

Kyle Godbey

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Google Scholar

Education

- 2015–2020 **PhD in Physics**, *Vanderbilt University*, Nashville, TN
2015–2017 **MA in Physics**, *Vanderbilt University*, Nashville, TN
2011–2015 **BA in Physics, Minor in Computer Science**, *Berea College*, Berea, KY, Cum Laude

Positions Held

- 2023–Current **Research Assistant Professor**, *Facility for Rare Isotope Beams*
2021–2023 **Postdoctoral Research Associate**, *Facility for Rare Isotope Beams*
2020–2021 **Postdoctoral Research Associate**, *Texas A&M*
2017–2020 **Graduate Research Assistant**, *Vanderbilt University*
May 2018, **Visiting Researcher**, *Australian National University*
March 2019,
Feb. 2020
2015–2017 **Graduate Teaching Assistant**, *Vanderbilt University*
Fall 2014 **Visiting Researcher**, *Frankfurt Institute for Advanced Studies*
Summer 2014 **Student Researcher**, *GSI Helmholtz Centre for Heavy Ion Research*

Grants

- 2024 FY **PAIRS - Pairing dynAmics In nucleaR colliSions**
Co-PI on LUMI supercomputing time allocation through the Polish PLGrid consortium.
- Pending **Center for Multiscale Modeling in Nuclear Science**
Lead PI of multidisciplinary center on multifidelity modeling in nuclear physics.
- Pending **Genetic programming for surrogate model discovery in Density Functional theory**
Co-PI on grant to incorporate novel genetic algorithms into the emulator development pipeline for nuclear DFT.
- Pending **Microscopic description of the fission process**
Co-PI on NNSA SSAA program proposal to study microscopic descriptions of fission.
- Funded **STREAMLINE Collaboration: Machine Learning for Nuclear Many-Body Systems**
Senior Personnel on DOE proposal in applications of machine learning to nuclear physics.
- 2020–2021 FY **Texas A&M High Performance Research Computing Research Grant**
Service unit research grant to study systematic uncertainties in low-energy nuclear fusion reactions.

Invited Talks/Seminars

Summary Colloquia: 1, Seminars: 7, Panels: 2, Invited Talks: 17
2023-Current

Detailed List Please visit <https://github.com/kylegodbey/CV/blob/main/CV/presentations.md>

(Co)Organized Workshops, Summer Programs, Symposia, etc.

- 2025 **APS Combined March-April Meeting Minisymposium on density functional theory in condensed matter and nuclear physics**
- 2024 **APS DNP Invited Session on Inclusivity**
- 2024 **FRIB-TA Topical Program on the Path to Superheavies, FRIB**
- 2023 **APS-JPS DNP Workshop on Time-Dependent Approaches in Nuclear Physics, Hawaii**
- 2023 **FRIB-TA Summer School on Practical Uncertainty Quantification and Emulation, FRIB**

Workshops/Hackathons/Summer Schools

- 2022 **Quantum Computing and Nuclear Few- and Many-Body Problems FRIB-Theory Alliance Summer School, Michigan State University**
- 2021,2022 **QHack Quantum Machine Learning Hackathon, Online**
- 2020 **IBM Quantum Challenge, Online**
- 2020 **1st Lindau Sciathon, Online**
- 2019 **69th Lindau Nobel Laureate Meeting, Lindau, Germany**
- 2019 **Machine Learning Applied to Nuclear Physics FRIB-Theory Alliance Summer School, Michigan State University**
- 2018 **Frontiers in Nuclear and Hadronic Physics Nuclear Reactions, Galileo Galilei Institute**
- 2016 **Density Functional Theory TALENT School, University of York**
- 2014 **GSI Summer Student Program, GSI**

