STATE UNIVERSITY COLLEGE AT CORTLAND

FACULTY EVALUATION FORM

ERIC M. EDLUND

February 2022

DEPARTMENT:	Physics
PRESENT RANK:	Associate Professor
ACTION UNDER REVIEW:	Continuing Appointment effective September 1, 2023
DATE OF APPOINTMENT:	September 1, 2017 with title F leave until December 31, 2017
DATE OF PRESENT RANK:	September 1, 2021

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I. Mastery of subject matter

A. *Formal preparation:*

Ph.D.	2009	Massachusetts Institute of Technology	Physics
B.S.	2003	California State University, Chico	Physics & Mathematics

B. *Status of Degree:* N/A

C. *Post doctoral study:*

2009 – 2013	Princeton Plasma Physics Laboratory	Lab Astrophysics

D. *Honors, awards and other experiences:*

2019 Fellow, Writing in the Disciplines, Institute for College Teaching, SUNY Cortland
2019 Fine Teaching Award
2019 SUNY Cortland award for Excellence in Research, Scholarship, and Outreach (2 awards)
2018 SUNY Cortland award for Excellence in Research, Scholarship, and Outreach
2018 SUNY Cortland MOVE award for excellence in campus engagement

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II. Effectiveness in teaching

A. *Courses regularly taught at SUNY Cortland since appointment:*

- PHY 105 – Elementary Mechanics and Heat (lecture only)
- PHY 201 – Principles of Physics I (lecture and lab)
- PHY 202 – Principles of Physics II (lecture and lab)
- PHY 203 – Principles of Physics III
- PHY 357 – Intermediate Laboratory
- PHY 405/505 – Energy & Sustainability
- PHY 420 – Classical Mechanics
- PHY 429/529 – Special Topics in Physics (Advanced Classical Mechanics)
- PHY 495/690 – Independent Study in Physics

B. *Teaching materials developed and/or methods employed since initial appointment:*

As the instructor for all of the 200-level physics courses upon my arrival here, I invested a large effort in moving the PHY 201 and PHY 202 labs away from instruction-prescribed labs to inquiry-based labs. This has required significant redesign of many of the labs to find the optimal balance between minimal, essential information and specific instructions. Along with the move toward inquiry-based labs, I have abandoned the lab packets used for student work and have required students to write formal lab reports to help them develop their technical writing and statistical analysis skills.

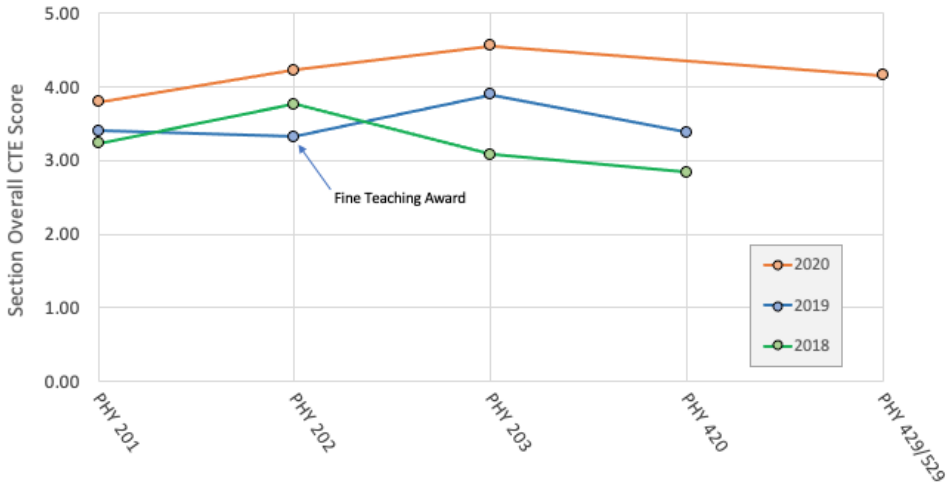
In my work in the 100-level courses (PHY 105), I have worked closely with Sean Nolan and Dave Kornreich to incorporate flipped-classroom and active learning techniques into the courses. These efforts have been transformative for my teaching and have given me increased awareness of student engagement. While the future of PHY 105 is open for debate and discussion, it is clear to me that these techniques will have a substantial role, in one form or another, in my classes moving forward.

During the move to online teaching I migrated all of my course materials to Microsoft Teams, where each course has its own space. I used these spaces for video conferencing, file sharing, posting of assignments, and text-based discussion forums for answering student questions. Numerous students have commented that my handling of online classes has been done very well (see, for example, student CTE comments from Spring 2020 for PHY 203 and the Fall 2021 comments for PHY 202). I have continued to host my classes using Teams since then, and have found that it has greatly aided in communication, transparency, and efficiency for everyone.

