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## Education & Employment

- 2008–Present **Research Associate**, *Fermi National Accelerator Laboratory*, Batavia, IL  
Research focus on search for low-mass Higgs boson and service focus on tracking algorithms
- 2005–2008 **Ph.D. Experimental Particle Physics**, *Rice University*, Houston, TX  
Thesis:  $WW$  production cross section measurement and limits on anomalous trilinear gauge couplings at  $\sqrt{s} = 1.96$  TeV (*Advisor: Marjorie Corcoran*)
- 2001–2005 **M.S. Experimental Particle Physics**, *Rice University*, Houston, TX  
Thesis: Operation and efficiency of the  $D\emptyset$  central track trigger
- 1997–2001 **B.S. Physics**, *Carnegie-Mellon University*, Pittsburgh, PA  
Graduated with Honors

## Research Experience

- 2012–Present **Active collaborator on the MicroBooNE experiment**
- Reviewing  $\nu_\tau$  appearance sensitivity analysis
  - Studying track vertexing algorithms for use in three dimensional vertex reconstruction
  - Overseeing inventory management of cryogenic piping systems
  - Assembling liquid argon time projection chamber hardware
- 2009–Present **Lead the  $D\emptyset$  team that searches for the standard model Higgs boson via  $WH \rightarrow \ell\nu bb$ ,  $H \rightarrow WW \rightarrow \ell\nu jj$  and  $WH \rightarrow WWW \rightarrow \ell\nu jjjj$  production**
- Improved analysis sensitivity, beyond the gain from increased luminosity, by increasing event selection acceptance, improving analysis techniques and implementing the efficiency gains available from updated object identification tools
  - Applied advanced multivariate techniques to separate a small signal from a large background in stages, first focusing on instrumental then physics backgrounds
  - Improved the data-driven estimation of the multijet instrumental background where a jet has been misidentified as a charged lepton
  - Introduced new tracking-based discriminants to enhance the rejection of the multijet background
  - Helped create, update and maintain a framework of common tools to streamline analysis of channels with similar final states, then added the expansions that allow the  $H \rightarrow WW \rightarrow \ell\nu jj$  and  $WH \rightarrow WWW \rightarrow \ell\nu jjjj$  analyses to run within the framework

- 2009–Present **Convener of the Tracking & Vertexing Algorithms group at DØ**
- Developed novel discriminants against fake tracks using previously unused light-pulse timing and intensity information from the Central Fiber Tracker
  - Guided a number of efforts to improve tracking and vertexing performance, including optimization of Silicon Microstrip Tracker (SMT) readout thresholds for greater tracking efficiency, development of vertexing improvements that make use of fake track discriminants to optimize performance in low track multiplicity events, and implementation of specialized calorimeter- and muon-seeded track finding algorithms
  - Directed efforts to improve tracking simulation, including revising the method for muon momentum scale and resolution correction and making iterative improvements to the modeling of the SMT efficiency
  - Produced, updated, maintained and certified reliable code that is used for event reconstruction by the entire collaboration
- 2005–2009 **Measured  $WW$  cross section and set limits on anomalous  $WW\gamma$ ,  $WWZ$  triple gauge couplings (TGCs)**
- Performed a highly optimized cut-based analysis, leading to the most precise measurement of  $WW$  cross section at time of publication
  - Analyzed two-dimensional kinematic distributions to enhance TGC sensitivity and set most stringent  $WW$ -decay based anomalous TGC limits
  - Collaborated to expanded TGC studies to perform a simultaneous analysis of the  $W\gamma$ ,  $WW$  and  $WZ$  final states, yielding the most stringent anomalous coupling limits from Tevatron
- 2001–2005 **Member of the Central Fiber Tracker (CFT) and Central Track Trigger (CTT) groups**
- Served as an on-call expert for the CFT hardware from 2003–2005, with additional duties including training new control room shifters and maintaining reference documentation for use during shifts
  - Developed, updated and maintained software used in the DØ control room to monitor the status of the CTT and help diagnose hardware problems as they occurred
  - Measured efficiency of the DØ Central Track Trigger using  $Z \rightarrow ee$  events in data

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## Student Teaching & Mentoring

