# Matthias Heinz

*Research Scientist*

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## Education

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| Dr. rer. nat. | Technische Universität Darmstadt | 2024 |
| M.Sc. | Technische Universität Darmstadt | 2020 |
| B.Sc. | The Ohio State University | 2018 |

## Appointments

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| Research Scientist | RIKEN Nishina Center | 2026–present |
| Eugene P. Wigner Fellow | Oak Ridge National Laboratory | 2024–2026 |

## Fellowships and Awards

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|---|---|---|
| FRIB Achievement Award for Early Career Researchers (Theory) | Facility for Rare Isotope Beams | 2026 |
| Distinguished Staff Fellowship | Oak Ridge National Laboratory | 2024–2026 |
| Giersch Award for an Outstanding Doctoral Thesis | Giersch Foundation | 2024 |
| Gerhard Herzberg Research Prize | Gerhard Herzberg Society | 2024 |
| Giersch Excellence Award | Giersch Foundation | 2022 |
| M.Sc. Research Prize | Gerhard Herzberg Society | 2022 |
| Doctoral Fellowship | German Academic Scholarship Foundation | 2022–2024 |
| Merit pregraduation scholarship for international students | Technische Universität Darmstadt | 2020 |
| Division of Nuclear Physics CEU Travel and Lodging Award | Division of Nuclear Physics | 2015–2017 |
| Physics Summer Research Scholarship | The Ohio State University | 2015 |
| Maximus Scholarship | The Ohio State University | 2013–2017 |

## Referee

Physical Review Letters, Physics Letters B, Physical Review C, Computer Physics Communications, The European Physical Journal A, Journal of Physics G, Physica Scripta

National Science Foundation Quantum Information Science program

ORNL Director's Research and Development program, ASCR Leadership Computing Challenge (ALCC), INCITE (Innovative and Novel Computational Impact on Theory and Experiment) program, Oak Ridge Leadership Computing Facility Director's Discretion program

## Professional Societies

American Physical Society, Deutsche Physikalische Gesellschaft, Phi Beta Kappa

**Funding**

| | | |
|---|---|---|
| AI/ML-Ready Data Labeling for Low Energy Nuclear Physics (PI: Mario Cromaz) | $2,000,000 | 2025–2026 |
| STREAMLINE 2: Machine Learning for Nuclear Many-Body Systems (PI: Dean Lee) | $1,370,000 | 2025–2027 |
| ORNL LDRD Grant (single PI) | $603,800 | 2024–2027 |

**Computing Grants**

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| Jülich Supercomputing Centre (GCS project scalannm) | CPU: 4.3M core-h, GPU: 1.3M core-h (2026) | 2024–present |
| Lichtenberg II Cluster (project 2455) | CPU: 0.3M core-h | 2024 |
| Jülich Supercomputing Centre (GCS project tensornuclei) | CPU: 7.5M core-h, GPU: 2.8M core-h | 2021–2024 |
| Lichtenberg II Cluster (project 1949) | CPU: 1.0M core-h | 2022 |

**Students Advised**

Vivek Booshan (ongoing), Ben Johnson-Toth (summer 2025), Aidan O'Bryan (summer 2026), Tom Plies (B.Sc. 2022, M.Sc. 2024), Maxwell Rothman (ongoing)

**Lectures at Physics Schools**

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|---|---|
| Nuclear Physics Tortoise Lecture Series (Seoul, South Korea): Ten 75-minute lectures and five 90-minute exercises on "Quantum computing in nuclear physics" | 2027 |
| Exotic Beam Summer School (Oak Ridge, TN, USA): Two 60-minute lectures on "Modern nuclear structure theory" | 2026 |
| Multi-Particle Summer School Berkeley (Berkeley, CA, USA): Five 40-minute lectures on "Ab initio computations of nuclei" | 2025 |
| Nuclear Physics Turtle Lecture Series (Busan, South Korea): Six 75-minute lectures and three 90-minute exercises on "Ab initio Hartree-Fock calculations of nuclei" | 2025 |
| Arbeitstreffen Kernphysik (Schleching, Germany): Three 75-minute lectures on "Modern nuclear structure" | 2023 |

