

Curriculum Vitae

Personal Information

Name: Bob McElrath
Place of Birth: Newport News, Virginia, USA
Date of Birth: September 14, 1975
Address: 2300 Providence Way Telephone: +1 630 890 9709 (cell)
 Joliet, Illinois
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 bob@mcelrath.org

Education and Research

1/10–8/11 Post-Doctoral Researcher, Heidelberg University
9/07–12/09 CERN Fellow
9/03–9/07 Post-Doctoral Researcher, University of California, Davis
 supervisor: John F. Gunion
6/00–9/03 Research Assistant, Teaching Assistant, System Administrator [Ph.D. Student]
 Dept. of Physics, Phenomenology Institute
 University of Wisconsin, Madison, USA
 advisor: Prof. T. Han
6/02 Theoretical Advanced Study Institute (TASI)
 University of Colorado at Boulder
Summer 1998, Research Assistant, Aleph Experiment (CERN)
Summer 1999 Research Assistant, BaBar Experiment (SLAC)
 Dept. of Physics, Experimental High-Energy Physics
 University of Wisconsin, Madison, USA
 advisor: Prof. S. L. Wu
8/98 Van Vleck Fellowship
 Department of Physics
 University of Wisconsin, Madison, USA
9/94–6/98 Northwestern University [undergraduate]
 Majors: Physics, Math, Integrated Science Program
 Advisors: Heidi Schellman and David Buchholz
 Evanston, IL, USA
9/96–6/98 Teaching Assistant for ISP A01 (C++/Maple/Scientific and Numeric Methods)
 Integrated Science Program, Northwestern University
Summer 1997 Undergraduate Research Assistant, D0 Experiment (Fermilab)
 Dept. of Physics, Northwestern University
 supervisor: Heidi Schellman
9/96–6/97 Undergraduate Research Assistant
 Dept. of Electrical Engineering, Northwestern University
 supervisor: S. T. Ho

List of Publications

- 1) **Hidden Extra U(1) at the Electroweak/TeV Scale**
with B.N. Grossmann, S. Nandi, Santosh Kumar Rai
Phys.Rev.D82:055021,2010 [arXiv:1006.5019 (hep-ph)]
- 2) **New Physics at the LHC. A Les Houches Report: Physics at TeV Colliders 2009 - New Physics Working Group**
CERN-PH-TH-2010-096 [arXiv:1005.1229 (hep-ph)]
- 3) **On The Origin of Neutrino Mass and Mixing in the Standard Model**
[arXiv:0909.3090 (hep-ph,astro-ph.CO,cond-mat.stat-mech)]
- 4) **Gaugephobic Higgs Signals at the LHC**
with J. Galloway, J. McRaven, J. Terning
JHEP 0911:031,2009 [arXiv:0908.0532 (hep-ph)]
- 5) **Accurate Mass Determinations in Decay Chains with Missing Energy. II**
with H.C. Cheng, J. Gunion, Z. Han
Phys.Rev.D80:035020,2009 [arXiv:0905.1344 (hep-ph)]
- 6) **Measuring neutrino mass with radioactive ions in a storage ring**
with M. Lindroos, C. Orme, T. Schwetz
Eur.Phys.J.C64:549-560,2009 [arXiv:0904.1089 (hep-ph)]
- 7) **Laboratory tests for the cosmic neutrino background using beta-decaying nuclei**
PANIC 2009 Proceedings [arXiv:0901.3491 (hep-ph)]
- 8) **Emergent Electroweak Gravity**
[arXiv:0812.2696 (gr-qc)]
- 9) **Proceedings of SuperB Workshop VI: New Physics at the Super Flavor Factory**
[arXiv:0810.1312]
- 10) **There is no explosion risk associated with superfluid Helium in the LHC cooling system**
with M. Fairbairn
[arXiv:0809.4004 (physics.pop-ph)]
- 11) **Signatures of Extra Dimensions from Upsilon Decays with a Light Gaugephobic Higgs Boson**
with J. Galloway, J. McRaven
Phys.Lett.B670:363-366,2009 [arXiv:0807.2657]
- 12) **Accurate Mass Determinations in Decay Chains with Missing Energy**
with H. S. Cheng, D. Engelhardt, J. Gunion, Z. Han
Phys.Rev.Lett.100:252001,2008 [arXiv:0802.4290]
- 13) **Light Higgses and dark matter at bottom and charm factories**
ECONF-C070805 [arXiv:0712.0016]
- 14) **Mass determination in SUSY-like events with missing energy**
with H. S. Cheng, J. Gunion, Z. Han
JHEP 0712:076,2007

