

# Victor M. Galitski

## Home Address

1515 Jefferson Davis Hwy., #709  
Arlington, VA 22022  
Phone: 434.284.2713

## Business Address

Physics Department, University of Maryland  
College Park, MD 20742-4111  
Phone: 301.405.6107 Fax: 301.314.9465  
E-mail: lastname@umd.edu  
Web page: <http://terpconnect.umd.edu/~galitski/>

## Degrees

- August 2002 Ph.D. in theoretical condensed matter physics with the focus on superconductivity (PhD advisor: Prof. A. Larkin; Thesis title: “Quantum Fluctuations in Superconductors”) Theoretical Physics Institute, University of Minnesota, Minneapolis
- August 1999 Ph.D. in physical-mathematical sciences received in a record time of 18 months with the focus on applied mathematical methods in astrophysics; (PhD advisor: Prof. D. Sokoloff; Thesis title: “Spectrum of Parker’s equations”) Moscow Engineering Physics Institute (MEPhI), Moscow, Russia
- April 1998 Equivalent to a MS degree in Engineering (diploma *Cum Laude*) with a minor in Computer Science, MEPhI

## Employment

- Since 09/2007 Member of the Center for Nanophysics and Advanced Materials (University of Maryland)
- Since 09/2006 Fellow of the Joint Quantum Institute (JQI) and member of the NSF Physics Frontier Center at the JQI (since 01/2009)
- Since 09/2006 Asst. Professor in the Department of Physics within the College of Computer, Mathematical, and Physical Sciences (CMPS) at the University of Maryland
- 08/2005 – 08/2006 Asst. Professor in the Department of Physics of the University of Virginia
- 09/2004 – 08/2005 Research Fellow, Kavli Institute for Theoretical Physics University of California, Santa Barbara
- 09/2002 – 08/2004 Research Fellow, Condensed Matter Theory Center and Center for Superconductivity Research, University of Maryland
- 09/1999 – 08/2002 Research/Teaching Assistant, University of Minnesota
- 09/1997 – 03/1998 Internship at the *Institut des Science Nuclearies*, Grenoble, France

## Honors and awards

- 2009 CMPS Board of Visitors Faculty Award (cash prize of \$2,500)
- 2009 National Science Foundation CAREER Award (\$400,000 of research funding)
- 1997 – 1998 Grant of French Government (one-time award of 12,000 Francs)
- 1996 George Soros Fellowship (cash prize of \$1,000)

**Funding**

- PI on the Department of Energy (DOE) grant “Theory of fluctuations in Superconductors”  
Number of Senior Investigators: 1  
Total award amount: \$309,000  
Period covered 2009-2012
- PI on The Defense Advanced Research Projects Agency (DARPA) seedling contract “Stabilizing Coherent Quantum States via Many-Body Quantum Control of Electronic Environments”  
Number of Senior Investigators: 2  
Total award amount: \$186,000  
Period covered 2009-2010
- PI on the Army Research Office (ARO) contract (single-investigator award) “Spin-orbit-coupled Bose-Einstein condensates”  
Number of Senior Investigators: 1  
Total award amount: \$400,000  
Period covered: 06/01/09 - 05/31/13
- PI on the National Science Foundation (NSF) grant DMR-0847224  
Number of Senior Investigators: 1  
Total award amount: \$400,000  
Period covered: 09/01/09 - 08/31/13
- Co-PI on the The Intelligence Advanced Research Projects Activity (IARPA) grant “Conventional and ALD Dielectric Film Studies for Improved Phase Qubits,”  
Number of Senior Investigators: 4  
Total Award amount: \$2,828,591  
Period covered: 2009-2015
- Co-PI on the DARPA contract “Topological Quantum Entanglement”  
Number of Senior Investigators: 5  
Total award amount: \$2,123,654  
Period covered: 12/01/08 - 11/30/13
- Participating Senior Investigator of the NSF-supported Physics Frontier Center at the Joint Quantum Institute, “Processing Quantum Coherence,”  
Period covered: 09/01/08 - 08/31/13