Nearly all of the teaching materials used in my classes (lectures, exams, labs, auxiliary notes, etc.) are original creations. One of my foremost goals in the introductory courses has been to ensure that there is a regular and appropriate discussion of calculus integrated into the physics analysis. Given that the range of mathematical ability is quite diverse in PHY 201, I began the semester with a crash-course in calculus and now provide students with an early exam assessment that focuses on basic math skills. Given some past troubles in PHY 420 (during the Fall 2018 semester in particular) where many students did not know basic calculus or that essentially all of physics is the study of differential equations, I have started introducing students to such language as early as PHY 201.

C. *Evidence of accomplishments in teaching:*

As a snapshot of my effectiveness and growth as an instructor, I present here a few important snapshots of CTE data. Perhaps most importantly is the growth seen in the improvement of my scores, measured across a series of classes and over time. While I do not believe that my teaching was deficient upon arrival, I believe that the improvement in scores shown here indicates a fine-tuning of my style toward our student body.



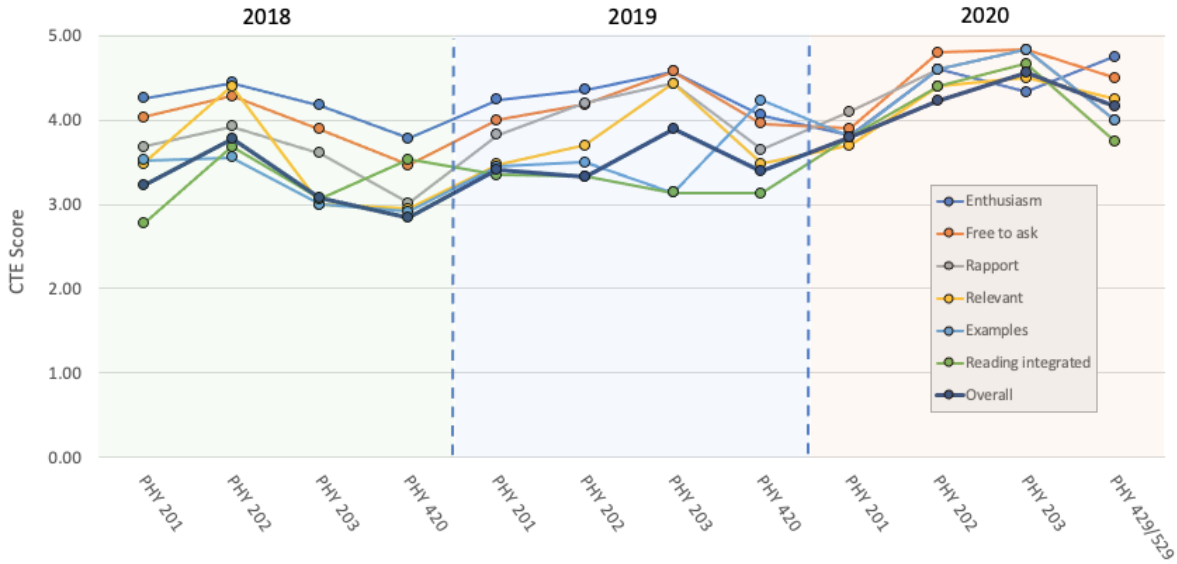
In the second part of my CTE summary I present data from six specific questions together with the Section Overall ratings. These data show a generally upward progress with strong performance in 2020. MY CTE scores tend to be somewhat lower for PHY 201, on average, which is not surprising given that this is a general education course and enrollment in these classes has tended to be larger than in my other classes, common patterns noted across our lower-division physics courses.

The first three questions presented here comprise a summary of my interactions with students, which show solid performance since my arrival, with the exception of my PHY 420 course in Fall 2018, which was a problematic class that effectively ended with academic misconduct violations on the part of all students, a result of systemic use of online resources (Chegg) throughout the semester and into the midterm exam. Outside of a few exceptional circumstances, the far majority of my interactions with students here have been very positive and enjoyable. The questions presented here are:

1) My instructor displays **enthusiasm** when teaching.
2) I feel **free to ask** to ask questions in class.
3) My instructor readily maintains **rapport** with this class.

The second set of questions highlight areas where I have specifically strived to improve my performance. Across all courses that I have taught I have made an effort to make the material more relevant to the student body by expanding the variety of examples and the number of examples worked in class (both by myself and as active-learning, in-class exercises), and have made a practice of emphasizing the importance of reading the textbook to leverage multiple learning sources and carry-on with learning outside of lecture. There are numerous subtleties to these numbers, such as the lower score regarding the integration of assigned reading for my Spring 2020 PHY 429/529 course, which did not have a textbook and used various sources, and I caution against reading too much into any of these in the absence of context. I am happy to provide additional information if further discussion of specific points is desired.

