

# Kyle Godbey

## 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 & Computational Awards

- Pending **Center for Multiscale Modeling in Nuclear Science**  
Lead PI of multidisciplinary center on multifidelity modeling in nuclear physics.
- Pending **STREAMLINE 2: Machine Learning for Nuclear Many-Body Systems**  
Co-PI on DOE proposal in applications of machine learning to 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.
- Funded **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.
- 2024 FY **The Bayesian Mass Explorer Science Gateway**  
PI on NSF ACCESS award for cloud-enabled science gateway.
- 2024 FY **PAIRS - Pairing dynAmics In nucleaR colliSions**  
Co-PI on LUMI supercomputing time allocation through the Polish PLGrid consortium.
- 2023 FY **Nuclear Dynamics and Machine Learning**  
PI on NSF ACCESS award for ML-accelerated nuclear dynamics studies.

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 **1<sup>st</sup> Lindau Sciathon, Online**
- 2019 **69<sup>th</sup> 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

- [0] J. Dobaczewski, A. Gade, K. Godbey, R. V. F. Janssens, and W. Nazarewicz, "Extraction of ground-state nuclear deformations from ultrarelativistic heavy-ion collisions: nuclear structure physics context", Phys. Rev. Res. **7**, 043159 (2025).

- [0] K. Godbey, M. Albertsson, J. M. Gates, K. Hagel, J. Lubian, A. Makowski, P. McGlynn, G. Potel, J. L. Pore, J. R. Borges, et al., "Paths to superheavy nuclei", *Journal of Physics G: Nuclear and Particle Physics*, **10**.1088/1361-6471/ae198f (2025).
- [0] I. Bakurov, P. Giuliani, K. Godbey, N. Haut, W. Banzhaf, and W. Nazarewicz, "Genetic programming for the nuclear many-body problem: a guide", *J. Phys. G Nucl. Part. Phys.* **52**, 102001 (2025).
- [0] C. L. Armstrong, P. Giuliani, K. Godbey, R. Somasundaram, and I. Tews, "Emulators for scarce and noisy data: application to auxiliary-field diffusion monte carlo for neutron matter", *Phys. Rev. Lett.* **135**, 142501 (2025).
- [0] T. Dumont, A. Bonhomme, A. Griffiths, A. Choplin, M. A. Aloy, G. Meynet, K. Godbey, C. Simenel, G. Scamps, F. Castillo, A. Cosoli-Ortega, and S. Courtin, "The advanced evolution of massive stars: i. new reaction rates for carbon and oxygen nuclear reactions", *Astronomy amp; Astrophysics* **702**, A86 (2025).
- [0] C. Simenel, K. Godbey, H. Lee, P. McGlynn, and A. Umar, "Shell effects in quasi-fission: reactions forming actinide and superheavy compound nuclei", *Nuclear Physics A* **1062**, 123170 (2025).
- [0] H. Desilets, R. Kumar, R. deSouza, S. Hudan, C. Ciampi, A. Chbihi, K. Brown, K. Godbey, B. Pinheiro, E. Cardozo, and J. Lubian, "Impact of pairing and neutron-excess on suppression of the above-barrier fusion cross-section in  $^{190}\text{O} + ^{12}\text{C}$ ", *Physics Letters B* **868**, 139643 (2025).
- [0] R. Y. Cheng, K. Godbey, Y. B. Niu, W. B. He, and S. M. Wang, "Reduced-basis method for few-body bound-state emulation", *Phys. Rev. C* **111**, 064315 (2025).
- [0] 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", *Physics Letters B* **866**, 139558 (2025).
- [0] B. A. Brown, A. Gade, S. R. Stroberg, J. E. Escher, K. Fossez, P. Giuliani, C. R. Hoffman, W. Nazarewicz, C.-Y. Seng, A. Sorensen, N. Vassh, D. Bazin, K. W. Brown, M. A. Caprio, H. Crawford, P. Danielewicz, C. Drischler, R. F. Garcia Ruiz, K. Godbey, R. Grzywacz, L. Hlophe, J. W. Holt, H. Iwasaki, D. Lee, S. M. Lenzi, S. Liddick, R. Lubna, A. O. Macchiavelli, G. Martínez-Pinedo, A. McCoy, A. Mercenne, K. Minamisono, B. Monteagudo, P. Navratil, R. Ringle, G. H. Sargsyan, H. Schatz, M.-C. Spieker, A. Volya, R. G. T. Zegers, V. Zelevinsky, and X. Zhang, "Motivations for early high-profile frib experiments", *Journal of Physics G: Nuclear and Particle Physics* **52**, 050501 (2025).
- [0] Y. Qiang, J. Pei, and K. Godbey, "Quantum entanglement in nuclear fission", *Physics Letters B* **861**, 139248 (2025).
- [0] K. Godbey, C. Ross, and A. S. Umar, "Isospin composition of fission barriers", *Phys. Rev. C* **110**, L041601 (2024).
- [0] L. Li, L. Guo, K. Godbey, and A. S. Umar, "Impact of tensor forces on quasifission product yield distributions", *Phys. Rev. C* **110**, 064607 (2024).
- [0] K. Godbey, "Barrier distribution extraction via gaussian process regression", *EPJ Web of Conferences* **306**, edited by F. Minato, K. Hagino, K. Hirose, Y. Ito, K. Nishio, and F. Suzuki, 01001 (2024).
- [0] 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).
- [0] 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).

