

Aravind Natarajan

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Education

- Ph.D (Physics) 2007, University of Florida, Gainesville
Thesis supervisor: Pierre Sikivie.
Thesis title: Inner caustics of cold dark matter halos.
- Master of Science (Physics) 2004, University of Florida, Gainesville
- Bachelor of Engineering (Electronics and Communication) 2000, Bangalore University, India

Academic positions

- McWilliams Postdoctoral Research Associate,
Carnegie Mellon University, Sep 2009 - present.
- Postdoctoral Fellow, Bielefeld University (Germany), Oct 2007 - Aug 2009
- Graduate Assistant, University of Florida, Aug 2002 - Aug 2007

Awards and Fellowships

- McWilliams Postdoctoral Fellowship Award
Carnegie Mellon University Center for Cosmology, 2009
- Chuck Hooper Memorial Award for Distinction in Research and Teaching
Department of Physics, University of Florida, 2006
- Award for Outstanding Academic Achievement by an International Student
University of Florida International Center, 2006
- J. Michael Harris Fellowship Award
Department of Physics, University of Florida, 2005

Scientific Grants Applied

- *“Understanding the Nature of Dark Matter Using Astrophysical, Cosmological, and Collider Data.”*
Submitted December 1. Currently being reviewed.
National Science Foundation (NSF) Theoretical Particle Physics and Cosmology division.
Co-Investigator on the grant, and Institutional P.I. for Carnegie Mellon.
- *“Large Scale Structure with 21 cm Intensity Mapping.”*
Submitted Nov 15. Currently being reviewed.
National Science Foundation (NSF) Astronomy and Astrophysics division.
Collaborator on the grant.
- *“21 cm Intensity Mapping”*
Proposal: Green Bank Telescope GBT/11B-055
Awarded 100 hours observation time.

Professional activities

2011 - present: Member, American Physical Society.

2011 - present: Member, American Astronomical Society.

2011 - present: Associate Member, Pittsburgh Particle Physics, Astrophysics, and Cosmology Center (Pitt-PACC).

2011: Referee for the Astrophysical Journal (ApJ)

2011: Referee for the Monthly Notices of the Royal Astronomical Society (MNRAS).

2011: Referee for the Journal of Cosmology and Astroparticle Physics (JCAP).

2009: Co-organizer of the “International Workshop on Cosmic Structure and Evolution” held in Bielefeld, Germany.

2009: Chair of the Editorial Board for the Proceedings of the “International Workshop on Cosmic Structure and Evolution”, published by Proceedings of Science

2009: Referee for the Monthly Notices of the Royal Astronomical Society (MNRAS)

2008: Referee for the Journal of Cosmology and Astroparticle Physics (JCAP)

2007: Referee for the Monthly Notices of the Royal Astronomical Society (MNRAS)

Publications

15. *“A closer look at CMB constraints on WIMP dark matter”*
A. Natarajan
arXiv:1201.3939 [astro-ph] (2012), Submitted to Physical Review D
14. *“Probing dark matter streams with CoGeNT”*
A. Natarajan, C. Savage, K. Freese
Physical Review D 84, 103005 (2011)
13. *“Mass varying neutrinos, quintessence, and the accelerating expansion of the Universe”*
G.Y. Chitov, T. August, **A. Natarajan**, T. Kahniashvili
Physical Review D 83, 045033 (2011)
12. *“DAMA and the self similar infall halo model”*
A. Natarajan
Physical Review D 83, 043517 (2011)
11. *“Caustics, Cold Flows, and Annual Modulation”*
A. Natarajan
Advances in Astronomy, vol. 2011, id. #285346 (2011)
10. *“Distinguishing standard reionization from dark matter models”*
A. Natarajan, D.J. Schwarz
Physical Review D 81, 123510 (2010)
9. *“Dark matter annihilation and its effect on CMB and Hydrogen 21 cm observations”*
A. Natarajan, D.J. Schwarz
Physical Review D 80, 043529 (2009)
8. *“Dark matter annihilation and primordial star formation”*
A. Natarajan, J.C. Tan, B.W. OShea
Astrophysical Journal 692, 574 (2009)
7. *“The effect of early dark matter halos on reionization”*
A. Natarajan, D.J. Schwarz
Physical Review D 78, 103524 (2008)

6. *“Further look at particle annihilation in dark matter caustics”*
A. Natarajan, P. Sikivie
 Physical Review D 77, 043531 (2008)

5. *“Does the second caustic ring of dark matter cause the Monoceros ring of stars?”*
A. Natarajan, P. Sikivie
 Physical Review D 76, 023505 (2007)

4. *“Weakly interacting massive particle annihilation in caustics”*
A. Natarajan
 Physical Review D 75, 123514 (2007)

3. *“Inner caustics of cold dark matter halos”*
A. Natarajan, P. Sikivie
 Physical Review D 73, 023510 (2006)

2. *“Robustness of discrete flows and caustics in cold dark matter cosmology”*
A. Natarajan, P. Sikivie
 Physical Review D 72, 083513 (2005)

1. *“Role of the Cesium Antimonide layer in the Na₂KSb/Cs₃Sb photocathode”*
A. Natarajan, A.T. Kalghatgi, B.M. Bhat, M.Satyam
 Journal of Applied Physics, 90, 6434 (2001)

Conference proceedings

2. *“Dark matter caustics”*
A. Natarajan
 Axions 2010: AIP Conference Proceedings, vol. 1274, p. 97 (2010)

