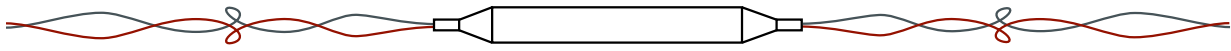


# Dr. Elena Long



## Curriculum Vitae

### Education

- 2008–2012 **Ph.D. in Physics**, *Kent State University*, Kent, OH.  
Advisors: Dr. Bryon Anderson and Dr. Douglas Higinbotham
- 2006–2008 **M.A. in Physics**, *Kent State University*, Kent, OH.  
Advisor: Dr. David Allender
- 2002–2006 **B.S. cum laude in Physics**, *Juniata College*, Huntingdon, PA.  
Advisors: Dr. Jamie White and Alexander McBride

### Doctoral Dissertation

- Title *Polarized  $^3\text{He}(e, e'n)$  Asymmetries in Three Orthogonal Measurements*
- Committee B. Anderson, D. Higinbotham, D.M. Manley, P. Tandy, D. Stroup
- Description Measured asymmetries in the quasi-elastic  $^3\text{He}(e, e'n)$  channel in the first measurements on identical apparatus with the target polarized in three orthogonal directions. These measurements constrain models that use polarized  $^3\text{He}$  as an effective neutron target.

### Biographical Sketch

- 2013–Present **Post Doctoral Research Associate**, *University of New Hampshire*, Durham, NH.  
Research Advisor: Prof. Karl Slifer
- Fall 2010 **Adjunct Professor**, *Thomas Nelson Community College*, Hampton, VA
- 2008–2012 **Graduate Student Researcher**, *Kent State University and Thomas Jefferson National Accelerator Facility*, Newport News, VA.

### Awards and Honors

- 2014 JSA Promising Young Scientist
- 2011 Nominated for Membership to Golden Key International Honor Society
- 2005 Society of Physics Students Leadership Scholarship  
Paul Yoder Scholarship  
Sigma Pi Sigma Induction
- 2002–2005 Academic Scholarship for Juniata College  
Juniata College Dean's List

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## Professional Experience

### Research

- 2013–Present **Post Doctoral Research Associate**, *University of New Hampshire*, Durham, NH.  
Lead an active role in the polarized target spin structure research program.
- Co-spokesperson of the approved Jefferson Lab experimental proposal PR12-13-011, *The Deuteron Tensor Structure Function  $b_1$* 
    - Developed software to calculate the kinematics and rates of the proposed experiment
  - Lead spokesperson of the submitted JLab Letter of Intent LOI12-14-002, *Tensor Asymmetry  $A_{zz}$  in the  $x > 1$  Region*
  - Mentored graduate students analyzing data from the JLab experiment E08-027, *A Measurement of  $g_2^p$  and the Longitudinal-Transverse Spin Polarizability*
  - Mentored undergraduate students working in the solid polarized target lab
  - Organized new laboratory to study spin polarization in nuclei
  - Analyzed data from the JLab experiment EG4, *The GDH Sum Rule with Nearly-Real Photons and the Proton  $g_1$  Structure Function at Low Momentum Transfer*
  - Finalized results from dissertation experiment and preparing them for first-author publication
  - Drew up CAD designs for equipment to be machined
  - Awarded travel funding through the JSA Promising Young Scientist program
  - Co-organized the 2014 Tensor Spin Observables Workshop at JLab
    - Co-PI on \$2000 Jefferson Science Associates grant for the workshop
  - Co-editor of the Proceedings of the 2014 Tensor Spin Observables Workshop
- 2008–2012 **Graduate Student Collaborator**, *Thomas Jefferson National Accelerator Facility*, Newport News, VA.  
Managed operations of the laboratory to lead to the successful completion of a number of nuclear physics experiments.
- Co-authored the approved experiment proposal C12-11-008, *A Proposal for the DarkLight Experiment at the Jefferson Laboratory Free Electron Laser*
    - Measured neutron and photon radiation backgrounds from cryomodules in the Free Electron Laser lab using NaI calorimeters
  - Tested 1877S Multi-hit TDCs for use in the JLab experiment E12-10-009, *A' Experiment*
  - Served as Run Coordinator for JLab experiment E06-014, *Precision Measurement of the Neutron  $d_2$ : Towards the Electric  $\chi_E$  and Magnetic  $\chi_B$  Color Polarizabilities*
  - Served as Shift Leader, Target Operator, and Analyzer for many Hall A experiments

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2008–2012 **Graduate Student Research Assistant**, *Kent State University*, Kent, OH, and *Thomas Jefferson National Accelerator Facility*, Newport News, VA.