**Workshops Co-organized**

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|---|---|
| Oak Ridge Annual Nuclear Gathering Event 2026 | 2026 |
| RadIs Workshop: "Radioactive Isotopes for Fundamental Physics" | 2026 |
| ECT* Workshop: "Nuclear theory for astrophysics: Bridging bound-state and continuum physics" | 2026 |
| Oak Ridge Annual Nuclear Gathering Event 2025 | 2025 |
| CRC 1245 Mini-Workshop: "Neutrino-nucleus interactions in the standard model and beyond" | 2024 |

**Research**

Matthias Heinz researches the theoretical description of atomic nuclei. His specific interests are in understanding nuclear forces, simulating how the structure and dynamics of nuclei emerge from nuclear forces, and

predicting how the structure of nuclei impacts fundamental processes in nature, including the synthesis of heavy elements and possible new physics processes beyond the standard model. Matthias employs effective field theories, ab initio quantum many-body methods, Bayesian statistics, and emulators based on machine learning techniques in his research. Matthias is also exploring how quantum computing can accelerate quantum many-body simulations.

Author of 30 papers (21 published) with 579 citations on Google Scholar (October 31, 2026). Average citations per paper: 19.3. h-index: 11 on Google Scholar, 11 on INSPIRE. 47 invited talks, seminars, and colloquia.

**Selected Publications**

- *Toward scalable quantum computations of atomic nuclei*
  C. Gu, **M. Heinz**, O. Kiss, T. Papenbrock, Physical Review C **113**, 034321 (2026), arXiv:2507.14690
- *NuLattice: Ab initio computations of atomic nuclei on lattices*
  M. Rothman, B. Johnson-Toth, G. Hagen, **M. Heinz**, T. Papenbrock, The European Physical Journal A **62**, 28 (2026), arXiv:2509.08771
- *Ab initio calculations of overlap integrals for $\mu \to e$ conversion in nuclei*
  **M. Heinz**, M. Hoferichter, T. Miyagi, F. Noël, A. Schwenk, Physics Letters B **871**, 139975 (2025), arXiv:2412.04545
- *Improved structure of calcium isotopes from ab initio calculations*
  **M. Heinz**, T. Miyagi, S. R. Stroberg, A. Tichai, K. Hebeler, A. Schwenk, Physical Review C **111**, 034311 (2025), arXiv:2411.16014
- *Probing new bosons and nuclear structure with ytterbium isotope shifts*
  M. Door, C.-H. Yeh, **M. Heinz**, F. Kirk, C. Lyu, *et al.*, Physical Review Letters **134**, 063002 (2025), arXiv:2403.07792
- *In-medium similarity renormalization group with three-body operators*
  **M. Heinz**, A. Tichai, J. Hoppe, K. Hebeler, A. Schwenk, Physical Review C **103**, 044318 (2021), arXiv:2102.11172

A complete list of publications can be found below, on INSPIRE, and on Google Scholar.