1. *“Dark matter annihilation and Hydrogen 21 cm cosmology”*
A. Natarajan, D.J. Schwarz
 Proceedings of the International Workshop on Cosmic Structure and Evolution,
 Sep 23-25 2009, Bielefeld, Germany, (2009)

Presentations

- *“Dark matter bounds from direct and indirect searches.”*
Particle Astrophysics Seminar
Case Western Reserve University, Nov 2011
- *“CMB Bounds on low mass WIMPs”*
Workshop on Exploring Low Mass Dark Matter Candidates,
Pittsburgh PA, Nov 14-16, 2011
- *“Probing dark matter streams with DAMA and CoGeNT.”*
COSMO-2011,
Porto, Portugal, Aug 2011
- *“DAMA and non-standard halo models.”*
PHENO-2011, Phenomenology Symposium,
Madison, WI, May 2011
- *“DAMA and the self similar infall halo model.”*
High Energy Theory Seminar
University of Florida, Gainesville, Jan 2011
- *“DAMA and non-standard halo models.”*
Rust Belt Cosmology Workshop,
SUNY Buffalo, Jan 2011
- *“Distinguishing standard reionization from dark matter models.”*
COSMO/CosPA 2010
Tokyo, Japan, Sep 2010
- *“Distinguishing standard reionization from dark mater models.”*
McWilliams Cosmology seminar
Carnegie Mellon University, March 2010
- *“Hydrogen 21cm cosmology without active stars”*
Dark Stars Workshop
University of Michigan, Ann Arbor, Nov 2009

- *“Dark matter annihilation and Hydrogen 21 cm cosmology.”*
International Workshop on Cosmic Structure and Evolution,
Bielefeld, Germany, Sep 2009
- *“The effect of WIMP annihilation on CMB and Hydrogen 21cm observations.”*
Kosmologietag Workshop
Bielefeld, Germany, May 2009
- *“The effect of dark matter halos on reionization.”*
Dark Matter at the Crossroads
DESY, Hamburg, Germany, Sep 2008
- *“The effect of dark matter halos on reionization and the Hydrogen 21 cm line.”*
ISCAP noon Seminar
Department of Physics/Astronomy, Columbia University, Sep 2008
- *“The effect of early dark matter halos on reionization.”*
COSMO-2008
Madison, WI, Aug 2008
- *“Dark matter annihilation in clumps.”*
DESY ENTApP workshop on dark matter
Hamburg, Germany, Feb 2008
- *“Can a dark matter caustic form a ring of stars?”*
Astrophysics Theory Lunch Seminar
Department of Astronomy, University of Florida, Gainesville, Oct 2006
- *“Dark matter caustics in galaxies.”*
Aspen winter conference on astrophysics
Aspen, CO, Jan 2006
- *“Detecting galactic caustics.”*
UF-FSU conference on high energy phenomenology
Gainesville, FL, Dec 2005
- *“Caustics in galactic halos.”*
TeV particle astrophysics conference
Fermilab, July 2005

Teaching Experience

I worked as a Teaching Assistant from 2002 - 2006 at the University of Florida, while I was working on my doctorate degree. I taught basic physics courses: Newtonian Mechanics, and Electricity and Magnetism. These courses were based on the undergraduate physics textbook by Resnick and Halliday. My duties involved teaching students how to effectively solve physics problems, preparing and grading quizzes, and participating in the larger exams. I also supervised the Physics laboratories for undergraduate students during this time.

Since joining the Center for Cosmology at Carnegie Mellon University, I have had the opportunity of meeting very talented and motivated undergraduate students. I presented 2 undergraduate colloquia on cosmology and dark matter. These colloquia were organized by Professor Kunal Ghosh (kunalghosh@cmu.edu) who serves as the Assistant Head for undergraduate affairs. These talks were well received by the students. Following these talks, I was invited to serve as the supervisor of an undergraduate student, who worked on the formation of supermassive black holes. The student received credit for his research work, and successfully presented his work in the form of a poster. I enjoy teaching and supervising research, and look forward to continuing my teaching activities in addition to research.

Undergraduate courses (2002 - 2006)

- Introductory Lab, Mechanics: Fall 2002, Spring 2002
- Introductory Lab, Electricity and Magnetism: Spring 2003
- Physics without Calculus, Electricity and Magnetism: Fall 2005, Spring 2005
- Physics with Calculus, Mechanics: Summer 2003
- Physics with Calculus, Electricity and Magnetism: Spring 2004, Fall 2006, Spring 2006

Undergraduate colloquia (2010, 2011)

- *"The Dark Matter Puzzle"*
Carnegie Mellon University
Feb 18, 2011
- *"Dark matter, Particles, and Cosmology"*
Carnegie Mellon University
Feb 19, 2010

Research supervision (2010, 2011)

I supervised the research of an undergraduate student working on the growth of supermassive black holes during the fall semester (2010) and the spring semester (2011).

References

1. **Pierre Sikivie** (Thesis advisor)
Professor, Department of Physics,
University of Florida, Gainesville, FL 32611
Email: sikivie@phys.ufl.edu
Ph: 352-392-1923
2. **Dominik Schwarz**
Professor, Fakultät für Physik, Universität Bielefeld,
Universitätsstraße 25, Bielefeld 33615, Germany
Email: dschwarz@physik.uni-bielefeld.de
Ph: (49-521) 106 6226
3. **Katherine Freese**
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4. **Jeffrey Peterson**
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5. **Jonathan Tan**
Associate Professor, Department of Astronomy,
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6. **Rupert Croft**
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