and Santa Barbara
1997	Visiting Professor, University of Florida (Tallahassee), Collaboration with Nobel Laureate Prof. J. R. Schrieffer
1999/2000	Stanford University, McCullough Visiting Professor, Work with Prof. S. C. Zhang
2002	Visiting Professor, University of Tokyo, Japan
1990-until today	University of California, Santa Barbara, Kavli Institute of Theoretical Physics and Physics Department, Visiting Professor, supported by several DFG research awards, as well as NSF (USA) grants
2011	Appointment to a Fellow of the American Physical Society
2016	Honorary PhD (Dr. h.c.), Graz University of Technology (TU) Graz

Research Topics:

Many-body physics applied to the theory of condensed matter:

- Competing phases in novel solid-state systems
- Superconductivity, in particular, high- T_c superconductivity
- Magnetism and its interplay with superconductivity
- Topology, in particular, topological superconductivity and quantum spin Hall effect
- Methodology:
 - Numerical (Quantum-Monte-Carlo, Exact Diagonalization, Variational Cluster techniques, etc.)
 - Analytical (Renormalization-group (RG) techniques, Symmetry (such as SO(5) symmetry) analysis)

Committees (selected):

since 1994	Scientific Councils (National German Supercomputing Centers Munich and Stuttgart)
since 2003	Member of the Computer-Science Commission of the Bavarian Academy of Science
2004 - 2008	Member of the Scientific Board of the Bavarian-Californian Technology Center (BaCaTeC)
2009/2010	Member of the Research-Field (Natural Science) Commission of the Max-Planck (MPG) Society, which give advice to the President on the Future of the Natural-Science Institutes within the MPG.

Selected Publications:

- (1) W. Hanke and L.J. Sham, *Local-Field and Excitonic Effects in the Optical Spectrum of a Covalent Crystal*, Phys. Rev. B **12**, 4501 (1975).
- (2) W. Kohn and W. Hanke, *Nonlocal Correlations in the Exchange and Correlation Energy of an Inhomogeneous Electron Gas*, Workshop Rep. on One-Electron Ab-Initio Potentials at “CECAM”, edited by C. Moser, p. 143, (1976).
- (3) W. Hanke, *Theory of Elementary Excitations in Crystals*, Adv. in Physics **27**, 287 (1978).
- (4) G. Strinati, H.J. Mattausch and W. Hanke, *Dynamical Aspects of Correlation Corrections in Covalent Crystals*, Phys. Rev. B **25**, 2867 (1982).
- (5) W. Hanke and L.J. Sham, *Density-functional theory in insulators: Analytical model for the self-energy v_{xc} , and the gap correction*, Phys. Rev. B **38**(18), 13361–13370 (1988).
- (6) G. Dopf, A. Muramatsu and W. Hanke, *Consistent description of high- T_c superconductors with the three-band Hubbard model*, Phys. Rev. Lett. **68**, 353 (1992).
- (7) F.F. Assaad, W. Hanke and D. J. Scalapino, *Temperature derivative of the Superfluid Density and Flux-Quantization as a Criterion for Superconductivity in Two-dimensional Hubbard Models*, Phys. Rev. B **50**, 12835 (1994).
- (8) R. Preuss, W. Hanke and W. v.d. Linden, *Quasiparticle dispersion of the 2D Hubbard model: From an insulator to a metal*, Phys. Rev. Lett. **75**, 1344 (1995).
- (9) M.G. Zacher, E. Arrigoni, W. Hanke and J.R. Schrieffer, *Systematic numerical study of spin-charge separation in one-dimension*, Phys. Rev. B **57**, 6370 (1998).
- (10) E. Arrigoni, A.P. Harju, W. Hanke, B. Brendel and S.A. Kivelson, *Stripes and superconducting pairing in the t - J model with Coulomb interactions*, Phys. Rev. B **65**, 134503 (2002).
- (11) E. Demler, W. Hanke and S.C. Zhang, *The $SO(5)$ Theory of antiferromagnetism and superconductivity*, Rev. Mod. Phys **76**, 909–974 (2004).
- (12) M. Aichhorn, E. Arrigoni, M. Potthoff and W. Hanke, *Antiferromagnetic to superconducting phase transition in the hole- and electron-doped Hubbard model at zero temperature*, Phys. Rev. B **74**, 024508 (2006).
- (13) T. Dahm, V. Hinkov, S.V. Borisenko, A.A. Kordyuk, V.B. Zabolotnyy, J. Fink, A. Büchner, D.J. Scalapino, W. Hanke and B. Keimer, *Strength of the Spin-Fluctuation-Mediated Pairing Interaction in a High-Temperature Superconductor*, Nature Physics 2009/01/18/online (2009).
- (14) C. Bruene, A. Roth, E.G. Novik, M. Koenig, H. Buhmann, E.M. Hankiewicz, W.

Hanke, J. Sinova and L.W. Molenkamp, *Evidence for the ballistic intrinsic spin Hall effect in HgTe nanostructure*, Nature Physics 2010/05/02/online (2010).

- (15) G. Li, P. Höpfner, J. Schäfer, C. Blumenstein, S. Meyer, A. Bostwick, E. Rotenberg, R. Claessen and W. Hanke, *Magnetic-Order in a frustrated two-dimensional atom lattice at a semiconductor surface*, Nature Communications, Vol. 4, 1620 (2013).
- (16) Ch. Platt, W. Hanke and R. Thomale, *Functional renormalization group for multi-orbital Fermi surface instabilities*, Review Article: Advances in Physics, Vol. 62, 453-562 (2013).
- (17) M.H. Fischer, T. Neupert, Ch. Platt, A.P. Schnyder, W. Hanke, R. Thomale and M. Sigrist, *Chiral d-wave superconductivity in SrPtAs*, Phys. Rev. B 89, 020509 (R) (2014).
- (18) L. Elster, Ch. Platt, R. Thomale, W. Hanke and E. M. Hankiewicz, *Accessing topological superconductivity via a combined STM and renormalization group analysis*, Nature Comm. 6, 8232 (2015).
- (19) F. Reis, G. Li, W. Hanke, R. Thomale, J. Schäfer, R. Claessen, in Science. DOI: 10.1126/science.aai8142 (2017), June 29th
- (20) G. Li, W. Hanke, E.M. Hankiewicz, F. Reis, J. Schäfer, R. Claessen, C. Wu, R. Thomale, *Theoretical paradigm for the quantum spin Hall effect at high temperatures*, Phys. Rev. B98, 165146 (2018)
- (21) X. Wu, W. Hanke, M. Fink, M. Klett, R. Thomale, *Harmonic fingerprint of unconventional superconductivity in twisted bilayer graphene*, Phys. Rev. B101, 134517 (2020)
- (22) X. Wu, D. Di Sante, T. Schwemmer, W. Hanke, H.Y.Hwang, S. Raghu, R. Thomale, *Robust d x^2 - y^2 -wave superconductivity of infinite-layer nickelates*, Phys. Rev. B101, 060504 (R) (2020)
- (23) T. Schwemmer, H. Hohmann, M. Dürrnagel, J. Potten, J. Beyer, S. Rachel, Y. Wu, S. Raghu, T. Müller, W. Hanke, R. Thomale, *Sublattice modulated superconductivity in the kagome Hubbard model*, Phys. Rev. B110, 024501 (2024)