

JELENA STAJIC

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EDUCATION

Ph.D. in physics

University of Chicago, Chicago, Illinois, September 2004

Thesis title: BCS-BEC crossover in high temperature superconductors and ultracold Fermi gas superfluids

B.S. in physics

University of Belgrade, Belgrade, Serbia and Montenegro, October 1998

EMPLOYMENT HISTORY

Postdoctoral Research Associate, October 2004-present

Theoretical Division and Center for Nonlinear Studies, Los Alamos National Laboratory, Los Alamos, New Mexico

Supervisor: Michael Wall

Research Assistant, 2000–2004

Department of Physics, University of Chicago, Chicago, Illinois

Advisor: Kathryn Levin

Teaching Assistant, 1999–2003

Department of Physics, University of Chicago, Chicago, Illinois

RESEARCH INTERESTS

- Gene networks
- Signal transduction in prokaryots
- Pattern formation in biological systems
- Developmental biology
- Noise in biological networks
- Neuroscience
- Protein folding

RESEARCH EXPERIENCE

Genetic regulatory networks (biological physics):

- Modelled the dynamic behavior of the multiple antibiotic resistance genetic circuit in *Escherichia coli* in collaboration with Drs. Martin and Rosner from the NIH.
- Analyzed and quantified bistability of the *lac* operon of *E. coli*.

Compact polymer configurations (statistical, biological physics):

- Obtained a closed form expression for the number of Hamiltonian walks on a class of fractal lattices used to model polymers in solutions.
- Developed a computer program in C to efficiently count Hamiltonian walks on a basis for the 2D Sierpinski fractal with up to 45 vertices.
- Demonstrated that the form of the asymptotic expression for the number of Hamiltonian walks on fractal lattices differs from that of homogeneous lattices.

Superfluidity of ultracold Fermi gases (atomic, condensed matter physics):

- Provided theoretical backing for groundbreaking thermodynamical measurements obtained by Prof. Thomas's group at Duke University, establishing firm evidence for a phase transition in the strongly interacting regime.
- Calculated density profiles for trapped Fermi gases over the entire crossover region and at all temperatures below the critical temperature. Established the first method for thermometry in the strongly interacting regime.
- Analyzed density of states and momentum distribution as possible signatures of superfluidity in ultracold Fermi gases with a Feshbach resonance in collaboration with Prof. Holland's group from the University of Colorado.
- Determined the effects of Feshbach resonance induced bosons on the density profiles of trapped Fermi gases in the near-BEC limit.

High temperature superconductivity (condensed matter physics):

- Collaborated with an experimental group led by Prof. Lemberger of OSU to explain one of the most puzzling high T_c experimental findings – the near universality of the temperature dependence of the inverse squared penetration depth with doping.
- Generalized the time-dependent Ginzburg-Landau theory to arbitrary coupling strength thus achieving a crossover mean field theory in compliance with the ground state first proposed by Leggett.
- Studied pseudogap effects in the *ab* plane AC conductivity of the cuprates and identified the condensed integrated spectral weight as a quantity central to comparison of theory with experiment.

TEACHING EXPERIENCE

Teaching Assistant, 1999-2003

Department of Physics, University of Chicago, Chicago, Illinois

- Led weekly lab and discussion sessions for 8 physics courses ranging from introductory to advanced.
- Provided solutions for and graded weekly homework problem sets, midterm and final exams.
- Helped individual students during and outside office hours.

ACADEMIC SERVICE

Referee for Physical Review Letters and Physical Review B

Admissions Committee Member, 2001

Department of Physics, University of Chicago, Chicago, Illinois

- Evaluated graduate school applications for the class of 2001.
- Recruited admitted students.

HONORS AND FELLOWSHIPS

- McCormick Graduate Fellowship, 1999-2001, University of Chicago
- Robert G. Sachs Summer Graduate Fellowship, 2000, University of Chicago
- Scholarship of the Serbian Republic Foundation for Youth Development in Arts and Sciences, 1997-1999

PROFESSIONAL AFFILIATIONS

- Member, American Physical Society

PUBLICATIONS IN REFEREED JOURNALS

1. Qijin Chen, **Jelena Stajic**, Kathryn Levin, Thermodynamics of interacting fermions in atomic traps, to appear in *Phys. Rev. Lett.*
2. Qijin Chen, **Jelena Stajic**, Kathryn Levin, Applying BCS-BEC crossover theory to high temperature superconductors and ultracold atomic Fermi gases, to appear in *J. Low. Temp. Phys.*
3. J. Kinast, A. Turlapov, J. E. Tomas, Qijin Chen, **Jelena Stajic**, K. Levin, Heat capacity of a strongly-interacting Fermi gas, *Science*, **307**, 1296 (2005)
4. Qijin Chen, **Jelena Stajic**, Shina Tan, Kathryn Levin, BCS-BEC crossover: From high temperature superconductors to ultracold superfluids, *Phys. Rep.* **412**, 1-88 (2005) [review article]
5. **Jelena Stajic**, Qijin Chen, Kathryn Levin, Density profiles of strongly interacting trapped Fermi gases, *Phys. Rev. Lett.* **94**, 060401 (2005)

