Christopher Fuse
Professional Assessment Statement
Spring 2020

INTRODUCTION

I came to Rollins because I had been educated in the liberal arts and understood its value. I also came because the job advertisement seemed like it was written for me, matching my research specialties in computational physics and astrophysics. My decision to join the Rollins faculty has been everything that I had hoped. I love teaching our students, interacting with them and mentoring them. I remain passionate about researching across a broad variety of astronomical subjects and sharing in that endeavor with students. I also appreciate learning from and collaborating with my colleagues in my department and beyond. I had wanted to be part of a department and college where students and faculty had close interactions and there was a strong sense of community; Rollins has never failed to deliver.

Since coming to Rollins College, I have tried to remain an active member of my department, of the College, and the Central Florida community. I have taught nearly all of the courses offered within the department, including numerous general education courses, multiple RCCs, and Honors courses. I chaired the department for several years, in addition to chairing committees and taskforces. I have directed the Student-Faculty Collaborative Scholarship program for a decade. I have given presentations to numerous elementary and high schools.

In the 12 years since arriving at Rollins I have been fortunate enough to team teach with some outstanding faculty, from whom I have learned a great deal. I am most proud of my students and their successes. Whether in the classroom or in the research lab, I have been lucky enough to play a small role in my students publishing research, earning national awards, attending graduate school, and pursuing careers. Watching my students grow and find their passions is the most rewarding part of my job.

Self-evaluation and goals

Teaching

I find teaching to be the most fun part of my job. I get to challenge students, help them make connections across disciplines, and push them to explain their results with math. Teaching really affords me the opportunity to be a kid and show students that excitement and passion aren't a bad thing, even if we are trying to explain superhero science. Even when using odd or atypical source material, I have tried to create challenging assignments that fairly assess student skills and abilities.

My teaching style can best be described as loud, excited, and Socratic. I want students to struggle, which forces them to think and together we can overcome their difficulties. My goal is for students to develop confidence in their work, as well as enhance their critical thinking and analysis skills. I will admit that not every student connects with this style, but I have tried to take the CIE comments and criticisms to heart. I am not sure I have ever taught two iterations of a course the same way, students' suggestions and new teaching techniques give me a way to make each semester better than the last.

I teach with a philosophy that concepts learned in a physics course can be applied beyond the sciences and provide students with the critical thinking and analysis skills needed in an ever-changing technological world. My goal is to emphasize that the study of physics cannot be a "sometimes" endeavor; it needs to be an ongoing process of practice and evaluation. I want students to learn to be a kid again and play, to interact and experiment with their everyday world. I believe that this can be accomplished by open-ended lab assignments and extensive class participation.

The most common and helpful criticism from my evaluations is that I am a tough grader. I absolutely agree with this assessment and I take pride in that fact. I want to maintain high standards, while also providing useful feedback to my students. I continue to be ever-mindful that grading tough can easily miss the point. If the assignment is unnecessarily difficult or inaccessible to students, then I haven't challenged them, I have discouraged them. It can be difficult to balance challenging with the fun of a course, yet I continue to work to achieve that balance.

Now that we have a full department of six faculty, I have found myself taking on a different role within the department. In terms of teaching, I now view myself as the department's utility player – I cover whatever is needed to support the team. As of late that has been to cover courses while faculty were on course release. I can say that it has been anything but monotonous. As members of the department reach tenure, I am hoping to move out of the utility player role and focus on different courses. I am hoping to develop new general education courses like Physics of Sports or Physics in the Movies, as well as design courses to support our pre-engineering program and the Grand Challenge Scholars Program.

SCHOLARSHIP

My primary goal in research has always been and remains involving students in original astrophysical research focused on the sub-fields of computational planet formation, X-ray astronomy, and isolated galaxies. I always try to impress upon students the notion that research is an extension of teaching. I believe students gain a better understanding of the topics from their courses by actively engaging in research. Collaborating with undergraduates, while incredibly time consuming, provides a benefit to both the student and myself. In teaching the basic skills needed to perform publishable research, I am afforded the chance to investigate phenomena in a more complete and comprehensive manner while the student gains knowledge and experience preparing them for future endeavors. My most rewarding experiences have been during my collaborative research with undergraduates.

