

Curriculum Vitae

Nicole F. Bell

CONTACT DETAILS

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RESEARCH POSITIONS

Jan 2007 - continuing Lecturer Level B
School of Physics, The University of Melbourne, Australia

Sept 2004 - present Sherman Fairchild Postdoctoral Scholar in Physics
Division of Physics, Mathematics and Astronomy
California Institute of Technology, USA

Sept 2001 - Sept 2004 Research Associate
NASA/Fermilab Theoretical Astrophysics Group
Fermi National Accelerator Laboratory, USA

Associate Fellow, Center for Cosmological Physics, University of Chicago
Visiting Scholar, Dept. Astronomy and Astrophysics, University of Chicago

March - Sept 2001 Australian Postdoctoral Fellow (Australian Research Council)
School of Physics, The University of Melbourne

EDUCATION

Feb 1998 - Feb 2001 Doctor of Philosophy, Physics, The University of Melbourne
Thesis title: *Neutrino Oscillations and the Early Universe*
Advisor: Prof. Raymond R. Volkas

1994 - 1997 Bachelor of Science (Honours), The University of Melbourne
4th Year Project: *Horizontal SU(3) Gauge Theory*

RESEARCH INTERESTS

- Neutrino physics and astrophysics
- Dark matter
- Astroparticle physics and particle cosmology
- Particle physics beyond the Standard Model

PRIZES, SCHOLARSHIPS, AWARDS

- 2006 Michelson Postdoctoral Prize Lectureship
Case Western Reserve University
- 2005 Lifto Amundson Lecturer
Phi Beta Kappa Society, Alpha Chapter of South Dakota
- 2004 - 2007 Sherman Fairchild Postdoctoral Scholar
Caltech Prize Fellowship in Theoretical Physics
- 2004 Alvin Tollestrup Award for Postdoctoral Research
Fermilab/Universities Research Association
- 2002 Young Researchers Competition in Honor of John Archibald Wheeler – Second Prize
Science & Ultimate Reality Symposium, Princeton
- 2002 Chancellor's Prize
The University of Melbourne, thesis award
- 2001 Bragg Gold Medal for Excellence in Physics
Australian Institute of Physics – best physics PhD thesis at an Australian university
- 2001 Australian Postdoctoral Fellowship
Australian Research Council, competitive research grant
- 1999 Jean Gilmore/Thenie Baddams Grant
Travel grant
- 1999 Melbourne Abroad Scholarship
Travel scholarship
- 1998 Helen M. Schutt Scholarship
Highest ranked female student beginning a science PhD at The University of Melbourne
- 1998 - 2000 Australian Postgraduate Award
PhD scholarship
- 1997 John Tyndall Scholarship
Honours year work
- 1997 Professor Kernot Scholarship in Physics
Honours year work
- 1996 Bryan Scholarship in Natural Science
Undergraduate coursework
- 1994 - 1997 Dean's Honours List
Undergraduate coursework