Awards

- 2023 **FRIB Achievement Award for Early Career Researchers, FRIB**
Citation can be found [here](#).
- 2023 **Postdoctoral Excellence in Research Award, Michigan State University**
Awarded yearly for "outstanding achievements and commitment to research, as recognized by peers and community"
- 2021-2022 **Cloud Computing Fellow, MSU Institute for Cyber-Enabled Research**
Fellowship program exploring cloud computing technologies for research applications. [More info here](#).
- 2018 **Most Outstanding Student Publication Award, Vanderbilt University**
Awarded yearly to "recognize the most outstanding student publication for a paper published during the previous calendar year"
- 2017 **A.V. Ramayya Award, Vanderbilt University**
Awarded yearly to "the most outstanding physics or astronomy graduate student Teaching Assistant"
- 2016 **Robert T. Lagemann Award, Vanderbilt University**
Awarded yearly to an "entering or first-year graduate student for exceptional promise in physics"

2014 **Global Education Opportunity (GEO) Scholarship**, Berea College

2013 **Physics Presentation Award**, Kentucky Academy of Sciences

Software Projects

ASCSN **Project Lead**, *Advanced Scientific Computing and Statistics Network*, Co-founded the ASCSN forum and organization

PyNEB **Project Lead**, *Python-based Nudged Elastic Band Package*, Flexible Python package for determining minimum energy and least action pathways in collective potential energy surfaces

BMEX **Project Lead**, *Bayesian Mass Explorer Web App*, Online tool to explore nuclear model predictions and uncertainties of masses and related quantities. Additional functionality includes various emulators for masses, potential energy surfaces, and full solutions.

HFBFFT **Project Lead**, *Hartree-Fock-Bogoliubov Fast Fourier Transform Solver*, Next-generation 3D coordinate space HFB solver for atomic nuclei.

VU-TDHF3D **Project Lead**, *Time-dependent Hartree-Fock software*, 3D coordinate space HF solver for atomic nuclei and their real-time dynamics.

Sky3D **Project Contributor**, *Time-dependent Hartree-Fock software*, 3D coordinate space HF solver for atomic nuclei and their real-time dynamics. Open-source fork of VU-TDHF3D.

LISE-SLDA **Project Contributor**, *Time-dependent Superfluid DFT Software*, 3D coordinate space DFT solver with pairing correlations.

BAND Framework **Project Contributor**, *Collection of software for the Bayesian Analysis of Nuclear Dynamics collaboration*, Contributor to the emulation and calibration machinery of the framework.

Computer skills

Programming Languages Fortran, Python, C, C++, CUDA

Paradigms High performance computing, Machine learning, Cloud Computing

System Experience MSU HPCC; TAMU HPRC - Terra, Ada; Australian NCI - Raijin, Gadi; OLCF - Summit; OLCF - Frontier; ALCF - Polaris; AMD Private Cluster

Society memberships

American Physical Society

The Internet Society

Journal Articles

- [1] I. Bakurov, P. Giuliani, K. Godbey, N. Haut, W. Banzhaf, and W. Nazarewicz, "Discovering reduced order model equations of many-body quantum systems using genetic programming: a technical report", arXiv preprint arXiv:2406.04279 (2024).
- [2] P. Giuliani, K. Godbey, V. Kejzlar, and W. Nazarewicz, "Model orthogonalization and bayesian forecast mixing via principal component analysis", Phys. Rev. Res. **6**, 033266 (2024).

