

# Wouter Deconinck

## Activity Report, Calendar Year 2014

### Major Contributions:

*In the Spring of 2014, Deconinck was one of the co-authors of the publication in Nature of the results of the parity-violating deep inelastic scattering experiment at Jefferson Lab. In 2014, Deconinck supervised 4 graduate students and 9 undergraduate students. In the Spring of 2014, Deconinck was on a teaching leave. In the Fall of 2014, Deconinck taught introductory physics for life sciences for 170 students.*

### Scholarly and Professional Activities-Research:

#### Invited Talks

- “The Qweak Experiment: The First Determination of the Proton’s Weak Charge,” astro/nuclear/high energy physics seminar at University of Michigan, Spring 2014.
- “The Qweak Experiment: The First Determination of the Proton’s Weak Charge,” nuclear physics colloquium at MIT, Spring 2014.
- “The Qweak Experiment: The First Determination of the Proton’s Weak Charge,” nuclear physics seminar at BNL, Spring 2014.
- “The Qweak Experiment: The First Determination of the Proton’s Weak Charge,” physics colloquium at Kenyon College, Spring 2014.
- “Sub-Percent Electron Polarimetry for the EIC,” Electron-Ion Collider 2014 accelerator workshop at JLab, Spring 2014.
- Gender, Sexuality and Women Studies brown bag lunch seminar on “Queer Geeks: Creating an LGBT+ Inclusive Climate in the Physical Sciences.”

#### Contributed Talks/Posters (none)

- “Parity-violating and parity-conserving asymmetries in electron-proton and electron-nucleus scattering at the Qweak experiment,” Southeastern Section of the APS (SESAPS).

#### Refereed Papers Published

1. “Spin density matrix elements in exclusive  $\omega$  electroproduction on  $^1\text{H}$  and  $^2\text{H}$  targets at 27.5 GeV beam energy,” HERMES Collaboration (A. Airapetian et al.), Eur.Phys.J. C74 (2014) 11, 3110.
2. “Transverse polarization of  $\Lambda$  hyperons from quasireal photoproduction on nuclei,” HERMES Collaboration (A. Airapetian et al.), Phys.Rev. D90 (2014) 7, 072007.
3. “Single spin asymmetries in charged kaon production from semi-inclusive deep inelastic scattering on a transversely polarized  $^3\text{He}$  target,” Jefferson Lab Hall A Collaboration (Y.X. Zhao et al.), Phys.Rev. C90 (2014) 5, 055201.
4. “Early results from the  $Q_{\text{weak}}$  experiment,” D. Androic et al., EPJ Web Conf. 66 (2014) 05002.
5. “A Precision Measurement of the Neutron Twist-3 Matrix Element  $d_2^n$ : Probing Color Forces,” Jefferson Lab Hall A Collaboration (M. Posik et al.), Phys.Rev.Lett. 113 (2014) 2, 022002.
6. “Measurement of parity violation in electron-quark scattering,” PVDIS Collaboration (D. Wang et al.), Nature 506 (2014) 7486, 67-70.
7. “Probing the Repulsive Core of the Nucleon-Nucleon Interaction via the  $^4\text{He}(e,e'pN)$  Triple-Coincidence Reaction,” Lab Hall A Collaboration (I. Korover et al.), Phys.Rev.Lett. 113 (2014) 2, 022501.
8. “Reevaluation of the parton distribution of strange quarks in the nucleon,” HERMES Collaboration (A. Airapetian et al.), Phys.Rev. D89 (2014) 9, 097101.
9. “Measurement of pretzelosity asymmetry of charged pion production in Semi-Inclusive Deep Inelastic Scattering on a polarized  $^3\text{He}$  target,” Jefferson Lab Hall A Collaboration (Y. Zhang et al.), Phys.Rev. C90 (2014) 5, 055209.
10. “Single spin asymmetries of inclusive hadrons produced in electron scattering from a transversely polarized  $^3\text{He}$  target,” Jefferson Lab Hall A Collaboration (K. Allada et al.), Phys.Rev. C89 (2014) 4, 042201.
11. “Measurement of the Target-Normal Single-Spin Asymmetry in Deep-Inelastic Scattering from the Reaction  $^3\text{He}(e,e')X$ ,” J. Katich et al., Phys.Rev.Lett. 113 (2014) 2, 022502.
12. “Beam-helicity asymmetry in associated electroproduction of real photons  $e p \rightarrow e \gamma \pi N$  in the  $\Delta$ -resonance region,” HERMES Collaboration (A. Airapetian et al.), JHEP 1401 (2014) 077.
13. “Transverse target single-spin asymmetry in inclusive electroproduction of charged pions and kaons,” HERMES Collaboration (A. Airapetian et al.), Phys.Lett. B728 (2014) 183-190.

