

AUSTIN HINKEL

📍 Thomas More University, Department of Mathematics & Physics

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📌 Research Interests: Galactic Archaeology, Applied Data Science, Physics & Astronomy Education/Outreach

Ph.D. Physics | Galactic Archaeology, Astrophysics, Data Science

EDUCATION

2016 - 2021	PH.D., M.S. IN PHYSICS Dissertation: "Axial Symmetry Tests of Milky Way Disk Stars Probe the Galaxy's Matter Distribution", GPA: 3.94	University of Kentucky
2015 - 2015	Summer study abroad program in geopolitics and history	Danish Institute for Study Abroad
2012 - 2016	B.S. IN PHYSICS, MINOR IN MATHEMATICS Honors Program, summa cum laude, GPA: 4.00	University of Kentucky

APPOINTMENTS

2023 -	ASSISTANT PROFESSOR	Thomas More University
2021 - 2023	VISITING ASSISTANT PROFESSOR	Colorado College
2016 - 2021	TEACHING AND RESEARCH ASSISTANT	University of Kentucky

COURSES TAUGHT

ELEMENTS OF PHYSICS II - LECTURE Sole lecture instructor for 21 students. Designed course around lecture tutorial worksheets, Think-Pair-Share activities, and other active learning techniques I learned at the AAPT's New Faculty Workshop.	Spring 2024
ELEMENTS OF PHYSICS II - LAB Sole lab instructor for 15 students. Designed inquiry-based learning labs to challenge common misconceptions and elicit opportunities for peer teaching.	Spring 2024
ASTRONOMY AND DATA ANALYSIS WITH THE GAIA SPACE TELESCOPE Sole lecture instructor for 2 upper-level students. Facilitated the use of real astronomy data for students to learn programming, databases, data analysis techniques, and astrophysics. Designed course around mini-tutorials, mini-lectures, and more involved labs and projects.	Spring 2024
ELEMENTS OF PHYSICS I - LECTURE Sole lecture instructor for 31 students. Designed course around lecture tutorial worksheets, Think-Pair-Share activities, and other active learning techniques I learned at the AAPT's New Faculty Workshop.	Fall 2023
ELEMENTS OF PHYSICS I - LAB Sole lab instructor for 17 students. Designed inquiry-based learning labs to challenge common misconceptions and elicit opportunities for peer teaching.	Fall 2023
ELEMENTS OF PHYSICS I - LAB Sole lab instructor for 13 students. Designed inquiry-based learning labs to challenge common misconceptions and elicit opportunities for peer teaching.	Fall 2023
ASTRONOMY - LAB Sole lab instructor for 14 students. Designed labs to improve numeracy, scientific literacy, and data literacy skills, while illustrating lecture concepts in action.	Fall 2023
INTRODUCTORY PHYSICS FOR THE LIFE SCIENCES I - LAB Sole laboratory instructor for around 20 students. Designed inquiry-based learning labs to challenge common misconceptions and elicit opportunities for peer teaching.	Spring 2023
INTRODUCTORY ASTRONOMY - LAB Sole laboratory instructor for around 30 students. Designed labs to improve numeracy, scientific literacy, and data literacy skills, while illustrating lecture concepts in action.	Spring 2023

