

Curriculum Vitae

Paul McConihay King Research Associate Professor

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Education

- 2000:** Ph.D. in Physics; The College of William and Mary in Virginia, Williamsburg, VA
Dissertation Title: *Precision Measurements of the Proton and Deuteron Polarized Structure Functions*
Adviser: Professor Keith Griffioen
- 1996:** M.S. in Physics; The College of William and Mary, Williamsburg, VA
- 1994:** B.A. in Physics; State University of New York College at Geneseo, Geneseo, NY

Employment

- 2021 - Present:** Research Associate Professor, Ohio University, Athens, OH.
- 2016 - 2021:** Lecturer, Ohio University, Athens, OH.
- 2006 - 2016:** Research Assistant Professor, Ohio University, Athens, OH.
- 2004 - 2006:** Postdoctoral Research Associate, University of Illinois at Urbana-Champaign, Urbana, IL.
- 2000 - 2004:** Research Associate, University of Maryland, College Park, MD.

Current and Past Grants

National Science Foundation

- 2021-2024** “Collaborative Research: Apparatus for Normalization and Systematic Control of the MOLLER Experiment” (King), NSF grant, \$1041k, 4 years.
- 2019-2022** “Study of the Electro-weak Structure of the Nucleon” (Roche, King), NSF grant, \$510k, 3 years.
- 2016-2019** “Study of the Electro-weak Structure of the Nucleon” (Roche, King), NSF grant, \$540k, 3 years.
- 2013-2016** “Study of the Electro-weak Structure of the Nucleon” (Roche, King), NSF grant, \$497k, 3 years.
- 2010-2013** “Study of the Electro-weak Structure of the Nucleon” (Roche, King), NSF grant, \$491k, 3 years.
- 2007-2010** “Study of the Electro-weak Structure of the Nucleon” (Roche, King), NSF grant, \$375k, 3 years.

Jefferson Science Associates

- 2021-2023** “Development for Hall A TDIS and MOLLER Programs” (King), subcontract award from Jefferson Science Associates; \$131k, 3 years.
- 2019** “Development for Hall A PREX, CREX, and TDIS Program” (King), subcontract award from Jefferson Science Associates; \$42.2k, 4 months.
- 2017** “Development for Hall A TDIS and parity program” (King), subcontract award from Jefferson Science Associates; \$41.6k, 4 months.
- 2016** “Development for Hall A DVCS, TDIS, and Parity Program” (King), subcontract award from Jefferson Science Associates; \$41.3k, 4 months.
- 2014** “Data acquisition development for DVCS” (King), subcontract award from Jefferson Science Associates; \$33.3k, 4 months.
- 2008-2012** “Data acquisition development for Qweak” (King), subcontract awards from Jefferson Science Associates; \$16k for 03/31/2008 to 06/30/2008, \$30k for 11/03/2008 to 11/02/2009, \$30k for 01/01/2010 to 06/30/2010, \$30.3k for 11/15/2010 to 03/31/2011, \$30.8k for 10/01/2011 to 05/31/2012.

Other Sponsors

- 2010-2012** “Parity-Violating Electron Scattering” (Roche, King), subcontract award from The College of William and Mary to support a joint postdoctoral fellow, \$150k, 3 years.
- 2008** “Beyond the Standard Model of particle physics” (Roche, King), Internal award from the Ohio University post-doctoral fellow program, \$25k, 1 year.
- 2006** “Strange Quark Form Factors of the Proton - A Program of Medium Energy Nuclear Physics” (King), Subcontract award from UIUC, \$20.9k, 3 months.

Service Activities**Departmental (Ohio University, Department of Physics and Astronomy)**

Dissertation committee member for U. Shrestha, Jan. 2019 - Jan 2021.

Doctoral research adviser for R. Radloff, Sep. 2018 - May 2022.

Masters thesis adviser for R. Radloff, May 2017 - Sep. 2018.

Masters thesis adviser for M. Anik, May 2017 - May 2018.

Dissertation committee member for T. Danley, April 2016 - Aug. 2018.

Dissertation committee chair for H. Attanayanke, June 2012 - May 2017.

Dissertation committee member for D. Divaratne, June 2012 - Feb. 2014.

