



Dr. Andrej Favia

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DEGREES

Ph.D. University of Maine, Department of Physics and Astronomy, Orono, ME, 2014
Committee: Dr. Neil F. Comins and Dr. Geoffrey L. Thorpe, University of Maine, Orono, ME
An Inventory of Student Recollections of their Past Misconceptions as a Tool for Improved Classroom Astronomy Instruction

B.A., Physics, University of Southern Maine, Physics, Portland, ME, 2007
Graduated summa cum laude
Advisor: Dr. Paul Nakroshis, Associate Professor of Physics

High School diploma, Pascack Hills High School, Montvale, NJ, 2003
AP Calculus (5), AP Chemistry (4)

APPOINTMENTS

Introductory Physics Lab Coordinator for Physics majors, University of Maine, Orono, ME
Physics II Lab: Fall 2019–2021, Physics I Lab: 2020–2022

- Taught lab TAs how to teach individual labs, troubleshoot technical equipment, and review grading strategies (over Zoom in 2021)
- Coordinated with Physics course instructor to ensure continuity of physics themes and lab equipment manager to ensure appropriateness of apparatus

Temp Professional and Laboratory Assistant, University of Maine, Physics and Astronomy, Orono, ME, 2016–2022

- Various teaching responsibilities including Intro Quantum Mechanics, Descriptive Physics, and introductory labs for Physics majors

Adjunct Faculty, Eastern Maine Community College, Math & Science, Bangor, ME, 2016–2022

- Taught Technical Mathematics, Trigonometry, and Statistics
- Tutored Physics and Mathematics from developmental Mathematics through Calculus, drop-in and appointment, live and over Zoom

Instructor (online, supervision), Beal College, Bangor, ME, 2020

- Co-supervised online dialogue and student-constructed solutions to questions in Algebra and Statistics

Physics Lab Instructor, Husson University, Bangor, ME, 2019–2020

- Teaching first semester introductory Physics labs, calculus-based and algebra-based

TRiO Tutor, University of Maine, Orono, ME, Spring 2019

- Arranged one-on-one appointments with two students to tutor Pre-Calculus and Calculus I

Assistant Professor of Physics (non-tenure track), University of Maine, Physics and Astronomy, Orono, ME, 2014–2016

- Taught full Physics and Astronomy courses (listed below) and introductory labs for Physics majors, taught recitation using McDermott tutorials, tutored Physics I & II in the Physics Learning Center, students were using *Mastering Physics*
- Physics courses taught: Mechanics, Modern Physics, Quantum Mechanics, Descriptive physics with labs (non-Physics majors)
- Astronomy courses taught: General Astronomy I (stellar evolution, planetary systems), General Astronomy II (galaxies, extragalactic astronomy), Cosmology

Ph.D. Program in Physics, University of Maine, Physics and Astronomy, Orono, ME, 2007–2014

- Developed a new survey to measure the persistence of 215 misconceptions held by college students taking introductory Astronomy, the subset is taken from a [larger list of misconceptions](#) that Ph.D. Co-advisor Neil Comins has heard from his own students in the course over ~30 years of instruction
- Taught introductory Physics and Astronomy labs on a graduate TA appointment starting in Fall 2007, with total physics lab teaching experience of 11 years (continuing at UMaine as an adjunct)

Level I Math Tutor, University of Southern Maine, Mathematics, Gorham, ME, 2006

- Tutored students one-on-one through Calculus on both drop-in and appointment bases
- Participated in tutor training workshops

INSTRUCTOR POSITIONS

University of Maine - Course Instructor

Descriptive Physics, 2014–2015, 2021 (online), 2022

- Emphasized the physics of sound, waves, and optics with an interdisciplinary focus for students majoring primarily in Communication Sciences & Disorders
- Utilized PhET simulations to convey physics principals in lecture and lab
- Implemented active learning and active feedback techniques using Think-Pair-Share and voting questions (colored voting cards instead of clickers in 2015; Zoom polls in 2021)
- Utilized *Mastering Physics* for homework and tutorials
- Textbook used: P. Hewitt. (2021). *Conceptual Physics* (13th ed.), San Francisco, CA: Pearson., included *Mastering Physics*

General Physics I (non-calculus), summer 2022

- Taught kinematics, Newton's laws, conservation of momentum and energy, rotational and wave mechanics to Science majors
- R. D. Knight, B. Jones, & S. Field. (2009). *College Physics: A Strategic Approach* (4th ed.), San Francisco, CA: Addison-Wesley.