INTRODUCTORY ASTRONOMY	Fall 2022
Sole lecture instructor for 34 students. Designed course around lecture tutorial worksheets, Think-Pair-Share activities, and other active learning techniques I learned at the AAPT's New Faculty Workshop.	
INTRODUCTORY PHYSICS FOR THE PHYSICAL SCIENCES II - LAB	Fall 2022
Sole laboratory instructor for 37 students. Designed inquiry-based learning labs to challenge common misconceptions and elicit opportunities for peer teaching.	
INTRODUCTORY PHYSICS FOR THE LIFE SCIENCES II	Fall 2022
Sole lecture instructor for 31 students. Designed course around lecture tutorial worksheets, Think-Pair-Share activities, and other active learning techniques I learned at the AAPT's New Faculty Workshop.	
ASTRONOMY AND DATA ANALYSIS WITH THE GAIA SPACE TELESCOPE	Spring 2022
Sole lecture instructor for 7 upper-level students. Facilitated the use of real astronomy data for students to learn programming, databases, data analysis techniques, and astrophysics. Designed course around mini-tutorials, mini-lectures, and more involved labs and projects.	
INTRODUCTORY PHYSICS FOR THE LIFE SCIENCES I	Spring 2022
Sole lecture instructor for around 20 students. Designed course around lecture tutorial worksheets.	
INTRODUCTORY PHYSICS FOR THE PHYSICAL SCIENCES II - LAB	Spring 2022
Sole laboratory instructor for around 10 students.	
INTRODUCTORY PHYSICS FOR THE LIFE SCIENCES II	Fall 2021
Sole lecture instructor for around 20 students. Designed course around lecture tutorial worksheets.	
INTRODUCTORY PHYSICS FOR THE LIFE SCIENCES I - LAB	Fall 2021
Sole laboratory instructor for around 20 students.	
INTRODUCTORY PHYSICS FOR THE PHYSICAL SCIENCES I - LAB	Fall 2021
Sole laboratory instructor for around 10 students.	

PUBLICATIONS

Peer-Reviewed Journal Articles

1. **Hinkel, Austin**, Susan Gardner, and Brian Yanny (2023e). "Two-Point Correlation Function Studies for the Milky Way: Discovery of Spatial Clustering from Disk Excitations and Substructure". In: *The Astrophysical Journal* 942.1, p. 41. DOI: [10.3847/1538-4357/ac9ccc](https://doi.org/10.3847/1538-4357/ac9ccc).
2. Gardner, Susan, **Austin Hinkel**, and Brian Yanny (2020). "Applying Noether's theorem to matter in the Milky Way: evidence for external perturbations and non-steady-state effects from Gaia Data Release 2". In: *The Astrophysical Journal* 890.2, p. 110.
3. **Hinkel, Austin**, Susan Gardner, and Brian Yanny (2020b). "Axial Asymmetry Studies in Gaia Data Release 2 Yield the Pattern Speed of the Galactic Bar". In: *The Astrophysical Journal Letters* 899.1, p. L14.
4. **Hinkel, Austin**, Susan Gardner, and Brian Yanny (2020c). "Probing Axial Symmetry Breaking in the Galaxy with Gaia Data Release 2". In: *The Astrophysical Journal* 893.2, p. 105.

Theses

1. **Hinkel, Austin** (2021). "Axial Symmetry Tests of Milky Way Disk Stars Probe the Galaxy's Matter Distribution". In: *Theses & Dissertations*.
2. **Hinkel, Austin** (2016). "Modeling Extrasolar Trojan Asteroids in Gravitational Potentials of Migrating Jovian-like Planets to Inform Future Observations". In: *Theses & Dissertations*.

Journal Articles In Preparation

1. Yin, Ziyuan and **Austin Hinkel** (2024). "A Wave-Corrected Assessment of the Local Midplane". In: *The Astrophysical Journal* (In Prep.)
2. **Hinkel, Austin** (2023a). "The Brocard-Ramanujan Problem and an Unexpected Connection to Primitive Pythagorean Triples". In: *Mathematics Magazine* (In Prep.)

Conference Proceedings

1. **Hinkel, Austin**, Susan Gardner, and Brian Yanny (2023f). “Two-Point Correlation Function Studies for the Milky Way: Discovery of Spatial Clustering from Disk Excitations and Substructure”. In: 241st Meeting of the AAS.
2. **Hinkel, Austin**, Susan Gardner, and Brian Yanny (2021a). “Axial Symmetry Tests of Milky Way Disk Stars Probe the Galaxy’s Matter Distribution”. In: 237th Meeting of the AAS.
3. **Hinkel, Austin**, Susan Gardner, and Brian Yanny (2021b). “Axial Symmetry Tests of Milky Way Disk Stars Probe the Galaxy’s Matter Distribution”. In: APS April Meeting.
4. **Hinkel, Austin**, Susan Gardner, and Brian Yanny (2020a). “Applying Noether’s Theorem to Matter in the Milky Way: Axisymmetry Tests with Gaia Data Release 2 Reveal External Perturbations and Non-Steady-State Effects”. In: vol. 65. APS April Meeting.

