

Curriculum Vitae

Niayesh Afshordi

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- **Contact Information**

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- **Citizenship**

Iran (US Permanent Resident)

- **Current Positions**

1. **Assistant Professor**

Department of Physics and Astronomy, University of Waterloo, Waterloo

2. **Associate Faculty**

Perimeter Institute for Theoretical Physics, Waterloo

- **Employment History**

6. **Distinguished Research Fellow**

Perimeter Institute for Theoretical Physics, Waterloo, 2007-2009

5. **Institute for Theory and Computation (ITC) Postdoctoral Fellow**

Harvard-Smithsonian Center for Astrophysics, Harvard University, Cambridge, 2004-2007

4. **Graduate Student Instructor and Researcher**

Department of Astrophysical Sciences, Princeton University, Princeton, 2000-2004

3. **Graduate Student Teaching Assistant**

Physics Department, Brown University, Providence, 1999-2000

2. **Research Associate**

Institute for theoretical studies in Physics and Mathematics (IPM), Tehran, Iran, 1998-1999

1. **Instructor**

Iranian National Physics Olympiad Camp, Tehran, Iran, 1996-1998

- **Education**

5. **Princeton University, Princeton 2000-2004**

PhD in Astrophysics: *The Other 99 Percent*

November 2004, (Thesis Advisor: David N. Spergel)

4. **Brown University, Providence 1999-2000**
3. **Sharif University of Technology, Tehran, Iran 1996-1999**
BA in Physics – 2nd in class, 1999
2. **Iranian National Physics Olympiad Camp, Tehran, Iran 1995-1996**
1. **Allameh Helli High School, Tehran, Iran 1992-1995**

• **Awards**

4. **1st place, National Collegiate Physics Olympiad (1st stage), Iran, 1999**
3. **IPM Undergraduate Fellowship**, Institute for studies in theoretical Physics and Mathematics (IPM), Iran, 1997
2. **Silver Medal, 27th International Physics Olympiad**, Oslo, Norway, 1996
1. **Gold Medal, 8th National Physics Olympiad**, Tehran, Iran, 1995

• **Teaching**

7. **Perimeter Scholar International (PSI)**
 - Instructor, Cosmology Review (with H. Peiris and P. Singh; Fall 09)
6. **University of Waterloo**
 - Instructor, Astrophysics and Cosmology through Problems (with M. Wyman; Fall 08)
 - Guest Lecturer, Physics 10: Undergraduate Seminar Series (Prof. M. Balogh; Winter 08)
5. **Harvard University**
 - Guest Lecturer, Astronomy 145: Topics in Astrophysics (Prof. A. Loeb; Spring 07)
4. **Princeton University**
 - Assistant in Instruction, Astrophysics 301: Gravitational Astronomy: Newton to Einstein (Prof. R. Gott; Fall 01)
 - Assistant in Instruction, Astrophysics 204: Topics in Modern Astronomy (Profs. J. Gunn and J. Knapp; Spring 02)
3. **Brown University**
 - Teaching Assistant, Physics 24: Introduction to Astronomy (Prof. G. Tucker; Fall 99)
 - Teaching Assistant, Physics 4: Introduction to Physics (Prof. R. Partridge; Spring 00)
2. **Sharif University, Tehran, Iran**
 - Instructor, Introductory Electrodynamics (Informal; Spring 97)
 - Teaching Assistant, Quantum Mechanics I&II (Prof. V. Karimipour; Fall 98 and Spring 99)
1. **National Physics Olympiad Camp, Tehran, Iran**
 - Organized precepts and exams. (1996-1998).

• **Student (Co-)Supervision**

4. **Chanda Prescod-Weinstein, Perimeter Institute and University of Waterloo, 2008-**
co-supervisor: Lee Smolin (Perimeter Institute)

3. **Matthias Mueller, Ulm University, 2008-2009**
co-supervisor: Mike Hudson (Waterloo)
2. **Marilena LoVerde, Columbia University (now at IAS, Princeton), 2007-2008**
primary advisor: Lam Hui (Columbia University)
1. **Georg Robbers, Heidelberg University (now at Max Planck Inst. for Astrophysics) 2007**
primary advisor: Christof Wetterich (Heidelberg)