During the last twelve years, as part of the Student-Faculty Collaborative Scholarship program, I have worked with seventeen students on fifteen projects. I have presented at eleven meetings of the American Astronomical Society, which include twenty-one co-authored presentations of collaborative research with fourteen Rollins students. My collaborations have also resulted in three Rollins Honor theses. It is clear that astrophysical research is accessible to undergraduates and they are able to not only actively contribute, students can accel in this field of research.

While research has been largely successful, there have been some unexpected difficulties. I had a post-tenure goal to publish one article per year with students as co-authors. I have not come close to that goal. I have had the unfortunate circumstance of having had five students that were one-off collaborations in the last six years. I have found myself training new students each year, which has slowed the pace of research and hampered my ability to complete unfinished projects. In no way am I trying to assign blame to students, this is simply the nature of working with undergraduates; some of these students went on to complete research in other fields more in line with their research interests and goals. My research was also slowed by the amount of service I chose to accept in the years since tenure. Serving as chair to the department, and numerous committees and programs, while important, definitely limited the time and effort needed to complete outstanding research.

Following tenure, I opted to begin pursuing research which was larger in scope that would take multiple years to complete. I have had two long-term projects which I have submitted for to peer-reviewed journals more than once, yet I have been unable to have them accepted for publication. I have recently collected additional data, as has been requested by reviewers, and I am exploring co-authorship with a well-known colleague. I am hopeful that these adjustments will help in the publication process.

In the future, I plan to complete some of the outstanding research projects I have remaining from past collaborations. Most important to me is continuing my research in the fields of X-ray astronomy, isolated galaxy studies, and planet formation. My students and I are deeply committed to these research topics. I plan to be more selfish with my time, step back from service where I can, and focus on my scholarship and the output of my research lab.

SERVICE

I will always view the most important aspect of my job as teaching. I have tried to focus on service where I can most benefit the students and the College. With that being the case, my most impactful and fulfilling service activity is undoubtedly as the director to the Student-Faculty Collaborative Scholarship Program. Even with all of the work that goes into running the SFCS program throughout the year, it is worth it to watch our students grow as researchers and scholars.

Since tenure I have served as chair of the Faculty Affairs Committee, a member of the Executive Committee, and chair of the Faculty Compensation Taskforce. Additionally, I have served on numerous high-school counselor fly-in, Programs of Excellence, and Discover Rollins panels in my roles as director of SFCS and Pre-engineering. Each of these activities gave me the opportunity to further interact with current and prospective students and their families.

Beyond the College, I have explored service to the larger Central Florida community as well. I worked extensively with the Orlando Science Center, serving as a member of the CineDome planning board and as a consultant for new exhibits. I have routinely presented astronomy lectures and physics demonstrations for Keeth Elementary, the Orlando Science Schools, and Bishop Moore and Winter Springs High Schools. These activities have allowed me the chance to connect with students and families beyond my classroom.

Looking to the future, I would like to continue growing the community aspect of my service. I would very much like to grow the connection between the Orlando Science Center and Rollins. I would also like to strengthen our connection to local middle and high schools; some of our most successful graduates have come from local high schools. We used to have a Physics major teaching locally, which provided a nice pipeline of students. I think by forging connections with local high schools, we can again tap into the best and brightest in our area.

As always, I will serve when called upon. While I know, and often remind my junior colleagues, that we should say no more often and guard our time, this is simply not in my nature. When the department or division or College ask for my service, I will provide it. I believe that my service allows me to better connect to the students, faculty, and community.

