Mark S. Neubauer

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# Education

**PhD** University of Pennsylvania, Physics June 2001

Dissertation: *Evidence for Electron Neutrino Flavor Change through Measurement of the 8B Solar Neutrino Flux at SNO*

Advisor: Dr. Eugene Beier

**BS** Kutztown University, Physics May 1994

Graduated *Summa Cum Laude*

# Professional Appointments

*University of Illinois at Urbana-Champaign, Urbana, IL USA*

**Affiliate Professor** Department of Electrical and Computer Engineering 2019 –

**Affiliate Professor** National Center for Supercomputing Applications 2018 –

**Professor** Department of Physics 2018 –

**Associate Professor** Department of Physics 2013 – 2018

**Assistant Professor** Department of Physics 2007 – 2013

*University of California at San Diego, La Jolla, CA USA*

**Postdoctoral Fellow** Department of Physics 2003 – 2007

*Massachusetts Institute of Technology, Cambridge, MA USA*

**Postdoctoral Fellow** Department of Physics 2001 – 2003

# Honors and Awards

**Breakthrough Prize in Fundamental Physics** 2016

**Dean’s Award for Excellence in Research** (U. Illinois) 2013

**Fellow, Center for Advanced Study** (U. Illinois) 2012 – 2013

**NSF Career Award** 2011

**Fellow, National Center for Supercomputing Applications** 2008 – 2009

**Arnold O. Beckman Research Award** (U. Illinois) 2007

**Member, Sigma Xi** (Massachusetts Institute of Technology) 2002

**Chairman’s Teaching Award** (University of Pennsylvania) 1995

# Professional Service & Leadership

Member, **Illinois Center for Advanced Studies of the Universe** (Physics) 2020 –

Member, **Center for Artificial Intelligence Innovation** (NCSA) 2019 –

**Executive Committees / Coordination Groups** (current)

[Fast Machine Learning Laboratory](https://fastmachinelearning.org/) 2019 –

[Institute for Research and Innovation in Software for High-Energy Physics](https://iris-hep.org/) 2018 –

[High-Energy Physics Software Foundation](https://hepsoftwarefoundation.org/) 2016 –

[Open Science Grid](https://opensciencegrid.org/) *2015* –

**Workshop Organization** (selected)

Fast Machine Learning for Science (*Fermilab, SMU*) 2019, 2020

Building Collaborations for Machine Learning (*MIT*) 2017

Practice & Experience in Advanced Research Computing (*New Orleans*) 2018

**Research Award Leadership** (selected, recent)

Principle Investigator (PI), [Illinois Tier-2 Computing Center](https://www.nsf.gov/awardsearch/showAward?AWD_ID=1624739) 2019 –

Co-PI, [FAIR for Data and Artificial Intelligence Models in HEP](https://fair4hep.github.io/) 2020 –

Co-PI, [Advancing Science with Accelerated Machine Learning](https://www.nsf.gov/awardsearch/showAward?AWD_ID=1934757) 2019 –

PI, [Scalable Cyberinfrastucture for AI and Likelihood-Free Inference](https://www.nsf.gov/awardsearch/showAward?AWD_ID=1841456) 2018 –

PI, [Conceptualization of a Software Innovation Institute for HEP](https://www.nsf.gov/awardsearch/showAward?AWD_ID=1558233) 2015 – 2018

Co-PI, [Data and Software Preservation for Open Science](https://www.nsf.gov/awardsearch/showAward?AWD_ID=1247316) 2012 – 2016

Co-PI, [MRI: Development of Ultrafast Tracking Electronics for ATLAS](https://www.nsf.gov/awardsearch/showAward?AWD_ID=1126275) 2011 – 2017

# Research Highlights

**Diboson Production as a Sensitive Probe of New Physics** 2007 –

My group is at the forefront of studying diboson production at colliders, producing:

* Stringent limits on production of new particles decaying to heavy boson pairs (*WW*, *WZ*, *ZZ*, *hW*, *hZ*) and constraints on new physics at the LHC [[PRD 98 (2018)](https://arxiv.org/abs/1808.02380), [JHEP 1803 (2018)](https://arxiv.org/abs/1710.07235), [PLB 765 (2017)](http://inspirehep.net/record/1477027), [JHEP 1609 (2016)](http://inspirehep.net/record/1469453), [PLB 755 (2016)](http://inspirehep.net/record/1409918), [JHEP 1601 (2016)](http://inspirehep.net/record/1391323), [EPJC 76 (2015)](http://inspirehep.net/record/1356730), [EPJC 75 (2015)](http://inspirehep.net/record/1352826), [JHEP 1501 (2015)](http://inspirehep.net/record/1324374), [PLB 737 (2014)](http://inspirehep.net/record/1300821), [PLB 718 (2012)](http://inspirehep.net/record/1120014), [PRL 107 (2011)](http://inspirehep.net/record/927667)]
* First measurement of ZZ at a hadron collider [[PRL 100 (2008) 201801](http://inspirehep.net/record/778518))]
* First observation of WZ production [[PRL 98 (2007) 161801](http://inspirehep.net/record/744786))]

I have also authored two review articles on tests of electroweak physics

[[RMP 84 (2012) 1477](http://link.aps.org/pdf/10.1103/RevModPhys.84.1477)] and diboson physics at colliders [[ARNPS 61 (2011) 223](http://inspirehep.net/record/1084754)]

**Higgs Boson Discovery** 2012

The ATLAS and CMS experiments announced the discovery of a Higgs boson *h*. This discovery lead to the [2013 Nobel Prize in Physics](https://www.nobelprize.org/nobel_prizes/physics/laureates/2013/) for its theoretical prediction

* My group contributed to this discovery [[PLB 716 (2012)](https://inspirehep.net/record/1124337) 1] through analysis of the *h*→*WW*\*→*e*νμν channel and *h*🡪*WW*\* observation [[PRD 92 (2015) 012006](http://inspirehep.net/record/1333228)], providing the most precise channel measurement of *h* couplings.

**Resolution of a *b*-baryon Lifetime Puzzle** 2007

On CDF, I lead an analysis of τ(Λ*b*) in exclusive decay Λ*b* →J/ψΛ. At the time of publication [[PRL 98 (2007) 122001](https://inspirehep.net/record/725884)], this was the single most precise measurement of τ(Λ*b*) and higher than the previous world average by 3.2σ. Our measurement resolved the “Λ*b* Lifetime Puzzle” in favor of earlier theory calculations of τ(Λ*b*).

**Resolution of the Solar Neutrino Problem** 2001

On the SNO experiment, my analysis of 8B solar neutrino data provided first direct evidence for *ν*e flavor change, resolving the decades-long “Solar Neutrino Problem”. The first SNO paper [[*PRL* 87 (2001) 71301](http://inspirehep.net/record/558620)] was based on my thesis work and lead to the [2016 Breakthrough Prize](https://breakthroughprize.org/Laureates/1/P1/Y2016) in Fundamental Physics and the [2015 Nobel Prize in Physics](https://www.nobelprize.org/nobel_prizes/physics/laureates/2015/) (A. McDonald and T. Kajita) for observation of *ν*e flavor change at SNO.

# Publications

Please find a list of my selected publications [here](https://msneubauer.github.io/assets/pdf/pubs_selected.pdf) and a full list of my publications [here](https://msneubauer.github.io/assets/pdf/pubs.pdf).