

# AMY N. NICHOLSON

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Dec. 13, 2019

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## RESEARCH INTERESTS

QCD at finite density, Strongly interacting few- and many-body systems,  
Monte Carlo sign problems, Lattice field theory, Effective field theory

## EDUCATION

UNIVERSITY OF WASHINGTON, *Seattle, WA*

Ph.D., Physics, *August 2011*

- Advisor: David B. Kaplan
- Thesis: Lattice techniques for studies of multi-particle systems

M.S., Physics, *June 2007*

NEW YORK UNIVERSITY, *New York, NY*

B.S., Physics (*minors in Mathematics, Biology, and French*), *June 2004*

## ACADEMIC POSITIONS

ASSISTANT PROFESSOR

University of North Carolina, Chapel Hill, NC *July 2017 to present*

POSTDOCTORAL RESEARCH ASSISTANT

University of California, Berkeley, CA *Sept. 2014 to June 2017*

POSTDOCTORAL RESEARCH ASSISTANT

University of Maryland, College Park, MD *Sept. 2011 to Aug 2014*

AWARDS

2018 Finalist: ACM Gordon Bell Prize for “Innovations in applying high-performance computing to science, engineering, and large-scale data analytics”

SELECTED  
INVITED  
PRESENTATIONS

ELECTROMAGNETIC INTERACTIONS WITH NUCLEONS AND NUCLEI (EINN 2019)

*Oct. 2019, Paphos, Cyprus*

Plenary talk: Nuclear Physics from Lattice QCD

APS DIVISION OF NUCLEAR PHYSICS FALL MEETING 2019

*Oct. 2019, Crystal City, VA*

Invited Talk: Theoretical approaches toward an understanding of double beta decay

QUARK CONFINEMENT AND THE HADRON SPECTRUM (CONFINEMENT XIII)

*Aug. 2018, Maynooth, Ireland*

Plenary Talk: Double beta decay, low energy hadron physics, neutron EDM: results from Lattice QCD

CONFERENCE ON THE INTERSECTIONS BETWEEN PARTICLE AND NUCLEAR PHYSICS (CIPANP 2018)

*Jun. 2018, Palm Springs, CA*

Plenary Talk: Symmetries and interactions from lattice QCD

APS DIVISION OF NUCLEAR PHYSICS FALL MEETING 2016

*October 2016, Vancouver, British Columbia*

Invited Talk: “Baryon phase shifts from improved operators”

LATTICE 2016: THE 34<sup>TH</sup> INTERNATIONAL SYMPOSIUM ON LATTICE FIELD THEORY

*July 2016, Southampton, United Kingdom*

Plenary Talk: “Neutrinoless double beta decay from lattice QCD”

FRIB THEORY ALLIANCE INAUGURAL MEETING

*April 2016, East Lansing, MI*

Invited Talk: “Nuclear physics from lattice QCD”

RECENT  
COLLOQUIA

January, 2020: University of Pennsylvania, Philadelphia, PA  
September, 2018: Los Alamos National Lab, Los Alamos, NM  
November, 2017: Old Dominion University, Norfolk, VA  
April, 2017: San Diego State University, San Diego, CA  
February, 2017: University of North Carolina, Chapel Hill, NC  
February, 2017: University of the Pacific, Stockton, CA

RECENT  
SEMINARS

July, 2019: CENPA, University of Washington, Seattle, WA  
February, 2019: MIT, Cambridge, MA  
August, 2018: CERN, Geneva, Switzerland  
April, 2018: Duke University, Durham, NC  
March, 2018: University of Maryland, College Park, MD  
November, 2017: Jefferson Lab, Newport News, VA  
April, 2017: Fermilab, Batavia, IL  
April, 2017: University of Illinois, Urbana-Champaign, IL  
February, 2017: University of Massachusetts, Amherst, MA  
January, 2017: Michigan State University, East Lansing, MI

RECENT  
CONFERENCES/  
WORKSHOPS

INT WORKSHOP: Fundamental Symmetries Research with  
Beta Decay  
*Nov., 2019, Seattle, WA*  
*To produce a white paper requested by DOE NP*

