Name: **Prof. Dr. W. Hanke**

Contact: Institute of Theoretical Physics and Astrophysics,
Julius-Maximilian-University of Würzburg
Am Hubland, D-97078 Würzburg, Germany
http://theorie.physik.uni-wuerzburg.de

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)