Erica W. Carlson Curriculum Vitae

Address: Purdue University Dept. of Phy 525 Northwestern Ave. West Lafayette, IN 47907	vsics V	Phone: (76 FAX: (76 E-mail: ewcarlson@ Veb: http://www.physics.purdu	65) 494-3041 65) 494-0706 Dpurdue.edu le.edu/~erica
Education			
University of California, Los Ph.D., Theoretical Conden Dissertation advisor M.S., Physics	Angeles sed Matter Physics r: Prof. Steven A. Kiv	elson	2000 1995
California Institute of Techno B.S., Physics	blogy, Pasadena, CA		1994
<u>Positions</u>			
Purdue University, West Lafa 150th Anniversary Professor Professor Associate Professor Assistant Professor École Supérieure de Physiqu Visiting Scientist	ayette, IN or of Physics and Ast Dept. of Physics and Dept. of Physics Dept. of Physics Je et de Chimie Indu Laboratoire de Phys	ronomy d Astronomy I strielles, Paris 2010, 2 ique et d'Étude des Matériaux	2018-Present 2013-Present 2009-2013 2003-2009 020, 2022, 2023
Visiting Scientist	Materials Science D	ivision	2003
Boston University, Boston, M Postdoctoral Researcher	IA Dept. of Physics	with Prof. David K. Campbell	2000-2003
University of California, Los Postdoctoral Researcher Research Assistant	Angeles Dept. of Physics Dept. of Physics	with Prof. Steven A. Kivelson with Prof. Steven A. Kivelson	Summer 2000 1996-2000
California Institute of Techno Research Assistant • Experiment: Live Research Assistant • Experiment: Bind Emory University, Atlanta, G	Diogy, Pasadena, CA Dept. of Physics neural networks embe Dept. of Chemistry ing constants of triple	with Prof. Jerome Pine edded in silicon with Prof. Peter Dervan helical DNA	Summer 1993 Spring 1991

 Research Assistant
 Dept. of Chemistry
 with Prof. Carl S. Hagan
 Summer 1991

 • Experiment: Created new organic cage molecules with inorganic centers

Awards and Honors

Seed for Success Acorn Award (Purdue)	2022
Fulbright Scholar	2020
Book of Great Teachers (Purdue)	2018
150th Anniversary Professor	2018
Fellow, Center for Instructional Excellence (Purdue)	2016-2018
Charles B. Murphy Outstanding Undergraduate Teaching Award, Purdue	2017
(The University's highest teaching award)	
Fellow, Purdue Teaching Academy	2017
Fellow of the American Physical Society	2015
For theoretical insights into the critical role of electron nematicity, disorder,	and noise in
novel phases of strongly correlated electron systems and predicting unique	е
characteristics. (DCMP)	
APS-IUSSTF Professorship Award in Physics	2013
Spira Award for Excellence in Undergraduate Teaching, Purdue Physics	2010
Spira Award for Excellence in Graduate Teaching, Purdue Physics	2009
Cottrell Scholar Award, Research Corporation	2006
College of Science Award for Outstanding Contributions	2006
to Undergraduate Education by an Assistant Professor	
Spira Award for Excellence in Undergraduate Teaching, Purdue Physics	2005
Outstanding Graduate Student Award, UCLA Physics	2001
University Postdoctoral Fellowship, Ohio State University (declined)	2000
Harvey Fellowship, Mustard Seed Foundation	1998-2000
Richardson Travel Award, UCLA Physics	1999
RA/Mentorship Fellowship, UCLA	1997-1998
Departmental Teaching Associate Award, UCLA Physics	1997
Graduate Opportunity Fellowship, UCLA	1994-1995
Summer Undergraduate Research Fellowship, Caltech	1993
Doris S. Perpall Speaking Award, Caltech	1993

Outreach and Community Engagement

See Examples at http://www.physics.purdue.edu/~erica/outreach/index.html

Outreach to the General Public and Students:

Live 1-Hour Interview on National Public Radio (NPR)'s radio show, 1A, "<u>The Scientific</u> <u>Method: Questioning Quantum Mechanics.</u>" (~ 6M listeners) January 2025

"<u>The Quantum Age: How It Will Change Your World</u>," Agents of Tech Podcast (74,000+ views). They also made a Short from it: <u>The Secret to Explaining Complex Science -</u> <u>YouTube</u> December 2024