ECT\* WORKSHOP: Exploring Nuclear Physics with Ultracold Atoms  
*June 2018, Trento, Italy*

INTERNATIONAL CONFERENCE ON MESON-NUCLEON  
PHYSICS AND THE STRUCTURE OF THE NUCLEON (MENU  
2019)  
*June, 2019, Pittsburgh, PA*

INT WORKSHOP: Nuclear Structure at the Crossroads  
*July 2019, Seattle, WA*

ECT\* WORKSHOP: Exploring Nuclear Physics with Ultracold Atoms  
*June 2018, Trento, Italy*

INT WORKSHOP: Multi-Hadron Systems from Lattice QCD  
*Feb. 2018, Seattle, WA*

CP<sup>3</sup> LATTICE WORKSHOP: Technical Advances in Lattice Field  
Theory  
*Dec. 2017, Odense, Denmark*

APS DIVISION OF NUCLEAR PHYSICS FALL MEETING  
*Oct. 2017, Pittsburgh, PA*

INT WORKSHOP: LQCD Input for Neutrinoless Double Beta Decay  
*July 2017, Seattle, WA*

INT PROGRAM: Neutrinoless Double-Beta Decay  
*June 2017, Seattle, WA*

## SYNERGISTIC ACTIVITIES

Member of the Flavour Lattice Averaging Group (FLAG) (2018)

Invited lecturer: Summer School on “Frontiers in Lattice QCD”, Peking  
University, Beijing, China, 2019,

ECT\* doctoral training program “Computational Nuclear Physics -  
Hadrons, Nuclei and Dense Matter”, Trento, Italy, 2015

PI for NERSC computing proposal: A variational determination of two-  
nucleon elastic scattering at  $m_{\pi} \sim 220$  MeV from Lattice QCD (2018,  
2019)

Co-PI for 2019 computing proposals: INCITE award on Summit, Early  
Science time on Sierra, Early Science time on Summit, Tier 1 allocation  
at Livermore computing

Co-organizer: INT Workshop “LQCD Input for Neutrinoless Double  
Beta Decay” Seattle, WA (2017),  
ECT\* workshop “Progress and Challenges in the Theory of Neutrinoless  
Double Beta Decay” - Trento, Italy (2019)

Presented at SHAPE 2018: Symposium on Horizons in Astronomy and Physics Education (2018),  
MAJORANA Collaboration Meeting (2018),  
DOE midterm review for the topical collaboration on “Nuclear Theory for Double Beta Decay and Fundamental Symmetries” (2019)

Contributed chapter for the textbook: An Advanced Course in Computational Nuclear Physics, eds. Morten Hjorth-Jensen, Maria Paola Lombardo, Ubirajara van Kolck, published by Springer Press (2017)

Departmental Committees: Graduate Admissions (Fall 2017, Spring 2018, Fall 2018, Fall 2019, Spring 2019), Undergraduate Studies (Fall 2017, Spring 2018), Website (Fall 2018), SPS/WIP Advisor (Fall 2018)

**TEACHING/  
SUPERVISORY  
ACTIVITIES**

Phys. 119 (Spring 2018) 94 students

Phys. 119 (Fall 2018) 84 students

Supervisory roles:

Graduate

Nolan Miller (to complete Prelim Fall 2019)

Zack Hall

Postdoctoral

Henry Monge-Camacho (hired as faculty at the University of Costa Rica beginning Fall 2020)

Undergraduate

Chase Roycroft (Fall 2018, Spring 2019)

Grant Bradley (Spring 2019)

## PUBLICATIONS

Sub-percent scale setting with the Omega baryon mass  
Logan Carpenter, Nolan Miller, Henry Monge-Camacho, Christopher Monahan, Enrico Rinaldi, Amy Nicholson, Pavlos Vranas, Andre Walker-Loud

*In preparation* (Feb. 2020)

Non-perturbative renormalization of 4-quark operators  
David Brantley, Nicolas Garron, Henry Monge-Camacho, Amy Nicholson, Andre Walker-Loud