Summer Internship adviser for thirteen undergraduate students at OU: M. Van Valkenburgh (2022), S. Carryer (2021), W. Eshbaugh (2020), M. Vallee (2018 & 2019), R. Radloff (2016), M. Scott (2015), M. Gomez (2014), A. Wood (2012), S. Meeker (2011), J. Kaisen (2010), B. Hatton (2009), R. Braid (2008), S. Elling (2007).

Professional community

Reviewer, National Science Foundation, 2017-2022

Chair of the JLab Hall A Coordination Committee, 2018-2019

Member-at-Large of the JLab Hall A Coordination Committee, 2017-2018

Member of the Qweak Institutional Council, 2007-2020

Recent Teaching Experience

PSC 1050/1051 “Color, Light, and Sound”, a physical science course for non-scientists offered as lecture and lecture+lab; Spring 2013, Spring 2014, Fall 2015, Sp 2017, Fall 2018.

PHYS 3001 “Mechanics”, classical mechanics for physics undergraduate majors; Fall 2012, Fall 2013, Fall 2015.

PHYS 3702 “Intermediate Laboratory - Photons & Nucleons”, laboratory course in nuclear and xray physics for physics undergraduate majors; Spring 2013, Spring 2015, Spring 2016, Spring 2017, Spring 2018.

PHYS 4032 “Electricity and Magnetism 2”, second semester of E&M for physics undergraduate majors; Spring 2018, Spring 2020.

PHYS 6751 “Graduate Laboratory: Nuclear and Particle”, laboratory course in nuclear physics for graduate students; Fall 2012, Spring 2014, Fall 2018, Fall 2020.

Selected Talks

Invited Talks

1. “Parity violation measurements of the neutron skin in ^{208}Pb and ^{48}Ca ”, Invited talk at the 2022 Congress of the Canadian Association of Physicists, McMaster University, Hamilton, Ontario, 6 June 2022.
2. “Hall A TDIS Run Group Proposal C12-15-006B.”, Jefferson Lab Program Advisory Committee (PAC49), Jefferson Lab, Newport News, VA, 21 July 2021.
3. “MOLLER Experiment.” For the MOLLER collaboration. Jefferson Lab Hall A/C Summer Collaboration Meeting, Jefferson Lab, Newport News, VA, 9 July 2021.
4. “MOLLER DAQ, Trigger, Monitoring: Requirements and Design”, Jefferson Lab MOLLER CD-1 Independent Project Review, Jefferson Lab, Newport News, VA, 14 October 2020.
5. “MOLLER DAQ, Trigger, Monitoring: Requirements and Design”, Jefferson Lab MOLLER Directors Review, Jefferson Lab, Newport News, VA, 19 August 2020.
6. “Data Acquisition and Online”, Jefferson Lab MOLLER Design Review, Jefferson Lab, Newport News, VA, 13 December 2019.
7. “Scattering electrons and neutron stars: PREX-II and CREX at Jefferson Lab”, Colloquium, Western Kentucky University, Bowling Green, KY, 4 November 2019.
8. “Measurement of the weak charge of the proton: Q_{weak} at Jefferson Lab”, For the Q_{weak} collaboration, Invited talk at XVII International Conference on Hadron Spectroscopy and Structure (Hadron2017), University of Salamanca, Spain, 26 September 2017.
9. “New limits on Physics Beyond the Standard Model from the Q_{weak} experiment”, Colloquium, Ohio University, 18 September 2017.
10. “Parity violating electron scattering at JLab: the MOLLER experiment.” For the MOLLER Collaboration. Invited talk at Southeastern Section of the American Physical Society (SESAPS) in Charlottesville, VA, 10 November 2016.
11. “The Q_{weak} Experiment.” For the Q_{weak} collaboration. Invited talk at QCD for New Physics at the Precision Frontier (INT-15-3) in Seattle, WA, 2 October 2015.
12. “First results from Q_{weak} .” For the Q_{weak} collaboration. Invited talk at APFB2014 in Hahndorf, SA, Australia, 10 April 2014.