**Publications**

1. *Beta decay of potassium-54 reveals the role of two-body currents in neutron-rich nuclei*
   Z. Y. Xu, R. K. Grzywacz, **M. Heinz**, T. Papenbrock, W. Ong, J. Allmond, B. C. Rasco, K. P. Rykaczewski, H. Schatz, B. M. Sherrill, O. Tarasov, P. Gysbers, G. Hagen, P. Navrátil, S. Ajayi, H. Arora, A. D. Ayangeakaa, H. Berg, J. Berkman, D. Bleuel, K. Bosmpotinis, N. Braukman, M. P. Carpenter, G. Cerizza, A. Chester, J. Christie, I. Cox, H. L. Crawford, B. Crider, J. Davis, A. Doetsch, J. Garcia-Duarte, A. Estrade, A. Fijalkowska, C. Frantzis, K. Fukushima, T. Gaballah, T. Gray, E. Good, K. Haak, S. Hanai, J. Harke, C. Harris, A. Hartley, M. Hausmann, K. Hermansen, D. Hoff, D. Hoskins, J. Huffman, R. Jain, M. Karny, T. King, N. Kitamura, K. Kolos, E. Kwan, S. N. Liddick, B. Longfellow, R. S. Lubna, S. Lyons, M. Madurga, M. Mogannam, S. Neupane, T. H. Ogunbeku, G. Owens-Fryar, J. Palomino, M. Portillo, M. M. Rajabali, A. Richard, I. Richardson, E. Ronning, G. Rose, T. Ruland, N. D. Scielzo, D. P. Scriven, D. Seweryniak, K. Siegl, M. Smith, A. Spyrou, M. Stepaniuk, A. Sweet, V. Tripathi, A. Tsantiri, S. Uthayakumaar, W. Walters, S. Watters, M. Wolinska-Cichocka, R. Yokoyama, Nature Communications (in press), arXiv:2610.36218
2. *Laser spectroscopy illuminates the $N = 32$ shell closure*
   T. E. Lellinger, L. V. Rodríguez, P. Müller, O. Ahmad, M. L. Bissell, K. Blaum, E. Burbach, B. Cheal, T. Fabritz, R. F. Garcia Ruiz, **M. Heinz**, J. Hughes, P. Imgram, K. König, Y. Liu, B. Maaß, E. N. Matthews, T. Miyagi, W. Nazarewicz, R. Neugart, G. Neyens, L. Nies, W. Nörtershäuser, J. Palmes, P. Plattner, P.-G. Reinhard, L. Renth, R. Sanchez, A. Schwenk, J. Spahn, X. F. Yang, D. T. Yordanov, Nature Communications (in press), arXiv:2608.10943
3. *Similarity renormalization group for nuclear forces*
   **M. Heinz**, Encyclopedia of Nuclear Physics (in press), arXiv:2603.04311
4. *Accurate charge radius measurement of $^{14}$C confronts ab initio theory*
   K. König, P. Müller, T. Gesser, E. Burbach, S. Gandolfi, **M. Heinz**, P. Imgram, A. Lovato, P. Maris, T. Miyagi, W. Nörtershäuser, R. Roth, A. Schwenk, J. Spahn, Physical Review Letters **137**, 182501 (2026), arXiv:2608.17052
5. *Uncertainties with low-resolution nuclear forces*
   T. Plies, **M. Heinz**, A. Schwenk, Physical Review C **114**, 024327 (2026), arXiv:2509.24671
6. *Computational schemes for the Magnus expansion of the in-medium similarity renormalization group*
   **M. Heinz**, Physical Review C **113**, L041301 (2026), arXiv:2601.16133
7. *Toward scalable quantum computations of atomic nuclei*
   C. Gu, **M. Heinz**, O. Kiss, T. Papenbrock, Physical Review C **113**, 034321 (2026), arXiv:2507.14690
   **Editors' Suggestion**
8. *NuLattice: Ab initio computations of atomic nuclei on lattices*
   M. Rothman, B. Johnson-Toth, G. Hagen, **M. Heinz**, T. Papenbrock, The European Physical Journal A **62**, 28 (2026), arXiv:2509.08771
9. *Ab initio computations of the fourth-order charge density moments of $^{48}$Ca and $^{208}$Pb*
   T. Miyagi, **M. Heinz**, A. Schwenk, Physics Letters B **872**, 140032 (2026), arXiv:2508.10767
10. *Exactness of the normal-ordered two-body truncation of three-nucleon forces*
    M. Rothman, B. Johnson-Toth, F. Bonaiti, G. Hagen, **M. Heinz**, T. Papenbrock, Physical Review C **112**, L051301 (2025), arXiv:2508.01507
11. *Ab initio calculations of overlap integrals for $\mu \to e$ conversion in nuclei*
    **M. Heinz**, M. Hoferichter, T. Miyagi, F. Noël, A. Schwenk, Physics Letters B **871**, 139975 (2025), arXiv:2412.04545

12. *Connecting relativistic density functional theory to microscopic calculations*
B. T. Reed, **M. Heinz**, P. Arthuis, A. Schwenk, I. Tews, Physical Review C **112**, 034331 (2025), arXiv:2505.00828

13. *The nuclear charge radius of* $^{13}$C
P. Müller, **M. Heinz**, P. Imgram, K. König, B. Maaß, T. Miyagi, W. Nörtershäuser, R. Roth, A. Schwenk, Nature Communications **16**, 6234 (2025), arXiv:2507.05680

**Press Release: "How large is a carbon nucleus?"**

14. *Improved structure of calcium isotopes from ab initio calculations*
**M. Heinz**, T. Miyagi, S. R. Stroberg, A. Tichai, K. Hebeler, A. Schwenk, Physical Review C **111**, 034311 (2025), arXiv:2411.16014