Introductory Quantum Mechanics, for Physics majors, 2014, 2020 (hy-flex)

- Taught the principles of particle-wave duality, Schrödinger's equation, the wave function, probability density, atomic theory, bonding and spectra of diatomic molecules
- K. S. Krane. *Modern Physics* (4th ed.), Indianapolis, IN: Wiley.

Cosmology, for astronomy minors, 2016

- Taught senior-level course in astrophysics with analyses on the Friedmann equations and examination of large-scale structure
- B. Ryden. (2003). *Introduction to Cosmology*, San Francisco, CA: Addison-Wesley.

Sophomore Classical Mechanics, 2015–2016

- Led workshops using inquiry-based tutorials, designed on the basis of supported current pedagogical practices in physics education research:
- [Intermediate Mechanics Tutorials](#), Ambrose & Wittmann
 - Newton's laws and velocity-dependent forces
 - Conservative forces and equipotential diagrams
 - Accelerating reference frames: Rotating frames
- [Tutorials in Physics Sense Making](#), University of Maryland
 - What's the purpose of Free-Body Diagrams?
- [Intermediate Mechanics Tutorials](#), University of Colorado–Boulder
 - Line Integrals and Work
- J. R. Taylor. (2004). *Classical Mechanics*, Mill Valley, CA: University Science Books.

General Astronomy II: Stars, Galaxies, Cosmology, for astronomy minors, 2014, 2016

- Designed curriculum, syllabus, lecture presentations, homework problems, and in-class learning activities involving analysis of concepts and relevant astrophysical data
- P. Schneider. (2006). *Extragalactic Astronomy and Cosmology: An Introduction*, New York: Springer.

General Astronomy I: Solar System Astronomy, for astronomy minors, 2015

- Designed curriculum, syllabus, lecture presentations, homework problems, and in-class learning activities involving analysis of concepts and astrophysical data specifically pertaining to the solar system
- Utilized inquiry-based tutorials: E. E. Prather, T. F. Slater, J. P. Adams, & G. Brissenden. (2013). *Lecture-Tutorials for introductory astronomy* (3rd ed.), San Francisco, CA: Pearson.
- M. L. Kutner. (2003). *Astronomy: A Physical Perspective* (2nd ed.), Cambridge University Press.

Senior Undergraduate Quantum Mechanics, 2015

- Implemented a pedagogy of learning by example, emphasizing experiential learning, and allowed students to correct their homework for additional partial credit to encourage re-learning of material
- D. McIntyre. (2012). *Quantum Mechanics: A Paradigms Approach*, San Francisco, CA: Pearson.

General Physics II (non-calculus), summer 2014

- Taught electromagnetism and optics with examples and demonstrations to Science majors
- R. D. Knight, B. Jones, & S. Field. (2009). *College Physics: A Strategic Approach* (2nd ed.), San Francisco, CA: Addison-Wesley.

University of Maine - Lab Instructor and Assistant

Introductory Physics I Lab and Physics II Lab Teaching Assistant, 2007–current

- Facilitated group discussions, taught students how to use lab equipment and plot data using software, managed and troubleshooted equipment, lead lab meetings, graded lab reports (all via Zoom in Fall 2020–Spring 2021)

Descriptive Physics Lab, for non-Physics majors, 2015, 2022

- Tailored the labs to the Communication Science & Disorders majors, the largest student group in this course, by incorporating labs on sound, e.g., standing waves on a string, Chladni plates
- Designed a lab emphasizing how to analyze waveforms and spectrograms using the free software program Audacity
- Modified a lab on radioactivity, to address a common misconception that radioactive objects necessarily “glow in the dark”

Introductory Astronomy Assistant (Online), 2018

- Facilitated online dialogues with class on homework and related news in astronomy
- Troubleshooted technical issues concerning access to video content on Blackboard on both desktop and mobile platforms

Astronomy Lab Assistant (Online), 2009–2013, 2017–2018

- Delivered, maintained, and organized online course assignments
- Graded online homework assisted new graduate teaching assistants with learning management software (Blackboard)

Astronomy Lab Assistant, 2008–2011, 2014–2015, 2017

- Facilitated group discussions, utilized lab equipment, telescopes, spectroscopes, and astronomy software
- Lead observatory night sessions using the 8” refractor telescope at the Maynard F. Jordan Observatory

University of Maine - Recitation Instructor

Algebra-based Physics II, for Biology and Pre-Med majors, Spring 2018

- Developed lecture plans covering electric and magnetic fields, electric potential, capacitance, Ohm’s law, Kirchhoff’s laws, geometric optics, microscopes, telescopes, electromagnetic waves, and radioactivity
- Tutored in the Physics Learning Center, to provide extra help for the students in the class
- Graded homework and exams, reviewed homework and exams in class
- R. D. Knight, B. Jones, & S. Field. (2009). *College Physics: A Strategic Approach* (2nd ed.), San Francisco, CA: Addison-Wesley.