PUBLICATIONS

1. *General Upper Bound on the Dark Matter Total Annihilation Cross Section*
J. F. Beacom, N. F. Bell, and G. D. Mack, astro-ph/0608090.
2. *Model Independent Bounds on Magnetic Moments of Majorana Neutrinos*
N. F. Bell, M. Gorchtein, M. J. Ramsey-Musolf, P. Vogel and P. Wang, hep-ph/0606248.
3. *Cosmological Signatures of Interacting Neutrinos*
N. F. Bell, E. Pierpaoli and K. Sigurdson, Phys. Rev. D **73**, 063523 (2006) [hep-ph/0511410].
4. *How Magnetic is the Dirac Neutrino?*
N. F. Bell, V. Cirigliano, M. J. Ramsey-Musolf, P. Vogel and M. B. Wise, Phys. Rev. Lett. **95**, 151802 (2005) [hep-ph/0504134].
5. *Cosmological Lepton Asymmetry, Primordial Nucleosynthesis and Sterile Neutrinos*
K. N. Abazajian, N. F. Bell, G. M. Fuller and Y. Y. Y. Wong, Phys. Rev. D **72**, 063004 (2005) [astro-ph/0410175].
6. *Gamma-Ray Constraint on Galactic Positron Production by MeV Dark Matter*
J. F. Beacom, N. F. Bell and G. Bertone, Phys. Rev. Lett. **94**, 171301 (2005) [astro-ph/0409403].
7. *Neutrinoless Universe*
J. F. Beacom, N. F. Bell, and S. Dodelson, Phys. Rev. Lett. **93**, 121302 (2004) [astro-ph/0404585].
8. *Sensitivity to θ_{13} and δ in the Decaying Cosmic Neutrino Scenario*
J. F. Beacom, N. F. Bell, D. Hooper, S. Pakvasa and T. J. Weiler, Phys. Rev. D **69**, 017303 (2004) [hep-ph/0309267].
9. *Pseudo-Dirac Neutrinos, A Challenge for Neutrino Telescopes*
J. F. Beacom, N. F. Bell, D. Hooper, J. G. Learned, S. Pakvasa and T. J. Weiler, Phys. Rev. Lett. **92**, 011101 (2004) [hep-ph/0307151].
10. *Measuring Flavor Ratios of High-Energy Astrophysical Neutrinos*
J. F. Beacom, N. F. Bell, D. Hooper, S. Pakvasa and T. J. Weiler, Phys. Rev. **D68**, 093005 (2003) [hep-ph/0307025].
11. *Speed-up through Entanglement – Many-Body Effects in Neutrino Processes*
N. F. Bell, A. A. Rawlinson and R. F. Sawyer, Phys. Lett. **B573**, 86 (2003) [hep-ph/0304082].
12. *Decay of High-Energy Astrophysical Neutrinos*
J. F. Beacom, N. F. Bell, D. Hooper, S. Pakvasa and T. J. Weiler, Phys. Rev. Lett. **90**, 181301 (2003) [hep-ph/0211305].
13. *State Permutations from Manipulation of Near Level-Crossings*
N. F. Bell, R. F. Sawyer, R. R. Volkas and Y.Y.Y. Wong, Phys. Rev. **A 68**, 032307 (2003) [quant-ph/0204136].

14. *Do Solar Neutrinos Decay?*
J. F. Beacom and N. F. Bell, Phys. Rev. **D65**, 113009 (2002) [hep-ph/0204111].
15. *Stringent Constraints on Cosmological Neutrino-Antineutrino Asymmetries from Synchronized Flavor Transformation*
K. N. Abazajian, J. F. Beacom and N. F. Bell, Phys. Rev. **D66**, 013008 (2002) [astro-ph/0203442].
16. *Generation of Entangled States and Error Protection from Adiabatic Avoided Level Crossings*
N. F. Bell, R. F. Sawyer, R. R. Volkas and Y.Y.Y. Wong, Phys. Rev. **A65**, 042328 (2002) [quant-ph/0109014].
17. *Entanglement and Quantal Coherence: Study of Two Limiting Cases of Rapid System-Bath Interactions*
N. F. Bell, R. F. Sawyer and R. R. Volkas, Phys. Rev. **A65**, 052105 (2002) [quant-ph/0106082].
18. *Synchronization and MSW Sharpening of Neutrinos Propagating in a Flavour Blind Medium*
N. F. Bell, R. F. Sawyer and R. R. Volkas, Phys. Lett. **B500**, 16 (2001) [hep-ph/0011068].
19. *Bottom-up Model for Maximal $\nu_\mu - \nu_\tau$ Mixing*
N. F. Bell and R. R. Volkas, Phys. Rev. **D63**, 013006 (2001) [hep-ph/0008177].
20. *Mirror Matter and Heavy Singlet Neutrino Oscillations in the Early Universe*
N. F. Bell, Phys. Lett. **B479**, 257 (2000) [hep-ph/0003072].
21. *Mirror Matter and Primordial Black Holes*
N. F. Bell and R. R. Volkas, Phys. Rev. **D59**, 107301 (1999) [astro-ph/9812301].
22. *Relic Neutrino Asymmetry Evolution from First Principles*
N. F. Bell, R. R. Volkas and Y. Y. Y. Wong, Phys. Rev. **D59**, 113001 (1999) [hep-ph/9809363].
23. *Relic Neutrino Asymmetries and Big Bang Nucleosynthesis in a Four Neutrino Model*
N. F. Bell, R. Foot and R. R. Volkas, Phys. Rev. **D58**, 105010 (1998) [hep-ph/9805259].

