Curriculum Vitae: David Wright

Personal Data

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University Education

2016 – 2021	University of Central Florida BSc Physics, Astronomy Track BSc Mathematics Burnett Honors College Student
2021 – present	University of Central Florida Physics PhD

Awards and Honors

2021	**Recent Addition:** National 2021 Outstanding Undergraduate Research Award runner-up, the Society of Physics Students
2021	**Recent Addition:** Student Scholar Symposium Judges' Choice Award, UCF
2021	**Recent Addition:** Founders' Day Award, UCF
2021	Society of Physics Students Blake Lilly Award
2021	Society of Physics Students Chapter Research Award
2021	Society of Physics Students Future Faces of Physics Award
2020	Distinguished Undergraduate Researcher Award, UCF
2020 – present	Sigma Pi Sigma Physics Honor Society Member
2016 – 2020	Bailey Family Foundation Scholarship
2016 – 2020	University of Central Florida Provost Scholarship
2016 – 2020	Florida Bright Futures Academic Scholar Scholarship

Publications

[1] Joseph Harrington et al. "An Open-Source Bayesian Atmospheric Radiative Transfer (BART) Code: I. Design, Tests, and Application to Exoplanet HD 189733 b". In: *arXiv:2104.12522 [astro-ph]* (Apr. 2021). arXiv: 2104.12522. In press at Planetary Science Journal.

[2] Michael D. Himes et al. "Accurate Machine Learning Atmospheric Retrieval via a Neural Network Surrogate Model for Radiative Transfer". In: *arXiv:2003.02430 [astro-ph]* (Jan. 2021). arXiv: 2003.02430. In press at Planetary Science Journal.

[3] David C. Wright. "Simulating Systematic Errors in Exoplanetary Transits for the James Webb Space Telescope". In: *Honors Undergraduate Theses* (May 2021).

Conference Presentations

[4] David C. Wright et al. *Simulating Systematic Errors in Exoplanetary Transits for the James Webb Space Telescope*. Poster presented at the 53rd Annual Meeting of the AAS Division for Planetary Sciences. 2021.

[5] David C. Wright, Christos Velissaris, and Ahlam Al-Rawi. *Introducing Integration in Physics without Calculus*. Poster presented at the American Association of Physics Teachers 2020 Winter Conference, Orlando, FL. 2020.

[6] David C. Wright et al. *Simulating Systematic Errors in Exoplanetary Transits for the James Webb Space Telescope*. Poster presented at the 52nd Annual Meeting of the AAS Division for Planetary Sciences. 2020.

[7] David C. Wright et al. *Simulating Systematic Errors in Exoplanetary Transits for the James Webb Space Telescope*. Poster accepted for presentation at the Showcase of Undergraduate Research Excellence at UCF. Showcase cancelled due to COVID19. 2020.

[8] David C. Wright, Dina Maia, and Gizelle Salama. *Strain and Raman Spectroscopy Experiments on Synthetic Polymer and Hard Biological Materials*. Poster presented at the Showcase of Undergraduate Research Excellence at UCF, Orlando, FL. 2019.

Research Experience

2021 – present **Precision Cosmology and Optics** (Dr. Stephen Eikenberry[1,2] — [1]UCF, [2]UF). Investigated the effects of systematic errors on LIGO Hubble constant calculations, created optical instruments in Zemax optics software, worked with universe-scale simulations on the University of Florida's HiPerGator computing cluster.

2019 – present **Exoplanet Measurement Group** (Dr. Joseph Harrington[1] — [1]UCF). Contributed to open-source planetary-transit simulator, acted as system administrator for group computing cluster, simulated data for James Webb Space Telescope observations, explored applications of machine learning to problems in astronomy, designed and built high performance computers for the group, built large, fault-tolerant storage solutions for research data using advanced file-systems.