#### Unpublished Reports

1. “Pentaquark  $\Theta^+$  search at HERMES,” HERMES Collaboration (N. Akopov et al.); arXiv:1412.7317 [hep-ex].
2. “The MOLLER Experiment: An Ultra-Precise Measurement of the Weak Mixing Angle Using Møller Scattering,” MOLLER Collaboration (J. Benesch et al.); arXiv:1411.4088 [nucl-ex].
3. “Measurement of Parity-Violating Asymmetry in Electron-Deuteron Inelastic Scattering,” D. Wang et al.; arXiv:1411.3200 [nucl-ex].
4. “The  $Q_{\text{weak}}$  Experimental Apparatus,” Qweak Collaboration (T. Allison et al.); arXiv:1409.7100 [physics.ins-det].
5. “Precision Measurements of  $A_1^n$  in the Deep Inelastic Regime,” Jefferson Lab Hall A Collaboration (D.S. Parno et al.); arXiv:1406.1207 [nucl-ex].

#### Grants and Awards

- NSF MPS “Precision Electroweak Measurements using Parity-Violating Electron Scattering”, 06/2012-05/2015, \$300k.
- NSF MPS “Precision Studies of the Standard Model using Parity-Violating Electron Scattering” (as co-PI with PI Armstrong), 08/2014-07/2017, \$900k.
- NSF REU (as PI with co-PI Jack Kossler): 06/2012-05/2014, \$180k.
- NSF REU (as PI with co-PI Irina Novikova): 06/2014-05/2017, \$309k.
- Jefferson Science Associates “Promising Young Scientist Program,” \$4k.
- National Nuclear Physics Summer School 2014: \$40k through National Science Foundation, \$10k through Jefferson Lab.

### Teaching:

#### Courses

- Fall 2014, PHYS107, “Physics for Life Sciences.” The students reported in their evaluations that the midterms were too difficult, despite having passed muster by multiple colleagues who have taught 107 before. The final exam was for 80% identical to the 2010 final exam for 107: averages and standard deviations were remarkably similar between the two exam, despite differences in instructors, textbook, and current lack of problem sessions.

#### Senior/Honor Theses

- Rachel Taverner (honors, Summer 2013-Spring 2014): Determination and simulation of kinematic parameters in the Qweak experiment at JLab. Rachel is currently a graduate student at Michigan State University.
- Jack Anderson (senior, Spring 2013-Spring 2014): Simulation in Geant4 of the calorimeter for the SoLID experiment at JLab.
- Oscar Deaver (senior, Summer 2014-present): Gain and crosstalk measurements of multi-anode photomultipliers for the SoLID experiment at JLab.
- Chris Haufe (honors, Spring 2013-present): Effect of different physical process lists on the detected rates in the MOLLER experiment; crosstalk between detectors in a full detector array simulation of the MOLLER experiment at JLab.
- Alice Perrin (honors, Fall 2014-present): Development of UV-curing resins for 3D printing of scintillators. Alice received the JSA Minority Undergraduate Research Assistantship to which she applied under the guidance of Charles Perdrisat.
- Marcus Starman (honors as junior, Fall 2013-present): Simulation of the MOLLER calorimeter using GDML; determination of the background asymmetry from hyperon generation in the Qweak experiment at JLab.

#### Summer Research Students (REU)

- Daniel Nemes (The College of New Jersey): Analysis and simulation of detector geometry rotations of the Qweak Vertical Drift Chambers. Dan has continued his research project at TCNJ, and he has presented his results at a Qweak collaboration meeting at Jefferson Lab in November 2014.
- Patrick Haurie (Longwood University): Gain and crosstalk measurements of multi-anode photomultiplier tubes for the SoLID experiment at JLab. Patrick presented a poster at the APS DNP Fall meeting in Hawaii through the CEU program.
- Marika McCarthy (Willamette University): Determination of kinematics in the Geant4 simulation of the Qweak experiment.