*In preparation* (Jan. 2020)

Determination of  $g_A(0)$  and  $g_A(q^2)$  from Lattice QCD

Jason Chang, Luigi Del Debbio, Amy Nicholson, Sergey Syritsyn, Pavlos Vranas, Andre Walker-Loud, James Zanotti

Invited contribution to Volume 70 of the Annual Review of Nuclear and Particle Science

*In preparation* (Jan. 2020)

$F_K/F_\pi$  from Mobius domain-wall fermions solved on gradient-flowed dynamical HISQ ensembles

Nolan Miller, Henry Monge-Camacho, Chia-Cheng Chang, Enrico Rinaldi, Evan Berkowitz, David Brantley, Arjun Gambhir, Chris Koerber, Chris Bouchard, M.A. Clark, Balint Joo, Amy Nicholson, Pavlos Vranas, Andre Walker-Loud

*In preparation* (Dec. 2019)

Lattice QCD Inputs for Double Beta Decay

Vincenzo Cirigliano, William Detmold, Amy Nicholson, Phiala Shanahan

Invited contribution to Progress in Particle and Nuclear Physics 2020

*In preparation* (Dec. 2019)

Towards grounding nuclear physics in QCD

Christian Drischler, Wick Haxton, Kenneth McElvain, Emanuele Mereghetti, Amy Nicholson, Pavlos Vranas, Andre Walker-Loud

Invited contribution to the EPJ A Topical Issue "The tower of effective (field) theories and the emergence of nuclear phenomena"

arXiv:1910.07961 (2019)

Short Range Operator Contributions to  $0\nu\beta\beta$  decay from LQCD  
Henry Monge-Camacho, Evan Berkowitz, David Brantley, Chia Cheng  
Chang, M.A. Clark, Arjun Gambhir, Nicolas Garrón, Bálint Joó,  
Thorsten Kurth, Amy Nicholson, Enrico Rinaldi, Brian Tiburzi, Pavlos  
Vranas, André Walker-Loud  
PoS LATTICE2018 (2019) 263

The Stochastic Feynman-Hellmann Method  
Arjun Singh Gambhir, Evan Berkowitz, David Brantley, Chia Cheng  
Chang, M. A. Clark, Thorsten Kurth, Chris Monahan, Amy Nicholson,  
Pavlos Vranas, André Walker-Loud  
PoS LATTICE2018 (2019) 126

Progress in Multibaryon Spectroscopy  
Evan Berkowitz, David Brantley, Kenneth McElvain, André Walker-  
Loud, Chia Cheng Chang, M.A. Clark, Thorsten Kurth, Bálint Joó,  
Henry Monge-Camacho, Amy Nicholson, Enrico Rinaldi, Pavlos Vranas  
PoS LATTICE2018 (2018) 003

FLAG Review 2019  
Flavour Lattice Averaging Group  
arXiv:1902.08191  
*submitted to EPJC* (2019)

Symmetries and Interactions from Lattice QCD  
A. Nicholson, E. Berkowitz, H. Monge-Camacho, D. Brantley,  
N. Garron, C.C. Chang, E. Rinaldi, C. Monahan, C. Bouchard,  
M.A. Clark, B. Joo, T. Kurth, B.C. Tiburzi, P. Vranas, A. Walker-Loud  
Proceedings for the 13th Conference on the Intersections of Particle and  
Nuclear Physics (CIPANP 2018)  
arXiv:1812.11127

Simulating the Weak Death of the Neutron in a Femtoscale Universe  
with Near-Exascale Computing  
Evan Berkowitz, M.A. Clark, Arjun Gambhir, Ken McElvain, Amy  
Nicholson, Enrico Rinaldi, Pavlos Vranas, André Walker-Loud, Chia  
Cheng Chang, Bálint Joó, Thorsten Kurth, Kostas Orginos  
Gordon Bell Prize Finalist, (2018)  
SC18: International Conference for High Performance Computing, Net-  
working, Storage and Analysis, pages 697-705