• Organized Meetings/Workshops

8. **New Prospects for Solving the Cosmological Constant Problem** (May 25-27, 2009; Perimeter Institute)
 - with Claudia de Rham, Ghazal Geshnizjani (Perimeter Institute), and Georgi Dvali (CERN/NYU)
7. **Sunyaev-Zel’dovich Universe and the Future of Cluster Cosmology** (April 27-May 1, 2009; Perimeter Institute)
 - with Michael Balogh (U-Waterloo), Gil Holder (McGill), and Lyman Page (Princeton)
6. **Young Researchers Conference** (December 8-12, 2008; Perimeter Institute)
 - as part of the *Perimeter Institute postdoctoral search committee*
5. **PI/CITA cosmology mini-workshop** (October 23, 2008; Perimeter Institute)
 - with Brice Menard (CITA)
4. **Cosmology seminar chair** (2008-2009 academic year; Perimeter Institute)
3. **Small Scale Structure of Dark Matter** (June 7-8, 2008; Perimeter Institute)
 - with James Taylor (U-Waterloo)
2. **Origins and Observations of Primordial Non-Gaussianity** (March 8-10, 2008; Perimeter Institute)
 - with Justin Khoury (Perimeter Institute) and Ben Wandelt (U-Illinois at Urbana-Champaign)
1. **Peyton Hall Wednesday Lunch (Wunch) scientific talks** (2002-2003 academic year; Princeton University)
 - founder and organizer

• Refereed Publications

26. **“Cuscuton and low energy limit of Horava-Lifshitz gravity”**
N. Afshordi
Phys. Rev. D **80**, 081502 (2009) [arXiv:0907.5201 [hep-th]] SPIRES entry
25. **“Stellar Black Holes and the Origin of Cosmic Acceleration”**
C. Prescod-Weinstein, N. Afshordi, and M. L. Balogh
Phys. Rev. D **80**, 043513 (2009) [arXiv:0905.3551 [astro-ph.CO]] SPIRES entry
24. **“Observational Evidence for Cosmological-Scale Extra Dimensions”**
N. Afshordi, G. Geshnizjani and J. Khoury
JCAP **08**, 030 (2009) [arXiv:0812.2244] SPIRES entry

23. **“Hierarchical Phase Space Structure of Dark Matter Haloes: Tidal debris, Caustics, and Dark Matter annihilation”**
N. Afshordi, R. Mohayaee and E. Bertschinger
Phys. Rev. D **79**, 083526 (2009) [arXiv:0811.1582 [astro-ph]] SPIRES entry
22. **“Extended Limber Approximation”**
M. LoVerde and N. Afshordi
Phys. Rev. D **78**, 123506 (2008) [arXiv:0809.5112 [astro-ph]] SPIRES entry
21. **“Primordial non-gaussianity, statistics of collapsed objects, and the Integrated Sachs-Wolfe effect”**
N. Afshordi and A. J. Tolley
Phys. Rev. D **78**, 123507 (2008) [arXiv:0806.1046 [astro-ph]] SPIRES entry
20. **“Fundamental Plane of Sunyaev-Zeldovich clusters”**
N. Afshordi
Astrophys. J. **686**, 201 (2008) [arXiv:0704.2416 [astro-ph]] SPIRES entry
19. **“Does Planck mass run on the cosmological horizon scale?”**
G. Robbers, N. Afshordi and M. Doran
Phys. Rev. Lett. **100**, 111101 (2008) [arXiv:0708.3235 [astro-ph]] SPIRES entry
18. **“Cuscuton Cosmology: Dark Energy meets Modified Gravity”**
N. Afshordi, D. J. H. Chung, M. Doran and G. Geshnizjani
Phys. Rev. D **75**, 123509 (2007) [arXiv:astro-ph/0702002] SPIRES entry
17. **“Missing Thermal Energy of the Intracluster Medium”**
N. Afshordi, Y. T. Lin, D. Nagai and A. J. R. Sanderson
Mon. Not. Roy. Astron. Soc. **378**, 293 (2007) [arXiv:astro-ph/0612700] SPIRES entry
16. **“How well can (renormalized) perturbation theory predict dark matter clustering properties?”**
N. Afshordi
Phys. Rev. D **75**, 021302 (2007) [arXiv:astro-ph/0610336] SPIRES entry
15. **“Cuscuton: A Causal Field Theory with an Infinite Speed of Sound”**
N. Afshordi, D. J. H. Chung and G. Geshnizjani
Phys. Rev. D **75**, 083513 (2007) [arXiv:hep-th/0609150] SPIRES entry
14. **“On the stability of dark energy with mass-varying neutrinos”**
N. Afshordi, M. Zaldarriaga and K. Kohri
Phys. Rev. D **72**, 065024 (2005) [arXiv:astro-ph/0506663] SPIRES entry
13. **“Do large-scale inhomogeneities explain away dark energy?”**
G. Geshnizjani, D. J. H. Chung and N. Afshordi
Phys. Rev. D **72**, 023517 (2005) [arXiv:astro-ph/0503553] SPIRES entry
12. **“CMB B-mode polarization from Thomson scattering in the local universe”**
C. M. Hirata, A. Loeb and N. Afshordi
Phys. Rev. D **71**, 063531 (2005) [arXiv:astro-ph/0501167] SPIRES entry
11. **“Bypass to Turbulence in Hydrodynamic Accretion: Lagrangian Analysis of Energy Growth”**
N. Afshordi, B. Mukhopadhyay and R. Narayan
Astrophys. J. **629**, 373 (2005) [arXiv:astro-ph/0412194] SPIRES entry