- 15) **Probing NMSSM Scenarios with Minimal Fine-Tuning by Searching for Decays of the Upsilon to a Light CP-Odd Higgs Boson**
with R. Dermisek, J. Gunion
Phys.Rev.D76:051105,2007. [arXiv: hep-ph/0612031]
- 16) **CP Studies and Non-Standard Higgs Physics**
CERN Yellow Report CERN-2006-009 [arXiv: hep-ph/0608079]
- 17) **Light Neutralino Dark Matter in the NMSSM**
with J. Gunion, D. Hooper
Phys.Rev.D73:015011,2006 [arXiv: hep-ph/0509024]
- 18) **Invisible Quarkonium Decays as a Sensitive Probe of Dark Matter**
Phys.Rev.D72:103508,2005 [arXiv: hep-ph/0506151]
- 19) **The Higgs Sector in a $U(1)'$ Extension of the MSSM**
with T. Han and P. Langacker
Phys.Rev.D70:115006,2004 [arXiv: hep-ph/0405244]
- 20) **Loop Induced Decays of the Little Higgs: $H \rightarrow gg, \gamma\gamma$**
with T. Han, H. Logan, L. Wang
Phys.Lett.B563:191-202,2003, Erratum-ibid.B603:257-259,2004 [arXiv: hep-ph/0302188]
- 21) **Effects of Dimension-Six Operators on the SM Higgs Sector**
with V. Barger, T. Han, P. Langacker and P. Zerwas
Phys.Rev.D67:115001,2003 [arXiv: hep-ph/0301097]
- 22) **Phenomenology of the Littlest Higgs Model**
with T. Han, H. Logan and L. Wang
Phys.Rev.D67:095004,2003 [arXiv: hep-ph/0301040]
- 23) **Black hole evaporation with separated fermions**
with T. Han and G. D. Kribs
Phys.Rev.Lett.90:031601,2003 [arXiv: hep-ph/0207003]
- 24) **$h \rightarrow \mu^+ \mu^-$ via Gluon Fusion at the LHC**
with T. Han
Published in Phys. Lett. B528:81-85,2002 [arXiv: hep-ph/0201023]
- 25) **Radion Effects on Unitarity in Gauge Boson Scattering**
with T. Han and G. D. Kribs
Published in Phys. Rev. D64:076003,2001 [arXiv: hep-ph/0104074]

Work In Progress

- Dynamics of the relic neutrino background and relativistic free Fermi gases
- Medium-induced neutrino masses, Haag's theorem, and the Nielsen-Ninomiya theorem
- Electroweak symmetry breaking by neutrinos
- Emergent Electroweak Gravity
- Comparative evaluation of mass methods at the LHC
- Theories and experiments to explain and verify the GSI anomaly

Professional Activities

- Organizer for Les Houches 2009 project on Mass methods for the LHC
- Discussion Leader for the 2009 Hadron Collider Physics Summer School
- Organizer of the CERN workshop “New Instruments for Neutrino Relics and Mass”, December 8, 2008
- Convener for the Little Higgs section of the CP Violation and Non-Standard Higgs working group (also a contributor to multiple sections)
- Referee for Physical Review D, Physical Review Letters, Physics Letters B, and JHEP
- Local organizer for the PhenClub journal club (CERN)
- Local organizer for LHC Olympics activities (UC Davis)
- Local seminar and journal club organizer (UC Davis)
- Member, West Coast LHC Theory Network
- Member, LHC / ILC Working Group
- Member, Quarkonium Working Group
- Member, American Association for the Advancement of Science
- Member, American Physical Society

Conference Participation

- *Pheno 2010*
Madison, Wisconsin, USA, May 10-12, 2010
- *Deutsche Physikalische Gesellschaft Jahrestagung*
Bonn, Germany, March 15-19, 2010
- *Workshop on Neutrino, Neutron, Nuclear, Medical and Muon Physics at ESS*
Lund, Sweden, Dec 2-4, 2009
- *CosmoOLE09*
IFIC, Valencia, Nov 9-20, 2009
- *European Strategy for Future Neutrino Physics*
CERN, 1-3 October, 2009
- *Weak Interactions and Neutrinos 2009*
Perugia, Italy, 14-19 September, 2009
- *COSMO*
CERN, 7-11 September, 2009
- *Workshop Towards Neutrino Technologies*
ICTP Trieste, 13-17 July, 2009
- *Les Houches 2009: Physics at TeV Colliders*
18-26 June, 2009
- *Hadron Collider Physics Summer School*
8-17 June, 2009