Studied the internal structure of neutrons at a national electron accelerator laboratory.

- Served as Neutron Detector Expert during Jefferson Lab's Quasi-Elastic Family of Experiments E05-015, E05-102, E08-005
- Assembled, tested, calibrated, wired, and maintained the Hall A Neutron Detector and its associated ADC and TDC electronics
- Wrote analysis software in ROOT/C++ to calibrate and obtain useful data
- Calculated proton contamination and nitrogen dilution factors
- Applied particle identification cuts to isolate scattered electrons and correlated knocked-out neutrons
- Accounted for charge, target densities, target and beam polarizations, detector efficiencies
- Measured  ${}^3\text{He}^\uparrow(e, e'n)$  target single-spin asymmetry at  $Q^2 = 0.1, 0.5, \text{ and } 1.0 \text{ (GeV}/c)^2$
- Measured  ${}^3\vec{\text{He}}(\vec{e}, e'n)$  beam-target double-spin asymmetry at  $Q^2 = 0.5 \text{ and } 1.0 \text{ (GeV}/c)^2$  in two orthogonal directions in the scattering plane

Summer 2005 **REU Participant**, *Wright State University and Air Force Research Laboratory*, Dayton, OH.

Tested spectroscopic properties of a number of potentially conductive polymers.

- Produced samples of hP-pT, hTPA-pT, and p3HT polymers in a matrix of polycarbonate or PMMA
- Designed and built a frame to hold a diamond anvil cell which housed the polymers while the optical absorption was measured in a spectrometer

### Teaching

Fall 2010 **Adjunct Professor**, *Thomas Nelson Community College*, Hampton, VA.

Developed and engaged students in an algebra-based introductory physics curriculum.

- General College Physics I Lab (PHY-199)
  - 17 students
- General College Physics II Lecture (PHY-202-C81L)
  - 18 students
- General College Physics II Lab (PHY-202-C80H)
  - 18 students

2006–2008 **Teaching Assistantship**, *Kent State University*, Kent, OH.

Taught laboratory classes and guided students through a previously established curriculum.

- Physics in Art and Entertainment Lab (24041-020)
  - 19 students
  - Wrote guide for future instructors, which included grading scales, answer sheets, and examples of the physics concepts that students encountered in class and use on a daily basis
- Recitation for Introductory Physics

2004–2006 **Teaching Assistantship**, *Juniata College*, Huntingdon, PA.

Assisted faculty and engaged students in laboratory curricula.

- Introductory Physics Lab I (PC-206)
- Introductory Physics Lab II (PC-207)

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## Skills

### Overview

- Nuclear physics detectors, instrumentation, hardware, and analysis
- Curriculum development and instruction
- Collaboration management
- C++, ROOT, FORTRAN, Python, Processing
- HTML, Wiki, L<sup>A</sup>T<sub>E</sub>X
- Linux, Mac OS X, and Windows Development

### Software Development

- Developed FORTRAN and bash shell scripts to calculate and plot kinematics and rate estimates for proposed experiments
- Developed a Python script to search through a large number of HTML sites to extract run information and convert it to a CSV format
- Developed C++/ROOT scripts to fit gaussian TDC signals to a single channel and output the values needed to enter into the database to normalize it
- Developed C++/ROOT scripts to create a graphical representation of the neutron detector to keep track of the individual bars I was looking at
- Developed C++/ROOT scripts to apply correlation cuts on the data to cutout data that wasn't relevant
- Modified Perl script used to submit XML files to the Jefferson Lab supercomputer that would let my C++/ROOT scripts run on multiple computer nodes simultaneously
- Developed C++/ROOT scripts to analyze the cut data which fit and subtracted back grounds as well as isolated and analyzed signals
- Wrote dissertation and scientific articles using L<sup>A</sup>T<sub>E</sub>X
- Designed HTML website and Wiki pages to collaborate data with colleagues around the world
- Designed HTML websites for various organizations