10. **“Bypass to Turbulence in Hydrodynamic Accretion Disks: An Eigenvalue Analysis”**
B. Mukhopadhyay, N. Afshordi and R. Narayan
Astrophys. J. **629**, 383 (2005) [arXiv:astro-ph/0412193] SPIRES entry
9. **“WMAP constraints on the Intra-Cluster Medium”**
N. Afshordi, Y. T. Lin, and A. J. .R. Sanderson
Astrophys. J. **629**, 1 (2005) [arXiv:astro-ph/0408560] SPIRES entry
8. **“Coarse-grained back reaction in single scalar field driven inflation”**
G. Geshnizjani and N. Afshordi
JCAP **0501**, 011 (2005) [arXiv:gr-qc/0405117] SPIRES entry
7. **“Integrated Sachs-Wolfe effect in Cross-Correlation: The Observer’s Manual”**
N. Afshordi
Phys. Rev. D **70**, 083536 (2004) [arXiv:astro-ph/0401166] SPIRES entry
6. **“Cross-Correlation of the Cosmic Microwave Background with the 2MASS Galaxy Survey: Signatures of Dark Energy, Hot Gas, and Point Sources”**
N. Afshordi, Y. S. Loh and M. A. Strauss
Phys. Rev. D **69**, 083524 (2004) [arXiv:astro-ph/0308260] SPIRES entry
5. **“Primordial Black Holes as Dark Matter: The Power Spectrum and Evaporation of Early Structures”**
N. Afshordi, P. McDonald and D. N. Spergel
Astrophys. J. **594**, L71 (2003) [arXiv:astro-ph/0302035] SPIRES entry
4. **“Geometrically Thin Disk Accreting Into a Black Hole”**
N. Afshordi and B. Paczynski
Astrophys. J. **592**, 354 (2003) [arXiv:astro-ph/0202409] ADS entry
3. **“Mass-Temperature Relation of Galaxy Clusters: A Theoretical Study”**
N. Afshordi and R. Cen
Astrophys. J. **564**, 669 (2002) [arXiv:astro-ph/0105020] SPIRES entry
2. **“Super-Hubble nonlinear perturbations during inflation”**
N. Afshordi and R. H. Brandenberger
Phys. Rev. D **63**, 123505 (2001) [arXiv:gr-qc/0011075] SPIRES entry
1. **“A Dynamical Approach to a Self-similar Universe”**
E. Abdalla, N. Afshordi, K. Khodjasteh and R. Mohayaee
Astron. Astrophys. **345**, 22 (1999) [arXiv:astro-ph/9803187] SPIRES entry

• Submitted Manuscripts

2. **“Hierarchy in the Phase Space and Dark Matter Astronomy”**
N. Afshordi, R. Mohayaee and E. Bertschinger
(submitted to Phys. Rev. Lett.)
arXiv:0911.0414 [astro-ph] arXiv entry
1. **“Gravitational Aether and the thermodynamic solution to the cosmological constant problem”**
N. Afshordi
(submitted to Phys. Rev. Lett.)
arXiv:0807.2639 [astro-ph] SPIRES entry

- **Conference Proceedings**

3. **“Intracluster Medium through three years of WMAP”**

N. Afshordi

New Astron. Rev. **50**, 905 (2006)

Prepared for Workshop on Fundamental Physics with Cosmic Microwave Background Radiation, Irvine, California, 23-25 Mar 2006 [arXiv:astro-ph/0608503] SPIRES entry

2. **“Growth of Hydrodynamic Perturbations in Accretion Disks: Possible Route to Non-Magnetic Turbulence”**

B. Mukhopadhyay, N. Afshordi and R. Narayan

In the Proceedings of COSPAR Colloquium on Spectra and Timing of Accreting X-ray Binaries, Mumbai, India, 17-21 Jan 2005

arXiv:astro-ph/0507046 SPIRES entry

1. **“Hydrodynamic Turbulence in Accretion Disks”**

B. Mukhopadhyay, N. Afshordi and R. Narayan

In the Proceedings of 22nd Texas Symposium on Relativistic Astrophysics at Stanford University, Stanford, California, 13-17 Dec 2004, pp 1609 [arXiv:astro-ph/0501468]

