Kyle Godbey

☎ +1 (606) 416 3644
✉ me@kyle.ee
🖥 kyle.ee
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	**Postoctoral Research Associate**, *Facility for Rare Isotope Beams*
2020–2021	**Postoctoral Research Associate**, *Texas A&M*
2017–2020	**Graduate Research Assistant**, *Vanderbilt University*
May 2018, March 2019, Feb. 2020	**Visiting Researcher**, *Australian National University*
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
2023-Current **Colloquia: 1, Seminars: 7, Panels: 2, Invited Talks: 17**

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 <u>here.</u>

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. <u>More info here.</u>

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] Y. Qiang, J. Pei, and K. Godbey, "Quantum entanglement in nuclear fission", arXiv preprint arXiv:2408.07375 (2024).

[2] K. Godbey, "Barrier distribution extraction via gaussian process regression", arXiv preprint arXiv:2406.04477 (2024).

[3] 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).

[4] 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).

[5] 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", arXiv preprint arXiv:2404.11566 (2024).

[6] 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).

[7] 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).

[8] L. Buskirk, K. Godbey, W. Nazarewicz, and W. Satuła, "Nucleonic shells and nuclear masses", Phys. Rev. C **109**, 044311 (2024).

[9] 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).

[10] 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).

[11] 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).

[12] 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).

[13] K. Godbey, A. S. Umar, and C. Simenel, "Theoretical uncertainty quantification for heavy-ion fusion (Editors' Suggestion)", Phys. Rev. C **106**, L051602 (2022).

[14] 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).

[15] 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).

[16] 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).

[17] 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).

[18] C. Simenel, P. McGlynn, A. S. Umar, and K. Godbey, "Comparison of fission and quasi-fission modes", Physics Letters B **822**, 136648 (2021).

[19] A. S. Umar, C. Simenel, and K. Godbey, "Pauli energy contribution to the nucleus-nucleus interaction (Editors' Suggestion)", Phys. Rev. C **104**, 034619 (2021).

[20] 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).

[21] C. Simenel, K. Godbey, and A. S. Umar, "Timescales of quantum equilibration, dissipation and fluctuation in nuclear collisions", Phys. Rev. Lett. **124**, 212504 (2020).

[22] K. Godbey, C. Simenel, and A. S. Umar, "Microscopic predictions for the production of neutron-rich nuclei in the reaction $^{176}\mathrm{Yb} + {}^{176}\mathrm{Yb}$", Phys. Rev. C **101**, 034602 (2020).

[23] K. Godbey and A. S. Umar, "Quasifission dynamics in microscopic theories", Frontiers in Physics **8**, 40 (2020).

[24] 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).

[25] K. Godbey, C. Simenel, and A. S. Umar, "Absence of hindrance in a microscopic $^{12}\mathrm{C} + {}^{12}\mathrm{C}$ fusion study", Phys. Rev. C **100**, 024619 (2019).

[26] K. Godbey, A. S. Umar, and C. Simenel, "Deformed shell effects in $^{48}\mathrm{Ca} + {}^{249}\mathrm{Bk}$ quasifission fragments", Phys. Rev. C **100**, 024610 (2019).

[27] 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).

[28] 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).

[29] K. Godbey, A. S. Umar, and C. Simenel, "Dependence of fusion on isospin dynamics", Phys. Rev. C **95**, 011601 (Rapid Communication) (2017).

[30] 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. Yamauchi, L. Buskirk, P. Giuliani, and K. Godbey, *Normalizing flows for bayesian posteriors: reproducibility and deployment*, 2023.

[2] P. Giuliani, K. Godbey, V. Kejzlar, and W. Nazarewicz, *Model orthogonalization and bayesian forecast mixing via principal component analysis*, 2024.

Books

[1] K. Godbey, A. Semposki, 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/`.