Contributed Talks

13. “Beam-normal single spin asymmetries in electron-proton scattering”, For the Q_{weak} collaboration, Contributed talk at the 27th International Nuclear Physics Conference (INPC2019), Glasgow, UK, 2 August 2019.
14. “The Q_{weak} Experiment: First determination of the weak charge of the proton.” For the Q_{weak} collaboration. Contributed talk at PANIC2014 in Hamburg, Germany, 28 August 2014.
15. “ Q_{WEAK} at Jefferson Lab: precision measurement of the parity-violating e-P asymmetry.” For the Q_{weak} collaboration. Contributed talk at QNP2012 in Palaiseau, France, 18 April 2012.

Publications

Proposals

1. “Measurement of Tagged Deep Inelastic Scattering”. C.E. Keppel, B. Wojtsekhowski, P.M. King, D. Dutta, J.R.M. Annand, J. Zhang, *et al.* Jefferson Lab Proposal, PR12-15-006. 18 May 2014.
2. “Measurement of Tagged Deep Inelastic Scattering (TDIS)”. C.E. Keppel, B. Wojtsekhowski, P.M. King, D. Dutta, J.R.M. Annand, J. Zhang, *et al.* Jefferson Lab Proposal, PR12-14-010. 2 June 2014.
3. “Measurement of meson cloud in the nucleon”. P.M. King *et al.* Jefferson Lab Letter of Intent, LOI05-001. 6 December 2004.
4. “Measuring the two-photon exchange amplitude with vector analyzing powers in elastic electron-proton scattering”. S.P. Wells & P.M. King *et al.* Jefferson Lab Proposal, PR04-103. 24 May 2004.

Journal articles

1. “Precision Determination of the Neutral Weak Form Factor of ^{48}Ca ,” D. Adhikari *et al.* [CREX], Phys. Rev. Lett. **129**, 042501 (2022)
2. “Deeply Virtual Compton Scattering Cross Section at High Bjorken x_B ,” F. Georges *et al.* [Jefferson Lab Hall A], Phys. Rev. Lett. **128**, 252002 (2022)
3. “New Measurements of the Beam-Normal Single Spin Asymmetry in Elastic Electron Scattering over a Range of Spin-0 Nuclei,” D. Adhikari *et al.* [PREX and CREX], Phys. Rev. Lett. **128**, 142501 (2022)
4. “Determination of the ^{27}Al Neutron Distribution Radius from a Parity-Violating Electron Scattering Measurement,” D. Androic *et al.* [Qweak], Phys. Rev. Lett. **128**, 132501 (2022)
5. “Measurement of the Nucleon F_2^n/F_2^p Structure Function Ratio by the Jefferson Lab MARATHON Tritium/Helium-3 Deep Inelastic Scattering Experiment,” D. Abrams *et al.* [Jefferson Lab Hall A Tritium], Phys. Rev. Lett. **128**, 132003 (2022)
6. “Form Factors and Two-Photon Exchange in High-Energy Elastic Electron-Proton Scattering,” M. E. Christy *et al.* Phys. Rev. Lett. **128**, 102002 (2022)
7. “Deep Exclusive Electroproduction of π^0 at High Q^2 in the Quark Valence Regime,” M. Dlamini *et al.* [Jefferson Lab Hall A], Phys. Rev. Lett. **127**, 152301 (2021)
8. “Measurement of the Beam-Normal Single-Spin Asymmetry for Elastic Electron Scattering from ^{12}C and ^{27}Al ,” D. Androic *et al.* [QWeak], Phys. Rev. C **104**, 014606 (2021)
9. “Accurate Determination of the Neutron Skin Thickness of ^{208}Pb through Parity-Violation in Electron Scattering,” D. Adhikari *et al.* [PREX], Phys. Rev. Lett. **126**, 172502 (2021)
10. “Ruling out Color Transparency in Quasielastic $^{12}\text{C}(e,e'p)$ up to Q^2 of $14.2 (\text{GeV}/c)^2$,” D. Bhetuwal *et al.* [Hall C Collaboration] Phys. Rev. Lett. **126**, 082301 (2021)
11. “Probing the Deuteron at Very Large Internal Momenta,” C. Yero *et al.* [Hall C Collaboration] Phys. Rev. Lett. **125**, 262501 (2020)
12. “Precision Measurement of the Beam-Normal Single-Spin Asymmetry in Forward-Angle Elastic Electron-Proton Scattering,” D. Androic *et al.* [Qweak Collaboration], Phys. Rev. Lett. **125**, 112502 (2020)
13. “A modular apparatus for use in high-precision measurements of parity violation in polarized eV neutron transmission,” D.C. Schaper *et al.*, Nucl. Instrum. Methods Phys. Res. A **969**, 163961 (2020)
14. “Probing Few-Body Nuclear Dynamics via ^3H and ^3He ($e, e'p$)pn Cross-Section Measurements,” R. Cruz-Torres *et al.* [Jefferson Lab Hall A Tritium Collaboration] Phys. Rev. Lett. **124**, 212501 (2020)

