

# MARK S. NEUBAUER

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## EDUCATION

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- PhD** University of Pennsylvania, Physics June 2001  
Dissertation: *Evidence for Electron Neutrino Flavor Change through Measurement of the  $^8\text{B}$  Solar Neutrino Flux at SNO*  
Advisor: Dr. Eugene Beier
- BS** Kutztown University, Physics May 1994  
Graduated *Summa Cum Laude*  
Minored in Mathematics

## PROFESSIONAL APPOINTMENTS

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- University of Illinois at Urbana-Champaign, Urbana, IL USA*
- Professor** Department of Physics 2018 –  
**Associate Professor** Department of Physics 2013 – 2018  
**Assistant Professor** Department of Physics 2007 – 2013  
**Affiliate Professor** Department of Electrical and Computer Engineering 2019 –  
**Affiliate Professor** National Center for Supercomputing Applications 2018 –
- 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

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- 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

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- Committees / Co-Organizer**
- Building Collaborations for Machine Learning in HEP* Workshop, MIT 2017  
*Practice & Experience in Advanced Research Computing (PEARC17)* Workshop 2017  
Fermilab Operational Readiness Review Committee 2017  
Chair, *Fostering HEP & Computer Science Collaboration* Workshop, U. Illinois 2016  
Open Science Grid Campus Infrastructures Community Committee 2016

## RESEARCH HIGHLIGHTS

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### Diboson Production as a Sensitive Probe of New Physics

2007 – 2019

The search for diboson resonances is a sensitive probe of new physics. My group has been at the forefront of studying diboson production at colliders, producing:

- Stringent limits on the production of new heavy particles decaying to heavy boson pairs ( $WW$ ,  $WZ$ ,  $ZZ$ ,  $hW$ ,  $hZ$ ) and constraints on new physics models predicting these signatures at the LHC [[PRD 98 \(2018\)](#), [JHEP 1803 \(2018\)](#), [PLB 765 \(2017\)](#), [JHEP 1609 \(2016\)](#), [PLB 755 \(2016\)](#), [JHEP 1601 \(2016\)](#), [EPJC 76 \(2015\)](#), [EPJC 75 \(2015\)](#), [JHEP 1501 \(2015\)](#), [PLB 737 \(2014\)](#), [PLB 718 \(2012\)](#), [PRL 107 \(2011\)](#)]
- First measurement of  $ZZ$  at a hadron collider [[PRL 100 \(2008\) 201801](#)]
- First observation of  $WZ$  production [[PRL 98 \(2007\) 161801](#)]

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

[[RMP 84 \(2012\) 1477](#)] and diboson physics at colliders [[ARNPS 61 \(2011\) 223](#)]

### Higgs Boson Discovery!

2012

The ATLAS and CMS experiments announced the discovery of a Higgs boson  $h$ . This discovery led to the [2013 Nobel Prize in Physics](#) for its theoretical prediction

- My group contributed to this discovery ( $5.9\sigma$ ) [[PLB 716 \(2012\) 1](#)] through analysis of the  $h \rightarrow WW^* \rightarrow e\nu\mu\nu$  channel
- My group contributed to the  $h \rightarrow WW^*$  observation ( $6.1\sigma$ ) [[PRD 92 \(2015\) 012006](#)], providing the most precise single-channel measurement of  $h$  couplings. My graduate student Philip Chang received the 2014 US ATLAS Graduate Student Achievement Award for his work on the  $h \rightarrow WW^*$  observation and the  $h$  couplings measurement

### Constraints on Charged Higgs Bosons

2012

Charged Higgs bosons ( $H^\pm$ ) often arise in new physics models. Through the work of Allison McCarn ([Ph.D. thesis](#)) and Anna Sfyrla, my group lead searches for  $H^\pm \rightarrow \tau\nu$  in top pair events using a direct mass reconstruction method [[JHEP 1206 \(2012\) 039](#)] and via an apparent violation of lepton universality [[JHEP 1303 \(2013\) 076](#)].

### Resolution of a b-baryon Lifetime Puzzle

2007

On CDF, I lead an analysis of  $\tau(\Lambda_b)$  in exclusive decay  $\Lambda_b \rightarrow J/\psi \Lambda$ . At the time of publication [[PRL 98 \(2007\) 122001](#)], this was the single most precise measurement of  $\tau(\Lambda_b)$  and higher than the previous world average by  $3.2\sigma$ . Our measurement resolved the “ $\Lambda_b$  Lifetime Puzzle” in favor of earlier theory calculations of  $\tau(\Lambda_b)$ .

### Resolution of the Solar Neutrino Problem

2001

On the SNO experiment, my analysis of  $^8\text{B}$  solar neutrino data provided first direct evidence for  $\nu_e$  flavor change, resolving the decades-long “Solar Neutrino Problem”. The first SNO paper [[PRL 87 \(2001\) 71301](#)] was based on my thesis work and led to the [2016 Breakthrough Prize in Fundamental Physics](#) and the [2015 Nobel Prize in Physics](#) (A. McDonald and T. Kajita) for observation of  $\nu_e$  flavor change at SNO.

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## PUBLICATIONS

Please find a list of publications [here](#), including a list of my selected publications.