Sabbatical Plans

For my upcoming sabbatical, scheduled for Spring 2022, I plan to work closely with at least one local high school to begin addressing issues we have observed amongst first-year science students, particularly those interested in the physics and pre-engineering majors. Specifically, faculty within the Physics department have noticed a diminishing level of perseverance in the face of a difficult major. Members of the Physics and Chemistry departments have had ongoing discussions of how we can better develop our students and help them to attain a level resolve and determination in our majors. At the encouragement of Laurel Habgood, I have done a deep dive into the work of Dr. Angela Duckworth. Dr. Duckworth has developed a grit scale and written extensively on passion and perseverance. I think that we are seeing an interesting situation where students have excitement and passion, but they have not developed grit and resolve. Knowing this deficiency, I think we have the ability to help students attain a high level of tenacity.
I plan to use my sabbatical to try to begin addressing our concerns with science major grit at the source, high schools. In my opinion, if we attempt to strengthen our students grit and determination without first understanding the schools and systems from which they come to us, we will again be stuck in the traditional dilemma of the Physics major as a high-attrition, small major. I think that working closely with high school teachers and administrators, I will be able to better understand the assessment practices, teaching methods, and habits that become instilled into students. Better clarity of policies and practices at the secondary education level will help college and university science faculty to develop methods to meet students where they are developmentally, while also charting a path where students can persevere. It will be important for me get in the classroom and observe teachers and students. I would also like to assist some of these teachers, to better understand their perspective on issues of grit and determination.
I would like to address basic structural questions, such as, how are topics being introduced? What role do labs, writing, and lab skills play in the student experience? How are equations presented and used? I would also like to understand the different assessment mechanisms used.

What is the policy on late work? Are deadlines hard or flexible? My plan is to also review the policies and practices within the Rollins Physics Department. Are we teaching and training students for the 21st century or have we become stuck in an antiquated way of teaching? Why are we seeing some of our students dig deep and grow, while others give up? Are there any common traits and experiences that help some to "stick it out" and succeed, while others do not.
I believe that I am well-suited for this type of investigation. I am the only member of my department that has high school teaching experience. I have also been teaching at the college level for fourteen years, which has provided me with a perspective on changes in student skills, grit, and preparation. I have a very strong connection with the faculty and staff at Winter Springs High School, where I serve as an assistant boy's lacrosse coach. When I return from sabbatical, in addition to compiling my findings for my department and hopefully for a Physics pedagogy journal, I would like to teach a course on physics and astronomy for education majors.

Conclusion

I go home every night happy with the work I have done and more fulfilled by the interactions I have had with my students and my colleagues. My department provides me support as I continue to grow as an educator and researcher. I appreciate the mentorship from those within my department and beyond and I am hopeful that I can be a source of knowledge and experience to my junior colleagues. I continue to work to find the best balance between teaching, scholarship, and service, but I am now wise enough to know this balance is always changing year-to-year or day-to-day. My plan is to continue pursuing astronomical research that challenges myself and my students, teach classes that excite and inspire our students, and serve the College and department as needed.

Sabbatical Plans Addendum

My Spring 2022 sabbatical plans have had to change given the ongoing pandemic. Local high schools have been unable to plan to have a college faculty member coming into the classroom. In light of my inability to work with local high schools, I am going to use my sabbatical to take up another line of outreach and inquiry. In addition to spending a significant amount of my sabbatical completing outstanding research and submitting results for publication, I am going to begin learning American Sign Language (ASL). Over the last year I learned that high schools and colleges for the deaf and hearing impaired are severely lacking in the sciences. It is apparently difficult to find educators with scientific knowledge and fluency in ASL. Even more concerning, many recent and relevant scientific terms do not yet have ASL signs because there are not deaf and hearing-impaired scientists creating these new signs or working to develop signs to enrich the language. I can't imagine not being able to share the wonders of astronomy and space because the language is inadequate. I am more saddened that some students are unable to learn astronomy because no one knows the material and the language.

This change to my sabbatical plans is also very personal to me. My grandfather and both of my parents have severe hearing loss. I also suffer from tinnitus and worsening hearing. I cannot imagine growing up and having my hearing or lack thereof stop me from learning physics and astronomy. I want to use part of my sabbatical to learn ASL so I can begin to work with students

that have been overlooked. I hope to someday partner with Gallaudet University or the National Technical Institute for the Deaf at RIT to help increase the science opportunities for hearing-impaired and deaf students.

Christopher R. Fuse

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Education

2008 Ph.D. Physics Texas Christian University
Dissertation: Isolated Early-type Galaxies and the Use of X-ray Diagnostics to Determine the Evolution History of Merging and Merged Systems

2002 M.S. Physics Miami University
Thesis: Origin of the Satellites of the Jupiter and Saturn Systems

2000 B.S. Physics St. Bonaventure University

Professional Experience

September 2014 – present: Associate Professor of Physics, Rollins College
Research focus: Formation of giant planet satellite systems, stability and habitability of extra-solar systems, evolution of galaxy group environments, formation of isolated early-type galaxies.