TSRA-2004-1609(2005) SPIRES entry

- **Other Preprints**

5. **“The case for a directional dark matter detector and the status of current experimental efforts”**

S. Ahlen *et al.*

whitepaper on direct dark matter detection with directional sensitivity

arXiv:0911.0323 [astro-ph.CO] SPIRES entry

4. **“Non-Gaussianity as a Probe of the Physics of the Primordial Universe and the Astrophysics of the Low Redshift Universe”**

E. Komatsu *et al.*

Science White Paper submitted to the Cosmology and Fundamental Physics (CFP) Science Frontier Panel of the Astro 2010 Decadal Survey

arXiv:0902.4759 [astro-ph.CO] SPIRES entry

3. **“A Recent Gamma Ray Burst in the Heart of Milky Way”**

A.E. Broderick, D. Finkbeiner, N. Afshordi and G. Dobler (2007)

2. **“Physical Evidence for Dark Energy”**

R. Scranton, A. J. Connolly, R. C. Nichol, A. Stebbins, I. Szapudi, D. J. Eisenstein, N. Afshordi and [SDSS Collaboration]

arXiv:astro-ph/0307335

FERMILAB-PUB-03-252-A(2003) SPIRES entry

1. **“Cyclotron Emission and Thermalization of the CMB Spectrum”**

N. Afshordi

arXiv:astro-ph/0202082 SPIRES entry

- **Selected Invited Colloquia, Seminars, and Summer School Lectures**

18. **“Cuscuton and solving the cosmological constant problem”**
-High Energy Physics seminar, Physics department, Vanderbilt University (Oct. 2009)
17. **“Stellar Black Holes and the origin of cosmic acceleration”**
-Cosmology seminar, KIPAC, Stanford University, (Sep. 2009)
-Theory Canada 5, Fredericton, NB (Jun. 2009)
16. **“Hierarchy in the Phase Space and Dark Matter Astronomy”**
-CYGNUS 2009 workshop on directional dark matter detection, MIT, Cambridge, MA (Jun. 2009)
15. **“The End of the Cosmological Constant Problem”**
-Invited Contribution, Interactions in the Dark Sector, Astrophysics Workshop, Lorentz Center, Leiden, Netherlands (Apr. 2009)
-Cosmology Seminar, IPMU, Kashiwa, Japan (Feb. 2009)
14. **“Missing Thermal energy of the Universe”**
Invited Contribution, Open questions from clusters of galaxies, OMP, Toulouse, France (Jun. 2008)
13. **“Galaxy Clusters as Cosmic Canaries”**
High Energy Physics seminar, Syracuse University (Mar. 2008)
12. **“Physics beyond the Horizon”**
Physics Colloquium, University of Pennsylvania (Feb. 2008)
11. **“Our Tumultuous Journey into the Dark Side”**
Physics Colloquium, York University (Nov. 2007)
10. **“WMAP-inspired Cosmology”**
Gravity Group Seminar, Princeton University (Apr. 2007)
9. **“Missing Thermal Energy of the Universe”**
Invited Contribution, Outstanding Questions in Cosmology, Imperial College, London, UK (Mar. 2007)
8. **“Life on the Dark Side”**
Physics Colloquium, University of Pittsburgh (Jan. 2007)
7. **“Galaxy Clusters as Cosmic Canaries”**
Astronomy Colloquium, Penn-State University (Dec. 2006)
6. **“Missing Thermal Energy of the Universe”**
Invited Contribution, Great Lakes Cosmology Meeting, Perimeter Institute, Waterloo, ON (Nov. 2006)
5. **“Cuscuton Cosmology: Dark Energy meets Modified Gravity”**
Invited Contribution, COSMO 06, Tahoe City, CA (Sep. 2006)
4. **“Digging for new (Astro-) Physics in the old CMB”**
KICP seminar, Astronomy Department, University of Chicago, IL (Jun. 2006)
3. **“Alternative Windows into the Nature of Dark Matter”**
ISCAP Seminar, Physics Department, Columbia University (Feb. 2006)
2. **“Large Scale Structure of the Universe and CMB Secondary Anisotropies”**
Invited Lectures, 2nd IPM summer school on Cosmology, Qeshm Island, IRAN (Jan 2005)

1. **“Cross-Correlating Cosmic Microwave Background with the Large-Scale Structure of the Universe”**
Astronomy Colloquium, Princeton University (Mar. 2004)