Andrea Shindler

Theoretical Physicist - Nonperturbative QCD, Hadron Structure, Fundamental Symmetries
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About Me: Theoretical physicist with over a decade of experience in nonperturbative quantum field theory, specializing in lattice QCD, effective field theories, and precision studies of fundamental symmetries. Research focuses on hadron structure, CP violation, and symmetry-breaking mechanisms within and beyond the Standard Model. Key contributions include the first-principles computation of higher moments of parton distribution functions and the development of gradient-flow-based frameworks for CP-violating operators. Recipient of $1.7M in competitive research funding as PI and co-PI, and senior key personnel in a $2.4M DOE-funded Topical Collaboration in nuclear theory. Strong commitment to teaching, mentoring, and community building. Current research directions include applications of machine learning and quantum computing to lattice field theory and high-precision hadronic physics.

Academic Titles and Education

Associate Professor
- Michigan State University — August 2016

Italian Professor Habilitation
- Abilitazione Scientifica Nazionale — January 2014

Ph.D. Degree
- **University of Rome "Tor Vergata", Department of Physics** Rome, Italy — March 2002

M.Sc Degree
- **University of Rome "La Sapienza", Department of Physics** Rome, Italy
- **University of Rome "Tor Vergata", Department of Physics** Rome, Italy — July 1998
  Mark: 110/110 *cum laude*

Work Experience

Lawrence Berkeley National Laboratory
- Visiting Associate Researcher — May 2024 -

RWTH-Aachen University
- Research Associate — January 2023 -

Michigan State University
- Associate Professor — August 2016 - December 2022

Forschungszentrum Jülich
- Post-doctoral fellow — October 2013 - July 2016

CERN - Humboldt-Universität zu Berlin
- Heisenberg Fellow — July 2010 - September 2013

Universidad Autónoma de Madrid
- Post-doctoral CSIC fellowship — October 2009 - June 2010

University of Liverpool
- Post-doctoral Research Associate — October 2007 - September 2009

NIC/DESY Zeuthen
- Post-doctoral Research Associate — July 2002 - September 2007

Third Party Funding and Resources

Grants

- **Beyond the Standard Model contributions to the nucleon electric dipole moment**
  - Funding Agency: DFG – Role: PI
  - Amount: **300, 000 €** (**Awarded**) $2023 - 2026$
- **Nuclear Theory for New Physics (NTNP) - Topical Collaboration**
  - Funding Agency: DOE – Role: Senior Key Personel
  - Amount: $ **2, 400, 000** (**Awarded**) $2023 - 2028$
- **Unravelling the Origin of the Matter-Antimatter Asymmetry in The Universe**
  - Funding Agency: NSF – Role: PI
  - Amount: $ **270, 000** (**Awarded**) $2022 - 2025$
- **Fundamental Symmetries using lattice QCD with the gradient flow**
  - Funding Agency: NSF – Role: PI
  - Amount: $ **270, 000** (**Awarded**) $2019 - 2022$
- **From Quarks to Stars: A Quantum Computing Approach to the Nuclear Many-Body Problem**
  - Funding Agency: DOE-Office of Science, Office of Nuclear Physics – Role: co-PI
  - Amount: $ **750, 000** (**Awarded**) $2020 - 2023$
- **Fundamental Symmetries from Lattice QCD**
  - Funding: Discretionary Funding Initiative (DFI) – Role: PI
  - Amount: $ **50, 000** (**Awarded**) $2018 - 2019$

Computer time

PI or co-PI of the following list of successful projects proposals

- **Hadron structure with stabilized Wilson fermions** $2024 - 2025$
  - HPC: GCS – JUWELS Cluster Module & JUWELS Booster Module CPU
  - Computing time: 50 M core-h (CPU) – 137 k node-h (GPU)
- **Beyond the Standard Model matrix elements from Lattice QCD** $2014 - 2025$
  - HPC: JARA - Gauss (Forschungszentrum Jülich) (11 proposals)
  - Computing time: 182 M core-h (CPU+KNL) – 47.82 M core-h (GPU)
- **The theta term contribution to the neutron electric dipole moment with stabilized Wilson fermions** $2023 - 2024$
  - HPC: EuroHPC – LUMI-C & Leonardo
  - Computing time: 128.7 M core-h (CPU) – 462.72 k node-h (GPU)
- **Neutron electric dipole moment with Stabilized Wilson Fermions: the theta term** $2022 - 2023$
  - HPC: PRACE – Irène Joliot Curie & Piz-Daint
  - Computing time: 78.5 M core-h (CPU) – 1.97 M node-h (GPU)
- **Electromagnetic corrections to strong dynamics** $2020 - 2023$
  - HPC: ALCC - Summit (3 proposals)
  - Computing time: 525 K Summit node-h
- **Quantum State Preparation for the Schwinger Model** $2022 - 2023$
  - HPC: ALCC - Summit
  - Computing time: Priority access to IBM_Q
- **Flowing the electric dipole moment** $2020 - 2021$
  - HPC: XSEDE - Stampede 2
  - Computing time: 30.6 M core-h (CPU)