15. *Probing new bosons and nuclear structure with ytterbium isotope shifts*
M. Door, C.-H. Yeh, **M. Heinz**, F. Kirk, C. Lyu, T. Miyagi, J. C. Berengut, J. Bieroń, K. Blaum, L. S. Dreissen, S. Eliseev, P. Filianin, M. Filzinger, E. Fuchs, H. A. Fürst, G. Gaigalas, Z. Harman, J. Herkenhoff, N. Huntemann, C. H. Keitel, K. Kromer, D. Lange, A. Rischka, Ch. Schweiger, A. Schwenk, N. Shimizu, T. E. Mehlstäubler, Physical Review Letters **134**, 063002 (2025), arXiv:2403.07792

**Press Release: "New insights into the structure of atomic nuclei"**
**Highlighted in Physics World: "Atomic anomaly explained without recourse to hypothetical 'dark force'"**

16. *Randomized low-rank decompositions of nuclear three-body interactions*
A. Tichai, P. Arthuis, K. Hebeler, **M. Heinz**, J. Hoppe, T. Miyagi, A. Schwenk, L. Zurek, Physical Review Research **6**, 043331 (2024), arXiv:2307.15572

17. *Spectroscopy of* $^{52}$K
M. Enciu, A. Obertelli, P. Doornenbal, **M. Heinz**, T. Miyagi, F. Nowacki, K. Ogata, A. Poves, A. Schwenk, K. Yoshida, N. L. Achouri, H. Baba, F. Browne, D. Calvet, F. Château, S. Chen, N. Chiga, A. Corsi, M. L. Cortés, A. Delbart, J.-M. Gheller, A. Giganon, A. Gillibert, C. Hilaire, T. Isobe, T. Kobayashi, Y. Kubota, V. Lapoux, H. N. Liu, T. Motobayashi, I. Murray, H. Otsu, V. Panin, N. Paul, W. Rodríguez, H. Sakurai, M. Sasano, D. Steppenbeck, L. Stuhl, Y. L. Sun, Y. Togano, T. Uesaka, K. Wimmer, K. Yoneda, O. Aktas, T. Aumann, L. X. Chung, F. Flavigny, S. Franchoo, I. Gašparić, R.-B. Gerst, J. Gibelin, K. I. Hahn, D. Kim, Y. Kondo, P. Koseoglou, J. Lee, C. Lehr, P. J. Li, B. D. Linh, T. Lokotko, M. MacCormick, K. Moschner, T. Nakamura, S. Y. Park, D. M. Rossi, E. Sahin, P.-A. Söderström, D. Sohler, S. Takeuchi, H. Toernqvist, V. Vaquero, V. Wagner, S. Wang, V. Werner, X. Xu, H. Yamada, D. Yan, Z. H. Yang, M. Yasuda, L. Zanetti, Physical Review C **110**, 064301 (2024), arXiv:2412.03602

18. *Normal ordering of three-nucleon interactions for ab initio calculations of heavy nuclei*
K. Hebeler, V. Durant, J. Hoppe, **M. Heinz**, A. Schwenk, J. Simonis, A. Tichai, Physical Review C **107**, 024310 (2023), arXiv:2211.16262

19. *Perspectives on an open-source toolchain for ab initio nuclear physics*
**M. Heinz**, T. Duguet, H. W. Grießhammer, H. Hergert, A. Tichai, Contribution in "Nuclear forces for precision nuclear physics: A collection of perspectives" Few-Body Systems **63**, 67 (2022), arXiv:2202.01105

20. *Least-square approach for singular value decompositions of scattering problems*
A. Tichai, P. Arthuis, K. Hebeler, **M. Heinz**, J. Hoppe, A. Schwenk, L. Zurek, Physical Review C **106**, 024320 (2022), arXiv:2205.10087

21. *Importance truncation for the in-medium similarity renormalization group*
J. Hoppe, A. Tichai, **M. Heinz**, K. Hebeler, A. Schwenk, Physical Review C **105**, 034324 (2022), arXiv:2110.09390

22. *Low-rank matrix decompositions for ab initio nuclear structure*
A. Tichai, P. Arthuis, K. Hebeler, **M. Heinz**, J. Hoppe, A. Schwenk, Physics Letters B **821**, 136623 (2021), arXiv:2105.03935
23. *In-medium similarity renormalization group with three-body operators*
**M. Heinz**, A. Tichai, J. Hoppe, K. Hebeler, A. Schwenk, Physical Review C **103**, 044318 (2021), arXiv:2102.11172
24. *Natural orbitals for many-body expansion methods*
J. Hoppe, A. Tichai, **M. Heinz**, K. Hebeler, A. Schwenk, Physical Review C **103**, 014321 (2021), arXiv:2009.04701