4) Lecture information is highly **relevant** to course objectives.
5) My instructor makes good use of **examples** and illustrations.
6) The assigned **reading** is well **integrated** into this course.



D. *Academic advising:*

I have recently developed a set of curriculum maps that list all of our programs (PHY, PEN, APH, and APM) on a single spreadsheet and provide a visual reference for the recommended order of courses. This is especially important for the APH and APM programs that have a very particular sequence of education courses for which there is very little room for adjustment.

I advise 10 current students through the Physics Department, though this was as high as 18 in the 2019-2020 academic year. In addition to advising current students, I have advised new and transfer students at 10 sessions since my arrival on the following dates:
July 7, 2021
July 6, 2021
July 12, 2020
January 7, 2020
August 23, 2019
July 19, 2019
July 12, 2019
July 10, 2019
January 25, 2019
August 24, 2018

In support of my advising I have created documents to help my advisees, such as a questionnaire to help students create an academic success plan, and have participated in academic advisor training (June 20, 2019) and Starfish training (September 23, 2019), as well as the Culturally Relevant Teaching Institute on May 22-23, 2019.

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III. Scholarly ability

A. *Manuscripts published or accepted for publication since initial appointment*:

a. *Books or monographs*: N/A

b. *Articles in refereed journals:*

E. M. Edlund, ``Interception and Rendezvous: an intuition building approach to orbital dynamics," *American Journal of Physics* **89, 559** (2021).

Z. Huang, **E. M. Edlund**, M. Porkolab, A. von Stechow, J.-P. Bähner, L.-G. Böttger, C. von Sehren, and O. Grulke, "The Wendelstein 7-X phase contrast imaging diagnostic," *Journal of Instrumentation* **16**, P01014 (2021).

J.-P. Bähner, J. A. Alcuśon, S. K. Hansen, A. von Stechow, O. Grulke, T. Windisch, H. M. Smith, Z. Huang, **E. M. Edlund**, M. Porkolab, M. N. A. Beurskens, S. A. Bozhenkov, O. P. Ford, L. Vanó, A. Langenber, N. Pablant, G. G. Plunk, A. Bañon Navarro, F. Jenko and the W7-X team, ``Phase contrast imaging measurements and numerical simulations of turbulent density fluctuations in has-fuelled ECRH dischages in Wendelstein 7-X, " *Journal of Plasma Physics* **87**, 905870314 (2021).

E. M. Edlund and S. Kadas, "Visual storytelling of scientific data: collaborations between physics and graphic design in the college classroom" *The SUNY Journal of the Scholarship of Engagement (JoSE)* **1**, article 2 (2020).

M. J. Burin, K. J. Kaspary, **E. Edlund**, R. Ezeta, E. P. Gilson, H. Ji, M. McNulty, J. Squire, G. R. Tynan, ``Turbulence and jet-driven zonal flows: Secondary circulation in rotating liquids due to asymmetric forcing," *Physical Review E* **99**, 023108 (2019).

E. M. Edlund, M. Porkolab, Z. Huang, O. Grulke, L.-G. Böttger, C. von Sehren, and A. von Stechow, ``Overview of the Wendelstein 7-X phase contrast imaging diagnostic," *Review of Scientific Instruments* **89**, 10E105 (2018).

T. Golfinopoulos, B. LaBombard, D. Brunner, J. Terry, S.-G. Baek, P. Ennever, **E. Edlund**, W. Han, W. Burke, S. Wolfe, J. Irby, J. Hughes, E. Fitzgerald, R. Granetz, M. Greenwald, R. Leccacorvi, E. Marmar, S. Pierson, M. Porkolab, R. Vieira, S. Wukitch, Stephen, "Edge Transport and Mode Structure of a QCM-Like Fluctuation Driven by the Shoelace Antenna" *Nuclear Fusion* **58**, 056018 (2018).

c. *Articles in non-refereed journals:* N/A

d. *Manuscripts submitted but not yet accepted for publication:*

S.~K. Hansen, M. Porkolab, Z. Huang, J-P. Bähner, A. von Stechow, O. Grulke, E. M. Edlund, F. Wilms, A. Bañón-Navarro, F. Jenko, E. Sánchez, ``Development of a synthetic phase contrast imaging diagnostic for Wendelstein 7-X" submitted to *Plasma Physics and Controlled Fusion*.

S. Kadas and **E. M Edlund**, “A multidisciplinary collaboration between graphic design and physics classes responding to COVID-19” submitted to *Journal of the Scholarship of Engagement: JoSE* (February 2021).

A. Marinoni, C. P. Moeller, J. C. Rost, M. Porkolab, and **E. M. Edlund**, “A heterodyne phase contrast imaging system for ion cyclotron emission detection” submitted to *Review of Scientific Instruments*, June 2020.