2020 – 2021 **Honors Undergraduate Thesis** (Drs. Joseph Harrington[1], Theodora Karalidi[1], and Enzo Pascale[2] — [1]UCF, [2]La Sapienza Università di Roma). "Simulating Systematic Errors and Planetary Transits for the James Webb Space Telescope." Accurately simulated observations of planetary transits made by the James Webb Space Telescope (JWST), including complex noise sources such as jitter noise and instrument peculiarities such as multiple-ordered spectral traces. Used a codebase provided by one of our collaborators and then developed the necessary features to accurately simulate JWST observations, wrote validation tests, and parallelized sections of the code to increase performance.

2020 – 2021 **Sports Data Analysis** (Drs. Costas Efthimiou[1] and Barry Griffiths[1] — [1]UCF). Investigated effects of alternative soccer point systems on league rankings and Pareto distribution models of soccer-team manager rankings. Wrote web-scraping, data analysis, and model-fitting routines in Python.

2019 – 2020 **Physics Education Research** (Dr. Christos Velissaris[1] — [1]UCF). Created course materials and investigated pedagogy techniques for the purpose of better teaching introductory physics students integration.

2019 – 2020 **Physics Education Research** (Dr. Zhongzhou Chen[1] — [1]UCF). Created teaching materials for online instructional environment and researched pedagogic techniques to improve both online and in person physics courses.

2018 – 2020 **Materials Research** (Drs. Alfons Schulte[1] and Ahlam Al-Rawi[1] — [1]UCF). Investigated mechanical properties of organic and inorganic materials. Built custom electronics to measure material properties, wrote data-analysis pipeline for observations, and probed molecular structure using Raman spectroscopy.

Activities and Leadership Experience

2020 – present **Local Organizing Comittee (LOC) member for APS CUWiP 2022 at UCF**. CUWiP is a three-day regional conference for undergraduate physics majors. Its goal is to help undergraduate women continue in physics by providing them with the opportunity to experience a professional conference, information about graduate school and professions in physics, and access to other women in physics of all ages with whom they can share experiences, advice, and ideas. I developed the website for the UCF conference and helped coordinate the event.

2020 – present **Co-author and Project Leader for the Society of Physics Students Chapter Research Award.** This project aims to simulate the motion of particles around black holes using a variety of solutions to the Einstein field equations, such as the Schwarzchild, Kerr, Kerr-Newman, and Reissner-Nordstrom solutions.

2017 – present **Annual volunteer at UCF STEM Day**, a public outreach event designed to give K-12 students the opportunity to explore STEM fields through demonstrations, activities, speakers, and exhibits. I ran demonstrations and helped coordinate the event each year.

2018 – present **Annual volunteer at UCF Physics Career Day**. Students were invited to the Physics Department to learn about career opportunities in physics. I prepared presentation materials, ran demonstrations, and helped coordinate the event annually.

2019 – 2021 **Society of Physics Students Treasurer and Network Administrator.** Coordinated weekly meetings, planned outreach events, handled finances, prepared research/funding proposals, managed website and digital infrastructure, and acted as a liaison between students and faculty. Prepared students for success in academia and professional careers.

2019 – 2020 **UCF Physics video project project leader**. Created solution videos for introductory Physics courses. Project lead for the introductory mechanics group.

2019 **Volunteer at the UCF Summer Institute of Physical Sciences**. The summer institute is a program that provides K-12 students with the opportunity to do hands-on learning at UCF. I ran demonstrations, helped guide students around campus, and facilitated lectures at this event.

Teaching Experience

2021 — **Graduate Teaching Assistant and Grader** for a Python-based numerical computing course. Held weekly office hours, assisted in classroom pedagogy, proctored examinations, and graded coding assignments.

2021 — **Teaching Assistant** for introductory Astronomy course. Held weekly office hours and additional review sessions when needed.

2021 — **Grader and University-Appointed Tutor** for introductory Physical Sciences Course. Will hold weekly tutoring sessions and grade coursework.

2018 – 2021 — **PhysTEC Learning Assistant** for three Introductory Electricity and Magnetism (E&M) courses and a Python-based numerical computing course. I have held this position in both algebra and calculus-based E&M courses. Facilitated student learning in large-enrollment courses, held weekly office hours, managed classroom equipment and demonstrations, proctored examinations, and oversaw frequent labs.