- [3] D. Odell, P. Giuliani, K. Beyer, M. Catacora-Rios, M. Y.-H. Chan, E. Bonilla, R. J. Furnstahl, K. Godbey, and F. M. Nunes, "Rose: a reduced-order scattering emulator for optical models", *Phys. Rev. C* **109**, 044612 (2024).
- [4] R. T. deSouza, K. Godbey, S. Hudan, and W. Nazarewicz, "Search for beyond-mean-field signatures in heavy-ion fusion reactions", *Phys. Rev. C* **109**, L041601 (2024).
- [5] L. Buskirk, K. Godbey, W. Nazarewicz, and W. Satuła, "Nucleonic shells and nuclear masses", *Phys. Rev. C* **109**, 044311 (2024).
- [6] D. Lay, E. Flynn, S. Agbemava, K. Godbey, W. Nazarewicz, S. A. Giuliani, and J. Sadhukhan, "Multimodal fission from self-consistent calculations", *Phys. Rev. C* **109**, 044306 (2024).
- [7] A. S. Umar, K. Godbey, and C. Simenel, "Cluster model of ^{12}C in the density functional theory framework", *Phys. Rev. C* **107**, 064605 (2023).
- [8] P. Giuliani, K. Godbey, E. Bonilla, F. Viens, and J. Piekarewicz, "Bayes goes fast: uncertainty quantification for a relativistic mean field nuclear model emulated by the reduced basis method", *Frontiers in Physics* **10**, 10.3389/fphy.2022.1054524 (2023).
- [9] E. Bonilla, P. Giuliani, K. Godbey, and D. Lee, "Training and projecting: a reduced basis method emulator for many-body physics", *Phys. Rev. C* **106**, 054322 (2022).
- [10] K. Godbey, A. S. Umar, and C. Simenel, "Theoretical uncertainty quantification for heavy-ion fusion (Editors' Suggestion)", *Phys. Rev. C* **106**, L051602 (2022).
- [11] E. Flynn, D. Lay, S. Agbemava, P. Giuliani, K. Godbey, W. Nazarewicz, and J. Sadhukhan, "Nudged elastic band approach to nuclear fission pathways", *Phys. Rev. C* **105**, 054302 (2022).
- [12] L. Li, L. Guo, K. Godbey, and A. Umar, "Impact of tensor force on quantum shell effects in quasifission reactions", *Physics Letters B* **833**, 137349 (2022).
- [13] A. Bulgac, I. Abdurrahman, K. Godbey, and I. Stetcu, "Fragment intrinsic spins and fragments' relative orbital angular momentum in nuclear fission", *Phys. Rev. Lett.* **128**, 022501 (2022).
- [14] K. Godbey, Z. Zhang, J. W. Holt, and C. M. Ko, "Charged pion production from Au + Au collisions at $\sqrt{s_{NN}} = 2.4$ GeV in the Relativistic Vlasov-Uehling-Uhlenbeck model", *Physics Letters B* **829**, 137134 (2022).
- [15] C. Simenel, P. McGlynn, A. S. Umar, and K. Godbey, "Comparison of fission and quasi-fission modes", *Physics Letters B* **822**, 136648 (2021).
- [16] A. S. Umar, C. Simenel, and K. Godbey, "Pauli energy contribution to the nucleus-nucleus interaction (Editors' Suggestion)", *Phys. Rev. C* **104**, 034619 (2021).
- [17] A. Bulgac, I. Abdurrahman, S. Jin, K. Godbey, N. Schunck, and I. Stetcu, "Fission fragment intrinsic spins and their correlations", *Phys. Rev. Lett.* **126**, 142502 (2021).
- [18] C. Simenel, K. Godbey, and A. S. Umar, "Timescales of quantum equilibration, dissipation and fluctuation in nuclear collisions", *Phys. Rev. Lett.* **124**, 212504 (2020).
- [19] K. Godbey, C. Simenel, and A. S. Umar, "Microscopic predictions for the production of neutron-rich nuclei in the reaction $^{176}\text{Yb} + ^{176}\text{Yb}$ ", *Phys. Rev. C* **101**, 034602 (2020).
- [20] K. Godbey and A. S. Umar, "Quasifission dynamics in microscopic theories", *Frontiers in Physics* **8**, 40 (2020).
- [21] K. Godbey, L. Guo, and A. S. Umar, "Influence of the tensor interaction on heavy-ion fusion cross sections", *Phys. Rev. C* **100**, 054612 (2019).