CONFERENCE PROCEEDINGS

1. *Magnetic Moments of Dirac Neutrinos*
N. F. Bell, V. Cirigliano, M. J. Ramsey-Musolf, P. Vogel and M. B. Wise, to appear in the proceedings of PANIC 2005 (Particles and Nuclei International Conference, Santa Fe, NM, USA) [hep-ph/0601005].
2. *Neutrino Mixing and Cosmology*
N. F. Bell, Nucl. Phys. B Proc. Suppl. **138**, 76 (2005) [hep-ph/0311283].
3. *Neutrino Oscillations and Big Bang Nucleosynthesis*
N. F. Bell, Nucl. Instrum. Meth. A **503**, 226 (2003) [hep-ph/0108123].

INVITED CONFERENCE TALKS

1. *Neutrino Astrophysics Panel Discussion*
Bethe Centennial Symposium on Astrophysics, Cornell University, 2nd June 2006.
2. *Highlights of Neutrinos in Cosmology*
Plenary talk, April Meeting of the American Physical Society, Dallas, Texas, 24th April 2006.
3. *Magnetic Moments of Dirac Neutrinos*
PANIC 05, Particles and Nuclei International Conference, Santa Fe, NM, 27th October 2005.
4. *Cosmological Signatures of Neutrino Interactions*
Santa Fe Summer Workshop: Implications of Neutrino Flavor Oscillations, Santa Fe, 12th July 2005.
5. *Neutrino Signatures in Cosmology*
Workshop on Exploring the Physics Frontier at the Deep Underground Laboratories, Institute for Nuclear Theory, Seattle, 24th June 2005.
6. *Neutrino Signatures in Cosmology*
Frontiers in Contemporary Physics III, Vanderbilt University, 26th May 2005.
7. *Galactic Positrons and MeV Dark Matter*
Frontiers in Contemporary Physics III, Vanderbilt University, 25th May 2005.
8. *Relic Neutrino Abundance and Cosmological Neutrino Mass Limits*
Fermilab Annual Users' Meeting, 2nd June 2004.
9. *Neutrino Astrophysics: Theoretical Overview*
WIN 03, 19th International Workshop on Weak Interactions and Neutrinos, Lake Geneva, Wisconsin, 9th October 2003.
10. *Neutrino Mixing and Cosmology*
TAUP 2003, Eighth International Workshop on Topics in Astroparticle and Underground Physics, University of Washington, Seattle, 5th September 2003.
11. *Cosmological Connections of Neutrino Physics*
Workshop On Trends In Neutrino Physics, Argonne National Laboratory, 13th May 2003.
12. *Neutrino Mixing and Big Bang Nucleosynthesis*
American Physical Society Meeting, Philadelphia, 7th April 2003.
13. *The Universe's Lepton Number*
Neutrinos: Data, Cosmos, and Planck Scale conference, Kavli Institute for Theoretical Physics (KITP) UC Santa Barbara, 7th March 2003.
14. *Neutrinos and Cosmology*
"Starry Messages" lecture series, Fermilab, 24th October 2002.
15. *Cosmological Lepton Number Constraints from Neutrino Flavour Transformation*
COSMO-02, International Workshop on Particle Physics and the Early Universe, Adler Planetarium, Chicago, 19th Sept 2002.
16. *Neutrino Oscillations and the Early Universe – the Quantum Mechanics of Open Systems*
Bragg Lecture, AIP Congress, Sydney, Australia, 10th July 2002.