15. “Parity-violating inelastic electron-proton scattering at low Q^2 above the resonance region,” D. Androic *et al.* [Qweak Collaboration], Phys. Rev. C **101**, 055503 (2020)
16. “Proton form factor ratio $\mu_p G_E^p/G_M^p$ from double spin asymmetry,” A. Liyanage *et al.* [SANE Collaboration], Phys. Rev. C **101**, 035206 (2020)
17. “Exclusive π^+ electroproduction off the proton from low to high $-t$,” S. Basnet *et al.* [Jefferson Lab $F_{\pi-2}$ Collaboration], Phys. Rev. C **100**, 065204 (2019)
18. “Unique Access to u -Channel Physics: Exclusive Backward-Angle Omega Meson Electroproduction” W. B. Li *et al.* [Jefferson Lab F_{π} Collaboration], Phys. Rev. Lett. **123**, 182501 (2019)
19. “Comparing proton momentum distributions in $A = 2$ and 3 nuclei via ${}^2\text{H}$ ${}^3\text{H}$ and ${}^3\text{He}$ ($e, e'p$) measurements,” R. Cruz-Torres *et al.* [Jefferson Lab Hall A Tritium Collaboration], Phys. Lett. B **797**, 134890 (2019)
20. “Measurement of the single-spin asymmetry A_y^0 in quasi-elastic ${}^3\text{He}^\uparrow(e, e'n)$ scattering at $0.4 < Q^2 < 1.0 \text{ GeV}/c^2$ ” E. Long *et al.*, Phys. Lett. B **797**, 134875 (2019)
21. “Revealing Color Forces with Transverse Polarized Electron Scattering,” W. Armstrong *et al.* [SANE Collaboration], Phys. Rev. Lett. **122**, no. 2, 022002 (2019)
22. “Measurement of double-polarization asymmetries in the quasi-elastic ${}^3\bar{\text{H}}e(\vec{e}, e'p)$ process,” M. Mihovilovic *et al.* [Jefferson Lab Hall A Collaboration], Phys. Lett. B **788**, 117 (2019).
23. “Precision measurement of the weak charge of the proton,” D. Androic *et al.* [Qweak Collaboration], Nature **557**, no. 7704, 207 (2018).
24. “One- and two-neutron removal cross sections of O24,” D. A. Divaradne *et al.*, Phys. Rev. C **98**, no. 2, 024306 (2018).
25. “Separated Kaon Electroproduction Cross Section and the Kaon Form Factor from 6 GeV JLab Data,” M. Carmignotto *et al.*, Phys. Rev. C **97**, no. 2, 025204 (2018).
26. “Design and Performance of the Spin Asymmetries of the Nucleon Experiment,” J. D. Maxwell *et al.*, Nucl. Instrum. Meth. A **885**, 145 (2018).
27. “Polarization Transfer Observables in Elastic Electron Proton Scattering at $Q^2 = 2.5, 5.2, 6.8,$ and 8.5 GeV^2 ,” A. J. R. Puckett *et al.*, Phys. Rev. C **96**, no. 5, 055203 (2017). Erratum: Phys. Rev. C **98**, no. 1, 019907 (2018).
28. “Extraction of the Neutron Electric Form Factor from Measurements of Inclusive Double Spin Asymmetries,” V. Sulkosky *et al.*, Phys. Rev. C **96**, no. 6, 065206 (2017).
29. “A novel comparison of Miller and Compton electron-beam polarimeters,” J. A. Magee *et al.*, Phys. Lett. B **766**, 339 (2017).
30. “Precision Electron-Beam Polarimetry at 1 GeV Using Diamond Microstrip Detectors,” A. Narayan *et al.*, Phys. Rev. X **6**, no. 1, 011013 (2016).
31. “Measurement of the Target-Normal Single-Spin Asymmetry in Quasielastic Scattering from the Reaction ${}^3\text{He}^\uparrow(e, e')$,” Y. W. Zhang *et al.*, Phys. Rev. Lett. **115**, 172502 (2015).
32. “Measurement of parity-violating asymmetry in electron-deuteron inelastic scattering,” D. Wang *et al.* [PVDIS Collaboration], Phys. Rev. C **91**, 045506 (2015).
33. “Separated Response Functions in Exclusive, Forward π^\pm Electroproduction on Deuterium,” G. M. Huber *et al.* [Jefferson Lab F_{π} Collaboration], Phys. Rev. C **91**, 015202 (2015).
34. “The Q_{weak} experimental apparatus,” T. Allison *et al.* [Qweak Collaboration], Nucl. Instrum. Meth. A **781**, 105 (2015).

