

PAUL FANTO

101 Bishop St, Apt. 3, New Haven, CT 06511
914-715-1365 ♦ paul.fanto@yale.edu

EDUCATION

Yale University

Expected May 2021

Ph.D. in Theoretical Nuclear Physics. Advisor: Prof. Yoram Alhassid
Dissertation: *Statistical properties of nuclei: beyond the mean field*
Department of Energy NNSA Stewardship Science Graduate Fellow

Princeton University

June 2015

B.A. in Physics, *magna cum laude*. GPA: 3.84/4.0
Senior Thesis: *The many-body localization transition in a generic one-dimensional quantum system*

RESEARCH EXPERIENCE

Department of Physics, Yale University

July 2015–present

Ph.D. Researcher, Alhassid Group

- Designed and benchmarked a high-performance, parallelized Monte Carlo code to calculate nuclear state densities from microscopic nuclear interactions using the static-path plus random-phase approximation, which improves the accuracy of calculated state densities by a factor of 10 over a benchmark method.
- Developed and implemented a novel numerical method to study neutron resonance statistics in the statistical theory of compound nucleus reactions in order to show the limits of this theory.
- Included individual gamma-ray decay channels within a computational random-matrix model of the compound nucleus in order to verify the disagreement between theory and a recent experiment.
- Introduced two methods for exact particle-number projection in the finite-temperature mean-field approximation in order to improve mean-field calculations of the nuclear state density.

Theoretical Division, Los Alamos National Laboratory

May–August 2018

Stewardship Science Graduate Fellowship practicum. Supervisor: Dr. Toshihiko Kawano

- Designed and implemented computer programs for simulating nuclear cross sections to verify the reliability of widely used R-matrix methods for extracting resonances from cross section data.

Department of Physics, Princeton University

September 2014–June 2015

Senior Thesis Research. Advisor: Prof. David Huse

- Developed a computer program implementing the strong-disorder renormalization group to study the transition to the many-body localized phase in a generic one-dimensional quantum system.

Princeton Plasma Physics Laboratory

June–August 2014

Princeton Environmental Institute research internship

- Designed an experiment to study the effect of liquid metal in nuclear fusion reactors. Validated the design with computer simulations.

AWARDS

Department of Energy NNSA Stewardship Science Graduate Fellowship

Awarded 2017

Awarded to 4–5 Ph.D. students each year “to build the next generation of leaders with expertise in stewardship science in support of national defense.”

Phi Beta Kappa

Awarded 2015

Allen G. Shenstone Prize in Physics

Awarded 2014 and 2015

Given by the Princeton University Department of Physics.

SKILLS

Computing: Significant programming experience in Python, Fortran, C++, MATLAB, and Julia. Substantial experience with high-performance parallel computing on clusters at the National Energy Research Scientific Computing Center and the Yale Center for Research Computing.

Numerical Methods: Substantial experience with Markov-chain Monte Carlo and random-matrix theory. Some experience with nonlinear optimization.

PUBLICATIONS

1. Y. Alhassid, G. F. Bertsch, and **P. Fanto**, Derivation of K -matrix reaction theory in a discrete basis formalism, arXiv:2003.07843 (2020).
2. **P. Fanto**, Y. Alhassid, and H. A. Weidenmüller, Statistical-model description of γ decay from compound-nucleus resonances. Phys. Rev. C **101**, 014607 (2020).
3. Y. Alhassid, G. F. Bertsch, **P. Fanto**, and T. Kawano, Transmission coefficients in compound-nucleus reaction theory. Phys. Rev. C **99**, 024621 (2019).
4. **P. Fanto**, G. F. Bertsch, and Y. Alhassid. Neutron width statistics in a realistic resonance-reaction model. Phys. Rev. C **98**, 014604 (2018).
5. **P. Fanto**, Projection after variation in the finite-temperature Hartree-Fock-Bogoliubov approximation. Phys. Rev. C **96**, 051301(R) (2017).
6. **P. Fanto**, Y. Alhassid, and G. F. Bertsch, Particle-number projection in the finite-temperature mean-field approximation. Phys. Rev. C **96**, 014305 (2017).

TALKS

1. **7th Workshop on Nuclear Level Density and Gamma Strength** **University of Oslo**
Rotational enhancement of the nuclear level density in the static-path plus random-phase approximation *May 2019*
2. **APS April Meeting** **Denver, CO**
Level densities in deformed nuclei: beyond the mean-field approximation *April 2019*
3. **CNR*18: 6th International Workshop on Compound-Nuclear Reactions and Related Topics** **Lawrence Berkeley National Laboratory**
Neutron width statistics in a realistic resonance-reaction model *September 2018*
4. **Nuclear Theory Group Seminar** **Los Alamos National Laboratory**
Cross sections in the resolved-resonance region: S-matrix vs. R-matrix approaches *August 2018*
5. **15th International Conference on Nuclear Reaction Mechanisms** **Varenna, Italy**
Neutron width statistics in a realistic resonance-reaction model *June 2018*
6. **APS April Meeting** **Columbus, OH**
Neutron width statistics in a realistic resonance-reaction model *April 2018*
7. **Workshop on Nuclear Structure and Reaction Theories: Building Together for the Future** **GANIL**
Neutron width statistics in a realistic resonance-reaction model *October 2017*
8. **6th Workshop on Nuclear Level Density and Gamma Strength** **University of Oslo**
Particle-number projection in finite-temperature mean-field approximations *May 2017 to level densities*

SELECTED POSTER PRESENTATIONS

NNSA Stewardship Science Academic Programs Symposium

Washington, D.C.

State densities of nuclei in the static-path plus random phase approximation

February 2020

Winner of Outstanding Poster Award

Workshop on Statistical Properties of Nuclei

ECT*, Trento

Particle-number projection in the finite-temperature mean-field approximation

July 2016

SELECTED TEACHING AND LEADERSHIP EXPERIENCE

Yale Distilled

2017 and 2018 Issues

Editor and Writer

- As editor, collaborated closely with the author to ensure timely completion of an article to the inaugural issue of this graduate-student-run magazine (2017).
- Independently researched and wrote an article arguing for investment in nuclear power (2018).

Physics 500: Advanced Classical Mechanics

Fall 2016

Teaching Fellow

- Planned and ran regular review sessions and occasional classroom lectures for 25 graduate students in topics including Lagrangian and Hamiltonian mechanics.

Physics 165L-166L: General Physics Laboratory

Fall 2015, Spring 2016, Spring 2017

Teaching Fellow

- Led weekly laboratory sessions for 10-15 undergraduate students in topics including introductory mechanics and basic circuits.

Yale Writing Center, Yale University

February 2016–May 2017

Writing Fellow

- Tutored first-year undergraduate students on writing essays for a range of humanities and social science classes at Yale.