**Manuscripts in Review**

1. *Searching for charged lepton flavor violation*
L. Calibbi, K. Fuyuto, **M. Heinz**, J. Zupan, arXiv:2610.11839
2. *Probing the size of neutron and proton single-particle orbitals from nucleon knockout reactions*
M. Enciu, A. Obertelli, P. Doornenbal, C. Barbieri, S. Brolli, **M. Heinz**, W. Horiuchi, T. Inakura, W. H. Long, T. Miyagi, F. Nowacki, K. Ogata, A. Poves, A. Schwenk, K. Yoshida, N. L. Achouri, H. Baba, F. Browne, D. Calvet, F. Château, S. Chen, N. Chiga, A. Corsi, M. L. Cortés, A. Delbart, J.-M. Gheller, A. Giganon, A. Gillibert, C. Hilaire, T. Isobe, T. Kobayashi, Y. Kubota, V. Lapoux, H. N. Liu, T. Motobayashi, I. Murray, H. Otsu, V. Panin, N. Paul, W. Rodríguez, H. Sakurai, M. Sasano, D. Steppenbeck, L. Stuhl, Y. L. Sun, Y. Togano, T. Uesaka, K. Wimmer, K. Yoneda, O. Aktas, T. Aumann, L. X. Chung, F. Flavigny, S. Franchoo, I. Gašparić, R.-B. Gerst, J. Gibelin, K. I. Hahn, D. Kim, Y. Kondo, P. Koseoglou, J. Lee, C. Lehr, P. J. Li, B. D. Linh, T. Lokotko, M. MacCormick, K. Moschner, T. Nakamura, S. Y. Park, D. M. Rossi, E. Sahin, P.-A. Söderström, D. Sohler, S. Takeuchi, H. Toernqvist, V. Vaquero, V. Wagner, S. Wang, V. Werner, X. Xu, H. Yamada, D. Yan, Z. H. Yang, M. Yasuda, L. Zanetti, arXiv:2608.16549
3. *Ab initio calculations of parity-violating electron scattering off* $^{48}$Ca *and* $^{208}$Pb
F. Noël, **M. Heinz**, M. Hoferichter, T. Miyagi, A. Schwenk, arXiv:2606.25019
4. *Saturation of nuclear binding from lattice Hamiltonians*
M. Rothman, G. Hagen, **M. Heinz**, T. Papenbrock, arXiv:2606.12166
5. *Taming nuclear size and shape effects in superallowed beta-decay*
B. He, M. Gorchtein, **M. Heinz**, B. Ohayon, L. Platter, C.-Y. Seng, arXiv:2605.13985
6. *Nuclear charge radii of aluminium isotopes at the proton drip line*
A. Brinson, B. Rickey, P. Arthuis, A. Belley, S. Campbell, X. Chen, A. Dockery, S. Elhatisari, H. Erington, N. Gamage, R. F. Garcia Ruiz, **M. Heinz**, J. Holt, C. Ireland, C. Izzo, C. Jones, J. Karthein, K. König, D. Lee, Y.-Z. Ma, F. Maier, U.-G. Meißner, K. Minamisono, M. Moenter, J. M. Munoz, W. Nörtershäuser, A. Ortiz-Cortes, J. Palmes, S. Papa, F. P. Cruz, R. Ringle, H. Sims, C. Sumithrarachchi, A. R. Vernon, T. Wang, S. G. Wilkins, R. Yadav, S. Zhang, arXiv:2605.09139

**Presentations at Conferences and Workshops**

1. "NuLattice: Computations of nuclei on lattices"
*CRC 1245 Workshop*
Mainz, Germany — September 2026
Invited Talk
2. "Improving precision and reach of ab initio nuclear theory"
*Low Energy Community Meeting 2026*
Argonne National Laboratory, Lemont, IL, USA — August 2026
Plenary Talk: *FRIB Achievement Award for Early Career Researchers*