17. *Coherence, Decoherence and Oscillating Neutrinos – from Quantum Zeno to Getting in Sync*
Science & Ultimate Reality Symposium – Young Researchers Competition in Honor of John Archibald Wheeler, Princeton, 17th March 2002.
18. *Relic Neutrino Asymmetries and Big Bang Nucleosynthesis in a 4 Neutrino Model*
NuFact'01, Third International Workshop on Neutrino Factories based on Muon Storage Rings, Tsukuba, Japan, 29th May 2001.

SEMINARS, COLLOQUIA AND OTHER CONFERENCE TALKS

1. Seminar: *Astrophysical Neutrinos: Revealing Neutrino Properties at the Highest Energies*
Seminar: *Cosmological Neutrinos: Relic Neutrino Abundance and Neutrino Mass Constraints*
Seminar: *Neutrino Magnetic Moments and Galactic Positrons & Annihilating Dark Matter*
Colloquium: *Neutrino Physics and Astrophysics: What we have learnt & what we would like to discover*
Michelson Postdoctoral Prize lectures, Case Western Reserve University, 1-5 May 2006.
2. *Cosmic Neutrinos – from the Highest Energies to the Lowest*
Physics Colloquium, California State University, Fresno, 4th November 2005.
3. *Topics in Particle Physics and Cosmology*
School of Physics Colloquium, The University of Melbourne, 8th April 2005.
4. *Neutrinoless Universe and MeV Dark Matter & Galactic Positrons*
University of California at San Diego, Astrophysics and Space Sciences Seminar, 2nd Nov 2004.
5. *Galactic Positrons and MeV Dark Matter*
TASC 04, 4th Theoretical Astrophysics in Southern California Meeting, UC Irvine, 15th Oct 2004.
6. *Cosmic Neutrinos – from the Highest Energies to the Lowest*
University of New Mexico, Nuclear, Particle & Astroparticle Physics Seminar, 7th September 2004.
7. *Cosmic Neutrinos – from the Highest Energies to the Lowest*
Fermilab, Joint Experimental – Theoretical Seminar, 20th August 2004.
8. *Cosmological Neutrino Mass Limits — The Case of the Disappearing Relic Neutrinos*
PHENO 2004 Symposium, University of Wisconsin, Madison, 26th April 2004.
9. *Revealing Neutrino Properties via High Energy Neutrino Astrophysics*
University of California, Irvine, 16th March 2004.
10. *Revealing Neutrino Properties via High Energy Neutrino Astrophysics*
Caltech, Kellogg Seminar, 12th March 2004.
11. *Revealing Neutrino Properties via High Energy Neutrino Astrophysics*
University of Wisconsin, Madison, Cosmology and Astrophysics Seminar, 5th February 2004.
12. *High Energy Astrophysical Neutrinos: Revealing Neutrino Properties with Flavour Ratio Measurements*
Los Alamos National Laboratory, T-8 seminar, 15th January 2004.
13. *High Energy Astrophysical Neutrinos: Revealing Neutrino Properties with Flavour Ratio Measurements*
Institute for Nuclear Theory, University of Washington, Seattle, 12th January 2004.
14. *High Energy Astrophysical Neutrinos: Revealing Neutrino Properties with Flavour Ratio Measurements*
School of Natural Sciences, Institute for Advanced Study, Princeton, 19th December 2003.