Teaching Experience

Courses

- Lattice Field Theory (Hands-on exercise) - RWTH Aachen University — Spring 2025
- PHY 909 - Statistical Field Theory - MSU — Fall 2021
- PHY 183 - Physics for Scientists and Engineers I (Calculus Based) - MSU — Spring 2021
- PHY 989 - Introduction to Renormalization Group - MSU — Fall 2020
- PHY 855/955 - Quantum Field Theory - MSU — Spring 2020
- PHY 855/955 - Quantum Field Theory - MSU — Spring 2019
- PHY 989 - Introduction to Lattice Field Theory - MSU — Fall 2018
- PHY 855/955 - Quantum Field Theory - MSU — Spring 2018
- PHY 812 - Advanced Mathematical Methods for Theoretical Physics - MSU — Spring 2017
- Introduction to the Standard Model of Particle Physics - Humboldt University - Berlin, Germany — Fall 2011

Schools

- Lecturer – Summer School "Effective Field Theory and Lattice Field Theory"
  Courses: "*Introduction to lattice QCD*" - "*Introduction to the gradient flow: lattice*"
  German Physical Society - Physikzentrum, Bad Honnef, Germany — July 2023
- Organizer, Lecturer, Students Coordinator – TALENT School
  "From quarks and gluons to nuclear forces and structure"
  Course: "*Introduction to Lattice QCD*" – ECT*, Trento, Italy — July - Aug. 2019
- Lecturer – Summer school "National Nuclear Physics Summer School"
  Course: "*Introduction to lattice QCD*"
  William and Mary College - Williamsburg, USA — June 2014
- Exercises Tutor – BUSSTEPP 2008 and 2009
  (British Universities Summer School Theoretical Elementary Particle Physics)
  Tutorials on all the courses given at the school — June 2008, June 2009
- Lecturer – Summer student program in DESY-Zeuthen
  Course: "*Introduction to lattice QCD*"
  DESY-Zeuthen, Germany — Sep. 2006, Sep. 2007
- Lecturer – Joint Dutch Belgian German Graduate School
  Course: "*Lattice QCD*" – Bad-Honnef, Germany — Sep. 2006

Mentoring

Ph.D. Students and Post Docs

- Official Supervisor – Ph.D. student Giovanni Pederiva — 2018 - 2022
- Official Supervisor – Ph.D. student Matthew D. Rizik — 2017 - 2022
- Official Co-Supervisor – Ph.D. student Ahmed Yousif — 2016 -2022
- Official Co-Supervisor – Ph.D. student José G. Reyes — 2017 - 2020
- Co-Supervisor/Mentor – Ph.D. student Carsten Urbach — 2002 - 2005
- Co-Supervisor/Mentor – Ph.D. student Jénifer González López — 2007 - 2012
- Co-Supervisor/Mentor – Ph.D. student Elena García Ramos — 2010 - 2013
- Official Supervisor - Post Doc Dr. Jangho Kim — 2018 - 2019
- Official Supervisor - Post Doc Dr. Jack Dragos — 2016 - 2019

Undergraduate and M.Sc. Students

- Official Supervisor – M.Sc. student Adrian Kleven — 2021 - 2022
- Official Supervisor – M.Sc. student Giovanni Pederiva — 2017 - 2018
- Official Supervisor – M.Sc. student Hans Mathias Vege — 2017 - 2019
- Official Supervisor – Honor's College student Madison M. Macmahan — 2019 - 2020
- Official Supervisor – Honor's College student Nestor Kamwana — 2018 - 2019
- Official Supervisor – Honor's College student Sam Liao — 2017 - 2018
- Co-supervisor/Mentor – M.Sc. student Isaac Hailperin — 2007 - 2008
- Co-supervisor/Mentor – M.Sc. student Andreas Nube — 2007 - 2008

Peer Reviewed Publications

Complete list of publications and citation statistics provided in a separate document