A. von Stechow, O. Grulke, T. Wegner, J. H. E. Proll, J. A. Alcuśon H. M. Smith, J. Baldzuhn, C. D. Beidler, M. N. A. Beurskens, S. A. Bozhenkov, **E. M. Edlund**, B. Geiger, Z. Huang, O. P. Ford, G. Fuchert, A. Langenberg, N. Pablant, E. Pasch, M. Porkolab, K. Rahbania, J. Schilling, E. R. Scott, H. Thomsen, L. Van´o, G. Weir, and the W7-X Team, “Suppression of core turbulence by profile shaping in Wendelstein 7-X” submitted to *Physical Review Letters*, April 2020.

e. *Book Reviews:* N/A

f. *Op-ed pieces:* N/A

g. *Creative writing:* N/A

h. *Other:*

A. Marinoni, C. P. Moeller, M. Porkolab, J. C. Rost, E. M. Davis and **E. M. Edlund**, ``A wide frequency heterodyne detection method using the Pockels effect," *MIT Plasma Science and Fusion Center technical report*, PSFC/RR-18-3 (2018).

E. M. Edlund, ``Analysis of optimal ranges of pendula lengths for a coupled-oscillator experiment,'' white paper considering design constraints for a pedagogical experiment constructed at SUNY Cortland (2018).

E. M. Edlund, “Rendezvous revisited: the full solution to the circular orbit intercept problem,” manuscript in development for *The American Journal of Physics*.

E. M. Edlund, V. Kilfeather, K. Hipius, N. Rose, S. Blankenbaker, and T. Edgar, “Wave tunneling in a system of coupled pendula,” manuscript in development for *The American Journal of Physics*.

J. Carrick-Hagenbarth, **E. M.** Edlund, and A. Mukherjee, “An analysis of hybrid epidemiological economic models of COVID-19 mitigation policies,” manuscript in development, journal TBD.

B. *Manuscripts published prior to initial appointment*:

a. *Books or monographs*: N/A

b. Articles in refereed journals:

First-author papers

E. M. Edlund and H. Ji, ``Reynolds number scaling of the influence of boundary layers on the global behavior of laboratory quasi-Keplerian flows," *Physical Review E **92***, 043005 (2015).

E. M. Edlund and H. Ji, ``Nonlinear stability of laboratory quasi-Keplerian flows," *Physical Review E **89***, 021004 (2014).

E. M. Edlund, M. Porkolab, G. J. Kramer, L. Lin, Y. Lin, N. Tsujii and S. J. Wukitch, ``Experimental study of reversed shear Alfvén eigenmodes during the current ramp in the Alcator C-Mod tokamak," *Plasma Physics and Controlled Fusion **52***, 115003 (2010).

E. M. Edlund, M. Porkolab, G. J. Kramer, L. Lin, Y. Lin and S. J. Wukitch, ``Phase contrast imaging measurements of reversed shear Alfvén eigenmodes during sawteeth in Alcator C-Mod," *Physics of Plasmas **16***, 056106 (2009).

E. M. Edlund, M. Porkolab, G. J. Kramer, L. Lin, Y. Lin and S. J Wukitch, ``Observation of reversed shear Alfvén eigenmodes during sawteeth in Alcator C-Mod," *Physical Review Letters **102***, 165003 (2009).

Contributing-author papers

A. Creely, A. White, **E. M. Edlund**, N. Howard, A. Hubbard, ``Perturbative thermal diffusivity from partial sawtooth crashes in Alcator C-Mod," *Nuclear Fusion **56***, 036003 (2016).

J. L. Terry, M. L. Reinke, J. W. Hughes, B. LaBombard, C. Theiler, G. M. Wallace, S. G. Baek, D. Brunner, R. M. Churchill, **E. M. Edlund**, P. Ennever, I. Faust, T. Golfinopoulos, M. Greenwald, A. E. Hubbard, J. Irby, Y. Lin, R. R. Parker, J. E. Rice, S. Shiraiwa, J. R. Walk, S. J. Wukitch, P. Xu, "Improved confinement in high-density H-modes via modification of the plasma boundary with lower hybrid waves," *Physics of Plasmas **22***, 056114 (2015).

J. H. Rhoads, **E. M. Edlund** and H. Ji, ``Effects of magnetic field on the turbulent wake of a cylinder in MHD channel flow," *Journal of Fluid Mechanics **742***, 446 (2014).

S. E. Sharapov, B. Alper, H. L. Berk, D. N. Borba, B. N. Breizman, C. D. Challis, I. G. J. Classen, **E. M. Edlund**, J. Eriksson, A. Fasoli, ``Energetic particle instabilities in fusion plasmas," *Nuclear Fusion **53***, 104022 (2013).

A. H. Roach, E. J. Spence, C. Gissinger, **E. M. Edlund**, P. Sloboda, J. Goodman and H. Ji, ``Observation of a free-Shercliff-layer instability in cylindrical geometry," *Physical Review Letters **108***, 154502 (2012).