6. **Jelena Stajic**, Suncica Elezovic-Hadzic, Hamiltonian walks on Sierpinski and n-simplex fractals, *J. of Phys. A: Math. Gen.* **38**, 5677 (2005)
7. **Jelena Stajic**, Qijin Chen, K. Levin, Particle density distributions in Fermi gas superfluids: Differences between one- and two-channel models, *Phys. Rev. A* **71**, 033601 (2005)
8. **Jelena Stajic**, J. N. Milstein, Qijin Chen, M. L. Chiofalo, M. J. Holland, K. Levin, The nature of superfluidity in ultracold Fermi gases near Feshbach resonances, *Phys. Rev. A* **69**, 063610 (2004)
9. **Jelena Stajic**, Andrew Iyengar, Qijin Chen, K. Levin, The pseudogap state in superconductors: Extended Hartree approach to time-dependent Ginzburg-Landau Theory, *Phys. Rev. B* **68**, 174517 (2003)
10. **Jelena Stajic**, Andrew Iyengar, K. Levin, B. R. Boyce, T. Lemberger, The cuprate pseudogap: competing order parameters or precursor superconductivity, *Phys. Rev. B* **68**, 024520 (2003)
11. Andrew Iyengar, **Jelena Stajic**, Ying-Jer Kao, K. Levin, The pseudogap challenge: Understanding the ab-Plane AC conductivity below T_c , *Phys. Rev. Lett.* **90**, 187003 (2003)
12. Ying-Jer Kao, Andrew P. Iyengar, **Jelena Stajic**, K. Levin, Pair-breaking effects in the pseudogap regime: Application to high temperature superconductors, *Phys. Rev. B* **66**, 214519 (2002)

PRESENTATIONS AND CONFERENCES

- Selected to and participated in the Summer school Workshop on ultracold atomic gases at the Aspen Center for Physics, Aspen, CO, June 2005
- “Density profiles of strongly interacting trapped Fermi gases”, contributed talk at the APS March meeting, Los Angeles, March 2005
- “The nature of superfluidity in ultracold Fermi gases near Feshbach resonances”, contributed talk at the APS March meeting, Montreal, March 2004
- “From ultracold superfluids to high temperature superconductors”, invited talk at the Condensed matter theory center, University of Maryland, February 2004
- “From ultracold superfluids to high temperature superconductors”, invited talk at the CNLS, LANL, December 2003
- “Relationship between conventional time-dependent Ginzburg-Landau (TDGL) theory and a mean field theory of the cuprate pseudogap”, contributed talk at the APS March meeting, Austin 2003
- “Using scaling observations of the superfluid density to distinguish models of the pseudogap”, contributed talk at the APS March meeting, Indianapolis 2002

COMPUTER SKILLS AND LANGUAGES

- Computer skills: FORTRAN, C, PASCAL, LaTeX, Mathematica, Matlab; UNIX, Windows
- Languages: Serbian (native), Spanish (basic), good reading ability in Russian

REFERENCES

- **Prof. Kathryn Levin, University of Chicago (thesis advisor);** phone: (773) 702-7186, e-mail: levin@jfi.uchicago.edu, mailing address: James Franck Institute, University of Chicago, 5640 S. Ellis Ave., Chicago, IL 60637
- **Dr. Michael Wall, technical staff member, Los Alamos National Laboratory (postdoctoral advisor);** phone: (505) 665-4209, e-mail: mewall@lanl.gov, mailing address: Los Alamos National Laboratory, MS B256, Los Alamos, NM 87545
- **Prof. Thomas Lemberger, Ohio State University (collaborator);** phone: (614) 292-7799, e-mail: trl@mps.ohio-state.edu, mailing address: Department of Physics, Ohio State University, 1040 Physics Research Building, 191 W. Woodruff Ave., Columbus, OH 43210
- **Dr. Zoltan Toroczkai, technical staff member, Los Alamos National Laboratory (supervisor);** phone: (505) 667-3218, e-mail: toro@lanl.gov, mailing address: Los Alamos National Laboratory, MS B258, Los Alamos, NM 87545
- **Prof. Suncica Elezovic-Hadzic, University of Belgrade (collaborator);** phone: +381 11 630-152, e-mail: suki@ff.bg.ac.yu, mailing address: Univerzitet u Beogradu, Fizicki fakultet, Studentski trg 12, Beograd, 11000, Serbia and Montenegro