3. "Ab initio theory for nuclear densities and parity-violating electron scattering"
   *Nuclear, Atomic, Molecular, and Optical Physics Workshop*
   Argonne National Laboratory, Lemont, IL, USA — August 2026
   Invited Talk
4. "NuLattice: Computations of nuclei on lattices"
   *SciDAC PI Meeting 2026*
   Rockville, MD, USA — August 2026
   Invited Talk
5. "Computations of parity-violating electron scattering off $^{48}$Ca and $^{208}$Pb"
   *SciDAC PI Meeting 2026*
   Rockville, MD, USA — August 2026
   Poster
6. "NuLattice: Computations of nuclei on lattices"
   *International Symposium on Lattice Field Theory (Lattice 2026)*
   University of Maryland, College Park, MD, USA — July 2026
   Contributed Talk
7. "Computing Nuclei from First Principles: Quantum Computations, AI Emulation, Deformation, and Fundamental Symmetries"
   *Atoms to Applications Symposium*
   Oak Ridge National Laboratory, Oak Ridge, TN, USA — June 2026
   Poster
8. "Hamiltonians for neutron densities and lattice calculations"
   *INT Program: Nuclear Hamiltonians for Advancing Nuclear Physics and Beyond*
   Institute for Nuclear Theory, Seattle, WA, USA — April 2026
   Invited Talk
9. "Nuclear radii from ab initio calculations: Successes and challenges"
   *Workshop: Precise nuclear charge radii and beyond*
   Max Planck Institute for Nuclear Physics, Heidelberg, Germany — January 2026
   Invited Talk
10. "Precise neutron densities of nuclei and what this means for neutron skins"
    *Hirschegg 2026 – Challenges in effective field theory descriptions of nuclei*
    Hirschegg, Austria — January 2026
    Invited Talk
11. "Nuclear densities, neutron skins, and IMSRG on the lattice"
    *IMSRG Workshop: Flow and Tell*
    University of Notre Dame, Notre Dame, IN, USA — October 2025
    Invited Talk
12. "Leadership computing for atomic nuclei and fundamental physics"
    *Smoky Mountains Computational Sciences and Engineering Conference*
    Chattanooga, TN, USA — August 2025
    Poster
13. "Developing precise predictions of electroweak structure of nuclei"
    *Workshop on Precision Measurements with Radioisotopes*
    Texas A&M University, College Station, TX, USA — August 2025
    Invited Talk
14. "First-principles nuclear structure theory and implications for fundamental physics"
    *ESNT Workshop: "Theoretical and experimental developments for symmetry-violating nuclear properties"*
    CEA Paris-Saclay, Saclay, France — June 2025
    Invited Talk

15. "Improving reach and precision of ab initio nuclear structure predictions"
*Gordon Research Conference on Nuclear Chemistry*
Colby-Sawyer College, New London, NH, USA — June 2025
Invited Talk

16. "Exploring new physics and nuclear structure with ytterbium isotope shifts"
*Conference on the Intersection of Nuclear and Particle Physics 2025*
University of Wisconsin, Madison, WI, USA — June 2025
Invited Parallel Talk

17. "Ab initio overlap integrals for muon to electron conversion in nuclei"
*Conference on the Intersection of Nuclear and Particle Physics 2025*
University of Wisconsin, Madison, WI, USA — June 2025
Invited Parallel Talk

18. "Ab initio overlap integrals for mu to e conversion"
*NUCLEI Collaboration Meeting 2025*
University of North Carolina, Chapel Hill, NC, USA — June 2025
Contributed Talk

19. "Ab initio nuclear structure for searches for $\mu \to e$ conversion"
*ECT* Workshop on "Lepton flavor change in nuclei"*
ECT*, Trento, Italy — April 2025
Invited Talk

20. "Perturbative treatment of subleading interactions in ab initio calculations"
*INT Workshop on "Chiral EFT: New Perspectives"*
Institute for Nuclear Theory, Seattle, WA, USA — March 2025
Invited Talk

21. "Ab initio nuclear structure for searches for $\mu \to e$ conversion"
*Progress in Ab Initio Nuclear Theory 2025*
TRIUMF, Vancouver, Canada — February 2025
Invited Talk

22. "Probing new physics with ytterbium isotope shifts"
*CERN Workshop on "Nuclear Shapes and BSM Searches at Colliders"*
CERN, Geneva, Switzerland (virtual) — January 2025
Invited Talk

23. "Ab initio nuclear theory for new physics searches in ytterbium and beyond"
*ORNL Radioactive Molecules Workshop*
Oak Ridge National Laboratory, Oak Ridge, TN, USA — September 2024
Invited Talk