E. J. Spence, A. H. Roach, **E. M. Edlund**, P. Sloboda and H. Ji, ``Free MHD shear layers in the presence of rotation and magnetic field," *Physics of Plasmas **19***, 056502 (2012).

L. Lin, M. Porkolab, **E. M. Edlund**, J. C. Rost, C. Fiore, M. Greenwald, Y. Lin, D. R. Mikkelsen, N. Tsujii and S. J. Wukitch, ``Studies of turbulence in Alcator C-Mod H-Mode plasmas with phase contrast imaging and comparisons with GYRO," *Physics of Plasmas **16***, 012502 (2009).

L. Lin, M. Porkolab, **E. M. Edlund**, J. C. Rost, M. Greenwald, N. Tsujii, J. Candy, R. E. Waltz and D. R. Mikkelsen, ``Studies of turbulence in Alcator C-Mod ohmic plasmas with phase contrast imaging and comparisons with GYRO," *Plasma Physics and Controlled Fusion **51***, 065006 (2009).

L. Lin, **E. M. Edlund**, M. Porkolab, Y. Lin and S. J. Wukitch, ``Vertical localization of phase contrast imaging diagnostic in Alcator C-Mod," *Review of Scientific Instruments **77***, 10E918 (2006).

M. Porkolab, C. Rost, N. Basse, J. Dorris, **E. M. Edlund**, L. Lin, Y. Lin and S. J. Wukitch, ``Phase contrast imaging of waves and instabilities in high temperature magnetized fusion plasmas," *IEEE Transactions on Plasma Science **34***, 229 (2006).

N. P. Basse, **E. M. Edlund**, D. R. Ernst, C. L. Fiore, M. J. Greenwald, A. E. Hubbard, J. W. Hughes, J. H. Irby, G. J. Kramer, L. Lin, Y. Lin, E. S. Marmar, D. R. Mikkelsen, D. A. Mossessian, M. Porkolab, J. E. Rice, J. A. Snipes and J. A. Stillerman, ``Characterization of core and edge turbulence in L- and enhanced D-alpha H-mode Alcator C-Mod plasmas," *Physics of Plasmas **12***, 052512 (2005).

E. Scime, R. Murphy, **E. M. Edlund** and G. Ganguli, ``Electrostatic ion-cyclotron waves in a currentless, anisotropic plasma with inhomogeneous flow," *Physics of Plasmas **10***, 4609 (2003).

c. Articles in non-refereed journals:

E. M. Edlund, P. T. Bonoli, M. Porkolab, S. J. Wukitch, ``Modeling of EAST ICRF heating with the full-wave code TORIC," 21st Topical Conference of Radio Frequency Power in Plasmas, (2015).

E. M. Edlund, M. Porkolab, G. J. Kramer, L. Lin, Y. Lin and S. J. Wukitch, ``Reversed shear Alfvén eigenmodes in Alcator C-Mod during ICRF minority heating and relationship to sawtooth crash phenomena," *Proceedings of the European Physics Society Plasma Physics Conference*, (2008).

M. Porkolab, **E. M. Edlund**, L. Lin, R. Parker, C. Rost, J. Sears, J. A. Snipes, S. J. Wukitch, B. N. Breizman, N. N. Gorelenkov, G. J. Kramer, A. Fasoli and H. Smith, ``Experimental studies and analysis of Alfvén eigenmodes in Alcator C-Mod," *Proceedings of the 21st IAEA Conference*, IAEA- CN 149 (2006).

d. Manuscripts submitted but not accepted for publication: N/A

e. *Book Reviews:* N/A

f. *Op-ed pieces:* N/A

g. *Creative writing:* N/A

h. *Other:* N/A

C. *Conference presentations since initial appointment:*

a. *Invited presentations or keynote addresses*: N/A

b. *Contributed talks at refereed conferences:* N/A

c. *Poster presentations at refereed conferences:*

``Overview of measurements from the Wendelstein 7-X stellarator phase contrast imaging diagnostic and plans for the OP-2 campaign" 62nd annual meeting of the American Physical Society, Division of Plasma Physics (APS-DPP) conference (2020).

``Upgrades to the Wendelstein 7-X phase contrast imaging diagnostic and plans for the OP2 campaign" European Physics Society Conference (2020 - cancelled).

``Observation of electron-driven Alfvén eigenmodes in Wendelstein 7-X" European Physics Society Conference, Prague, Czech Republic (2018).

``Overview of the phase contrast imaging diagnostic for Wendelstein 7-X" High Temperature Plasma Diagnostics conference, San Diego, California (2018).