Invited Talks

1. **Hinkel, Austin**, Susan Gardner, and Brian Yanny (2023a). “Galactic Archaeology with the Gaia Space Telescope: Digging for Galactic Structure with the Two-Point Correlation Function”. In: Invited talk at Kalamazoo College.
2. **Hinkel, Austin**, Susan Gardner, and Brian Yanny (2023b). “Galactic Archaeology with the Gaia Space Telescope: Digging for Galactic Structure with the Two-Point Correlation Function”. In: Invited talk at Centenary College of Louisiana.
3. **Hinkel, Austin**, Susan Gardner, and Brian Yanny (2023c). “Galactic Archaeology with the Gaia Space Telescope: Digging for Galactic Structure with the Two-Point Correlation Function”. In: Invited talk at Eastern Kentucky University.
4. **Hinkel, Austin**, Susan Gardner, and Brian Yanny (2023d). “Galactic Archaeology with the Gaia Space Telescope: Digging for Galactic Structure with the Two-Point Correlation Function”. In: Invited talk at Thomas More University.
5. **Hinkel, Austin**, Susan Gardner, and Brian Yanny (2021c). “Galactic Archaeology with Gaia: Digging for Structure in the Milky Way”. In: Invited talk at Colorado College.
6. **Hinkel, Austin**, Susan Gardner, and Brian Yanny (2021d). “Two-Point Correlation Function Studies in the Milky Way: Spatial Clustering from Disk Excitations and Substructure”. In: Ohio State University Little Galaxies Journal Club.

Poster Talks (Presenter)

1. **Hinkel, Austin** (2024). “Designing an Open Source, Skills-Based, Introductory Astronomy Course: Teaching Data Science and Python with Gaia Space Telescope Data”. In: 243rd Meeting of the AAS.

Conference Proceedings (Non-Presenting Coauthor)

1. Gardner, Susan, **Austin Hinkel**, and Brian Yanny (2023). “Two-Point Correlation Function Studies for the Milky Way: Discovery of Spatial Clustering from Disk Excitations and Substructure”. In: APS April Meeting.

Poster Talks (Non-Presenting Coauthor)

1. Hancock, Hart, Eryn Murphy, Ben Blackmore, and **Austin Hinkel** (2023). "Center of pressure metrics during the five-time sit-to-stand are associated with falls-history in older adults". In: 2023 Annual Meeting of the American College of Sports Medicine.
2. Yin, Ziyuan and **Austin Hinkel** (2022). "A Wave-Corrected Assessment of the Milky Way's Vertical Structure Near the Solar Neighborhood". In: Colorado College Student Summer Research Symposium.

Outreach Talks

1. **Hinkel, Austin** (2023b). "The Solar System's Time Capsules: Unlocking the Secrets of Asteroids & Comets". In: Thomas More University Observatory Public Lecture Series.
2. **Hinkel, Austin** (2020a). "Okay, the Climate's Changing... What Can We Do About It?" In: West Sixth Suds and Science Public Lecture Series.
3. **Hinkel, Austin** (2020b). "Swing Sets, Stars, and the Secrets of the Universe". In: U. of Kentucky Virtual Three Minute Thesis Competition (Finalist).
4. **Hinkel, Austin** (2019). "The Leftovers of Solar System Formation". In: Kentucky SkyTalk Lecture Series.