- [0] 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).
- [0] L. Buskirk, K. Godbey, W. Nazarewicz, and W. Satuła, "Nucleonic shells and nuclear masses", Phys. Rev. C **109**, 044311 (2024).
- [0] 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).
- [0] A. S. Umar, K. Godbey, and C. Simenel, "Cluster model of  $^{12}\text{C}$  in the density functional theory framework", Phys. Rev. C **107**, 064605 (2023).
- [0] P. Giuliani, K. Godbey, E. Bonilla, F. Viens, and J. Piekariewicz, "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).
- [0] 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).
- [0] K. Godbey, A. S. Umar, and C. Simenel, "Theoretical uncertainty quantification for heavy-ion fusion (Editors' Suggestion)", Phys. Rev. C **106**, L051602 (2022).
- [0] 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).
- [0] 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).
- [0] 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).
- [0] 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).
- [0] C. Simenel, P. McGlynn, A. S. Umar, and K. Godbey, "Comparison of fission and quasi-fission modes", Physics Letters B **822**, 136648 (2021).
- [0] A. S. Umar, C. Simenel, and K. Godbey, "Pauli energy contribution to the nucleus-nucleus interaction (Editors' Suggestion)", Phys. Rev. C **104**, 034619 (2021).
- [0] 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).
- [0] C. Simenel, K. Godbey, and A. S. Umar, "Timescales of quantum equilibration, dissipation and fluctuation in nuclear collisions", Phys. Rev. Lett. **124**, 212504 (2020).
- [0] 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).
- [0] K. Godbey and A. S. Umar, "Quasifission dynamics in microscopic theories", Frontiers in Physics **8**, 40 (2020).
- [0] 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).
- [0] 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).

- [0] 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).
- [0] 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).
- [0] 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).
- [0] K. Godbey, A. S. Umar, and C. Simenel, "Dependence of fusion on isospin dynamics", Phys. Rev. C **95**, 011601 (Rapid Communication) (2017).
- [0] 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

- [0] T. Dasher, A. Ravlić, S. Lalit, E. O'Connor, and K. Godbey, *Enhanced antineutrino emission from  $\beta$  decay in core-collapse supernovae with self-consistent weak decay rates*, 2025.
- [0] S. Lalit, P.-G. Reinhard, K. Godbey, and W. Nazarewicz, *Finite-range pairing in nuclear density functional theory*, 2025.
- [0] F. Bonaiti, C. Balos, K. Godbey, G. Hagen, T. Papenbrock, and C. S. Woodward, *Computing nuclear response functions with time-dependent coupled-cluster theory*, 2025.
- [0] L. Jin, A. Ravlić, P. Giuliani, K. Godbey, and W. Nazarewicz, *Surrogate models for linear response*, 2025.
- [0] C. M. Ireland, G. Bollen, S. E. Campbell, X. Chen, H. Erington, N. D. Gamage, K. Godbey, A. M. Houff, C. Izzo, B. Knight, S. Lalit, E. Leistenschneider, E. M. Lykiardopoulou, F. M. Maier, W. Nazarewicz, R. Orford, W. S. Porter, C. Quick, A. Ravlic, M. Redshaw, P.-G. Reinhard, R. Ringle, S. Schwarz, C. S. Sumithrachchi, A. A. Valverde, and A. C. C. Villari, *The mass of  $^{101}\text{Sn}$  and bayesian extrapolations to the proton drip line*, 2025.
- [0] J. Wylie, P. Giuliani, K. Godbey, and S. Agbemava, *Nuclear beavers*, 2025.
- [0] C. Simenel, A. S. Umar, K. Godbey, and P. McGlynn, *Shell effects in quasi-fission for calcium induced reactions forming thorium isotopes*, 2025.
- [0] R. Gumbel and K. Godbey, *Spherical and deformed shell effect competition in quasifission of superheavy nuclei*, 2025.
- [0] P. M. Jacobs, A. Boehnlein, B. Sawatzky, J. Carlson, I. Cloet, M. Diefenthaler, R. G. Edwards, K. Godbey, W. R. Hix, K. Orginos, T. Papenbrock, M. Ploskon, C. Ratti, R. Soltz, T. Wenaus, L. Andreoli, J. Brodsky, D. Brown, A. Bulgac, G. D. Chung, S. J. Coleman, J. Detwiler, A. Dubey, R. Ehlers, S. Gandolfi, G. Heyes, G. R. Jansen, F. Jonas, S. R. Klein, R. Kreucken, D. Lee, S. N. Liddick, H. W. Lin, A. Majumder, T. A. Manning, O. E. B. Messer, H. Monge-Camacho, T. Munson, B. Nachman, W. Nazarewicz, E. G. Ng, A. Panta, J. Putschke, T. Reed, F. Salazar, N. Sato, M. Savage, B. Schenke, L. Schwiebert, C. Shen, G. Vujanovic, and A. Walker-Loud, *White paper on software infrastructure for advanced nuclear physics computing*, 2025.
- [0] Y. Yamauchi, L. Buskirk, P. Giuliani, and K. Godbey, *Normalizing flows for bayesian posteriors: reproducibility and deployment*, 2023.
- [0] 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

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

## Conference Proceedings

- [0] 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.
- [0] 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.
- [0] 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.
- [0] 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).
- [0] 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.
- [0] 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

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