#### Undergraduate Research Students

- Rachel Hyneman (junior, Fall 2013-Spring 2014): Compton polarimetry at Jefferson Lab; construction of a musical Tesla coil.
- Melissa Guidry (freshman, Fall 2013-Fall 2014): Dependence of kinematic parameters on beam slope in the Qweak experiment; developing 3D printing capabilities with underwater-biodegradable PHA filament.

#### Graduate Students

- Juan Carlos Cornejo (Fall 2010-present): Compton polarimetry for the Qweak experiment at JLab, anticipated graduation in Spring/Summer 2015.
- Valerie Gray (Fall 2011-present): Track reconstruction and simulations for the Qweak experiment at JLab, anticipated graduation Spring/Summer 2016.
- Kurtis Bartlett (Summer 2012-present): Simulation of Moller scattering in the Qweak experiment using Geant4 and analysis of parity-conserving transversely polarized Carbon and Aluminum elastic scattering, anticipated graduation 2017.
- Darren Getts (Summer 2014): Implementation in Geant4 of the bubble chamber detector for oxygen photo-dissociation experiment at JLab.

#### Post Docs (none)

#### Service:

#### Department

- Fall 2010-present: Graduate admissions committee (represented department at grad fairs at Northeast CUWiP at Penn State, APS April 2014 meeting in Savannah, GA, SESAPS 2014 meeting in Columbia, SC; presentations to senior class; review of statements for current seniors applying to grad school).
- Summer 2012-present: W&M Physics REU site coordinator (12-15 non-W&M students and ~20 W&M students, implemented new program components such as tutorials, poster session, power plant trip), represented program at the Council for Undergraduate Research (CUR) symposium, Fall 2014, including poster session at the National Science Foundation (one invited poster by Harley Marrocco, who worked in Mumtaz Qazilbash's lab).
- Fall 2012-present: External relations committee (quarterly newsletters to alumni, website improvements, development of publicity materials).
- Fall 2013-present: Small Hall MakerSpace co-founder with Josh Erlich.
- Participation in conference on "Introductory Physics for Life Sciences" (IPLS 2014).
- Annual review committee: Raymundo Ramon, Zhen Wang, Matt Burton, Aria Johanssen, Yang Wang, Melissa Cummings, Josh Hoskins, Josh Magee, Jim Dowd, Sebouh Paul, AJ Pyle (and my own graduate students).
- Dissertation committee: Zak Brown (adviser: Orginos).
- Seminar host: "The nucleus at short distances" (Wim Cosyn, University of Gent), "A Potential Foundation for Emergent Space-Time" (Newshaw Bahreyni, Kenyon College), "Opportunities for Fundamental Interaction Studies Using Light Meson Decays in GlueX/Hall D" (Dave Mack, JLab).
- Colloquium host: "Experimental Tests of QCD Symmetries with Pions" (Aron Bernstein, MIT), "The SeaQuest Experiment at Fermilab" (Markus Dieffenthaler, University of Illinois, Urbana-Champaign).

#### University

- Selection committee for Charles Center scholarships for the physical sciences.
- Selection committee for Laurie Sanderson graduate award for excellence in undergraduate mentoring.
- Member of the organizing committee for the 2015 Boswell Symposium on the topic of "LGBT Youth."
- Moderator for William & Mary's honors symposium, undergraduate science research symposium.
- Freshmen adviser, Spring 2014 (8 students), Fall 2014 (8 students). Major adviser (2 students).

#### Physics Community

- PI on Jefferson Science Associates Initiatives Fund "Promising Young Physicist" project: selection of JLab postdocs for mock job interviews, including review and feedback on job application dossiers and presentations. Hosted Kei Moriya (Indiana University). Successfully transferred the program to new PI: Juliette Mammei (University of Manitoba), who participated in this program herself.
- LGBT issues/gender diversity in physics:
  - Organizer of discussion session at APS April 2014 meeting in Savannah, GA, and SESAPS 2014 meeting in Columbia, SC.
  - Member of the APS ad-hoc committee on LGBT+ issues in physics.
- Convenor at the Electron-Ion Collider 2014 accelerator workshop at JLab, chair of two sessions, delivered summary plenary talk.
- Convenor at the Electron-Ion Collider 2014 collaboration meeting at Stony Brook University, chair of two sessions, delivered summary plenary talk.
- Organizer of National Nuclear Physics Summer School 2014 at William & Mary.

#### Public Outreach

- Assisted in QuarkNet masterclass, Spring 2013.
- Participated in NewtonFest 2014, PhysicsFest 2014, Jefferson Lab open house, USA Science and Engineering Festival (APS booth).