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Michael McNeil Forbes

Publications

- M. M. Forbes and S. Y. Chang, *Quantifying the Phases of Dilute Fermi Gases*. (in preparation)
- A. Bulgac and M. M. Forbes, *LOFF in a Unitary Fermi Gas*. (in preparation)
- astro-ph/0611506 • M. M. Forbes and A. Zhitnitsky, *Diffuse X-rays: Directly Observing Dark Matter?* (Accepted for publication in JCAP)
- cond-mat/0606043 • A. Bulgac and M. M. Forbes, *Zero Temperature Thermodynamics of Asymmetric Fermi Gases at Unitarity*, Phys. Rev. A. **75** (2006) 031605(R)
- cond-mat/0602274 • A. Bulgac, M. M. Forbes and A. Schwenk, *Induced P-wave Superfluidity in Asymmetric Fermi Gases*, Phys. Rev. Lett. **97** (2006) 020402.
- hep-ph/0411001 • M. M. Forbes, *Kaon Condensation in an NJL Model at High Density*, Phys. Rev. **D72** (2005) 094032.
- hep-ph/0405059 • M. M. Forbes, E. Gubankova, W. V. Liu and F. Wilczek, *Stability Criteria for Breached Pair Superfluidity*, Phys. Rev. Lett. **94** (2005) 017001.
- hep-ph/0109173 • M. M. Forbes and A. R. Zhitnitsky, *Global strings in high density QCD*, Phys. Rev. **D65** (2002) 085009.
- hep-ph/0102158 • M. M. Forbes and A. R. Zhitnitsky, *Primordial galactic magnetic fields: An application of QCD domain walls*.
- hep-ph/0008318 • M. M. Forbes, *QCD Seeds for Primordial Magnetic Fields*, "From Particles to the Universe: Proceedings of the Fifteenth Lake Louise Winter Institute", (2000) 207-212.
- hep-ph/0008315 • M. M. Forbes and A. R. Zhitnitsky, *Primordial Galactic Magnetic Fields from the QCD Phase Transition*, "Minneapolis 2000, Continuous advances in QCD", 226-238.
- hep-ph/0004051 • M. M. Forbes and A. R. Zhitnitsky, *Domain walls in QCD*, JHEP **10** (2001) 013.
- M. M. Forbes and A. R. Zhitnitsky, *Primordial galactic magnetic fields from domain walls at the QCD phase transition*, Phys. Rev. Lett. **85** (2000) 5268-5271.

Talks

- Invited Seminar Talk • *The Fermion Many-Body Problem: From Cold Atoms to Cold Dark Matter*. LANL, 23 October 2007.
- Invited Talk • *Phase Structure of Two-Component Fermi Gases*. Workshop on Quantum Gases, Institut Henri Poincare, Paris, France, 5 July 2007.
- Invited Seminar • *Improving Self-Consistent Calculations of Fermion Systems*. SciDAC-UNEDF Collaboration Talk, University of Washington, Seattle, 7 May 2007.
- Invited Seminar • *The Fermion Many-Body Problem: From Cold Atoms to Cold Dark Matter*. TRIUMF, Vancouver, Canada, 27 September 2007.
- Invited Seminar • *Antimatter as a Galactic Heater: Cold Dark Matter that's neither cold nor dark*. UBC Theory Seminar, Vancouver, Canada, 11 September 2006.
- Invited Seminar • *Phases of Cold Asymmetric Fermionic Matter*. APCTP Focus Program: "Search for Exotic States of Dense Matter", Pohang, Korea, 25 June 2006.
- Talk • *Phases of Cold Asymmetric Fermionic Matter*. TRIUMF, Vancouver, Canada, 16 May 2006.
- Talk • *Phases of Cold Asymmetric Fermionic Matter*. University of Washington, Seattle, 8 February 2006.
- Invited Seminar • *Phases of Cold Asymmetric Fermionic Matter*. UBC Theory Seminar, Vancouver, Canada, 30 January 2006.
- Invited Seminar • *Properties of Gapless (Breached Pair) Superfluids: From Cold Atoms to Neutron Stars*. Harvard, March 2005.
- Invited Seminar • *Aspects of High-Density QCD: Kaon Condensation and Gapless Superfluidity*. BNL, 3 February 2005.
- Invited Seminar • *Aspects of High-Density QCD: Kaon Condensation and Gapless Superfluidity*. Ohio State University, Columbus, 31 January 2005.
- Invited Seminar • *Aspects of High-Density QCD: Kaon Condensation and Gapless Superfluidity*. LANL, 20 January 2005.
- Invited Seminar • *Aspects of High-Density QCD: Kaon Condensation and Gapless Superfluidity*. INT Seattle, Washington, 3 January 2005.
- Seminar • *The Thermodynamic Stability of Gapless (Breached Pair) Superfluids*. INT Program 04-1: "QCD and Dense Matter: From Lattices to Stars", INT Seattle, Washington, 7 June 2004.