## Hardware Experience

- Dynamically Nuclear Polarized Solid Targets
  - Installed and operated AMI 7T magnet
  - Designed and installed cryogenic thermometry system
- Neutron Detector
  - Expert with plastic scintillator neutron detector
  - Attached light guides with UV-activated glue
  - Tested for light-leaks
  - Designed brackets for the scintillator bar installation onto existing equipment
  - Installed and wired detector electronics
  - Calibrated electronic read-out devices including photomultiplier tubes, Phillips 776 amplifiers, LeCroy 1877 and 1877S TDCs, 1881 ADCs, and 4516 discriminators, and CAEN high voltage systems for data acquisition
- Gas Čerenkov Detector
  - Tested mu metal casing of photomultipliers to map the effects of external magnetic fields
  - Installed photomultipliers onto the detector

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## Service and Affiliations

### Professional Activities

- 2014–Present User's Group Board of Directors, Jefferson Lab
- *Postdoc Representative*
- 2009–Present American Physical Society
- *APS Member*
  - *DNP Member*
- 2009–Present Adopt-a-Physicist
- *Volunteer*
- 2008–Present Thomas Jefferson National Accelerator Facility's Hall A Collaboration
- *Member*
- 2010–2011 APS Forum of Graduate Student Affairs
- *Executive Committee Member at Large*
- 2006–2009 Kent State Graduate Association of Physics Students
- *President, 2007–2008*
  - *Member, 2006–2009*

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- 2002–2006 Juniata College Chapter of the Society of Physics Students
- Vice President, 2005–2006
  - President, 2004–2005
  - Member, 2002–2006

### Synergistic Activities

- 2012–Present oSTEM
- National Board Member
  - Director of the Trans Working Group
    - Co-organized annual National oSTEM Conference from 2012-present
- 2009–Present LGBT+ Physicists
- Founder
  - Organizer
    - Organized a 5-speaker invited session at the 2012 APS March Meeting with support from the APS Committee on the Status of Women in Physics, APS Committee on Minorities, and oSTEM
- 2013–2014 President's Committee on the Status of GLBT Issues, University of New Hampshire
- Member

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## Mentorship

- 2013–Present **University of New Hampshire Graduate Students.**
- Advised students and offered experiences with JLab's Hall A equipment and experimental techniques for graduate students working on experiment E08-027, *A Measurement of  $g_2^p$  and the Longitudinal-Transverse Spin Polarizability*, with a focus on extracting yields and dilution factors
- Tobias Badman
  - Ryan Zielinski
- 2013–Present **University of New Hampshire Undergraduate Students.**
- Advised and oversaw students working in the UNH polarized target lab with a focus on thermometry, automating electronics equipment through LabView, and development of an NMR system to measure polarization of a solid DNP target
- Zain Abbas
  - Justin Gilman
  - Makenzie O'Meara
- Summer 2008 **Jefferson Lab's High School Summer Honors Program.**
- Introduced high school student to equipment used at a national laboratory and helped her to develop a project for her science fair, *Cosmic Ray Detection Using Scintillators*
- Alania Foxx