Selected Advanced Coursework

Physics — **General Relativity**. Geodesics. Field equations. Schwarzchild and Kerr solutions. Textbook — Hobson.

Particle Physics. Renormalization. Scattering. Explicitly computed 1-loop correction for Møller scattering. QED. QCD. Symmetries. Gauge theories.
Textbooks — Griffiths, Halzen.

Quantum Field Theory (graduate, audited). Second quantization. Path integral formulation. Renormalization. Gauge theories.
Textbook — Ryder.

Electrodynamics I (graduate). Classical field theory. Applications.
Textbook — Landau Volume 2.

Classical Mechanics (graduate). Variational principles. Lagrange, Hamiltonian, and Poisson bracket formulations of mechanics. Hamilton's principle of least action. Hamilton-Jacobi theory. Perturbation theory. Continuous systems. Chaos.
Textbook — Landau Volume 1.

Quantum Mechanics I (graduate). Basic postulates of quantum mechanics. Operators. Eigenvalues. Parity. Potential wells. Harmonic oscillator. Time dependent and time independent Schrodinger equation. Matrix formulation. Time independent perturbation theory.
Textbook — Sakurai & Napolitano.

Astrophysics — **Galaxies and Cosmology**. Galactic evolution and dynamics. Active galaxies and quasars. Structure formation. Cosmic Microwave Background. Nucleosynthesis. Inflation. Calculations in FLRW background.
Textbook — Ryden, Instructor notes.

Astronomical Data Analysis (graduate). Astronomical data formation and acquisition. Detector physics. Measurement extraction. Error analysis. Modeling. Computer programming. Statistics. Written and oral presentation of results.
Textbook — Handbook of CCD Astronomy by Howell, Instructor notes.

Stellar Astrophysics. Physics and dynamics of stars. Star formation. Stellar evolution.
Textbook — Carroll & Ostlie.

Experimental Methods in Astronomy. Experimental design and experimental techniques in astrophysics. Spherical astronomy. Physics of telescopes and of common astronomical detectors. Error analysis.
Textbooks — Galloway, Léna, and Poggiani.

Mathematics

Bayesian Analysis and Approximation Theory (graduate). Bayes' theorem. Fourier and wavelet transforms. Function approximation in multidimensional spaces. Kernels. Splines. Bayesian data analysis. Monte Carlo and Markov Chain Monte Carlo methods.
Textbook — Gelman.

Non-linear Dynamics and Chaos Theory (graduate). Nonlinear differential equations. Bifurcation theory. Hamiltonian dynamics. Integrable systems and breakdown of integrability. Chaos in conservative and dissipative systems.
Textbook — Instructor notes.

Abstract Algebra I. Sets and mappings. Groups. Subgroups. Permutation groups. Homomorphisms and isomorphisms. The isomorphism theorems. Groups actions. The class equation. Sylow theorems. Rings.
Textbook — Fraleigh.

Point-set Topology. Metric spaces. Topological spaces. Limit points. Continuity. Compactness. Connectedness.
Textbooks — C. Wayne Patty, Munkres.

Mathematical Foundations of Machine Learning and Artificial Intelligence. Machine Learning. Artificial Intelligence. Expectation Maximalization algorithm. Projections Principal Component Analysis. Mixture Models. Support Vector Machines. Kernel methods.
Textbook — Mathematics for Machine Learning by Deisenroth, Faisal, and Ong.

Vector and Tensor Analysis (audited). Manifolds. Lagrangian and Hamiltonian mechanics. Differential forms.
Textbooks — Holm, Schutz.

Skills

Proposal preparation and submission
Organization of funded projects
Computer Skills
Data Analysis and scientific computing
Techniques for reproducible computational research
Fluent in Java, Python, C, Bash, and Mathematica programming languages
Novice web development
Proficient with containerization software such as Docker and Singularity
Experience with High-Performance Computing (HPC) environments
Extensive knowledge of computer hardware and Linux system administration
Designing and selecting components for computers and other electronics
Experience with open-source development and version-control systems