**Professional and other activities**

- Referee for the Army Research Office, Department of Energy, Department of Defense, the National Science Foundation, and the Israeli Science Foundation
- Referee for Physical Review Letters, Physical Review B, Physical Review A, and Europhysics Letters
- Translator for Oxford University Press; Currently involved in translating a book by Galitskii, V. M., Sr., Karnakov, V. M., and Kogan, V. M., “Problems in Quantum Mechanics” ( 1000pages) projected to be published in 2010 (Copyright transferred to OUP publishing house)
- Co-organizer of workshop on “Exotic Insulating States of Matter” to be held at the Johns Hopkins University, in January, 2010; \$20,000 of funding is provided by the Institute for Complex Adaptive Matter (ICAM)
- Member of the Board of Directors of the University of Minnesota Alumni Association (DC Chapter)

### Graduate and Postdoctoral Advisees

#### Graduate students

1. Mr. Meng Cheng (currently at UMD)
2. Mr. Brandon Anderson (currently at UMD)
3. Mr. Andrew Robertson (currently at UMD)
4. Mr. Justin Wilson (currently at UMD)
5. Mr. Pavel Nagornykh (switched to experiment, currently in NSA 's Laboratory for Physical Sciences)

#### Postdoctoral Associates

1. 01/2006-08/2009: Postdoctoral (PD) advisor of Dr. Tudor Stanescu (currently an Assistant Professor at University of W. Virginia)
2. 01/2008-06/2009: PD co-advisor of Dr. Handong Chen (currently in the hedge-fund industry)
3. Since 06/2009: PD co-advisor of Dr. Kai Sun (currently at UMD)
4. Since 09/2009: PD advisor of Dr. Maxim Dzero (currently at UMD)
5. Since 11/2009: PD advisor of Dr. Tigran Sedrakyan (currently at the Univ. of Wisconsin)

### Publications

#### Condensed Matter Physics:

1. Galitski, V. M. and Larkin, A. I., "Disorder and Quantum Fluctuations in Superconducting Films in Strong Magnetic Fields," *Physical Review Letters* **87**, 087001 (2001)
2. Galitski, V. M. and Larkin, A. I., "Superconducting fluctuations at low temperature," *Physical Review B* **63**, 174506 (2001)
3. Galitski, V. M. and Larkin, A. I., "Spin glass versus superconductivity," *Physical Review B* **66**, 064526 (2002)
4. Galitski, V. M. and Das Sarma, S., "Kohn-Luttinger pseudo-pairing in a two-dimensional Fermi-liquid," *Physical Review B* **67**, 144520 (2003)
5. Galitski, V. M. and Das Sarma, S., "Renormalization of the upper critical field by superconducting fluctuations," *Physical Review B* **67**, 144501 (2003)
6. Das Sarma, S., Galitski, V. M., and Zhang, Y., "Temperature dependent effective mass renormalization in 2D electron systems," *Physical Review B* **69**, 125334 (2004)
7. Galitski, V. M., Kaminski, A., and Das Sarma, S., "Griffiths phase in diluted magnetic semiconductors," *Physical Review Letters* **92**, 177203 (2004)
8. Galitski, V. M. and Das Sarma, S., "Universal temperature corrections to Fermi liquid theory in an interacting electron system," *Physical Review B* **70**, 035111 (2004)
9. Kaminski, A., Galitski, V. M. and Das Sarma, S., "Ferromagnetic and random spin ordering in dilute magnetic semiconductors," *Physical Review B* **70**, 115216 (2004)
10. Galitski, V. M. and Khodel, V. A., "Divergence of the effective mass near a density wave instability in a MOSFET system," cond-mat/0308203
11. Galitski, V. M., "The internal Josephson effect in a Fermi gas near a Feshbach resonance," *Physical Review A* **72**, 013612 (2005)
12. Chubukov, A. V., Galitski, V. M., and Yakovenko, V. M., "Quantum critical behavior near a density-wave instability in an isotropic Fermi liquid," *Physical Review Letters* **94**, 046404 (2005)