Calculus-based Physics I, for Physics majors, 2014

- Conducted physics workshops using inquiry-based tutorials for Physics majors utilizing L. C. McDermott, P. S. Shaffer, and the Physics Education Group at the University of Washington (2002). *Tutorials in introductory physics*, Upper Saddle River, NJ: Prentice Hall.
- Tutored in the Physics Learning Center, to provide extra help for the students in the class
- E. Mazur. (2014). *Principles and Practices of Physics*, San Francisco, CA: Pearson.

Eastern Maine Community College

Introduction to Statistics, for non-Mathematics majors, 2021 (live/hybrid), 2022 summer (online)

- Taught descriptive statistics, frequency distributions, the process of data collection and presentation, regression and correlation, sampling distributions, the rules of probability, estimation, and hypothesis testing
- Developed active learning group workshops for the purpose of building technical problem solving strategies in multi-step statistics calculations in regression and probabilities
- Demonstrated and utilized the statistics program StatCrunch to perform statistical analyses
- Assigned online homework with redos to encourage learning and real-time feedback
- R. De Veaux, P. Velleman, and D. Bock. (2017). *Intro Stats* (5th ed.), San Francisco, CA: Pearson.

Technical Mathematics I, for non-Mathematics majors, 2016–2021

- Taught pre-Algebra, proportions, fractions, percentages, measurements, algebra, inequalities, geometry, graphing, factoring, fractions, radicals, quadratic equations, exponential and logarithmic functions, vectors, and right-triangle trigonometry
- Developed new active learning workshops on formatting fractions for unit conversions, moving the decimal, scientific notation, variables and combining terms
- Utilized active learning workshops from [MathShell](#) on solving linear equations, proportions, defining lines by points, slopes, and equations
- Assigned online homework with redos to encourage learning and real-time feedback
- C. Cleaves, and M. Hobbs. (2014). *College Mathematics* (9th ed.), San Francisco, CA: Pearson.

Technical Mathematics II, for non-Mathematics majors, 2016–2018

- Taught graphical and algebraic solutions to linear equations, factoring, fractions, radicals, quadratic equations, exponential and logarithmic functions, vectors, right-triangle trigonometry, Law of Sines, and Law of Cosines
- Developed tutorials on unit conversions, solving for unknowns using algebra, graphing of linear functions, and factoring by grouping
- Assigned online homework with redos to encourage learning and real-time feedback
- C. Cleaves, and M. Hobbs. (2014). *College Mathematics* (9th ed.), San Francisco, CA: Pearson.

Trigonometry, 2017

- Taught trigonometric functions and their inverses, graphing trigonometric functions, analytic trigonometry, polar coordinates and graphing, complex numbers, and DeMoivre's Theorem
- Developed a tutorial to help students use periodicity and the symmetry of the unit circle to solve analytical problems involving trigonometric functions and their inverses
- Assigned online homework with redos to encourage learning and real-time feedback
- M. Sullivan. (2016). *Trigonometry: A Unit Circle Approach* (10th ed.), San Francisco, CA: Pearson.

Physics Lab I, for Science majors, 2016

- Taught students how to use lab equipment to gather and interpret data relating to motion, forces, energy, mechanical efficiency, and specific heat capacity, demonstrated how to type lab reports, graded individual lab reports

Husson University

Introductory Physics Lab, both Calculus-based and Algebra-based, 2019–2020

Physics I Lab: Fall 2019, Physics II Lab: Spring 2020

- Facilitated group discussions, taught students how to use lab equipment and plot data using software, managed and troubleshooted equipment, lead lab meetings, graded individual lab reports

Beal College

Instructor, College Algebra, Statistics, for Business majors, 2019–2020

- Moderated online discussion engagement where each student presents a worked solution to a problem, and then replies to other students' solutions (analogous to whiteboards)

EDUCATIONAL WORKSHOPS

Brightspace workshops at UMaine, 2020

- Participated in various workshops on assessments, discussions, and groups
 - Assignments; Quizzes, Surveys, & Self Assessments: August 12, 2020
 - Discussions; Groups: August 11, 2020
 - Grading Student Work: July 15, 2020
 - Building Content: July 14, 2020