Talks (continued)

- Seminar**
- *QCD Seeds for Primordial Magnetic Fields*. Fifteenth Lake Louise Winter Institute: “From Particles to the Universe”, February 2000.

Education

- 2000–2005**
- **Ph.D: Massachusetts Institute of Technology**
Thesis: “Fermionic Superfluids: From Cold Atoms to High Density QCD. Gapless (Breached Pair) Superfluidity and Kaon Condensation”
Supervisor: Frank Wilczek
- 1999–2001**
- **M.Sc: University of British Columbia**. Physics
Thesis: “Primordial Galactic Magnetic Fields from the QCD Phase Transition”
Supervisor: Ariel R. Zhitnitsky
- 1994–1999**
- **B.Sc: University of British Columbia**. Combined Honours Computer Science and Physics
Thesis: “One Dimensional Quantum Spin Chains: Computational Difficulties, Techniques and Generalizations”
Supervisors: Ian Affleck and James Varah

Research and Work Experience

- 2005–present**
- **University of Washington:** Nuclear Theory Group postdoc. Aspects of fermion superfluidity: Phase structure of polarized cold atom systems with short-ranged interactions. Density Functional Theory (SLDA) for fermionic systems. Aspects of cosmology and astrophysics: Colour-Flavour Locked (CFL) quark antimatter nuggets as Cold Dark Matter (CDM), a mechanism for Baryogenesis at the QCD phase transition, and a source for diffuse galactic X-ray emission.
- 2000–2005**
- **Massachusetts Institute of Technology:** Graduate studies with Frank Wilczek and Krishna Rajagopal. Aspects of high density QCD: low energy effective theories, numerical NJL model analysis, Kaon condensation, gapless superconductivity. Aspects of fermion superfluidity: Breached Pair (gapless) superfluidity and superconductivity, thermodynamic stability, low energy effective theories.
- 2000-2002**
- With Ariel Zhitnitsky: Topological defects (strings and vortices) in high density QCD; QCD domain walls and applications to cosmology and astrophysics (primordial magnetic fields and dark matter).
- 1999–2000**
- **University of British Columbia:** Graduate studies with Ariel Zhitnitsky. QCD domain walls with applications to generating primordial galactic magnetic fields at the QCD phase transition.
- 1998–1999**
- **University of British Columbia:** Undergraduate Honours thesis with Ian Affleck and James Varah. One-dimensional $S = 1$ Heisenberg spin chain: numerical and analytic work.
- Summer 1998**
- **Canadian Institute of Theoretical Astrophysics (CITA):** NSERC Summer Research Fellowship with John Dubinski. Numerical analysis of large-scale galaxy formation simulations.

Awards and Scholarships

- 2005**
- Natural Science and Engineering Research Council (NSERC) of Canada Postdoctoral Fellowships (PDF) (Declined).
- 2001-2003**
- Natural Sciences and Engineering Research Council (NSERC) of Canada PGSB Scholarship \$19 000 CAN
- 2000**
- Presidential Fellowship: MIT \$44 770 US
 - Faculty of Science Grant Supplement Award: UBC \$4000 CAN
- 1999**
- Faculty of Science Grant Supplement Award: UBC \$6000 CAN
 - NSERC of Canada PGSA Scholarship \$17 300 CAN
 - Rudi Haering Medal in Physics for Highest Academic Standing in Graduating Class.
 - Third place in the Canadian Association of Physicists University Prize Examination: National Competition.
- 1998**
- Gordon Merritt Shrum Memorial Scholarship: UBC \$1150 CAN
 - SHL Systemhouse President’s Award for Education and Technology: Industry, \$5000 CAN
 - Charles and Jane Banks Scholarship: UBC, \$800 CAN
- 1996**
- Computer Science Scholarship: UBC \$1200 CAN
- 1995**
- Kuan Mann Scholarship: UBC \$400 CAN
 - Charles and Jane Banks Scholarship: UBC \$1100 CAN
- 1994-1999**
- Canada Scholarship: National \$10 000 CAN
- 1994-1999**
- National Scholarship: UBC \$26 000 CAN
- 1994**
- Rutherford Scholarship: Alberta \$1500 CAN

Awards and Scholarships (continued)

- Ranked 1st place in Canada and 31st place in the world at the XXV International Physics Olympiad in Beijing. Bronze medals in both Theory and Overall.