Quantum Periodic Table Workshop for Middle School Teachers (IQ-PARC), Presenter. (Teacher training.) December 2024 Celebrity Jeopardy! consultant, September 2024

"Purdue Expert: Quantum Technology," Purdue University News June 2024

"Universal Features of Emergent Electronic Fractals in Quantum Materials," Quantum Science Center Summer School May 2024

Workforce Panel Discussion, Quantum Science Center Summer School May 2024

Superconductivity Demonstrations to High School Students, Harrison High School, West Lafayette, IN, May 2024

Interviewed by <u>Superheroes of Science</u> (February 2024)

- Superconductivity Demonstrations to High School Students, Harrison High School, West Lafayette, IN, May 2023
- "The New Universes Inside of Quantum Materials," <u>Public Lecture</u> at the Aspen Center for Physics, part of the Disorder and Quantum Phases of Matter conference, December 2023
- Co-PI on Innovation in Quantum Pedagogy, Application and its Relation to Culture (IQ-PARC) https://www.iqparc.com/

Launched new YouTube channel on Quantum Materials December 2023: <u>www.youtube.com/@TheQuantumAge</u> (99,000+ Views / 1.7K+ Subscribers) New videos already released:

 Welcome to The Quantum Age

 Why Magnets are Quantum Materials

 Superconductors and Their Quantum Tricks

 Quantum Spin Ice and Magnetic Monopoles

 Novel Superconductors and the National Quantum Initiative | Laura Greene

New videos completed but not yet released: Quantum Education Research | Chandralekha Singh

To support the launch of The Quantum Age YouTube channel, these were also launched:

www.thequantumage.com (submitted for an industry microsite award)

The Quantum Age on LinkedIn

The Quantum Age on Twitter/X

Advertising campaign to support the channel

Quantum Periodic Table Workshop for Middle School Teachers (IQ-PARC), co-Organizer. (Teachers received 3 days of training as well as lesson plans and materials.)

> June 2023 December 2024

Radioactivity Workshop for Middle School Teachers (IQ-PARC), co-Organizer.	(Teachers
days of training as well as lesson plans and materials.)	July 2022
Quantum Workforce Panel Discussion at the 2nd Annual Quantum Summer So Quantum Science Center, Purdue University	chool of the May 2022
"Lunch with the experts," outreach to students, APS March meeting	March 2022
Guest on Superheroes Of Science, Purdue CoS, https://www.youtube.com/watch?v=SrvmdIU3hds N	ovember 2020
YouTube channel, youtube.com/QuantumCoffeehouse (23,000+ Views; 1.3K-Subscribers)	+
for the Purdue Quantum Science and Engineering Institute See the outreach playlists: <u>Quantum Connections</u> and <u>Quantum Coffee</u>	May 2020 <u>e Break</u>
"Fractal Views on Quantum Matter," Presidential Colloquium Series, Purdue	April 2019
Popular Level Video Series "Understanding the Quantum World" Relea <u>https://www.thegreatcourses.com/courses/understanding-the-quantum-world.html</u> Best opening weekend of any course in the 2 years prior Top ROI of all of the Great Courses in 2019	sed April 2019
"Teaching@Purdue 2018" featuring the 150 th Anniversary Professors discussir Provost's Teaching & Learning Initiative	ng the Oct. 2018
President's Colloquium Series, Purdue University "Reductionism, Emergence, Are we bound by the laws of physics?"	and Freedom:
Eclipse Outreach to Cumberland Elementary School West Lafavette IN	August 2017
Outreach on Superconductivity to Harrison H.S., West Lafavette, IN	Mav. 2017
Lunch with the Experts, outreach to graduate students, APS March Meeting	2017
Panelist, The Veritas Forum, Oregon State University	2017
Panelist, The Veritas Forum, Washington University, St. Louis	2017
YouTube Channel for Electric and Magnetic Interactions	2016
www.youtube.com/profcarlson (250,000+ views; 5.8K Subscribers)	
Outreach on Big Bang, Universidad Científica del Sur, Villa El Salvador, PERÚ	2016
Outreach on Big Bang, Universidad Ricardo Palma, Santiago de Surco, PERU	2016
Interview with Modesto Montoya, "Encuentro con la Ciencia," PERU	2016
Outreach on Superconductivity to Harrison H.S., West Lafayette, IN	2016
Sample Lecture Recording for The Great Courses, "Quantum Mechanics,"	0045
I ne Learning Company, Washington, DC	2015
Public Lecture at West Larayette Public Library, "Quantum Mechanics in Plain English	1," 2015
Outroach on Magnetism to Cumberland Elementary School, West Lafevette, IN	2015
Outreach on Magnetism to Combenano Elementary School, West Lalayelle, In	N 2014
Outreach on Superconductivity to Harrison H.S. West Lafayette IN	2014
TFDy talk: "Are you more than your atoms?"	2013
http://www.voutube.com/watch?v=fhl.l9l46l_z7c_(15 000+ viewe)	2013
Outreach to Purdue Child Development Lab (CDL)	2010

