

# MARK S. NEUBAUER

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## EDUCATION

**Ph.D., Physics**, University of Pennsylvania 2001

Dissertation: *Evidence for  $\nu_e$  Flavor Change through Measurement of the  $^8B$  Solar Neutrino Flux at SNO*

Advisor: Dr. Eugene Beier

**B.S., Physics**, Kutztown University 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

## SELECTED FUNDING AWARDS

**Lead PI** [U. Illinois Experimental HEP base grant](#) DOE 2022 –

**PI** [Democratizing AI Hardware with an Open-Source AI-Chip Design Toolkit](#) DPI 2022 –

**Co-PI** [Accelerated AI Algorithms for Data-Driven Discovery Institute](#) NSF 2021 –

**PI** [FAIR Framework for Physics-Inspired Artificial Intelligence in HEP](#) DOE 2020 –

**PI** [U. Illinois ATLAS Phase-II HL-LHC Upgrade](#) NSF 2020 –

**Co-PI** [Advancing Science with Accelerated Machine Learning](#) NSF 2019 –

**PI** [U. Illinois Institute for Research and Innovation in Software for HEP Award](#) NSF 2018 –

**PI** [U. Illinois ATLAS Tier-2 Computing Center Award](#) NSF 2010 –

**PI** [Scalable Cyberinfrastructure for AI and Likelihood-Free Inference](#) NSF 2018 – 2022

**PI** [Conceptualization of a Software Innovation Institute for HEP](#) NSF 2015 – 2018

**Co-PI** [Data and Software Preservation for Open Science](#) NSF 2012 – 2016

**Co-PI** [MRI: Development of Ultrafast Tracking Electronics](#) NSF 2011 – 2017

**PI** [CAREER: Fast Hardware Tracking and Parallel Computing Strategies for Integrated Research, Education, and Outreach in Particle Physics](#) NSF 2011 – 2017

## PUBLICATIONS

Please find a list of my selected publications [here](#) and a full list of my publications [here](#).

## SCIENCE COLLABORATIONS AND SELECTED APPOINTMENTS

<b>ATLAS Collaboration</b> , CERN Large Hadron Collider, Geneva, Switzerland:	2007 –
• Team Leader, University of Illinois ATLAS Group	2014 –
• Member, US ATLAS Institutional Board	2014 –
• ATLAS Collaboration Board Institute Representative	2014 –
• ATLAS Trigger/DAQ Institute Board Representative	2014 –
• ATLAS Phase-II Upgrade Institutional Representative	2017 –
• Member, ATLAS Event Filter Tracking Heterogenous Commodity Hardware Task Force	2021
• Member, ATLAS Event Filter Tracking Custom Hardware Task Force	2021
• Member, US ATLAS Resource Allocation Committee (US, ATLAS)	2012 – 2017
• Deputy Manager, US ATLAS Physics Support, Software and Computing	2012 – 2015
• Member, US ATLAS Management Advisory Committee	2012 – 2015
• Chair, US ATLAS Tier-3 Computing Implementation Committee	2015
• Member, US ATLAS Tier-3 Study Group	2013
• ATLAS Representative to the OSG Council	2012 – 2015
• Level-3 Manager, US ATLAS Application Software	2010 – 2012
• Member, US ATLAS Program Management Plan Committee	2009
• Contact Editor for ATLAS Publications: <a href="#">JINST 16 (2021)</a> , <a href="#">JHEP 04 (2019)</a> , <a href="#">PLB 790 (2019)</a> , <a href="#">JHEP 01 (2016)</a> , <a href="#">EPJC 75 (2015)</a> , <a href="#">PLB 718 (2012)</a> , <a href="#">PRL 107 (2011)</a>	
• Member, ATLAS Editorial Board for ATLAS Publications: <a href="#">JHEP 06 (2018)</a> , <a href="#">PLB 761 (2016)</a> , <a href="#">PLB 756 (2016)</a> , <a href="#">PRD 92 (2015)</a> , <a href="#">PLB 737 (2014)</a> , <a href="#">PLB 718 (2013)</a> , <a href="#">PLB 712 (2012)</a>	
<b>CDF Collaboration</b> , Fermilab Tevatron, Batavia, IL USA:	2001 – 2008
• Convener, Diboson Physics Group	2006 – 2007
• Project Leader, Central Analysis Facility	2002 – 2004
<b>SNO Collaboration</b> , SNOlab, Sudbury, ON Canada:	1996 – 2002
• Trigger System and GPS-based Timing System	1996 – 2001

## RESEARCH HIGHLIGHTS

***Multi-boson Production as a Probe of New Physics*** 2007 –

My group has made extensive study of multi-boson (involving  $W$ ,  $Z$ , Higgs boson  $h$ ) production at hadron colliders:

- Stringent limits on the production of new particles decaying to multi-boson states and constraints on new physics [EPJC 80 \(2020\)](#), [JHEP 04 \(2019\)](#), [PRD 100 \(2019\)](#), [PLB 790 \(2019\)](#), [PRD 98 \(2018\)](#), [JHEP 03 \(2018\) 009](#), [JHEP 03 \(2018\) 042](#), [PLB 765 \(2017\)](#), [EPJC 77 \(2017\)](#), [JHEP 09 \(2016\)](#), [PLB 755 \(2016\)](#), [JHEP 01 \(2016\)](#), [EPJC 76 \(2016\)](#), [EPJC 75 \(2015\)](#), [JHEP 01 \(2015\)](#), [PLB 737 \(2014\)](#), [PLB 718 \(2012\)](#), [PRL 107 \(2011\) 231801](#), [PRL 107 \(2011\) 041802](#), [EPJC 71 \(2011\)](#)
- First measurement of  $ZZ$  production at a hadron collider [PRL 100 \(2008\)](#)
- First observation of  $WZ$  production [PRL 98 \(2007\)](#)
- Authored two review articles on electroweak and diboson physics [RMP 84 \(2012\)](#), [ARNPS 61 \(2011\)](#)
- Served as Chapter Editor for a review article on Di-Higgs Production [Rev. Phys. 5 \(2020\)](#)