- *Fourth Symposium on Large TPCs for Low Energy Rare Event Detection*
Institut Henri Poincaré, Paris, December 18-19, 2008
- *New Instruments for Neutrino Relics and Mass*
CERN, Geneva, Switzerland, December 8, 2008
- *PANIC 2008*
Eliat, Israel, November 9-15, 2008
- *Pheno 2008*
Madison, Wisconsin, April 28-30, 2008
- *Super-B Workshop IV*,
Valencia, Spain, Jan 8, 2008
- *Charm 2007*,
Cornell University, August 5-8, 2007
- *Pheno 2007: Prelude to the LHC*,
University of Wisconsin-Madison, May 7-9, 2007
- *The Hunt for Dark Matter*,
Fermilab, May 10-12, 2007
- *9th ACFA ILC Physics and Detector Workshop & ILC GDE Meeting*,
Institute for High Energy Physics, Beijing, February 4-7, 2007
- *New Physics at the Electroweak Scale and New Signals at Hadron Colliders*,
Aspen Center for Physics, January 8-13, 2007
- *West Coast LHC Theory Network UC-Davis Meeting*,
UC-Davis, California, USA, Dec 8, 2006
- *Beyond the Standard Model Ultra-Mini Conference*,
30 October - 4 November 2006, University of Edinburgh.
- *B Factories and New Measurements*,
KEK, Japan, 13-14 September, 2006.
- *International Workshop on Heavy Quarkonium 2006*,
Brookhaven National Laboratory, New York, June 27-30 2006.
- *PHENO 2005 Symposium*,
University of Wisconsin, Madison, May 15-17 2006.
- *Argonne Workshop on Collider Physics*,
Argonne National Laboratory, May 7-12, 2006.
- *Monte Carlo for Beyond the Standard Model (MC4BSM)*
Fermilab, March 20-21, 2006.
- *Dark Matter 2006*,
Marriott Hotel, Marina del Rey, California, February 22-24, 2006.
- *West Coast LHC Theory Network*
Stanford Linear Accelerator Center, February 3, 2006.
- *Fermilab TeV Particle Astrophysics*,
Fermilab, Illinois, 13-15 July, 2005.
- *Argonne National Laboratory Theory Institute 2005: Supersymmetry, Extra Dimensions, and Higgs Bosons*,
May 9-13, 2005.

- *PHENO 2005 Symposium*,
University of Wisconsin, Madison. May 2-4 2005.
- *CP-Violating and Non-Standard Higgs workshop*
Stanford Linear Accelerator, 24-25 March, 2005
- *PASCOS 2004 and Pran Nath Fest*
Northeastern University, Aug 16-22 (2004).
- *Michigan String Phenomenology Conference*
University of Michigan, Ann Arbor. July 31-Aug 7 (2004).
- *Victoria Linear Collider Workshop*
Victoria, B.C. July 28-31 (2004).
- *PHENO 2004 Symposium*,
University of Wisconsin, Madison. April 26-28 (2004).
- *KITP Workshop on Collider Physics*
Kavli Institute for Theoretical Physics, Santa Barbara, January 12-16 (2004)
- *SUSY 2003: SUSY in the Desert: 11th Annual International Conference on Supersymmetry and the Unification of Fundamental Interactions*,
Tucson, Arizona, 5-10 Jun 2003.
- *PHENO 2003 Symposium*,
University of Wisconsin, Madison, USA, May 5-7 2003.
- *Theoretical Advanced Studies Institute*
University of Colorado, Boulder, USA, June, 2002.
- *Argonne National Laboratory Theory Institute 2002*
Argonne, Chicago, Illinois, USA, September 9-13, 2002
- *Argonne National Laboratory Theory Institute 2001*
Argonne, Chicago, Illinois, USA, June 18-29, 2001

List of Talks

- 5/2010 *The Origin of Neutrino Mass in the Standard Model* Pheno 2010, Madison, Wisconsin, USA 10 May 2010
- 3/2010 *Missing Mass at the LHC*
DPG Annual Meeting, Bonn, Germany 16 March, 2010
- 2/2010 *QCD and the Free Fermi Gas*
Bielefeld University, Germany 9 February, 2010
- 2/2010 *QCD and the Free Fermi Gas*
Frankfurt University, Germany 4 February, 2010
- 1/2010 *On the Origin of Neutrino Mass and Mixing in the Standard Model*
University of Heidelberg, Germany 21 January, 2010
- 1/2010 *On the Origin of Neutrino Mass and Mixing in the Standard Model*
University of Chicago, Chicago, Illinois 4 January, 2010
- 12/2009 *Concluding Remarks: Neutrino and Muon Physics*
Workshop on Neutrino, Neutron, Nuclear, Medical and Muon Physics at ESS, Lund, Sweden 4 December, 2009