``First results from the Wendelstein 7-X phase contrast imaging diagnostic" 59th annual meeting of the APS-DPP, Milwaukee, Minnesota (2017).

d. *Contributed talks at non-refereed conferences:*

``Visual storytelling of scientific data: collaborations between art and physics in the college classroom" SUNY Applied Learning Conference, Albany, NY (October 2019).

e. Poster presentations at non-refereed conferences: N/A

f. Other:

``Exploring orbital interception,'' Physics & Astronomy Seminar, Ithaca College (March 22, 2022).

``Adapting physics labs to online teaching,'' SUNY Cortland, Institute for College Teaching (November, 2020). Co-presenter with Professor Greg Phelan (Chemistry).

``Strategies for increasing student engagement in synchronous instruction," SUNY Cortland, Institute for College Teaching seminar, August, 2020.

``Scientists as writers: commonalities and distinctions of writing across different disciplines," Institute for College Teaching, SUNY Cortland (March 2020). Co-presenter with Professor Karen Downey (Chemistry).

``Rubrics and Contract Grading," SUNY Cortland Writing in the Disciplines Fellows program, January, 2020. Co-presenter with Professor Jessica Carrick-Hagenbarth (Economics).

``Branches, paths, and junctions: what do electrons know of free-will?" Physics Department Colloquium, SUNY Cortland (September 2019).

``Ideas for first projects at SUNY Cortland,'' Research recruitment presentation given to students in the Physics & Engineering Club (February 2018).

D. *Conference presentations prior to initial appointment:*

a. *Invited presentations or keynote addresses*:

"Observation of revered shear Alfvén eigenmodes during the sawtooth cycle in Alcator C-Mod" 50th annual meeting of the APS-DPP, Dallas, Texas (2008).

"Phase contrast imaging diagnostics on the Alcator C-Mod and DIII-D tokamaks" 17th Topical Conference on High-Temperature Plasma Diagnostics, Albuquerque, New Mexico (2008).

b. Contributed talks at refereed conferences:

"Comparison of sawtooth heat pulses across confinement regimes in Alcator C-Mod" 56th annual meeting of the APS-DPP, New Orleans, LA (2014).

"Boundary layers and global stability of laboratory quasi-Keplerian flow" 66th annual meeting of the APS-DFD, Pittsburgh, PA (2013).

"Experimental studies of turbulence lifetimes in differentially rotating flows" 65th annual meeting of the APS-DFD, San Diego, CA (2012).

"A new concept for an advanced liquid centrifuge" Savannah River National Laboratory, Director's Colloquium (October 2012).

"Searching for a subcritical transition in quasi-Keplerian flows" 64th annual meeting of the APS-DFD, Baltimore, Maryland (2011).

"Studies of Rossby waves and hydrodynamic turbulence in a Taylor-Couette device" 63rd annual meeting of the APS-DFD, Los Angeles, California (2010).

"A new experiment for the study of hydrodynamic waves and turbulence" 52nd annual meeting the APS-DPP, Chicago, Illinois (2010).

c. Poster presentations at refereed conferences:

"Overview of the design of the phase contrast imaging diagnostic for Wendelstein 7-X" 58th annual meeting of the APS-DPP, San Jose, California (2016).

"Modeling of ICRF wave propagation and heating in EAST with the full-wave code TORIC" 57th annual meeting of the APS-DPP, Savannah, Georgia (2015).

"Recent results from the Princeton MRI and HTX experiments" 54th annual meeting of the APS-DPP, Providence, Rhode Island (2012).

"In search of a subcritical transition to turbulence in rotating hydrodynamic flows" 53rd annual meeting of the APS-DPP, Salt Lake City, Utah (2011).

"A method for minimizing secondary flows in Taylor-Couette experiments" 52nd annual meeting the APS-DPP, Chicago, Illinois (2010).

"Diagnostic systems of the Princeton MRI Experiment" 51st annual meeting of the APS-DPP, Atlanta, Georgia (2009).

"Experimental study of reversed shear Alfvén eigenmodes during ICRF minority heating and relationship to sawtooth crash phenomena in Alcator C-Mod" 21st Transport Taskforce Workshop, Boulder, Colorado (2008).

"Reversed shear Alfvén eigenmodes in Alcator C-Mod during ICRF minority heating and relationship to sawtooth crash phenomena" 35th European Physics Society Plasma Physics Conference, Crete, Greece (2008).

"Mode structure and stability analysis of RSAEs with NOVA-K" 49th annual meeting of the APS- DPP, Orlando, Florida (2007).

"Alfvén eigenmode activity during the sawtooth phase in Alcator C-Mod" 48th annual meeting of the APS-DPP, Philadelphia, Pennsylvania (2006).

"Observation of reverse shear Alfvén eigenmodes in Alcator C-Mod and their modeling with NOVA" 47th annual meeting of the APS-DPP, Denver, Colorado (2005).