24. "Ab initio nuclear structure calculations for new physics searches in ytterbium isotope shifts"
*Quark Confinement and the Hadron Spectrum Conference 2024*
Cairns, Australia — August 2024
Invited Parallel Talk

25. "Improved ab initio description of neutron-rich calcium isotopes"
*Direct Reactions in Exotic Beams 2024*
Wiesbaden, Germany — June 2024
Poster: *1st Place Theory Poster Award*

26. "Precision ab initio structure and implications for fundamental physics"
*Spring Meeting of the Deutsche Physikalische Gesellschaft*
Gießen, Germany — March 2024
Contributed Talk

27. "Improved medium-mass nuclear structure and responses with the IMSRG"
*Progress in Ab Initio Nuclear Theory 2024*
TRIUMF, Vancouver, Canada February 2024
Invited Talk
28. "IMSRG developments and medium-mass and heavy nuclei"
*CRC 1245 Workshop*
Technische Universität Darmstadt, Darmstadt, Germany September 2023
Invited Talk
29. "Diagrammatic resummations for the in-medium similarity renormalization group"
*ESNT Workshop "Automated tools for many-body theory"*
CEA Paris-Saclay, Saclay, France June 2023
Invited Talk
30. "Ab initio nuclear structure with the in-medium similarity renormalization group"
*Spring Doctoral Forum of the Studienstiftung*
Berlin, Germany April 2023
Contributed Talk
31. "Ab initio structure of neutron-rich calcium isotopes"
*Spring Meeting of the Deutsche Physikalische Gesellschaft*
Dresden, Germany March 2023
Contributed Talk
32. "IMSRG with three-body operators"
*Progress in Ab Initio Nuclear Theory 2023*
TRIUMF, Vancouver, Canada March 2023
Contributed Talk
33. "Improved ab initio nuclear structure for medium-mass and heavy nuclei"
*Arbeitstreffen Kernphysik 2023*
Schleching, Germany February 2023
Invited Talk
34. "Recent progress on in-medium similarity renormalization group calculations with three-body operators"
*Hirschegg 2023 – Effective field theories for nuclei and nuclear matter*
Hirschegg, Austria January 2023
Contributed Talk
35. "Extension and acceleration of the in-medium similarity renormalization group"
*Spring Meeting of the Deutsche Physikalische Gesellschaft*
Mainz, Germany (virtual) March 2022
Contributed Talk
36. "Approximations and uncertainties in the in-medium similarity renormalization group"
*ISNET 8*
Facility for Rare Isotope Beams, East Lansing, MI, USA December 2021
Contributed Talk
37. "Recent developments in the in-medium similarity renormalization group"
*CRC 1245 Workshop*
Technische Universität Darmstadt, Darmstadt, Germany March 2021
Invited Talk
38. "Exploring alternative SRG generators in one dimension"
*Spring Meeting of the Deutsche Physikalische Gesellschaft*
Munich, Germany March 2019
Contributed Talk

39. "Understanding uncertainties in jet quenching in high-energy nucleus-nucleus collisions"
*Fall Meeting of the Division of Nuclear Physics*
Pittsburgh, PA, USA October 2017
Poster
40. "Exploration of similarity renormalization group generators in 1-dimensional potentials"
*Fall Meeting of the Division of Nuclear Physics*
Vancouver, Canada October 2016
Poster
41. "Exploration of similarity renormalization group generators in 1-dimensional potentials"
*Fall Meeting of the Division of Nuclear Physics*
Santa Fe, NM, USA October 2015
Poster

**Invited Lectures at Summer/Winter Schools**

1. Ten 75-minute lectures and five 90-minute programming exercises on "Quantum computing in nuclear physics"
*Nuclear Physics Tortoise Lecture Series 2027*
Seoul, South Korea January 2027
2. Two 60-minute lectures on "Modern nuclear structure theory"
*Exotic Beam Summer School 2026*
Oak Ridge, TN, USA June 2026
3. Five 40-minute lectures on "Ab initio computations of nuclei"
*Multi-Particle Summer School Berkeley 2025*
Berkeley, CA, USA July 2025
4. Six 75-minute lectures and three 90-minute programming exercises on "Ab initio Hartree-Fock calculations of nuclei"
*Nuclear Physics Turtle Lecture Series 2025*
Busan, South Korea January 2025
5. Three 75-minute main speaker lectures on "Modern nuclear structure"
*Arbeitstreffen Kernphysik 2023*
Schleching, Germany February 2023