35. “Measurement of double-polarization asymmetries in the quasielastic ${}^3\bar{\text{H}}\text{e}(\vec{e}, e'd)$ process,” M. Mihovilovic *et al.* [Jefferson Lab Hall A Collaboration], *Phys. Rev. Lett.* **113**, 232505 (2014).
36. “Separated Response Function Ratios in Exclusive, Forward π^\pm Electroproduction,” G. M. Huber *et al.* [Jefferson Lab Fpi Collaboration], *Phys. Rev. Lett.* **112**, 182501 (2014).
37. “Measurement of the structure function of the nearly free neutron using spectator tagging in inelastic ${}^2\text{H}(e, e'p_s)X$ scattering with CLAS,” S. Tkachenko *et al.* [CLAS Collaboration], *Phys. Rev. C* **89**, 045206 (2014), [Publisher’s Note: *Phys. Rev. C* **90**, 059901 (2014)].
38. “Measurement of parity violation in electronquark scattering,” D. Wang *et al.* [PVDIS Collaboration], *Nature* **506**, 67 (2014).
39. “First Determination of the Weak Charge of the Proton,” D. Androic *et al.* [Qweak Collaboration], *Phys. Rev. Lett.* **111**, 141803 (2013).
40. “Measurements of Parity-Violating Asymmetries in Electron-Deuteron Scattering in the Nucleon Resonance Region,” D. Wang *et al.* [PVDIS Collaboration], *Phys. Rev. Lett.* **111**, 082501 (2013).
41. “New Measurements of the Transverse Beam Asymmetry for Elastic Electron Scattering from Selected Nuclei,” S. Abrahamyan *et al.* [HAPPEX and PREX Collaborations], *Phys. Rev. Lett.* **109**, 192501 (2012).
42. “Polarization components in π^0 photoproduction at photon energies up to 5.6 GeV,” W. Luo *et al.* [Gep-III and GEp2gamma collaboration], *Phys. Rev. Lett.* **108**, 222004 (2012).
43. “Measurement of the neutron F2 structure function via spectator tagging with CLAS,” N. Baillie *et al.* [CLAS Collaboration], *Phys. Rev. Lett.* **108**, 142001 (2012), [Publisher’s Note: *Phys. Rev. Lett.* **108**, 199902 (2012)].
44. “Measurement of the parity-violating asymmetry in inclusive electroproduction of π^- near the Δ^0 resonance,” D. Androic *et al.* [G0 Collaboration], *Phys. Rev. Lett.* **108**, 122002 (2012).
45. “Measurement of the Neutron Radius of 208Pb Through Parity-Violation in Electron Scattering,” S. Abrahamyan *et al.* [PREX Collaboration], *Phys. Rev. Lett.* **108**, 112502 (2012).
46. “New Precision Limit on the Strange Vector Form Factors of the Proton,” Z. Ahmed *et al.* [HAPPEX Collaboration], *Phys. Rev. Lett.* **108**, 102001 (2012).
47. “Transverse Beam Spin Asymmetries at Backward Angles in Elastic Electron-Proton and Quasi-elastic Electron-Deuteron Scattering,” D. Androic *et al.* [G0 Collaboration], *Phys. Rev. Lett.* **107**, 022501 (2011).
48. “The G0 Experiment: Apparatus for Parity-Violating Electron Scattering Measurements at Forward and Backward Angles,” D. Androic *et al.* [G0 Collaboration], *Nucl. Instrum. Meth.* **A646**, 59-86 (2011).
49. “Search for effects beyond the Born approximation in polarization transfer observables in $\vec{e}p$ elastic scattering,” M. Mezziane *et al.* [Gep2gamma Collaboration], *Phys. Rev. Lett.* **106**, 132501 (2011).
50. “Recoil Polarization Measurements of the Proton Electromagnetic Form Factor Ratio to $Q^2 = 8.5 \text{ GeV}^2$,” A. J. R. Puckett, *et al.*, *Phys. Rev. Lett.* **104**, 242301 (2010).
51. “Cross sections and Rosenbluth separations in $\text{H-1}(e, e'\text{K}^+)\text{Lambda}$ up to $Q^{*2} = 2.35\text{-GeV}^{*2}$,” M. Coman *et al.*, *Phys. Rev.* **C81**, 052201 (2010).
52. “Strange Quark Contributions to Parity-Violating Asymmetries in the Backward Angle G0 Electron Scattering Experiment,” D. Androic *et al.*, *Phys. Rev. Lett.* **104**, 012001 (2010).
53. “Charged pion form factor between $Q^2 = 0.60 \text{ GeV}^2$ and 2.45 GeV^2 . I. Measurements of the cross section for the $H_1(e, e'\pi^+)n$ reaction”, H.P. Blok *et al.*, *Phys. Rev.* **C78**, 045202 (2008).