Heavy physics contributions to neutrinoless double beta decay from QCD  
Amy Nicholson, Evan Berkowitz, Henry Monge-Camacho, David Brantley,  
Nicolas Garron, Chia Cheng Chang, Enrico Rinaldi, M.A. Clark,  
Balint Joo, Thorsten Kurth, Brian Tiburzi, Pavlos Vranas, Andre Walker-  
Loud  
Phys. Rev. Lett. 121 no. 17,172501 (2018)

A percent-level determination of the nucleon axial coupling from Quantum Chromodynamics  
Chia Cheng Chang, Amy Nicholson, Enrico Rinaldi, Evan Berkowitz,  
Nicolas Garron, David Brantley, Henry Monge-Camacho, Chris Monahan,  
Chris Bouchard, M.A. Clark, Balint Joo, Thorsten Kurth, Kostas Orginos,  
Pavlos Vranas, Andre Walker-Loud  
Nature 558 no. 7708, 91-94 (2018)

Nucleon axial coupling from Lattice QCD  
Chia Cheng Chang, Amy Nicholson, Enrico Rinaldi, Evan Berkowitz,  
Nicolas Garron, David Brantley, Henry Monge-Camacho, Chris Monahan,  
Chris Bouchard, M.A. Clark, Balint Joo, Thorsten Kurth, Kostas Orginos,  
Pavlos Vranas, Andre Walker-Loud  
PoS LATTICE2017 (2017)

Calm Multi-Baryon Operators  
Evan Berkowitz, Amy Nicholson, Chia Cheng Chang, Enrico Rinaldi,  
M.A. Clark, Balint Joo, Thorsten Kurth, Pavlos Vranas, Andre Walker-  
Loud  
PoS LATTICE2017 (2017)

An accurate calculation of the nucleon axial charge with lattice QCD  
Evan Berkowitz, David Brantley, Chris Bouchard, Chia Cheng Chang,  
M. A. Clark, Nicholas Garron, Balint Joo, Thorsten Kurth,  
Chris Monahan, Henry Monge-Camacho, Amy Nicholson, Kostas Orginos,  
Enrico Rinaldi, Pavlos Vranas, Andre Walker-Loud  
arXiv:1704.01114 (2017)

Mobius Domain-Wall fermions on gradient-flowed dynamical HISQ ensembles  
Evan Berkowitz, Chris Bouchard, Chia Cheng Chang, M. A. Clark,  
Balint Joo, Thorsten Kurth, Christopher Monahan, Amy

Nicholson, Kostas Orginos, Enrico Rinaldi, Pavlos Vranas, Andre Walker-Loud  
Phys. Rev. D96 (2017) no.5, 054513

Neutrinoless double beta decay from lattice QCD  
Amy Nicholson, Evan Berkowitz, Chia Cheng Chang, M.A. Clark,  
Balint Joo, Thorsten Kurth, Enrico Rinaldi, Brian Tiburzi, Pavlos  
Vranas, Andre Walker-Loud  
PoS LATTICE2016 017 (2016)

Lattice methods and effective field theory  
Amy N. Nicholson  
Lect. Notes Phys. 936 (2017) 155-235

Low energy scattering phase shifts for meson-baryon systems  
William Detmold, Amy N. Nicholson  
Phys.Rev. D93 no.11, 114511 (2016)

Nuclear parity violation from lattice QCD  
Thorsten Kurth , Evan Berkowitz, Amy Nicholson, Enrico Rinaldi, Mark  
Strother, Pavlos Vranas, Andre Walker-Loud  
PoS LATTICE2015 329 (2016)

Two-nucleon scattering in multiple partial waves  
Amy Nicholson, Evan Berkowitz, Thorsten Kurth, Enrico Rinaldi, Mark  
Strother, Pavlos Vranas, Andre Walker-Loud  
PoS LATTICE2015 083 (2016)

Universal Noise and Efimov Physics  
Amy N. Nicholson  
EPJ Web Conf. 113 03019 (2016)