August 2008 – August 2014: Assistant Professor of Physics, Rollins College, Winter Park, FL

November 2004 – June 2005: Chemistry Teacher, Bishop Gorman High School, Las Vegas, NV

August 2003 – July 2004: Visiting Instructor, Miami University, Oxford, OH

Courses Taught (2017 – 2020)

2017 – 2018
Astronomy Against the World
Honors Research: Theme Park Technology
Principles of Physics I
Introduction to Thermodynamics
Independent Study: Trappist-1 Exoplanets
The Science of Superheroes
Honors Research: Theme Park Technology
Topic: Astrophysics

2018 – 2019
Electricity & Magnetism I
Introduction to Thermodynamics
Science of Superheroes
Electricity & Magnetism II
Physics Senior Seminar

2019 – 2020
Introduction to Thermodynamics
Mathematical Methods for Physical Sciences I
RCC: Astronomy & NASA
Principles of Physics I Laboratory
Honors Research: Sub-moon Formation
Honors Research: SDSS Analysis
Independent Study: Isolated Ellipticals
Mathematical Methods for Physical Science II
Computational Physics
Topics: Astrophysics

Undergraduate Theses Mentored

1. Emma Broming (2012). The Evolution of Compact and Isolated Galaxy Systems
2. Evan Rapone (2018). Theme Park Technology
3. Josephine Spiegelberg (2020). A Numerical Approach to Modeling Submoons and Investigating Stability Regions
4. Christopher Becker (2020). Creating a Sample of Off-Color Galaxies using Big Data Tools

Funding

As Principle Investigator

Co-Investigator (with Dr. Christina Lee, Rollins College Department of Mathematics), Rollins College Course Development Grant, 2009 – 2010, “Design of the Mathematical Methods for the Physical Sciences Course” ($800)

Professional Society Membership

American Astronomical Society (AAS) since 2008
Council on Undergraduate Research (CUR) since 2015

Professional & College Service

Service to Rollins College

Committees

Chair, Faculty Affairs Committee, 2017 – 2019
Chair, Faculty Compensation Task Force, 2017 – 2019
Ad Hoc Member, Health Professions Advisory Committee, 2008 – present
Member, General Education Implementation Committee, 2013 – 2014
Member, Honors Program Advisory Committee, 2012 – 2014
Chair, AAC New Course Subcommittee, 2010 – 2011
Member, Academic Affairs Committee, 2009 – 2011

Student Group Advising

Advisor, Rollins Powerlifting Club, 2014 – 2018
Advisor, Academic Honors Council, 2011 - 2018
Advisor, Star Wars and Superheroes Club, 2015 - 2017
Advisor, Society of Physics Students, Rollins College Chapter, 2009 – 2013

Other Service

Director, Student-Faculty Collaborative Scholarship Program, 2010 – present
Director, 3/2 Pre-Engineering Program, 2014 – 2016, 2018 – 2020
Councilor, Council on Undergraduate Research, 2017 – 2020
Interim Co-Director Honors Degree Program, August 2014 – December 2014
Taught sample general education course, Science of Superheroes – Family Weekend 2014, 2015; Alumni Weekend 2015
Faculty representative, admission receptions Boston 2010, 2014, 2015, Baltimore & Philadelphia 2012 – 2014
Panelist, International High School Counselor Fly-in, 2010 – 2020
Panelist, 2010 Faculty Day of Scholarship
Panelist, Discover Rollins, 2009 – present
Member Alfond Scholarship selection committee 2015, 2020
Interviewer, Cornell & Alfond Scholarship Weekends, 2009 – 2018

Service to the Community

Science of Superheroes Community Engagement course, partnering with the Orlando Science Center 2015
Presented physics demonstrations to Fern Creek, Red Bug, and St. Charles Borromeo, Elementary schools 2010 – 2012
Presented astronomy in the news to Keeth Elementary School 2014 – 2020

Review Service

NSF Graduate Research fellowship program Reviewer, 2018 – 2020
Ad Hoc Reviewer for Monthly Notices of the Royal Astronomical Society, 2013 – present
Ad Hoc Reviewer for The Physics Teacher, 2013 – present

Publications

* - Denotes Rollins undergraduate coauthor

Published Peer-Reviewed Research Articles

1. Fuse, C.; August*, B.; Barker*, C.; Cannaday*, A. 2013, “Resistivity in Play-Doh: Time and Color Variation”, The Physics Teacher, 51, 2013).