Presentations Conferences and Workshops

Plenary talks and Colloquia

- "*The Strong Force: from Colliders to the Cosmos*"
  Invited Colloquium – LPSC - Grenoble, France — October 2025
- "*Deep Inelastic Scattering and the Role of Lattice QCD*"
  Invited Colloquium – RWTH - Aachen University — July 2025
- "*Unravelling the matter-antimatter asymmetry of the Universe*"
  Invited Colloquium – Trinity College - Dublin — Apr. 2023
- "*Gradient flow, perturbative and non-perturbative renormalization*"
  Invited Plenary – ConfXV – The XV International Conference on "Quark Confinement and the Hadron Spectrum" – University of Stavanger, Norway — Aug. 2022
- "*Flowing the Electric Dipole Moment*"
  Invited Colloquium - University of Trento, Trento, Italy — Jan. 2021
  (Zoom Seminar due to the COVID-19 pandemic)
- "*Flavor-diagonal CP-violation: the electric dipole moment*"
  Invited Plenary Review – Lattice 2020 – The XXXVIII International Symposium on Lattice Field Theory – University of Bonn, Germany — Aug. 2020
  (*Talk not given due to the COVID-19 pandemic. Proceedings published on EPJA.*)
- "*Flowing the Strong Interactions*"
  Invited Colloquium Triangle Nuclear Theory (UNC, Duke, NC)
  University of North Carolina, Chapel Hill, NC, USA — Apr. 2019
- "*Lattice QCD...with a twist*"
  Invited Plenary – DPG Tagung – University of Freiburg, Freiburg, Germany — Mar. 2008
- "*Lattice QCD: recent developments and results*"
  Invited Plenary – Physics in Collision - Annecy, France — June 2007
- "*Twisted mass lattice QCD: recent developments and results*"
  Invited Plenary – Lattice 2005 – The XXIII International Symposium on Lattice Field Theory – School of Mathematics, Trinity College, Dublin, Ireland — July 2005
- "*Structure functions from lattice QCD*"
  Invited Plenary – DIS 2004 – XII International Workshop on Deep Inelastic Scattering – Strbske Pleso, High Tatras, Slovakia — Apr. 2004
- "*Lattice Studies of Nucleon Structure*"
  Invited Plenary – Electron-Nucleus Scattering VII – Elba International Physics Center, Elba, Italy — June 2002

100+ Other Talks, and Posters including invited seminars
Attended 80+ Conferences and Workshops

Services

Scientific Working Groups and Committees

- Member of a National Science Foundation (NSF) Panel
- Member of the International Advisory Committee (IAC) of the "Quark Confinement and the Hadron Spectrum" Conference series — 2024 -
- Advisory Member of the Lattice Virtual Academy (LaVA) — 2023 -
- Coordinator FRIB Science Focus Group "Fundamental Symmetries"
  FRIB-NSCL & Department of Physics and Astronomy — 2019
- Convener Working Group "Nuclear Theory - QCD"
  CUSTIPEN-Beijing Workshop on RIB Science "2nd China-US-RIB Meeting on Physics of Nuclei and Hadrons" – Peking University, Beijing, China — 2017
- Member Graduate Student Recruiting Committee
  FRIB-NSCL & Department of Physics and Astronomy — 2016 - 2017
- Member Nuclear Theory Seminar Committee
  FRIB-NSCL & Department of Physics and Astronomy — 2016 - 2017
- Organizer Research Discussion
  FRIB-NSCL & Department of Physics and Astronomy — 2016 - 2018

Member of Ph.D. Thesis committees

Thomas Chuna (supervisor A. Bazavov - M. Murillo), Dillon Frame (supervisor D. Lee), Caleb Hicks (supervisor D. Lee), Jacob Watkins (supervisor D. Lee), Zhite Yu (supervisor C.-P. Yuan)

Organization

- Organizer – Workshop "Neutron Electric Dipole Moment: from theory to experiment"
  ECT*, Trento, Italy — Aug. 2022
- Organizer – FRIB-TA Summer School
  "Quantum Computing and Nuclear Few- and Many-Body Problems"
  FRIB, Michigan State University – USA — June 2022
- Organizer and chair – FRIB-TA Topical Program
  "Hadronic Electric Dipole Moments in the FRIB Era: from the Proton to Protoactinium"
  East Lansing, MI, USA — Aug. 2019
- Organizer, Lecturer and Student Coordinator –
  "Nuclear TALENT School 2019" – ECT*, Trento, Italy — July - Aug. 2019
- Organizer and co-chair –
  36th "Annual International Symposium on Lattice Field Theory"
  East Lansing, MI, US — July 2018
- Organizer – School/Workshop "New horizons in lattice field theory"
  Natal, Brazil — Mar. 2013
- Seminar organizer – Wednesday Seminar
  University of Liverpool: particle theory seminar — Oct. 2007 - Sep. 2009
- Coordinator – PostGrad/PostDoc Discussion Group
  University of Liverpool, Theoretical Physics division — Oct. 2007 - Sep. 2009
- Seminar organizer – Joint Tuesday Seminars "Field theory on the lattice and particle physics phenomenology seminar"
  Humboldt University - DESY Zeuthen — May 2006 - Feb. 2007

Other achievements

Scientific Referee

Physical Review Letters (Impact factor: 8.1)
JHEP (Impact factor: 6.220)
Physics Letters B (Impact factor: 6.019)
Physical Review D (Impact factor: 4.864)
Nuclear Physics B (Impact factor: 3.946)
JETP Letters (Impact factor: 1.364)

Fellowships & Awards

- Deutsche Forschungsgemeinschaft (DFG) Fellowship — 2023
- Greater Lansing Community Champion — 2018
  In recognition of your outstanding contribution to the Greater Lansing region
- Heisenberg Fellow - Deutsche Forschungsgemeinschaft (DFG) — 2010

Languages