



Universiteit
Leiden

The Netherlands

Fermions, criticality and superconductivity

She, J.H.

Citation

She, J. H. (2011, May 3). *Fermions, criticality and superconductivity*. *Casimir PhD Series*. Faculty of Science, Leiden University. Retrieved from <https://hdl.handle.net/1887/17607>

Version: Corrected Publisher's Version

License: [Licence agreement concerning inclusion of doctoral thesis in the Institutional Repository of the University of Leiden](#)

Downloaded from: <https://hdl.handle.net/1887/17607>

Note: To cite this publication please use the final published version (if applicable).

PUBLICATIONS

1. *Pacifying the Fermi-liquid: battling the devious fermion signs*,
J. Zaanen, F. Krueger, J.-H. She, D. Sadri, S. I. Mukhin, Iranian Journal of Physics Research **8**, 39 (2008), arXiv:0802.2455 [cond-mat.other][Chapter 3].
2. *Statistics, Condensation and the Anderson-Higgs Mechanism: The World-line Path Integral View*,
Jian-Huang She, Darius Sadri, Jan Zaanen, Phys. Rev. B **78**, 144504 (2008) [Chapter 2].
3. *BCS Superconductivity in Quantum Critical Metals*,
Jian-Huang She, Jan Zaanen, Phys. Rev. B **80**, 184518 (2009)[Editor's Suggestion] [Chapter 5].
4. *Stability of Quantum Critical Points in the Presence of Competing Orders*,
Jian-Huang She, Jan Zaanen, Alan R. Bishop, Alexander V. Balatsky, Phys. Rev. B **82**, 165128 (2010)[Editor's Suggestion] [Chapter 4].
5. *Proximity of the Superconducting Dome and the Quantum Critical Point in the Two-Dimensional Hubbard Model*,
S.-X. Yang, H. Fotso, S.-Q. Su, D. Galanakis, E. Khatami, J.-H. She, J. Moreno, J. Zaanen, M. Jarrell, Phys. Rev. Lett. **106**, 047004 (2011).
6. *Observing the Origin of Superconductivity in Quantum Critical Metals*,
J.-H. She, B. J. Overbosch, Y. Liu, Y.-W. Sun, J. A. Mydosh, J. Zaanen, to appear [Chapter 6].

CURRICULUM VITAE

I was born in Rudong, China, on the 7th of July 1981. After finishing primary school and high school there, I started my undergraduate studies at the Department of Modern Physics, University of Science and Technology of China, in 1999. I majored in theoretical physics, and the diploma work with which I graduated in summer of 2003, “Review of Seiberg-Witten duality in $N=2$ supersymmetric gauge theories” was supervised by Prof. Si-Cong Jing. During the undergraduate studies, I started to be exposed to research, first in a high energy theory group, where I reviewed the proton spin problem, then in a quantum information group, getting involved in the research of many body entanglement, and finally in a condensed matter theory group, working on the transport problem of semiconductors.

In September 2003, as a master student, I joined the string theory group of Prof. Miao Li at the Institute of Theoretical Physics, Chinese Academy of Science, in Beijing. During my master studies, I worked on the interplay of string theory and cosmology. I published 6 papers and gave several talks about my work both in the institute and in other universities.

In May 2007, I began my Ph.D. studies under the supervision of Prof. Jan Zaanen at the Instituut-Lorentz for theoretical physics in Leiden. This thesis contains the main results of the research during this period. In the summer of 2010, I spent three months working at Los Alamos National Lab in the group of Prof. Sasha Balatsky and Prof. Alan Bishop. As a graduate student, I presented my work through talks and posters at several conferences in the Netherlands, Japan, England and the United States. During my Ph.D, I was twice teaching assistant for a course in condensed matter physics for master students.

ACKNOWLEDGEMENTS

This thesis would not have been possible without the contributions and encouragements of the many people around me. First I would like to thank my supervisor Jan Zaanen, who has supported me throughout my thesis with his insight and enthusiasm whilst allowing me the room to work out problems in my own way. I had great fun working with him.

I am indebted to Sergei Mukhin, Sasha Balatsky, Alan Bishop and John Mydosh. Part of this thesis came out of collaborations with them and discussions with them have been wonderful experiences in my life. I would also like to thank Koenraad Schalm and Duncan Haldane, with whom I have had the privilege to work with during my Ph.D study. I enjoyed helpful conversations with David Santiago, Peter Denteneer, Hans van Leeuwen, Bas Edixhoven and Frans Oort.

It is such a great pleasure for me to have this chance thank my collaborators and friends ('comrades'): Frank Krüger, Darius Sadri and Bas Overbosch. We had been working together so enthusiastically on nodes and then on the pair susceptibility problem. I am grateful to all the Stripe Club members: Aron Beekman, Andrej Mesaroš, Daniel Abel, Mihailo Čubrović, Vladimir Juričić, Louk Rademaker, Kai Wu, Yan Liu and Ya-Wen Sun, for creating a productive intellectual atmosphere around me. In particular I thank Daniel Abel for being an active member of the nodal club, and thank Yan Liu and Ya-Wen Sun for contributions to the last chapter of this thesis. Special thanks to Bas Overbosch for translating the summary into Dutch, and Aron Beekman for checking the grammar.

I thank Fran, Marianne and Trudy for the motherly help during the last four years. I thank everybody in Institute Lorentz for making it like a family.

I am grateful to my friends: Xin Wang and Qing-Jing Yang, Jiong-Wei Wang and Xiao-Xun Yang, Jian-Wei Wang and Simon Haller, Lin-Hua Jiang and Hua Pan, Jun-Jun Shan and Hai-Yan Liu, Wei Xu and Ai-Ying He, Jun Wang and Ying Zhao, Jun Wang and Jin-Feng Shen, Guo-Cai Dong and Nan Li, Peng Yang, Keke Liu, Karine Bot, Xi Jin and especially Pang Gong and Xiao Shuaige.

I thank my parents and parents-in-law for their deep love and constant support during my study. I thank my wife Zhen and my daughter Ninjee, without whom all these would have been meaningless.