"Measurement and modeling of Alfvén cascades in Alcator C-Mod" 46th annual meeting of the APS-DPP, Savannah, Georgia (2004).

"Effects of temperature anisotropy and shear flow on ion-cyclotron instability of a magnetized plasma" 44th annual meeting of the APS-DPP, Orlando, Florida (2002).

d. Contributed talks at non-refereed conferences: N/A

e. Poster presentations at non-refereed conferences: N/A

f. Other: N/A

E. *Current research:*

Project 1: **Wendelstein 7-X collaboration**

Description: This collaboration, in partnership with the Max Planck Institut für Plasmaphysik and MIT, is a continuation of a project that I initiated in 2014 and for which I secured original funding from the US Department of Energy. Since my arrival at SUNY Cortland I have continued to work on this project and spent the majority of my 2018 summer in Germany. I secured additional funding for a student so that Mr. Nathaniel Rose could work with me on an optics design problem over the summer. This work has continued for approximately two years. I continue to do diagnostic design and development work for this project in support of the next experimental campaign that is currently scheduled to begin in 2022.

Project 2: **Turbulence in rotating fluids**

Description: My research in rotating hydrodynamics builds off of work I conducted as a postdoctoral researcher at the Princeton Plasma Physics Laboratory. That work culminated in two papers, one on the nonlinear stability of strongly perturbed rotating flows and the other on the Reynolds number scaling of flows and a theoretical interpretation based on boundary layer scaling. These works addressed some long-standing questions of dispute in the field, and opened up new topics for research. My work at SUNY Cortland continues with these studies and will address three main questions:

1. What is the role of the vertical propagation of turbulence in accretion disks?

2. Given what is now known of boundary layers, what mechanical design affords the best simulation of astrophysical flows?

3. By implementing prescribed boundary flux models for the interaction of the fluid with the solid boundaries, can we extend the range of Reynolds numbers in simulations to allow us to make better connection with experiments?

Project 3: **Wave propagation in inhomogeneous media, experiment and theory**

Description: This experiment is a student-centered project that will be used to demonstrate the nature of complex wave propagation. The non-uniform nature of the medium means that the local phase and group velocities need not be the same, resulting in wave dispersion. This system will illustrate physical concepts like tunneling, cutoffs, and resonance. These ideas have important connections to quantum mechanics and electromagnetic wave propagation in plasmas. Students have presented this work at the 2019 and 2020 Transformations events. With the experimental apparatus complete, computational analysis tools written, and a good theoretical basis we are now in a position to work toward a first publication. Experiments will resume when I am again able to work with students in the lab.

Project 4: **Orbital dynamics of interception and rendezvous**

Description: This work emerged from a series of lectures created for PHY 420 and my special topics class in Spring 2020, PHY 429/529. This analysis takes a deeper look at the orbital dynamics than is presented in many intermediate texts on the subject, and sought to create a series of interesting and challenging problems around the problem of interception and rendezvous, that is, the meeting of spacecraft in orbit around a planet. The novelty of the method presented is that it uses a primarily geometric and algebraic representation of the problem in an effort to reduce the analytical overhead of the problem to better enable student understanding and intuition-building exercises. While the original work considered that one of the spacecraft was on a circular orbit, extensions of this work can consider more varied trajectories. This work remains as potential for students who are interested in more theoretical problems. It has also been a great exercise for me to hone my written communication skills and think deeply about pedagogy.

Project 5: **Transitions in Braess' paradox**

Description: Braess' paradox describes the counter-intuitive result that commute times can be improved (i.e. reduced) by removal of roads, *under certain conditions*. My work in this area asks the question of how incremental improvements to the quality of the road network, especially under asymmetric conditions, affects commute times. This analysis has shown that particular incremental improvements can create improvements in the commute times, in contradiction to Braess' paradox. This work is part of my larger interest in game theory, and is also open to students who wish to pursue problems of a more theoretical nature.

F. *External grants:*

a. *Awarded:*

Project title: **Phase Contrast Imaging for the Wendelstein 7-X Stellarator (renewal)**
Applicants: MIT and SUNY Cortland
Role: co-Investigator
Agency: US Department of Energy
Award amount: $900k over three years
Award period: August 18, 2021 to August 17, 2024

Project title: **A Phase Contrast Imaging Diagnostic for the Wendelstein 7-X Stellarator**
Recipients: MIT and SUNY Cortland
Role: co-investigator and primary author of the grant
Agency: US Department of Energy, Office of Science, Fusion Energy Sciences
Award amount: $900k
Award period: August 18, 2018 to August 17, 2021

Project title: **A Phase Contrast Imaging Diagnostic for the Wendelstein 7-X Stellarator**
Recipients: MIT
Role: Key-personnel and primary author of the grant
Agency: US Department of Energy, Office of Science, Fusion Energy Sciences
Award amount: $1.038M
Award period: August 18, 2015 to August 17, 2018

b. *Pending:*

Project title: **Optictool: the intuitive optical design platform**
Applicants: Eric Edlund and Nathaniel Rose
Role: Project lead and primary author of the proposal
Agency: SUNY
Award request: $50,000

c. *Not funded:*

Project title: **Physics, engineering, and design using wind tunnels in the high school classroom**
Applicants: Eric Edlund and Anthony Canestaro
Role: Project lead and primary author of the proposal
Agency: American Institute of Physics
Award request: $25,000

G. *Artistic and creative work since initial appointment:*

Binary Processes, art installation in the *Measured Confluence* exhibition at the Dowd Gallery, SUNY Cortland. January-February, 2020.