15. *The Universe's Lepton Number*
Argonne National Lab, Theory seminar - Physics Division, 13th March 2003.
16. *Neutrino Mixing and Big Bang Nucleosynthesis*
Indiana University, High Energy Physics and Astrophysics Seminar, 4th November 2002.
17. *Do Neutrinos Decay?*
North Carolina State University, TNT seminar, 10th September 2002.
18. *Neutrino Mixing in the Early Universe*
Workshop on Neutrino News from the Lab and the Cosmos, Fermilab, 19th October 2002.
19. *Do Solar Neutrinos Decay?*
University of Melbourne, School of Physics, Theory Seminar, 23rd July 2002.
20. *Do Neutrinos Decay?*
PHENO 2002 Symposium, University of Wisconsin, Madison, 22nd April 2002.
21. *Do Solar Neutrinos Decay?*
University of Delaware, Particle Theory and Astrophysics seminar, 18th April 2002.
22. *Do Solar Neutrinos Decay?*
Institute for Nuclear Theory, University of Washington, Seattle. Neutrino Masses & Mixing Mini Workshop (Nucleosynthesis Program), 11th April 2002.
23. *Relic Neutrino Asymmetries and Big Bang Nucleosynthesis*
Ohio State University, Department of Physics, HEP/Astro Seminar, 6th March 2002.
24. *Relic Neutrino Asymmetries and Big Bang Nucleosynthesis*
Purdue University, Department of Physics, High Energy Theory Seminar, 19th February 2002.
25. *Neutrinos in the Early Universe*
Neutrinos for fun and profit lecture - Fermilab, 15th November 2001.
26. *Coherence and Decoherence - from Quantum Zeno to Getting in Sync*
Enrico Fermi Institute Interdisciplinary Theory Seminar, Chicago, 2nd November 2001.
27. *Relic Neutrino Asymmetries and Big Bang Nucleosynthesis*
Fermilab, Theoretical Astrophysics Seminar, 22nd October 2001.
28. *Synchronisation.*
University of Melbourne, School of Physics, Theory Seminar, November 2000.
29. *Relic Neutrino Asymmetries*
Les Houches Summer School on "The Primordial Universe", France, July 1999.
30. *Horizontal $SU(3)$ Gauge Theory*
School of Physics, Melbourne, November 1997.

CONFERENCE/WORKSHOP ORGANISATION

- Co-Chair of *Neutrino News from the Lab and the Cosmos*, Fermilab, October 2002. (125 participants.)
- Convenor of the parallel session on Neutrino Physics, 2006 Joint Meeting of the US Division of Particles and Fields (DPF), the Japan Physical Society (JPS), and the Particle Physicists of the Pacific Region, Honolulu, Hawaii, October 2006.

PROFESSIONAL ACTIVITIES

- Referee for Physical Review Letters, Physical Review D, Reviews of Modern Physics, Journal of High Energy Physics, and Physics Letters B.
- Member American Physical Society
- Member Australian Institute of Physics
- Seminar organiser, Fermilab Theoretical Astrophysics, 2002-2003
Journal club organiser, Kellogg Lab, Caltech, 2005-2006.

TEACHING EXPERIENCE

- Tutor, 1st Year Physics, University of Melbourne, 1998-2000.
- Undergraduate physics laboratory classes, University of Melbourne, 1997-1999.

PUBLIC OUTREACH

- Lifto Amundson Public Lecture: *Mysteries from the Sun and the Universe*
Phi Beta Kappa Society, University of South Dakota, 30th March 2005.
- Saturday Morning Physics – Cosmology class,
Fermilab lecture series for high school students, 2003-2004.
- Public Lecture: *Neutrinos – From the Sun to the Universe*,
Naperville Astronomical Association, Naperville IL, 3rd September 2002.

REFERENCES

Assist. Prof. John F. Beacom

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Columbus, OH 43210
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Fermilab
MS 209, PO Box 500
Batavia IL 60510
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Fermilab
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Prof. Raymond F. Sawyer

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Santa Barbara, CA 93106
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Prof. Thomas J. Weiler

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