13. Galitski, V. M., Vavilov, M. G., and Glazman, L. I., “Aharonov-Bohm effect as a probe of interaction between magnetic impurities,” *Physical Review Letters* **94**, 096602 (2005)
14. Galitski, V. M., Chubukov, A. V., and Das Sarma, S., “Temperature dependent spin susceptibility in a two-dimensional metal,” *Rapid Communications in Physical Review B* **71**, 201302 (2005)
15. Galitski, V. M., Refael, G., Senthil, T., and Fisher, M. P. A., “Vortices and quasiparticles near the “superconductor-insulator” transition in thin films,” *Physical Review Letters* **95**, 077002 (2005)
16. Galitski, V. M., “Metallic phase in a two-dimensional disordered Fermi system with singular interactions,” *Physical Review B* **72**, 214201 (2005)
17. Stanescu, T. and Galitski, V. M., “Surface states, Friedel oscillations, and spin accumulation in  $p$ -doped semiconductors,” *Physical Review B* **74**, 205331 (2006)
18. Galitski, V. M., Burkov, A. A., and Das Sarma, S., “Boundary conditions for spin diffusion in disordered systems,” *Physical Review B* **74**, 115331 (2006)
19. Stanescu, T. and Galitski, V. M., “Spin relaxation in a generic two-dimensional spin-orbit coupled system,” *Physical Review B* **75**, 125307 (2007)
20. Nagornykh, P. and Galitski, V. M., “Expansion of a mesoscopic Fermi system from a harmonic trap,” *Physical Review A* **75**, 065601 (2007)
21. Adam, S., Hwang E. H., Galitski V. M., and Das Sarma S., “A self-consistent theory for graphene transport,” Proceedings of the National Academy of Sciences of the USA (PNAS) **104**, 18392 (2007)
22. Stanescu, T. D., Zhang C., and Galitski, V. M., “Non-equilibrium spin dynamics in a trapped Fermi gas with effective spin-orbit interaction,” *Physical Review Letters* **99**, 110403 (2007)
23. Galitski, V. M., Adam, S., and Das Sarma, S., “Statistics of random voltage fluctuations and the low-density residual conductivity of graphene,” *Physical Review B* **76**, 245405 (2007)
24. Galitski, V. M. and Kim, Y.-B., “A mechanism for spinon pairing in a  $U(1)$  spin liquid,” *Physical Review Letters* **99**, 266403 (2007)
25. Galitski, V. M., “Mesoscopic gap fluctuations in an unconventional superconductor,” *Rapid Communications in Physical Review B* **77**, 100502(R) (2008)
26. Galitski, V. M., “Non-perturbative microscopic theory of superconducting fluctuations near a quantum critical point,” *Physical Review Letters* **100**, 127001 (2008)
27. Stanescu, T., Anderson, B. and Galitski, V. M., “Spin-orbit coupled Bose-Einstein condensates,” *Physical Review A* **78**, 023616 (2008)
28. Stanescu, T., Galitski, V. M., and Drew, H. D., “Effective masses in a strongly anisotropic Fermi liquid,” *Physical Review Letters* **101**, 066405 (2008)
29. Stanescu, T., Galitski, V. M., and Das Sarma, S., “Orbital fluctuation mechanism for superconductivity in iron-based compounds,” *Physical Review B* **78**, 195114 (2008)
30. Lutchyn, R., Galitski, V. M., Refael, G. and Das Sarma, S., “Dissipation-driven quantum phase transition in superconductor-graphene systems,” Editors’ suggestion in *Physical Review Letters* **101**, 106402 (2008)
31. Serbyn, M. N., Skvortsov, M. A., Varlamov, A. A., and Galitski, V. M., “Giant Nernst effect due to fluctuating Cooper pairs in superconductors,” *Physical Review Letters* **102**, 067001 (2009)
32. Stanescu, T. D., Galitski, V. M., Vaishnav, J. Y., Clark, C.W., and Das Sarma, S., “Topological Insulators and Metals in Atomic Optical Lattices,” *Physical Review A* **79**, 053639 (2009)
33. Galitski, V. M. and Sachdev, S., “Paired electron pockets in the hole-doped cuprates,” Editors’ suggestion in *Physical Review B* **79**, 134512 (2009) (2009)