- 2010–Present **Lead a team of undergraduates and high-school students in establishing a dedicated standard model Higgs boson search in the  $WH \rightarrow WWW \rightarrow \ell\nu jjjj$  channel**
- Supervised undergraduates through Fermilab's Summer Internships in Science and Technology program:
    - (2010–Present) Anthony Podkowa, Bradley University: updated code framework to support new channel and trained multivariate discriminants for signal vs. specific background sources
    - (2011) Stephanie Hamilton, Michigan State University: improved quark color-flow discriminants; improved multijet rejection by expanding use of track information
  - Supervised high-school students through the Illinois Mathematics and Science Academy's Student Inquiry and Research program:
    - (2010–Present) Alexander Abbinante: developed code framework to support channel-specific features then trained and implemented final multivariate discriminant to search for signal
    - (2011–2012) Ethan Gordon: determined optimal Higgs boson candidate reconstruction strategy and developed channel-specific variables to improve signal sensitivity
    - (2010–2011) Wesley Bradley: developed and tested updated framework while adding channel specific variables

Feb 2012 **Instructed graduate students in the Photodetector Track at the Excellence in Detector and Instrumentation Technologies (EDIT) symposium**

- Taught students about design, construction and performance of photomultiplier tubes
- Supervised laboratory sessions on calibration and operation of traditional and silicon-based photomultipliers using radioactive sources and cosmic rays

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## Leadership Experience

- 2012–Present Lead the  $\ell\nu$ +jets Higgs boson analysis group at DØ
- 2010–2012 Elected to the Fermilab User's Executive Committee and appointed as chair of the Quality of Life subcommittee
- 2010–Present Dean of the *University of DØ*, a lecture series offered to the DØ Collaboration, primarily targeting graduate students and postdocs, focused on topics relevant to a modern hadron collider physicist
- 2009–Present Convener of the tracking and vertexing algorithms group at DØ
- 2009–2010 Led the muon momentum scale and resolution task force at DØ

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## Selected Publications

- 2013 "Search for the standard model Higgs boson in  $\ell\nu$ +jets final states in  $9.7 \text{ fb}^{-1}$  of  $p\bar{p}$  collisions with the D0 detector", Accepted by Phys. Rev. D [arXiv:1301.6122]
- 2012 "Search for the standard model Higgs boson in associated  $WH$  production in  $9.7 \text{ fb}^{-1}$  of  $p\bar{p}$  collisions with the D0 detector", Phys. Rev. Lett. 109, 121804
- 2012 "Combined search for the standard model Higgs boson decaying to  $b\bar{b}$  using the D0 Run II data set," Phys. Rev. Lett. 109, 121802
- 2012 "Evidence for a particle produced in association with weak bosons and decaying to a bottom-antibottom quark pair in Higgs boson searches at the Tevatron," Phys. Rev. Lett. 109, 071804
- 2012 "Limits on anomalous trilinear gauge boson couplings from  $WW$ ,  $WZ$  and  $W\gamma$  production in  $p\bar{p}$  collisions at  $\sqrt{s} = 1.96 \text{ TeV}$ ," Phys. Lett. B 718, 451
- 2012 "Search for  $WH$  Associated Production in  $p\bar{p}$  Collisions at  $\sqrt{s} = 1.96 \text{ TeV}$ ," Phys. Rev. D 86, 032005
- 2011 "Search for  $WH$  Associated Production in  $5.3 \text{ fb}^{-1}$  of  $p\bar{p}$  Collisions at the Fermilab Tevatron," Phys. Lett. B 698, 6
- 2009 "Measurement of the  $WW$  Production Cross Section with Dilepton Final States in  $p\bar{p}$  Collisions at  $\sqrt{s} = 1.96 \text{ TeV}$  and Limits on Anomalous Trilinear Gauge Couplings," Phys. Rev. Lett. 103, 191801
- 2009 "Combined measurements of anomalous charged trilinear gauge-boson couplings from diboson production in  $p\bar{p}$  collisions at  $\sqrt{s} = 1.96 \text{ TeV}$ ," Fermilab-Pub-09/380-E
- 2006 "Limits on anomalous trilinear gauge couplings from  $WW \rightarrow e^+e^-$ ,  $WW \rightarrow e^\pm\mu^\mp$ , and  $WW \rightarrow \mu^+\mu^-$  events from  $p\bar{p}$  collisions at  $\sqrt{s} = 1.96 \text{ TeV}$ ," Phys. Rev. D 74, 057101
- 2004 "The DØ Central Track Trigger," J. Olsen for the DØ CTT Group, IEEE Trans. Nucl. Sci. 51, 345