2. Fuse, C. & Broming*, E. 2013, “The X-ray Evolution of Hickson Compact Groups”, ApJ, 764, 175.

3. Marcum, P.; Fuse, C.; Fanelli, M. 2012, “Isolated Early-Type Galaxies in the SDSS: Sample I.”, AJ, 144, 57.

In Preparation

1. Fuse, C., Alyssa Malespina*, Evan Rapone*, & Jacob Riegler*, Optimizing the Venturi Effect Using Soda Bottles (Submitted to the Physics Teacher).

2. Fuse, C.; Neville*, M. The Formation and Evolution of Satellites Around the Gas Giant Planets: I. Thommes Ejection.

3. Fuse, C., Allen*, J. & Broming*, E. Analysis of X-ray Point Sources Along the Toomre Sequence.

4. Fuse, C. & Alyssa Malespina*, X-ray Properties of Lenticular Galaxies.

5. Fuse, C., Spiegelberg*, J., Becker*, C., & Allen*, J., Stability of Exomoons in the Trappist-1 System.

6. Fuse, C. & Spiegelberg*, J., Formation and Evolution of Satellites Around the Ice Giant Planets: I. Thommes Ejection.

Conference Presentations

* - Denotes Rollins undergraduate coauthor

1. Spitzenberger*, J. & Fuse, C., “Star Formation Histories of Isolated Early-Type Galaxies”, 2020, American Astronomical Society, Honolulu, HI

2. Fuse, C., “Formation of Satellites Around the Outer Planets of the Trappist-1 System”, 2019, American Astronomical Society, St. Louis, MO.

3. Fuse, C. & Spiegelberg*, J., “ Formation of Ice Giant Satellites During Thommes Model Migration”, 2018, American Astronomical Society, Washington, D.C.

Conference Presentations cont'd

4. Allen*, J., Becker*, C., & Fuse, C., "Stability of Moons in the Trappist-1 System", 2018, American Astronomical Society, Washington, D.C.

5. Fanelli, M. N., Marcum, P. M., Ashley, T. L., Fuse, C. R., O'Toole Appleby, H., "The Origin of Isolated Early-type Galaxies: A Multiwavelength Study of Three Systems", 2017, American Astronomical Society, Grapevine, TX

6. Fuse, C. & Malespina*, A., " Examining the X-ray Properties of Lenticular Galaxies: Rollins S0 X-ray Sample (RSOX), 2017, American Astronomical Society, Grapevine, TX

7. Fuse, C. & Bokorney, J.*, "Properties of Exomoons Around the Habitable Zone Planets, Kepler 22b and HD160691b", 2016, American Astronomical Society, Kissimmee, FL

8. Fuse, C. & Allen, J.*, X-ray Properties Along the Toomre Sequence of Galaxy Merger", 2016, American Astronomical Society, Kissimmee, FL

9. Fuse, C. & Bokorney*, J., "The Properties of Exomoons Around the Habitable Zone Planet, Kepler 22b", 2015, American Astronomical Society, Seattle, WA.

10. Fuse, C. & Lamir, C.*, "Isolated Early-Type Galaxies in the 2dFGRS", 2014, American Astronomical Society, Washington, D.C.

11. Negron-Rivera*, A.; Fuse, C.; Marcum, P.; Fanelli, M. N., "Investigating the Isolated Early-Type Galaxy Selection Criteria", 2012, American Astronomical Society, Austin, TX.

12. Verboncouer*, R.; Fuse, C., "The X-ray Properties of Local Group Dwarf Galaxies", 2012, American Astronomical Society, Austin, TX.

13. Barker*, C.; Fuse, C., "X-ray Properties Across the Spiral Morphology", 2012, American Astronomical Society, Austin, TX.

14. Fuse, C., "The Evolution of Orbital Properties of Exomoons Around Habitable Zone Gas Giant Planets", 2012, American Astronomical Society, Austin, TX.

