

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

Research Experience

- 2021–Current **Facility for Rare Isotope Beams**, *Theoretical Nuclear Dynamics*
Postdoctoral research associate investigating real-time nuclear dynamics with a focus on microscopic descriptions of fission and reaction processes. Continued effort towards developing and maintaining state of the art nuclear simulation software. Advised by Prof. Witek Nazarewicz.
- 2020–2021 **Texas A&M**, *Theoretical Nuclear Dynamics*
Postdoctoral research associate in the CENTAUR Center for excellence investigating basic nuclear physics and related processes. Duties include developing performant simulation software and running at scale on leadership class computers. Advised by Prof. Jeremy Holt.
- 2015–2020 **Vanderbilt University**, *Theoretical Nuclear Dynamics*
Using time-dependent density functional theory (TDDFT) and its extensions to study low-energy nuclear reactions. Substantial effort devoted to maintaining and extending modern TDDFT software. Advised by Prof. Sait Umar.
- May 2018, **Visiting Researcher**, *Australian National University*, Canberra, Australia
March 2019, Invited guest of Prof. Cedric Simenel at the Australian National University primarily investigating
Feb. 2020 low-energy nuclear reactions using TDDFT.
- Fall 2014 **Frankfurt Institute for Advanced Studies**, *Theoretical Study of Nuclear Decay Modes in Neutron Rich Super Heavy Elements*
Theoretical study into characteristics and properties of extremely neutron rich elements under the supervision of Prof. Walter Greiner.

Grants

- Pending **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**
605000 service unit research grant to study systematic uncertainties in low-energy nuclear fusion reactions.

Invited Talks/Seminars

- 2023 **Eigenvector continuation method in nuclear structure and reaction theory**, *CEA-Saclay*
2023 **Rising Researchers Seminar Series**, *INT*
2022 **Lawrence Livermore National Lab NDT/NPP Seminar**, *Virtual*

- TBD **ICFN7**, *Sanibel Island, Florida*
- 2022 **UIUC Nuclear Theory Seminar**, *University of Illinois Urbana-Champaign*
- 2020 **Los Alamos National Lab T2 Seminar**, *Virtual*
- 2020 **Texas A&M Cyclotron Seminar**, *Texas A&M*

Contributed Talks

- Mult. **APS Division of Nuclear Physics**, *Virtual/In Person*
- 2021 **APS April Meeting**, *Virtual*
- 2014 **National Conference on Undergraduate Research**, *University of Kentucky*
- 2013 **99th Annual Meeting of the Kentucky Academy of Sciences**, *Morehead State University*

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 Workshop**, *Galileo Galilei Institute*
- 2016 **Density Functional Theory TALENT School**, *University of York*
- 2014 **GSI Summer Student Program**, *GSI*

Awards

- 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

- 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 DFT 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.
- 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, Parallel computing, Machine learning, Cloud Computing
- System MSU HPCC; TAMU HPRC - Terra, Ada; Australian NCI - Raijin, Gadi; OLCF - Summit;
- Experience ALCF - Polaris; AMD Private Cluster

Society memberships

- American Physical Society
- The Internet Society

Journal Articles

- [1] 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 (accepted)",
- [2] 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).
- [3] K. Godbey, A. S. Umar, and C. Simenel, "Theoretical uncertainty quantification for heavy-ion fusion (Editors' Suggestion)", *Phys. Rev. C* **106**, L051602 (2022).
- [4] 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).
- [5] 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).
- [6] 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).
- [7] 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).
- [8] C. Simenel, P. McGlynn, A. S. Umar, and K. Godbey, "Comparison of fission and quasi-fission modes", *Physics Letters B* **822**, 136648 (2021).

- [9] A. S. Umar, C. Simenel, and K. Godbey, "Pauli energy contribution to the nucleus-nucleus interaction (Editors' Suggestion)", *Phys. Rev. C* **104**, 034619 (2021).
- [10] 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).
- [11] C. Simenel, K. Godbey, and A. S. Umar, "Timescales of quantum equilibration, dissipation and fluctuation in nuclear collisions", *Phys. Rev. Lett.* **124**, 212504 (2020).
- [12] 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).
- [13] K. Godbey and A. S. Umar, "Quasifission dynamics in microscopic theories", *Frontiers in Physics* **8**, 40 (2020).
- [14] 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).
- [15] 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).
- [16] 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).
- [17] 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).
- [18] 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).
- [19] K. Godbey, A. S. Umar, and C. Simenel, "Dependence of fusion on isospin dynamics", *Phys. Rev. C* **95**, 011601 (Rapid Communication) (2017).
- [20] 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).

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] 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.
- [2] 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.
- [3] 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).
- [4] 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.

- [5] 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/>.