54. "Charged pion form factor between $Q^2 = 0.60 \text{ GeV}^2$ and 2.45 GeV^2 . II. Determination of, and results for, the pion form-factor", G.M. Huber *et al.*, Phys. Rev. **C78**, 045203 (2008).
55. "Transverse Beam Spin Asymmetries in Forward-Angle Elastic Electron-Proton Scattering" D. S. Armstrong *et al.*, Phys. Rev. Lett. **99**, 092301 (2007).
56. "G⁰ Electronics and Data Acquisition (Forward-Angle Measurements)" D. Marchand *et al.*, Nucl. Instrum. Meth. **A586**, 251-269 (2008).
57. "Precision Measurements of the Nucleon Strange Form Factors at $Q^{*2} \sim 0.1\text{-GeV}^{*2}$ " A. Acha *et al.*, Phys. Rev. Lett. **98**, 032301 (2007).
58. "Determination of the charged pion form factor at $Q^{*2} = 1.60\text{-(GeV/c)}^{*2}$ and 2.45-(GeV/c)^{*2} " T. Horn *et al.*, Phys. Rev. Lett. **97**, 192001 (2006).
59. "Ortho-para transition rate in mu-molecular hydrogen and the proton's induced pseudoscalar coupling $g(p)$ " J. H. D. Clark *et al.* Phys. Rev. Lett. **96**, 073401 (2006).
60. "Strange quark contributions to parity-violating asymmetries in the forward Gzero electron-proton scattering experiment" D.S. Armstrong *et al.*, Phys. Rev. Lett. **95**, 092001 (2005).
61. "Parity-violating electron deuteron scattering and the proton's neutral weak axial vector form factor" T.M. Ito *et al.*, Phys. Rev. Lett. **92**, 102003 (2004).
62. "Precision measurement of the proton and deuteron spin structure functions g_2 and asymmetries A_2 ." P.L. Anthony *et al.*, Phys. Lett. **B553**, 18-24 (2003).
63. "Measurements of the Q^2 dependence of the proton and neutron spin structure functions g_1^p and g_1^n ." P.L. Anthony *et al.* (E155 Collaboration). Phys. Lett. B **493** (2000) 19.
64. "Measurement of the deuteron spin structure function $g_1^d(x)$ for $1 \text{ (GeV/c)}^2 < Q^2 < 40 \text{ (GeV/c)}^2$." P.L. Anthony *et al.* (E155 Collaboration). Phys. Lett. B **463** (1999) 339.
65. "Inclusive hadron photoproduction from longitudinally polarized protons and deuterons." P.L. Anthony *et al.* (E155 Collaboration). Phys. Lett. B **458** (1999) 536.
66. "Measurement of the proton and deuteron spin structure functions g_2 and asymmetry A_2 ." P.L. Anthony *et al.* (E155 Collaboration). Phys. Lett. B **458** (1999) 529.