34. Cheng, M., Lutchyn, R., Galitski, V. M., and Das Sarma, S., “Splitting of Majorana modes due to intervortex tunneling in a  $p + ip$  superconductor,” *Physical Review Letters* **103**, 107001 (2009)
35. Robertson, A. and Galitski, V. M., “Non-equilibrium Enhancement of Cooper Pairing in Cold Fermion Systems,” submitted to *Physical Review A* (2009) [preprint: <http://arxiv.org/abs/0905.0912>]
36. Anderson, B., Stanescu, T., and Galitski, V. M., “Bulk Spin-Hall Effect,” submitted to *Physical Review Letters* (2009) [preprint: <http://arxiv.org/abs/0905.2771>]
37. Cheng, M., Sun, K., Galitski, V. M., and Das Sarma, S., “Stable Topological Phases In A Family Of Two-Dimensional Fermion Models,” submitted to *Physical Review Letters* (2009) [preprint: <http://arxiv.org/abs/0908.2805>]

Applied Math/Astrophysics: <sup>1</sup>

1. Galitski, V. M. and Sokoloff, D. D. “Dynamo waves in the theory of solar magnetism,” *Acta Astron. Geophys. Comeniae* **19**, 1 (1997)
2. Galitski, V. M. and Sokoloff, D. D., “Spectrum of Parker Equations,” *Astronomy Reports* **42**, 127 (1998); [translated from Russian: *Astronomicheskii Zhurnal* **71**, 144 (1998)]
3. Galitski, V. M. and Sokoloff, D. D., “Kinematic dynamo wave in the vicinity of the solar poles,” in *Geophysical and Astrophysical Fluid Dynamics* **91**, 147 (1999)
4. Galitski, V. M., Kuzanyan, K. M., and Sokoloff, D. D., “Equatorial dynamo wave,” *Astronomy Reports* **49**, 337 (2005) [translated from Russian: *Astron. Zh.* **82**, 378 (2005)]

**Presentations**

- “Application of quantum-mechanical methods to the Krause-Rädler equations of mean-field electrodynamics,” Conference “Stellar and Planetary Magnetoconvection,” Modra, Slovakia (October 1996)
- “Cosmic magnetic fields: review of recent observational and theoretical results,” *Institut des Sciences Nucléaires de Grenoble*, France (November, 1997)
- “Monte-Carlo simulations of cosmic rays at the AMS orbit,” Alpha Magnetic Spectrometer collaboration meeting, France, (February, 1998)
- “Kinematic dynamo-wave in the vicinity of the solar poles,” Conference “New cycle of the solar activity,” St. Petersburg, Russia, (June, 1998)
- “Asymptotic theory of dynamo waves in Parker approximation,” Conference “Large-scale solar magnetic activity,” St. Petersburg, Russia (June, 1999)
- “Kohn-Luttinger effect in a two-dimensional electron liquid,” APS March Meeting, Minneapolis, MN (March, 2000)
- “Magnetic field driven superconducting quantum phase transition,” Boulder Summer School in Condensed Matter and Material Physics, University of Colorado, Boulder, CO (July, 2000)
- “Superconducting fluctuations at low temperature,” APS March Meeting 2001, Seattle, WA (March, 2001)
- “Disorder and Quantum Fluctuations in Superconducting Films in Strong Magnetic Fields,” Conference “Landau Days,” Landau Institute for Theoretical Physics, Chernogolovka, Moscow Region, Russia (June, 2001)

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<sup>1</sup>The spelling of my last name was different from “Galitski” in some of the papers