Zoom workshop at UMaine, 2020

- Participated in Using Zoom in your Classroom Virtual Training, July 13, 2020

Various STEM education workshops at UMaine, 2010–2013

- Participated in various workshops showcasing modeling instruction, discussion questions, and other classroom engagement techniques, among these workshops were:
 - What learning happens outside the classroom? Students' study skills and the role of homework in learning
 - Teaching with Clickers

American Astronomical Society, 221st Meeting, Long Beach, CA, 2013

Teaching Excellence Workshop, Center for Astronomy Education

- Received training to engage students in the classroom through tutorials and Think-Paire-Share clicker questions

Academic Supervision

Astronomy Lab Coordinator, University of Maine, Orono, ME, 2011–2013

- Instructed graduate assistants on how to teach individual labs, use lab equipment including telescopes, and conducted observation sessions at the Maynard F. Jordan Observatory

Technology Workshop Presentation

Learning L^AT_EX - Workshop Co-Presenter, University of Maine, 2013

- Introduced graduate students in Geology on how to format papers in L^AT_EX, created templates

RESEARCH

Research Experience

Weak gravitational lensing analysis of two supercluster cores, 2013–2016

University of Maine, Physics and Astronomy, Orono, ME

Co-Investigators: Dr. David J. Batuski, University of Maine, Orono, ME; Dr. Chris Miller, University of Michigan, Ann Arbor, MI; Dr. Paul Howell, Boston University, Boston, MA

The purpose was to use background galaxy artifacts, caused by the lensing of concentrated mass centered in foreground supercluster cores, themselves consisting of galaxy clusters, to estimate the mass of the clusters and observe the effects of dark matter and dark energy on large-scale (~100 Mpc) intergalactic structures in the universe.

- Observed in R, V on the Blanco 4-m using DECam in Tololo, Chile on July 2-3, 2014
- Initiated analysis of data for a gravitational lensing analysis of $\sim 10^6$ background sources to recover substantial galaxy artifacts due to lensing
- Mentored both graduate and undergraduate students on data organization and analyses using R, IRAF
- Graduate student Sarah Rice has assumed responsibility for the remaining analysis for her doctoral research as I transitioned to multi-department adjunct work

Disk runaway and hypervelocity M dwarf candidates, 2013–2015

University of Maine, Physics and Astronomy, Orono, ME

Co-Investigators: Dr. Andrew A. West and Christopher A. Theissen, B.S., Boston University, Boston, MA

The purpose is to examine the spectra and kinematics from a catalog of ~70,000 M dwarfs to determine which stars have clean spectra and such high Galactocentric velocities that they may leave the galaxy (Favia et al. 2015).

- Analyzed spectral and kinematic information of disk runaway and potentially unbound M dwarfs
- Performed Monte Carlo simulations and integration runs using R

Ph.D. research in astronomy beliefs held by college students, 2011–2014

University of Maine, Physics and Astronomy, Orono, ME

Co-Investigators: Dr. Neil F. Comins, University of Maine; Dr. Geoff L. Thorpe, University of Maine

- Developed new survey instruments to record college student beliefs spanning all topics in astronomy
- Performed multiple statistical analyses using descriptive statistics, t - and MANOVA tests, principal components analysis (a kind of factor analysis), and item response theory
- Categorized and scored qualitative data in the form of written responses

Peer-Reviewed Publications

Favia, A., Comins, N. F., & Batuski, D. J. 2016, “Taking on Astronomy Misconceptions isn’t Easy,” *Physics Today*, **69**(8), 74.

Favia, A., West, A. A., & Theissen, C. A. 2015, “Runaway M Dwarfs from the Sloan Digital Sky Survey,” *Astrophys J*, **813**, 26.

Favia, A., Comins, N. F., & Thorpe, G. L. 2015, “A Direct Examination of College Student Misconceptions in Astronomy: Validity of the Astronomy Beliefs Inventory,” *J Rev Astron Educ Outreach*, **1**(3), A3-A40.

Favia, A., Comins, N. F., Thorpe, G. L., & Batuski, D. J. 2014, “A Direct Examination of College Student Misconceptions in Astronomy: A New Instrument,” *J Rev Astron Educ Outreach*, **1**(1), A21-A39.