**Invited Colloquia and Seminars**

1. "Ab initio analysis of parity-violating electron scattering"
*University of Tennessee Nuclear Physics Seminar*
University of Tennessee, Knoxville, TN, USA September 2026
2. "Towards precise ab initio predictions of neutron densities and skins"
*University of Tsukuba, Nuclear Physics Seminar*
University of Tsukuba, Tsukuba, Japan March 2026
3. "Towards precise ab initio predictions of neutron densities and skins"
*Notre Dame Nuclear Physics Seminar*
University of Notre Dame, Notre Dame, IN, USA March 2026
4. "Neutron radii and densities and skins, oh my!"
*University of Tennessee Nuclear Physics Seminar*
University of Tennessee, Knoxville, TN, USA March 2026
5. "Improving reach and precision of ab initio theory for new physics studies"
*Nuclear and Chemical Sciences Division Seminar*
LLNL, Livermore, CA, USA July 2025

6. "Nuclei on quantum computers"
   *ORNL Physics Division Summer Lecture Series*
   ORNL, Oak Ridge, TN, USA July 2025
7. "Improving reach and precision of ab initio theory for new physics studies"
   *ANL PHY Division Theory Seminar*
   Argonne National Laboratory, Lemont, IL, USA June 2025
8. "Improving reach and precision of ab initio theory for new physics studies"
   *Ohio University, INPP Seminar*
   Ohio University, Athens, OH, USA April 2025
9. "New bosons in ytterbium isotope shifts? An ab initio nuclear theory perspective"
   *University of Tennessee Nuclear Physics Seminar*
   University of Tennessee, Knoxville, TN, USA November 2024
10. "Improved ab initio nuclear structure of neutron-rich calcium isotopes"
    *R2S2 Seminar*
    Rising Researchers Seminar Series (virtual) June 2024
11. "First-principles nuclear structure theory and implications for fundamental physics"
    *TRIUMF NP Seminar*
    TRIUMF, Vancouver, Canada February 2024
12. "First-principles nuclear structure theory and implications for fundamental physics"
    *S@INT Seminar*
    Institute for Nuclear Theory, Seattle, WA, USA February 2024
13. "First-principles nuclear structure theory and implications for fundamental physics"
    *TRIUMF Interview Seminar*
    TRIUMF, Vancouver, Canada January 2024
14. "First-principles nuclear structure calculations and implications for fundamental physics"
    *ORNL – Distinguished Staff Fellowship Program – NCCS Seminar*
    Oak Ridge National Laboratory, Oak Ridge, TN, USA December 2023
15. "First-principles nuclear structure theory and implications for fundamental physics"
    *FRIB Theory Seminar*
    FRIB, East Lansing, MI, USA December 2023
16. "First-principles nuclear structure theory and implications for fundamental physics"
    *Subatomic, High Energy and Plasma Physics Seminar*
    Chalmers University of Technology, Göteborg, Sweden November 2023
17. "First-principles nuclear structure theory and implications for fundamental physics"
    *ITP Seminar*
    Universität Bern, Bern, Switzerland November 2023
18. "Precision nuclear structure with the in-medium similarity renormalization group"
    *Physics Seminar*
    Yonsei University, Seoul, South Korea May 2023
19. "Precision nuclear structure with the in-medium similarity renormalization group"
    *Triangle Nuclear Theory Colloquium*
    North Carolina State University, Raleigh, NC, USA March 2023
20. "Precision nuclear structure with the in-medium similarity renormalization group"
    *LANL T-2 Nuclear Theory Seminar*
    Los Alamos National Laboratory, Los Alamos, NM, USA March 2023
21. "Recent progress in ab initio nuclear structure calculations with the in-medium similarity renormalization group"
    *MPIK Seminar – Stored and Cooled Ions*
    Max-Planck-Institut für Kernphysik, Heidelberg, Germany November 2022

22. "Progress on IMSRG with 3-body operators"
*ORNL Nuclear Structure Theory Group Seminar*
Oak Ridge National Laboratory, Oak Ridge, TN, USA August 2022

23. "Analysis of three-body effects in the IMSRG"
*ANL Physics Theory Group Seminar*
Argonne National Laboratory, Lemont, IL, USA July 2022