- “Fluctuations in two-dimensional superconductors,” (poster presentation), Summer school on low-dimensional quantum systems: theory and experiment, The Abdus Salam International Center for theoretical physics, Trieste, Italy (July, 2001)
- “Spin glass versus superconductivity,” APS March Meeting, Indianapolis, IN (March, 2002)
- “Competition Between Disorder and Quantum Fluctuations in Superconducting Films,” Condensed Matter Theory Center seminar, College Park, MD (September, 2002) [INVITED]
- “Spin glass versus superconductivity,” workshop “Progress in Condensed Matter Theory,” *Max-Planck-Institut für physik komplexer systeme*, Dresden, Germany (October, 2002)
- “Essential singularities in disordered magnets,” Michael Fisher’s Statistical Physics Seminar, College Park, MD (September, 2003) [INVITED]
- “Physics of Diluted Magnetic Semiconductors,” Condensed Matter Seminar, Washington University in Saint Louis, MO (October, 2003) [INVITED]
- “Quantum Fluctuations in Superconductors,” Theory Seminar, Washington University in Saint Louis, MO (October, 2003) [INVITED]
- “The impact of magnetic impurity interaction on the conductance of disordered metals,” Condensed Matter Seminar, Yale University, New Haven, CT (January, 2004) [INVITED]
- “The impact of magnetic impurity interaction on the conductance of disordered metals,” Condensed Matter Seminar, University of California, CA (February, 2004) [INVITED]
- “Magnetoresistance of a dilute magnetic alloy,” Special Condensed Matter Seminar, Harvard University, MA (February, 2004) [INVITED]
- “Griffiths phase in diluted magnetic semiconductors,” APS March Meeting, Montreal, Canada (March, 2004)
- “Universal temperature corrections to Fermi liquid theory in an interacting two-dimensional electron system,” APS March Meeting, Montreal, Canada (March, 2004)
- “The effects of disorder in diluted magnetic semiconductors,” Condensed Matter Seminar, University of Maryland, College Park, MD (April, 2004)
- “Quantum critical behavior near a density wave instability in an isotropic Fermi liquid,” Workshop on frustrated magnetism, Brookhaven National Laboratory, NY (September, 2004) [INVITED]
- “Magnetoresistance of a dilute magnetic alloy,” Workshop on condensed matter theories (CMT 28), Saint Louis, MO (September, 2004) [INVITED]
- “Vortex Dynamics and Fluctuations Near the Magnetic-Field-Tuned Superconductor-Insulator Transition,” Colloquium, McMaster University, Hamilton, ON, Canada (January, 2005) [INVITED]
- “Magnetoresistance of a dilute magnetic alloy,” CMT seminar, University of Iowa, Iowa City, IA (February, 2005) [INVITED]
- “Vortex Dynamics and Fluctuations Near the Magnetic-Field-Tuned Superconductor-Insulator Transition,” CMT seminar, Boston University, Boston, MA (February, 2005) [INVITED]
- “Vortex Dynamics and Fluctuations Near the Magnetic-Field-Tuned Superconductor-Insulator Transition,” CMT seminar, University of Virginia, Charlottesville, VA (February, 2005) [INVITED]