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## Publications

### In Preparation

- E. Long, et al., *Single-spin asymmetry  $A_y^0$  in quasi-elastic  ${}^3\text{He}(e, e'n)$  scattering*, Phys. Rev. Lett., in preparation.
- E. Long, *Potential for a Tensor Asymmetry  $A_{zz}$  Measurement in the  $x > 1$  Region at Jefferson Lab*, IOP Conf. Series, in preparation.
- Y.-W. Zhang, E. Long, et al., *Measurement of the Target Normal Single-Spin Asymmetry in Quasi-Elastic Region from the Reaction  ${}^3\text{He}(e, e')X$* , Phys. Rev. Lett., in preparation.
- M. Mihovilovič, G. Jin, E. Long, et al., *Measurement of double-polarization asymmetries in the quasi-elastic  ${}^3\text{He}(\vec{e}, e'd)$  process*, Phys. Rev. Lett., in preparation, arXiv:1409.2253.
- V. Sulkosky, et al., *An Extraction of  $G_E^n$  at  $Q^2 = 0.98$  (GeV/c) $^2$  from Measurements of Inclusive  ${}^3\text{He}(e, e')$  Asymmetries*, Phys. Rev. Lett., in preparation.
- D. S. Parno, et al., *Precision Measurements of  $A_1^n$  in the Deep Inelastic Region*, Phys. Rev. Lett., in preparation.
- Y. Zhang, et al., *Measurement of pretzelosity asymmetry of charged pion production in Semi-Inclusive Deep Inelastic Scattering on a polarized  ${}^3\text{He}$  target*, Phys. Rev. Lett., in preparation.

### Peer Reviewed

- Y. X. Zhao, et al., *Single Spin Asymmetries in Charged Kaon Production from Semi-Inclusive Deep Inelastic Scattering on a Transversely Polarized  ${}^3\text{He}$  Target*, Phys. Rev. C **90**, 055201 (2014).
- M. Posik, et al., *A Precision Measurement of the Neutron Twist-3 Matrix Element  $d_2^n$ : Probing Color Forces*, Phys. Rev. Lett. **113**, 022002 (2014).
- J. Katich, et al., *Measurement of the Target-Normal Single-Spin Asymmetry in Deep-Inelastic Scattering from the Reaction  ${}^3\text{He}^\uparrow(e, e')X$* , Phys. Rev. Lett. **113**, 022502 (2014)
- I. Korover, et al., *Approaching the nucleon-nucleon short-range repulsive core via the  ${}^4\text{He}(e, e'pN)$  triple coincidence reaction*, Phys. Rev. Lett. **113**, 022501 (2014)
- K. Allada, et al., *Single spin asymmetries of inclusive hadrons produced in electron scattering from a transversely polarized  ${}^3\text{He}$  target*, Phys. Rev. C **89**, 042201 (2014)
- D. Wang, et al., *Measurement of parity violation in electron-quark scattering*, Nature **506**, 67-70 (2014)
- R. Alarcon, et al., *Measured radiation and background levels during transmission of megawatt electron beams through millimeter apertures*, Nucl. Instr. Meth. A, **729**, 233 (2013)
- D. Wang, et al., *Measurement of the Parity-Violating Asymmetry in Electron-Deuteron Scattering in the Nucleon Resonance Region*, Phys. Rev. Lett. **111**, 082501 (2013)

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- M. Mihovilović, et al., *Methods for Optical Calibration of the BigBite Hadron Spectrometer*, Nucl. Instr. Meth. A **686**, 20-30 (2012)
- J. Huang, et al., *Beam-Target Double Spin Asymmetry  $A_{LT}$  in Charged Pion Production from Deep Inelastic Scattering on a Transversely Polarized  $^3\text{He}$  Target at  $1.4 < Q^2 < 2.7\text{GeV}^2$* , Phys. Rev. Lett. **108**, 052001 (2012)
- Z. Ahmen, et al., *New Precision Limit on the Strange Vector Form-Factors of the Proton*, Phys. Rev. Lett. **108**, 102001 (2012)
- S. Abrahamyan, et al., *Search for a New Gauge Boson in Electron-Nucleus Fixed-Target Scattering by the APEX Experiment*, Phys. Rev. Lett. **107**, 191804 (2011)
- X. Qian, et al., *Single Spin Asymmetries in Charged Pion Production from Semi-Inclusive Deep Inelastic Scattering on a Transversely Polarized  $^3\text{He}$  Target*, Phys. Rev. Lett. **107**, 072003 (2011)
- X. Zhan, et al., *High Precision Measurement of the Proton Elastic Form Factor Ratio  $\mu_p G_E/G_M$  at Low  $Q^2$* , Phys. Lett. B **705**, 59-64 (2011)