- 11/2009 *Implications of Cosmological Relic Neutrinos*
CosmoOLE09, IFIC, University of Valencia, Spain 17 Nov 2009
- 11/2009 *On the Origin of Neutrino Mass and Mixing in the Standard Model*
Indiana University, Bloomington, Indiana 2 November, 2009
- 10/2009 *On the Origin of Neutrino Mass and Mixing in the Standard Model*
University of California, Davis 26 October, 2009
- 10/2009 *On the Origin of Neutrino Mass and Mixing in the Standard Model*
Southern Methodist University, Dallas, Texas 23 October, 2009
- 10/2009 *Polynomial systems for the determination of dark matter masses at the LHC*
Southern Methodist University, Dallas, Texas 19 October, 2009
- 10/2009 *On the Origin of Neutrino Mass and Mixing in the Standard Model*
Rutgers University, New Brunswick, New Jersey 13 October, 2009
- 10/2009 *On the Origin of Neutrino Mass and Mixing in the Standard Model*
University of Geneva, Geneva, Switzerland 2 October, 2009
- 7/2009 *Emergent Electroweak Gravity*
Workshop Towards Neutrino Technologies, ICTP Trieste, 13-17 July, 2009
- 6/2009 *Polynomial systems for the determination of masses in events with missing energy*
Les Houches 2009: Physics at TeV Colliders, 19 June, 2009
- 6/2009 *Emergent Electroweak Gravity*
Perimeter Institute, Waterloo, Canada 26 June, 2009
- 6/2009 *The Littlest Higgs Model*
Academia Sincia ATLAS Group, CERN June 8, 2009
- 4/2009 *Emergent Electroweak Gravity*
Max Planck Institute for Nuclear Physics, Heidelberg, Germany April 6, 2009
- 3/2009 *Emergent Electroweak Gravity*
ETH Zurich March 24, 2009
- 3/2009 *Emergent Electroweak Gravity*
Virtual Institute of Astroparticle Physics March 27, 2009
- 2/2009 *Light Higgses and Dark Matter at Bottom and Charm Factories*
Universidad Autonoma, Madrid February 10, 2009
- 2/2009 *Polynomial systems for the determination of masses in events with missing energy*
Universidad Autonoma, Madrid February 11, 2009
- 12/2008 *Emergent Electroweak Gravity*
University of Annecy, France, December 11, 2008
- 12/2008 *Polynomial systems for the determination of masses in events with missing energy*
CMS SUSY mini-workshop, CERN, December 10, 2008
- 12/2008 *Emergent Electroweak Gravity*
New Instruments for Neutrino Relics and Mass workshop, CERN, December 8, 2008
- 12/2008 *Emergent Electroweak Gravity*
Brookhaven National Laboratory, December 3, 2008
- 12/2008 *Emergent Electroweak Gravity*
Virginia Tech, December 1, 2008

- 11/2008 *Emergent Electroweak Gravity*
Argonne National Laboratory, November 25, 2008
- 11/2008 *Emergent Electroweak Gravity*
Femilab Astrophysics Seminar, November 24, 2008
- 11/2008 *Emergent Electroweak Gravity*
University of Wisconsin, Madison, November 21, 2008
- 11/2008 *Light Higgses and Dark Matter*
Wayne State University, November 19, 2008
- 11/2008 *Emergent Electroweak Gravity*
Northwestern University, November 17, 2008
- 11/2008 *Detecting Cosmic Neutrinos with Beta-Decaying Nuclei*
PANIC 2008, November 11, 2008
- 11/2008 *Emergent Electroweak Gravity*
CERN PhenClub, November 6, 2008
- 4/2008 *Polynomials for the determination of masses in events with missing energy*
Pheno 2008 Conference, Madison, Wisconsin, April 28, 2008
- 3/2008 *Light Higgses and Dark Matter*
University of Zürich, March 25, 2008
- 2/2008 *Mass Determination in Events with Missing Energy*
Université catholique de Louvain, February 25, 2008
- 2/2008 *Light Higgses and Dark Matter*
Université catholique de Louvain, February 27, 2008
- 1/2008 *Super-B Considerations for Higgses and Dark Matter*
Super-B Workshop IV, Valencia, Spain, Jan 8, 2008
- 11/2007 *Dark Matter: from Cosmos to Collider*
University of Wisconsin-Milwaukee Colloquium, November 16, 2007
- 10/2007 *Light Higgses and Dark Matter*
University of Freiburg, Germany, October 31, 2007
- 8/2007 *Light Higgses and Dark Matter*
Charm 07, Cornell University, August 6, 2007
- 5/2007 *Light Higgses and Dark Matter*
University of Chicago, May 14, 2007
- 5/2007 *Mass Determination in Events with Missing Energy*
Fermilab Dark Matter Workshop, May 10, 2007
- 5/2007 *Mass Determination in Events with Missing Energy*
Pheno 2007, Madison, May 7, 2007
- 3/2007 *Light Higgses and Dark Matter*
Institute for Advanced Study, Princeton, March 29, 2007
- 2/2007 *Light Higgses and Dark Matter*
Santa Cruz Institute for Particle Physics, February 26, 2007
- 1/2007 *Measurement of SUSY Parameters*
Aspen Collider Physics Workshop, January 8, 2007