Two-Nucleon Higher Partial-Wave Scattering from Lattice QCD  
Evan Berkowitz, Thorsten Kurth, Amy Nicholson, Balint Joo,  
Enrico Rinaldi, Mark Strother, Pavlos Vranas, Andre Walker-Loud  
Phys.Lett. B765 (2017) 285-292

Massive and massless modes of the triplet phase of neutron matter  
Paulo F. Bedaque, Amy N. Nicholson, Srimoyee Sen  
Phys.Rev. C92, 035809 (2015)

Baryon properties in meson mediums from lattice QCD  
Amy N. Nicholson, William Detmold  
PoSLATTICE2013, 203 (2013)

Baryon masses at nonzero isospin/kaon density  
William Detmold, Amy N. Nicholson  
Phys. Rev. D88, 074501 (2013)

The low lying modes of triplet-condensed neutron matter and their effective theory  
Paulo F. Bedaque, Amy N. Nicholson  
Phys.Rev. C87, 055807 (2013)

Elucidating the sign problem through correlator distributions  
Amy N. Nicholson, Dorota Grabowska, David B. Kaplan  
J.Phys.Conf.Ser. 432, 012032 (2013)

Lattice methods for strongly interacting many-body systems  
Joaquin E. Drut, Amy N. Nicholson  
J. Phys. G40, 043101 (2013)  
*Invited topical review*  
*Chosen for J. Phys. G "Highlights of 2013"*

Sign problems, noise, and chiral symmetry breaking in a QCD-like theory  
Dorota Grabowska, David B. Kaplan, Amy N. Nicholson  
Phys.Rev. D87, 014504 (2013)

Lattice Monte Carlo calculations for unitary fermions in a finite box  
Michael G. Endres, David B. Kaplan, Jong-Wan Lee, Amy N. Nicholson  
Phys.Rev. A87 2, 023615 (2013)

N-body Efimov states from two-particle noise  
Amy N. Nicholson  
Phys. Rev. Lett. 109, 073003 (2012)

Listening to Noise  
Michael G. Endres, David B. Kaplan, Jong-Wan Lee, Amy N. Nicholson  
PoSLATTICE2011, 017 (2011)

Extended study for unitary fermions on a lattice using the cumulant expansion technique  
Jong-Wan Lee, Michael G. Endres, David B. Kaplan, Amy N. Nicholson  
PoSLATTICE2011, 203 (2011)

Lattice Monte Carlo calculations for unitary fermions in a harmonic trap  
Michael G. Endres, David B. Kaplan, Jong-Wan Lee, Amy N. Nicholson  
Phys. Rev. A84, 043644 (2011)

Noise, sign problems, and statistics  
Michael G. Endres, David B. Kaplan, Jong-Wan Lee, Amy N. Nicholson  
Phys. Rev. Lett. 107, 201601 (2011)

A new approach for studying large numbers of fermions in the unitary regime  
Michael G. Endres, David B. Kaplan, Jong-Wan Lee, Amy N. Nicholson  
PoSLATTICE2010, 182 (2010)

Lattice study of trapped fermions at unitarity  
Amy N. Nicholson, Michael G. Endres, David B. Kaplan, Jong-Wan Lee  
PoSLATTICE2010, 206 (2010)

Lattice calculation for unitary fermions in a finite box  
Jong-Wan Lee, Michael G. Endres, David B. Kaplan, Amy N. Nicholson  
PoSLATTICE2010, 197(2010)

Reducing baryon noise in Lattice QCD through partial quenching  
Amy N. Nicholson  
Phys. Rev. C80, 065206 (2009)

Limits to the performance of the LHC with ion beams  
J.M. Jowett, Hans-Heinrich Braun, M.I. Gresham, E. Mahner,  
A. N. Nicholson, E. Shaposhnikova, I.A. Pshenichnov  
EPAC-2004-MOPLT020, Prepared for EPAC 2004, Lucerne, Switzerland, 5-9 July 2004

Parametrized shower simulation in Lelaps: a comparison with Geant4  
Daniel Birt, Amy Nicholson, Willem Gerhardus Johannes Langeveld,  
Dennis Wright  
SLAC-TN-03005 (2003)