### Proceedings

- E. Long, *Potential for a Tensor Asymmetry  $A_{zz}$  Measurement in the  $x > 1$  Region at Jefferson Lab*, J. Phys.: Conf. Ser. **543** 012010 (2014)
- K. Slifer, E. Long, *Novel Physics With Tensor Polarized Targets*, Proc. of Sci. PSTP2013 008 (2013)

## Presentations

### Invited Colloquia

- Sept. 2014 **Juniata College, Huntingdon, PA, USA.**  
*Understanding the Structure of Nucleons*
- Jan. 2014 **University of Manitoba, Winnipeg, MB, CA.**  
*Building the Bridge Between Partons and Nuclei*
- Sept. 2012 **Kent State University, Kent, OH, USA.**  
*Polarized  $^3\text{He}(e, e'n)$  Asymmetries in Three Orthogonal Measurements*

### Invited Seminars

- Oct. 2012 **University of New Hampshire, Durham, NH, USA.**  
*Understanding Neutrons Using  $^3\text{He}$*
- Aug. 2009 **Jefferson Lab Graduate Student Seminar, Newport News, VA, USA.**  
*Using Polarized  $^3\text{He}$  to Study  $A_y$ ,  $A_x$ ,  $A_z$ , and  $G_E^n$*

### Contributed Talks

- Sept. 2014 **APS DNP Long Range Plan: QCD and Hadronic Physics Town Hall Meeting, Philadelphia, PA, USA.**  
*Tensor Spin Observables*
- Apr. 2012 **APS April Meeting, Atlanta, GA, USA.**  
 *$A_y$  Measurement from  $^3\text{He}^\uparrow(e, e'n)$  Scattering at Jefferson Lab*

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- Apr. 2011 **APS April Meeting, Anaheim, CA, USA.**  
*Measurements from  ${}^3\text{He}(e, e'n)$  Scattering at Jefferson Lab*
- Feb. 2010 **APS April Meeting, Washington, DC, USA.**  
 *$A_y$  Measurement from  ${}^3\text{He}^\uparrow(e, e'n)$  Scattering at Jefferson Lab*
- Oct. 2009 **DNP Meeting, Waikoloa, HI, USA.**  
*The  ${}^3\text{He}(e, e'n)$  Channel in  $A_y$  and  $G_E^n$  Measurements*
- May 2009 **APS April Meeting, Denver, CO, USA.**  
*Know Your Target: Towards a Better Understanding of the  ${}^3\text{He}$  System*

#### Contributed Posters

- Aug. 2014 **Gordon Research Conference, Photonuclear Reactions, Holderness, NH, USA.**  
*Probing Nuclear Structure through Electron Scattering from Tensor Polarized Targets*
- Mar. 2012 **APS April Meeting, Atlanta, GA, USA.**  
*High Speed Data Acquisition in the APEX Dark Matter Experiment*
- July 2011 **Particles and Nuclei International Conference (PANIC), Cambridge, MA, USA.**  
 *$A_y$  Measurement from  ${}^3\text{He}(e, e'n)$  Scattering at Jefferson Lab*
- Aug. 2010 **Gordon Research Conference, Photonuclear Reactions, Tilton, NH, USA.**  
 *$A_y$  Measurement from  ${}^3\text{He}(e, e'n)$  Scattering at Jefferson Lab*

### Synergistic Presentations

#### Invited Talks

- Feb. 2012 **APS March Meeting, Boston, MA, USA.**  
*Physics Climate as Experienced by LGBT+ Physicists*
- Sept. 2011 **National oSTEM Conference, Washington, DC.**  
*Oh, the Places You'll Go (From Particles to Programming)*

#### Contributed Talks

- Jun. 2014 **Philadelphia Trans-Health Conference, Philadelphia, PA, USA.**  
*Trans People in STEM: Addressing Needs of Trans STEM Students and Professionals*
- Apr. 2011 **APS April Meeting, Anaheim, CA, USA.**  
*LGBT+ Issues in Physics*
- Feb. 2010 **APS April Meeting, Washington, DC, USA.**  
*LGBT+ Issues in Physics*

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