- 1/2007 *Light Dark Matter*
Institute for High Energy Physics, Beijing, January 2, 2007
- 10/2006 *Matrix Element Methods and Mass Determination*
Beyond the Standard Model Ultra-Mini Conference, 1 November 2006, University of Edinburgh.
- 9/2006 *Light Dark Matter in Quarkonium Decays*
B Factories and New Measurements 2006 KEK Laboratory, September 13-14, 2006.
- 6/2006 *Invisible Quarkonium Decays*
International Workshop on Heavy Quarkonium Brookhaven National Laboratory, June 27-30, 2006.
- 5/2006 *Measuring Mass and Spin at Colliders*
Pheno 2006 Symposium University of Wisconsin, Madison. May 15-17 2006.
- 5/2006 *Measuring Mass and Spin at Colliders*
Argonne Collider Physics Workshop 2006 Argonne National Laboratory, May 10, 2006.
- 1/2006 *Light Dark Matter*
University of Washington Theory Seminar January 10, 2006.
- 1/2006 *Light Dark Matter*
University of Oregon Theory Seminar January 9, 2006.
- 9/2005 *Light Dark Matter*
University of Florida, September 29, 2005.
- 7/2005 *Light Dark Matter and Invisible Quarkonium Decays*
Fermilab TeV Particle Astrophysics Fermilab, July 13-15, 2005.
- 7/2005 *Discovering Light Dark Matter at B-Factories*
SLAC Theory Seminar, July 8, 2005.
- 5/2005 *Light Dark Matter: Theory and Detection*
Argonne National Laboratory Theory Institute 2005: Supersymmetry, Extra Dimensions, and Higgs Bosons, May 9-13, 2005.
- 5/2005 *Light Supersymmetric Dark Matter: Theory and Detection*
PHENO 2005 Symposium, University of Wisconsin, Madison. May 2-4 2005.
- 8/2004 *Signatures of Extended SUSY Models*
PASCOS 2004 and Nath Fest Northeastern University, Aug 16-22 (2004).
- 7/2004 *The Higgs Sector in a String-inspired extension of the MSSM*
Michigan String Phenomenology Conference University of Michigan, Ann Arbor. July 31-Aug 7 (2004).
- 6/2004 *Signatures of Extended SUSY Models*
Invited talk at the Victoria Linear Collider Workshop Victoria, B.C. July 28-31 (2004).
- 4/2004 *Constraining Lorentz violation with high-energy neutrinos*
PHENO 2004 Symposium University of Wisconsin, Madison, WI USA
- 6/2003 *An NMSSM without domain walls*
SUSY 2003: SUSY in the Desert: 11th Annual International Conference on Supersymmetry and the Unification of Fundamental Interactions, Tucson, Arizona, 5-10 Jun 2003.
arXiv:hep-ph/200402064

- 5/2003 *Phenomenology of the Little Higgs*
PHENO 2003 Symposium University of Wisconsin, Madison, WI USA
- 11/2002 *Electroweak Symmetry Breaking in the MSSM*
Guest Lecturer for Collider Physics 835
University of Wisconsin, Madison, WI, USA
- 8/2002 *Radion effects on unitarity in gauge-boson scattering*
LBL Theory Seminar
Lawrence Berkeley Lab, Berkeley, CA, USA
- 7/2002 *Collider Black Hole Production and Evaporation*
TASI 2002 Student Lecture
University of Colorado, Boulder, CO, USA
- 4/2002 *Determining if the SM or MSSM Higgs bosons couple to muons*
Pheno 2002 Symposium
University of Wisconsin, Madison, WI, USA
- 11/2001 *The Light Sbottom Scenario*
Student Collider Physics Lecture
University of Wisconsin, Madison, WI, USA
- 5/2001 *Radion Effects on Unitarity in Gauge-Boson Scattering*
Pheno 2001 Symposium
University of Wisconsin, Madison, WI, USA