- [22] K. Godbey, C. Simenel, and A. S. Umar, "Absence of hindrance in a microscopic $^{12}\text{C} + ^{12}\text{C}$ fusion study", Phys. Rev. C **100**, 024619 (2019).
- [23] K. Godbey, A. S. Umar, and C. Simenel, "Deformed shell effects in $^{48}\text{Ca} + ^{249}\text{Bk}$ quasifission fragments", Phys. Rev. C **100**, 024610 (2019).
- [24] L. Guo, K. Godbey, and A. S. Umar, "Influence of the tensor force on the microscopic heavy-ion interaction potential", Phys. Rev. C **98**, 064607 (2018).
- [25] C. Simenel, A. S. Umar, K. Godbey, M. Dasgupta, and D. J. Hinde, "How the Pauli exclusion principle affects fusion of atomic nuclei", Phys. Rev. C **95**, 031601 (Rapid Communication) (2017).
- [26] K. Godbey, A. S. Umar, and C. Simenel, "Dependence of fusion on isospin dynamics", Phys. Rev. C **95**, 011601 (Rapid Communication) (2017).
- [27] V. Tarasov, K. Gridnev, S. Schramm, V. Kuprikov, D. Gridnev, D. Tarasov, K. Godbey, X. Viñas, and W. Greiner, "Light exotic nuclei with extreme neutron excess and $2 \leq Z \leq 8$ ", International Journal of Modern Physics E **24**, 1550057 (2015).

Submitted Articles

- [1] Y. Qiang, J. Pei, and K. Godbey, *Quantum entanglement in nuclear fission*, 2024.
- [2] K. Godbey, *Barrier distribution extraction via gaussian process regression*, 2024.
- [3] Y. Yamauchi, L. Buskirk, P. Giuliani, and K. Godbey, *Normalizing flows for bayesian posteriors: reproducibility and deployment*, 2023.
- [4] R. Somasundaram, C. L. Armstrong, P. Giuliani, K. Godbey, S. Gandolfi, and I. Tews, *Emulators for scarce and noisy data: application to auxiliary field diffusion monte carlo for the deuteron*, 2024.

Books

- [1] K. Godbey, A. Sempowski, P. Giuliani, and J. Li, *Quantum Computing Applications in Nuclear Physics*, <https://qc.kyle.ee> (Self Published).

Conference Proceedings

- [1] C. Simenel, K. Godbey, H. Lee, P. McGlynn, and A. Umar, "Shell effects in fission and quasi-fission reactions", in , Vol. 2586, 1 (2023), p. 012063.
- [2] A. S. Umar, C. Simenel, S. Ayik, and K. Godbey, "Equilibration dynamics in nuclear reactions", in 4th International Conference on Nuclear Structure and Dynamics (NSD2019) Venice, Italy, May 13-17, 2019, Vol. 223 (2019), p. 01066.
- [3] A. S. Umar, C. Simenel, and K. Godbey, "Equilibration dynamics and isospin effects in nuclear reactions", in IL NUOVO CIMENTO, Vol. C41, 5 (2019), p. 173.
- [4] C. Simenel, K. Godbey, A. S. Umar, K. Vo-Phuoc, M. Dasgupta, D. J. Hinde, and E. C. Simpson, "Effect of Pauli repulsion and transfer on fusion", in 7th International Conference on Heavy-Ion Collisions at Near-Barrier Energies (FUSION17) Hobart, Tasmania, February 20-24, 2017 (2017).
- [5] C. Simenel, M. Dasgupta, D. J. Hinde, K. Godbey, and A. S. Umar, "Microscopic Approach To Heavy-ion Fusion: role of the Pauli principle", in Proceedings of The 26th International Nuclear Physics Conference (INPC2016). 11-16 September, 2016. Adelaide, Australia. id.212 (2016), p. 212.

- [6] V. Tarasov, K. Gridnev, W. Greiner, V. Kuprikov, D. Gridnev, D. Tarasov, X. Viñas, and K. Godbey, “Investigating the properties of nuclei with extreme neutron excess and $2 \leq Z \leq 8$ ”, in , Vol. 79, 7 (2015), pp. 819–822.

Popular Science

- [1] K. Godbey, *Physics ex Machina*, (2019) <https://www.lindau-nobel.org/physics-ex-machina/>.