- “Vortex Dynamics and Fluctuations Near the Magnetic-Field-Tuned Superconductor-Insulator Transition,” Colloquium, Washington University in Saint Louis, MO (February, 2005) [INVITED]
- “Temperature dependent spin susceptibility in a two-dimensional metal,” APS March Meeting, Los Angeles, CA (March, 2005)
- “Vortex Dynamics and Fluctuations Near the Magnetic-Field-Tuned Superconductor-Insulator Transition,” CMT seminar, California Institute of Technology, Pasadena, CA (March, 2005) [INVITED]
- “Interplay between disorder and gauge fluctuations in a  $U(1)$  spin liquid,” CMT seminar, University of California, Santa Barbara, CA (June, 2005)
- “Vortex metals and singular Fermi liquids,” CMT seminar, Johns Hopkins University, Baltimore, MD (October, 2005) [INVITED]
- “Metallic phase in a two-dimensional disordered Fermi system with singular interactions,” and “The effect of interactions on the geometrical structure of the Fermi surface in systems with spin-orbit interactions,” APS March Meeting, Baltimore, MD (March, 2006)
- “Non-equilibrium phenomena in a Fermi gas near a Feshbach resonance,” JQI seminar, College Park, MD (April, 2006) [INVITED]
- “Spin diffusion in spin-orbit coupled systems,” CM seminar, Rutgers University, Piscataway, NJ (November, 2006) [INVITED]
- “Non-equilibrium dynamics of a mesoscopic atomic system,” NIST, Gaithersburg, MD (February, 2007) [INVITED]
- “Spin-orbit Coupling Effects in Solid State and Cold Atomic Systems,” Kavli Institute for Theoretical Physics, Santa Barbara, CA (June, 2007)
- “Superconducting fluctuations near a quantum critical point,” Landau Institute for theoretical physics, Chernogolovka, Russia (June, 2007) [INVITED]
- “Mesoscopic disorder fluctuations in a d-wave superconductor,” Aspen Center for Physics, Aspen, CO (August 2007)
- “Spin-orbit Coupling Effects in Solid State and Cold Atomic Systems,” California Institute of Technology, Pasadena, CA (October, 2007) [INVITED]
- “Spin-orbit Coupling Effects in Solid State and Cold Atomic Systems,” The XXXI International Workshop on Condensed Matter Theories, Bangkok, Thailand (December, 2007) [INVITED]
- “Spin-orbit Coupling Effects in Solid State and Cold Atomic Systems,” University of Toronto, Toronto, Canada (February, 2008) [INVITED]
- “Vortex Dynamics and Fluctuations Near the Magnetic-Field-Tuned Superconductor-Insulator Transition,” George Mason University, Fairfax, VA (March, 2008) [INVITED]
- “Disorder-induced quantum critical point in an anisotropic gap superconductor,” APS March Meeting, New Orleans, LA (March, 2008)
- “Quantum fluctuations in two-dimensional superconductors,” Texas A & M University, College Station, TX (April, 2008) [INVITED]
- “Quantum fluctuations in two-dimensional superconductors,” Boston University, Boston, MA (May, 2008) [INVITED]

“Quantum fluctuations in two-dimensional superconductors,” Harvard University, Cambridge, MA (May, 2008) [INVITED]

“Paired electron pockets in the hole-doped cuprates,” Rutgers University, Piscataway, NJ (February, 2009) [INVITED]

Quantum fluctuations in superconductors,” Physics Department Colloquium, Georgetown University, Washington, DC (March, 2009) [INVITED]

Invited presentation at the conference “Critical Issues Related to Higher-Temperature Superconductivity,” Kavli Institute of Theoretical Physics, University of California, Santa Barbara; Title of the talk: Paired electron pockets in the hole-doped cuprates ” (June, 2009)

Presentation at the Fifth International School and Conference on Spintronics and Quantum Information Technology, SPINTECH V, Kraków, Poland; Title of the talk: A general theory of spin relaxation in semiconductors” (July, 2009)

“General Theory of Spin Diffusion,” CM seminar, Department of Spintronics and Nanoelectronics, Institute of Physics of the Academy of Sciences of the Czech Republic, Prague, Czech Republic (August, 2009) [INVITED]

“Paired Electron Pockets in the Hole-Doped Cuprates,” Department of Physics, University of Fribourg, Fribourg, Switzerland (September, 2009) [INVITED]

“Paired Electron Pockets in the Hole-Doped Cuprates,” CMTC Symposium, University of Maryland, College Park, MD (October, 2009)

*Upcoming talks:*

“Paired Electron Pockets in the Hole-Doped Cuprates,” National High Magnetic Field Laboratory at Florida State University, Tallahassee, FL (November, 2009)

Invited Colloquium “Spin-orbit Bose-Einstein Condensates,” Virginia Tech Department of Physics, Blacksburg, VA (December, 2010)

IARPA kick-off meeting, Duck Keys, Florida (January, 2010)

Invited presentation at the conference “Spin manipulation in cold atoms and condensed matter” to be held in Utrecht, the Netherlands in January, 2010; Title of the talk: “Spin-orbit Bose-Einstein Condensates”