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## Invited Talks & Seminars

- Mar 10, 2013 "Measurements of Higgs Boson Couplings and Properties at the Tevatron," on behalf of the CDF and DØ Collaborations at the XLVIII Rencontres de Moriond on QCD and High Energy Interactions, La Thuile, Italy
- Feb. 13, 2013 "The Higgs Boson and Beyond," Public lecture and colloquium at Missouri State University, Springfield, MO
- May 29, 2012 "Diboson production cross section at the Tevatron," on behalf of the CDF and DØ Collaborations at the 24th Rencontres de Blois, Blois, France
- Nov 22, 2011 "The Tevatron's Massive Search for the Higgs" seminar at the University of Minnesota
- Aug 12, 2011 "Diboson production in p-pbar collisions at  $\sqrt{s}=1.96$  TeV with the D0 detector," on behalf of the DØ Collaborations at the Meeting of the Division of Particles and Fields of the American Physical Society, Providence, Rhode Island
- Aug 10, 2011 "Celebrating 30 Years of K-12 Educational Programming at Fermilab," presented with M. Bardeen at the Meeting of the Division of Particles and Fields of the American Physical Society, Providence, RI
- Aug 9, 2011 "Searches for the Higgs boson in  $VH \rightarrow VWW \rightarrow \text{leptons} + X$  decays in p-pbar collisions at  $\sqrt{s}=1.96$  TeV," on behalf of the CDF and DØ Collaborations at the Meeting of the Division of Particles and Fields of the American Physical Society, Providence, RI
- Mar 21, 2011 "Searches for Low-Mass SM Higgs at the Tevatron," on behalf of the CDF and DØ Collaborations at the XLVI Rencontres de Moriond on QCD and High Energy Interactions, La Thuile, Italy
- Nov 17, 2010 "The Tevatron's Massive Search for the Higgs" seminar at Columbia University in the City of New York
- Oct 4, 2010 "The Tevatron's Massive Search for the Higgs" seminar at the University of Illinois at Urbana-Champaign
- Sep 22, 2009 "WW Production at DØ" seminar at Michigan State University
- Apr 28, 2009 "Diboson Production at the Tevatron" on behalf of the CDF and DØ Collaborations at the XVII Int. Workshop on Deep-Inelastic Scattering and Related Topics, Madrid, Spain
- Oct 31, 2006 "Limits on Anomalous  $WW\gamma$  and  $WWZ$  Couplings from DØ" on behalf of the DØ Collaboration at the Joint Meeting of Pacific Region Particle Physics Communities, Honolulu
- Apr 23, 2006 "Measurement of the  $WW$  Production Cross Section and Anomalous Couplings in  $e^+e^-$ ,  $e^\pm\mu^\mp$  and  $\mu^+\mu^-$  Final States at DØ" at the APS Meeting, Dallas, TX

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## Honors & Awards

- 2010 Received the 2010 Fermilab Director's Award for Exceptional Volunteer Service to Fermilab K-12 Education Programs
- 2009 Honored as a finalist for the 2009 Fermilab Director's Award for Exceptional Volunteer Service to Fermilab K-12 Education Programs
- 2008 Received Wilson Award from Rice University for most outstanding thesis in the Physics & Astronomy Department

- 2001 Awarded College Honors and University Honors upon graduation from Carnegie-Mellon University for scholastic and undergraduate research achievements
- 2001 Accepted into *Sigma Xi*, The Scientific Research Society, as an associate member for undergraduate research achievements

## Community Outreach

- 2011–Present Author of the DØ Collaboration’s contributions to the “Result of the Week” column in the online periodical, *Fermilab Today*
- 2010–Present Created an interactive science demonstration, “FUNdamental Physics,” and presented it annually at the Fermilab Open House and during Fermilab’s *Bring Your Daughters and Sons to Work Day*
- 2010–Present Moderated physics discussions and data analysis sessions annually for the QuarkNet particle physics Masterclass
- 2006–Present Regularly give the “Charge! Electricity and Magnetism” demonstration to elementary school children near Fermilab and designed slides for this demonstration that the Fermilab Education Office has posted online for public use
- 2003–Present Frequent tour guide and “Ask a Scientist” volunteer for Fermilab and DØ visitors
  - Nov 9, 2009 Judge at the U.S. Department of Energys second annual Science and Energy Research Challenge, hosted at Oak Ridge National Laboratory
  - Aug 21, 2009 Performed a cryogenics show at Millennium Park in Chicago as part of *Science Chicago: LabFest!*
  - 2008–2009 Attended various *Science Chicago: LabFest!* events to run demonstrations and talk to the public about the research performed at Fermilab
  - Jan 17, 2009 Created and presented an interactive science demonstration, “The Physics of Spinning Toys,” for the Fermilab Open House
  - Jan 20, 2005 Judge at Chicago Public Schools Science Fair, Chicago State University