Forbidden Regions, with Jaroslava Prihodova, art installation in the *Measured Confluence* exhibition at the Dowd Gallery, SUNY Cortland. January-February, 2020.

H. *Artistic and creative work prior to initial appointment:* N/A

I. *Other scholarly or creative activity:*

E. M. Edlund, ``A b-1 multiplicative identity for base b,'' August 2020.

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IV. University service:

A1. *Committees chaired since last promotion:*

Educational Policy Committee (for the 2021-2022 academic year)

- Proposed modifications to the AGT policies (Fall 2021)

Physics Department Program Review (2019-2020)

- Coordinated the research and writing for the report
- Organized the virtual visit of the external reviewers on April 14, 2020

3+2 Program Coordinator for the Physics and Engineering (2020 – present)

- Investigating establishing an articulation agreement with Binghamton's Mechanical Engineering Department, TBD following curricular changes here.

Physics Department Curriculum Committee (2019 – present)

- Added PHY 430 – Statistical and Thermal Physics
- Added PHY 475 – Quantum Mechanics
- Work underway in the 2021-2022 year:
  - Adding a new computer programming course (PHY 386)
  - Modifying course attributes for a number of courses (357, 410, 420, 450, 559)
  - Modifying our programs (PHY, PEN, APH)

A2. *Committees served on since initial appointment:*

Ongoing

Educational Policy Committee	Fall 2018 – Present
Alumni-Undergraduate Research Science Symposium	Fall 2018 – Present
Physics Department Curriculum Committee	Spring 2018 – Present
Physics Department Personnel Committee	Spring 2018 – Present
Physics Department Scholarship Committee	Spring 2018 – Present

Completed

Physics Department Program Review Committee	Fall 2019 – Spring 2020
Physics Department Faculty Search Committee	2018 & 2019 years
Director of the Dowd Gallery Search Committee	Fall 2018 – Spring 2019

B. *Offices held in faculty governance or in the bargaining agents:* N/A

C. *Administrative responsibilities since initial appointment:*

Coordinator for the Physics Department celebration of graduates	Spring 2020
Representative for the Physics Department at the College Open House	Fall 2019, both events
Coordinator for the Physics Department colloquium series	Fall 2018 – Present

D. *Work with students undertaken in addition to the formal teacher-student relationship:*

Unofficial Teaching:
Instructor and creator of the Summer Python Programming School (SPPS) in summer 2020

Mentoring:
1. Olivia Wilburn (Spring 2022), Heating and power alternatives for Camp Huntington
2. Adam Aldrich (Spring 2022), Developing new PLTL/SI materials for PHY 105
3. Victoria Kilfeather (Spring 2022 & Fall 2021), Experimental measurements in CPX
4. Olivia Wilburn (Fall 2020), Modeling herding behavior
5. Hunter Reid (Summer 2020), Making ice in the desert
6. Nathaniel Rose (Summer 2018 – present), Optical design software
7. Karl Hipius and Nathaniel Rose (Spring 2019 - present), Coupled pendula experiment
8. Tyler Edgar (Spring 2020), Coupled pendula experiment
9. Scott Blankenbaker (Spring 2020), Coupled pendula experiment

F. *Professional Service:*

Co-creator of the "Faculty Lounge" team space, with Dakin Burdick (Spring 2020)
Member of the Online Teaching Group, through the Institute for College Teaching (Fall 2020)

E. *Community Service:*

Presenter of planetarium shows for 10+ groups since appointment

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V. Continuing growth:

A. *Membership in professional organizations:*

- American Physical Society (APS)
- American Association of Physics Teachers (AAPT)

B. *Professional meetings attended in the last three years:*

American Physical Society Conference	online	November 2020
American Physical Society Conference	Milwaukee, MI	November 2017

SUNY Applied Learning Conference	Albany, NY	October 2019
European Physics Society Conference	Prague, Czech Republic	July 2018

C. *Other professional activities which contribute to growth:*

Book club reading of ``Stamped from the Beginning'' by I. Kendi (2020-2021)
SafeZone training with the SUNY Cortland MLDO (October 12, 2021)