15. Fuse, C. & Neville*, M., "Formation of Satellites Around Migrating Ice Giant Planets", 2011, American Astronomical Society, Boston, MA.

16. Neville*, M. & Fuse, C., " Investigations on Gas Giant Moon Formation During Thommes Ejection", 2011, American Astronomical Society, Boston, MA.

Conference Presentations cont'd

17. Broming*, E. & Fuse, C., "The Evolution of Isolated Elliptical Galaxies and Fossil Groups: X-ray Point Sources and Diffuse Gas", 2011, American Astronomical Society, Boston, MA.

18. Fuse, C., "Evolution of X-ray Point Sources Along the Toomre Sequence", 2010, American Astronomical Society, Washington, D.C.

19. Broming*, E. & Fuse, C., "X-ray Analysis of Point Sources and Diffuse Gas in Hickson Compact Groups", 2010, American Astronomical Society, Washington, D.C.

20. Mahara*, A. & Fuse, C., "Pure S0 Galaxy Samples: An Infrared & Optical Morphological Selection Method", 2010, American Astronomical Society, Washington, D.C.

21. Fuse, C., "Anamolous Blue Isolated Early-type Galaxies", 2009, American Astronomical Society, Long Beach, CA.

22. Fuse, C.; Fanelli, M.; Marcum, P., "Dynamical Evolution Diagnostics of Compact Galaxy Groups & Isolated Systems", 2007, Eight Years of Science with Chandra Symposium, Huntsville, AL.

23. Fuse, C.; Abel, N.; Alexander, S.; Wu, T.; Newstadt, G., "Obliquity Evolution of Ceres and Vesta", 2007, Division of Planetary Science, American Astronomical Society, Orlando, FL.

24. Fuse, C.; Marcum, P.; Fanelli, M., "X-ray Diagnostics of Merging and Isolated Systems", 2007, Student Research Symposium, Texas Christian University.

25. 2006 Planetary Science Summer School Collaboration, "An ExoMars-Type Rover", 2007, European Geophysical Union, Abstract #: EGU2007-A-114119.

26. 2006 Planetary Science Summer School Collaboration, "SCREAM: Subsurface Characterization Rover for Exobiology Analysis on Mars", 2006, AGU, San Francisco, CA.

27. 2006 Planetary Science Summer School Collaboration, SCREAM: Subsurface Characterization Rover for Exobiology Analysis on Mars", 2006, Division of Planetary Science, American Astronomical Society, Pasadena, CA.

28. Fuse, C.; Marcum, P.; Fanelli, M., "A Sample of Extremely Isolated Early-Type Galaxies", 2006, Texas Section of APS, University of Texas at Arlington.

Conference Presentations cont'd

29. Fuse, C.; Marcum, P.; Fanelli, M.; Aars, C., "Extremely Isolated Elliptical Galaxies", 2006, AAS, Calgary, Alberta, Canada.

30. Fuse, C.; Marcum, P.; Fanelli, M., "Isolated Elliptical Galaxies", 2006, Student Research Symposium, Texas Christian University.

31. Fuse, C. & Alexander, S.G., "A Study on the Evolution of the Satellites of Jupiter and Saturn", 2002, Ohio Section of the APS, Columbus, OH.

Invited Talks

"Science Night", 2020, Keeth Elementary School, Winter Springs, FL

"Return to the Moon", 2019, Winter Springs High School, Winter Springs, FL

"Astronomy in the News" 2014 – 2019, Keeth Elementary School, Winter Springs, FL

"Look Up: Fun with Astronomy", 2014, Lake Sybelia Elementary School, Maitland, FL

"Awesome Astronomy", 2014, Orlando Science Schools, Orlando, FL

"STEM Careers: Astronomer", 2014, Maitland Middle School, Maitland, FL

"Physics of X-ray Astronomy", 2010, Bishop Moore High School, Orlando, FL

"Undergraduate Research: Planet Formation & X-ray Astrophysics", 2009, Bishop Moore High School, Orlando, FL

"X-ray Astrophysics", 2008, Lynchburg College, Lynchburg, VA

"Satellite Formation", 2005, University of Nevada Las Vegas, Las Vegas, NV

"Fourier Transform Analysis in Undergraduate Laboratories", 2004, University of Pittsburgh at Johnstown, Johnstown, PA