HONORS & AWARDS

Colorado College Dean of the Faculty Teaching Excellence Award	2022-2023 AY
Universities Research Association Visiting Scholars Program at Fermilab (3X)	2018-2021
U. Kentucky College of Arts & Sciences Dean's Competitive Fellowship	Fall 2020
GAANN Fellow, U.S. Dept. of Education for study at the U. Kentucky	Fall 2018
American Physical Society Five Sigma Physicist Award	2016
U. Kentucky Dept. of Physics & Astronomy Outstanding Senior	2016
U. Kentucky Dept. of Physics & Astronomy Outstanding Junior	2015
U. Kentucky Presidential Scholarship	2012-2016
U. Kentucky Department of Physics & Astronomy Scholarship	2014-2016
Sigma Pi Sigma Physics Honor Society inductee	2015
Kentucky Educational Excellence Scholarship	2012-2016
U. Kentucky Dean's List	2012-2016
Kentucky Governor's Scholar	2011



GRANTS


NASA KY EPSCoR, KY Space Grant Consortium - Enhanced Mini Grant	\$21,274.04	2023-2024 AY
Thomas More University Faculty Development Grant	\$1,000.00	2023-2024 AY
Colorado College Faculty-Student Collaborative Research Grant	\$4,000.00	Spring 2022
Colorado College Divisional Research & Development Grant	\$5,000.00	2023
Colorado College Divisional Research & Development Grant	\$1,000.00	2022





LEADERSHIP ACTIVITIES, PROFESSIONAL DEVELOPMENT, & SERVICE


American Association of Physics Teachers New Faculty Workshop	July 2022
QPR Suicide Intervention Certification	2022-2023
Various Kaggle Machine Learning Certifications	2023
Colorado College Senior Seminar Advisor	2022-2023
Student Sustainability Council Representative at U. Kentucky	2020-2021
Graduate Student Congress Leadership Team: Sustainability Advocate at U. Kentucky	2020-2021
Vice President of the Society of Physics Students at U. Kentucky	2015


OTHER PROJECTS, INTERDISCIPLINARY WORK, & ACTIVITIES


 **Two-Point Correlation Studies of the Milky Way** – Building on our previous work with the Two-Point Correlation Function (2PCF), my collaborators and I are working to develop an accurate model of the local Milky Way to allow for a traditional 2PCF analysis of the halo. By constraining the power spectrum of dark matter, our work may help to discriminate between particle physics models of dark matter.

 **Fall Risk Identification Project** – Interdepartmental collaborator on a Human Biology and Kinesiology research project wherein I designed and implemented a data reduction and processing pipeline, filtered Fourier Transform data, and developed a moving-window analysis to automatically identify particular data collection outliers inherent in the experimental setup. I also formulated a novel metric to highlight a particular type of human movement of interest. The metric was ultimately able to predict fall risk in elderly patients with very high accuracy.

 **Energy Savings Advisor Software and Sensor System** – Provisional patent filed in 2021 for a software-enabled hardware solution intended to lower energy usage of the built environment through thermodynamics calculations, building envelope monitoring, and consumer engagement.

 **Commission for Environmental Cooperation Youth Innovation Challenge Semi-Finalist** – Semi-finalist in the Commission for Environmental Cooperation's Youth Innovation Challenge for the invention above.

 **ESG Student Managed Investment Fund at University of Kentucky** – Led a student movement to move the University of Kentucky towards more sustainable practices, including carving out a multi-million dollar, student managed sustainable investment fund from the university's endowment. This fund is now being used to help prepare future sustainability leaders at the University.

 **Kaggle Machine Learning Competition: Prediction of Parkinson's Disease Freezing of Gait from Accelerometer Data** – Participated in a machine learning competition to identify and predict Freezing of Gait symptoms in Parkinson's Disease patients from accelerometry.

PROFESSIONAL MEMBERSHIPS

American Physical Society – Member, District Advocate, & 5-sigma Physicist

American Astronomical Society – Member

American Association for the Advancement of Science – Member

American Association of Physics Teachers – New Faculty Workshop Participant

Union of Concerned Scientists – Science Network Member

SELECTED PRESS COVERAGE

Thomas More Observatory Public Talk  – Outreach coverage

Astronomy Class Press Release  – Teaching coverage

Milky Way Structures Press Release  – Research coverage

Sustainable Finance at the University of Kentucky  – Leadership coverage