***Higgs Boson Discovery and Measurement*** 2012, 2015

My group contributed to the Higgs boson discovery [PLB 716 \(2012\)](#) through analysis of the  $\ell\nu\ell\nu$  channel, which led to the 2013 Nobel Prize in Physics for its theoretical prediction, and the observation of  $h \rightarrow WW^{(*)}$  [PRD 92 \(2015\)](#).

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

I led an analysis measuring the  $\Lambda_b^0$  lifetime  $\tau(\Lambda_b^0)$  in the exclusive decay  $\Lambda_b^0 \rightarrow J/\psi\Lambda^0$ . At the time of publication [PRL 98 \(2007\)](#), this was the most precise  $\tau(\Lambda_b^0)$  measurement and higher than the previous world average by  $3.2\sigma$ . This measurement resolved the long-standing " $\Lambda_b^0$  Lifetime Puzzle" in favor of the early theory calculations of  $\tau(\Lambda_b^0)$ .

***Resolution of the Solar Neutrino Problem*** 2001

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

## PROFESSIONAL SERVICE AND LEADERSHIP

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Core Member, <a href="#">Illinois Center for Advanced Studies of the Universe</a>	2020 –
Founding Member, <a href="#">Center for Artificial Intelligence Innovation</a>	2019 –
Member of the Executive Committees & Coordination Groups for:	
• <a href="#">Accelerated AI Algorithms for Data-Driven Discovery Institute</a>	2021 –
• <a href="#">Fast Machine Learning Laboratory</a>	2019 –
• <a href="#">Institute for Research and Innovation in Software for HEP</a>	2018 –
• <a href="#">HEP Software Foundation</a>	2016 –
• <a href="#">Open Science Grid</a>	2015 –
Guest Associate Editor, Machine Learning and Artificial Intelligence, <i>Frontiers in Artificial Intelligence</i>	2021 –
Review Editor, Cloud Computing, <i>Frontiers in High-Performance Computing</i>	2022 –
Member, Steering Board, Accelerated AI Algorithms for Data-Driven Discovery Institute	2021 –
Member, Equity & Career Committee, Accelerated AI Algorithms for Data-Driven Discovery Institute	2021 –
Community Engagement Coordinator, Accelerated AI Algorithms for Data-Driven Discovery Institute	2021 –
Blueprint Coordinator, Institute for Research and Innovation in Software for HEP	2018 –
Member, American Physical Society	2007 –
Co-Lead, Snowmass CompF4 Analysis Facilities Topical Group	2022
Member, IceCube Software and Computing Advisory Panel	2021
Faculty Advisor, Society of Physics Students (AIP)	2008 – 2019
OSG Resources Manager	2015 – 2017
Member, Fermilab Operational Readiness Review Committee	2017
Practice & Experience in Advanced Research Computing (PEARC) Workshop Reviewer	2017
Member, OSG Campus Infrastructures Community Committee	2016
Member, DOE LBNF Software and Computing Review Panel	2014
Chair, Mitsuyoshi Tanaka Dissertation Award Committee (DPF)	2012
Member, Mitsuyoshi Tanaka Dissertation Award Committee (DPF)	2011

## SERVICE ON UNIVERSITY COMMITTEES

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Member, NCSA Faculty Fellows Selection Committee	2022 –
Member, NCSA Resource Allocation Committee	2020 –
Member, Campus Research Network Architecture Committee	2018 –
Chair, Illinois Campus Cluster Executive Steering Committee	2014 – 2016
Chair, Illinois Campus Cluster Investor Forum	2014 – 2016
Senator, University Campus Senate	2009 – 2011

## SERVICE ON COLLEGE COMMITTEES

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Member, College Awards Committee	2022 –
Member, Course and Curriculum Committee	2022 –
Member, Engineering Open House Advisory Committee	2008 – 2018
Member, Research Information Technology Working Group	2014
Member, NSF Major Research Instrumentation Proposal Selection Committee	2010

## SERVICE ON DEPARTMENT COMMITTEES

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Member, Steering Board on New Courses	2022 –
Undergraduate Academic Advisor/Mentor	2018 –
Faculty Advisor, Society of Physics Students (U. Illinois Chapter)	2008 – 2018
Member, Ph.D. Qualifying Exam Committee	2012, 2018
Chair/Member, Preliminary Exam and Dissertation Committees	2008–09, 2011–12, 2016–17, 2021, 2023
Chair, Department Colloquium	2013
Member, Faculty Search Committee (High-energy Physics)	2013
Member, Faculty Search Committee (Nuclear Physics)	2013
Member, Communications Coordinator Search Committee	2012
Co-Chair, High-Energy Physics Seminar	2009, 2012, 2022
Faculty Leader, Entrepreneurial Leadership in STEM Teaching & Learning	2008 – 2011