Additional Publication

Thorpe, G. L. & **Favia, A.** 2012, “Data Analysis Using Item Response Theory Methodology: An Introduction to Selected Programs and Applications,” *Psychology Faculty Scholarship*, Paper 20.

Conference Poster Presentations

Favia, A., & West, A. A. 2014, “A Sample of Fast Moving M Dwarfs in the Milky Way,” American Astronomical Society, 224th meeting, Boston, MA.

Favia, A., Comins, N. F., & Thorpe, G. L. 2013, “Student Misconceptions About Astronomy and the Best Order of Teaching Astronomical Concepts,” American Astronomical Society, 221st meeting, Long Beach, CA.

Grants

2013

Maine Space Grant Consortium Fellowship

University of Maine, Photometric and Spectroscopic Analysis of the Corona Borealis Supercluster of Galaxies

Advisor: Dr. David J. Batuski, Professor of Physics, University of Maine

2013

Travel to Present to American Astronomical Society Meeting, University of Maine Graduate Student Government travel grant

2010

Maine Space Grant Consortium, Fellowship
Radio Observations of the Aquarius, Microscopium and Corona Borealis Superclusters
Advisor: Dr. David J. Batuski, Professor of Physics, University of Maine

Graduate Mentorship

2015–2018

Sarah Rice, computational analyses of astronomical data and writing automated routines using R, IRAF

Undergraduate Mentorship

2014–2015

Isaac Turner, evolution of pre-instructional astronomy beliefs over time, sup. Neil Comins

2014

Andrew Sturm, capstone project on misconceptions about the Moon

2014

Joshua Medina, categorization of written pre-instructional astronomy beliefs, supervisor Neil Comins

COMMUNITY ENGAGEMENT

From 2010–2017, 2019–2020, I have volunteered in community and state-wide events to demonstrate physical and astronomical principles. I have experience using a variety of equipment (e.g. Newton's cradle, lenses, rotating platforms) to illustrate captivating applications of physical and astronomical principles.

Audiences were typically middle and high school students, accompanied by parents. The public gained hands-on experience and voluntarily participated in the demonstrations during the events. I have been supervised under Mr. David Sturm, University of Maine, Physics and Astronomy, Orono, ME. These events are primarily part of the Mainly Physics Workshop. Demonstrations included angular momentum using rotating platforms, sound on an oscilloscope, optical illusions using mirrors and lenses, conduction of electricity using a Van Der Graaf generator, and magnetism using paperclips and giant magnets. At many of the events, we supervised graduate and undergraduate students on the proper use, packing, and demonstration of equipment. For promotional purposes, I have also photographed demonstrations performed by our staff.

Science Demonstration Expositions

- [Maine Engineers Week](#) Engineering Expo, ~1000–3000 visitors each year, 2013–2017, 2019–2020
In odd-numbered years, University of Southern Maine, Gorham, ME
In even-numbered years, University of Maine, Orono, ME
- [Physics Day](#) at Saco Amusement Park, ~1000 visitors each year, Saco, ME, 2010–2014, 2016–2017
- [Maine 4-H](#) at Windsor Fairgrounds, Windsor, ME, 2012–2014, 2016
- [Maine Science Festival](#), ~2000 visitors, Bangor, ME, 2016
- [American Folk Festival](#), Bangor, ME, 2015

Science Competitions

Middle School Science Olympiad

University of Maine, Orono, ME, 2013, 2014

University of Southern Maine, Gorham, ME, 2020

- Designed and scored written tests and supervised for: astronomy, density

High School Science Olympiad

University of Southern Maine, Gorham, ME, 2013

- Designed and scored written tests and supervised for astronomy
- Supervised data analysis event using TI-CAS calculators to measure sound

Additional Community Engagement

Acadia National Park, Bar Harbor, ME

Acadia Night Sky Festival - Telescope Co-Presenter, 2013

- Interacted with the general public to promote the Maynard F. Jordan Observatory at the University of Maine, presented about Messier objects, managed our portable telescope

Memberships

American Astronomical Society

Phi Kappa Phi

International Honors Society

National Honors Society

Technical Experience and Software

Brightspace, Canvas, Capstone, DataStudio, HTML, IRAF, Java, MyLab (Pearson), \LaTeX , Learning Catalytics, Linux, LoggerPro, R, SPSS

Personal Skills

Cooperative in teams and collaborative roles

Considerate of the needs of colleagues and students

Values creative and critical thinking

Works well on self-directed academic projects

Fluent using multiple technological platforms and softwares simultaneously

Receives supportive course evaluations and incorporates suggestions into future work