Preschool (Purdue) on Magnetism, for 2-3 year-olds	2012
Outreach on Superconductivity to Harrison H.S., West Lafayette, IN	2012
Outreach to CDL Preschool (Purdue) on Magnetism, for 3-5 year-olds	2011
Outreach on Superconductivity to Harrison H.S., West Lafavette, IN	2011
5 Public Lectures in Paris, FRANCE (in French)	2010
Outreach on Superconductivity to Harrison H.S., West Lafavette, IN	2009
Lunch with the Experts, outreach to graduate students, APS March Meeting	2007
Organize lunches/dinners for graduate women in physics at Purdue	2003-present
Interview with youtube com/ScienceTheater	
https://www.voutube.com/watch?v=xa4e-1Nuohg (1.600+ views)	2006
Research outreach and demonstrations Harrison H S. West Lafavette IN	2005
Finstein vs. the Bug, stage show at the Purdue Bug Bowl	2004 2005
Consultant for sciencetheater net	2005-present
Panelist Graduate Women in Science Program at Purdue	2004
Physics demonstrations at Bigelow Middle School Newton MA	2002
Science fair judge at Runkle Middle School, Brookline, MA	2001
Pathways Conference, Boston University	
For high school girls interested in science and technology careers	
Mentor and Demonstrator	2001, 2003
Mentored graduate student women in physics, UCLA	,
Organized highly attended lunch gatherings	1995-2000
Bountiful Harvest, Duarte, CA and Afikpo, Nigeria (nonprofit organization)	
Agricultural and economic development in rural Nigeria	
 Board of Directors 	1998-present
 Creator and webmaster www.bountifulharvest.org 	1998-present
 Spearheaded e-commerce collaboration with PCWorld 	
magazine	1998
Harvey Fellows, Arlington, VA (nonprofit organization)	
Chair. Advisory Board	2002-2003
Advisory Board Member	2001-2003
 Created and maintained alumni electronic listserv 	1998-2003
Mentored middle school girls in a local youth club. Los Angeles, CA	1995-1998
Outreach talk: "The Secret Life of Electrons in Cuprate Oxides"	
Purdue University, Undergraduate Honors Seminar	2004, 2005
Purdue University, REU Seminar (every summer)	2004-present
Purdue University, Graduate Research Seminar	February 2004
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Science Outreach to Religious Communities:	
Invited Talk, American Scientific Affiliation, Purdue	April 2025
(upcoming)	
Sermon, Connection Point Church, West Lafayette, IN	August 2024
https://www.youtube.com/watch?v=279ktQLKjFg&t=22s	
Invited Talk American Scientific Affiliation Purdue	February 2024
Invited Plenary Lecture, Palm Beach Atlantic University	October 2023
Presentation to Grad Resources Paris ERANCE	Juna 2022
TESCHAUUT U GIAU NESUULES, FAIIS, FRANCE	

Presentation in French to Groupes Bibliques Universitaires, Paris, FRANCE	June 2023	
Zoom interview for a Jesuit high school in Kaunas, Lithuania. Febr	ruary 2023	
Invited Plenary Lecture at Annual Meeting of the American Scientific Affiliation	July 2022	
Interview <i>in French</i> (online) with Le Forum Veritas, Paris, FRANCE <u>https://www.youtube.com/watch?v=MIXzShs0QMg&t=20s</u>	June 2022	
Interviewed on Science+God with Dr. G Ja https://www.accessmore.com/episode/Journey-88Theres-More-to-You-T an-Possibly-Imagine	nuary 2022 <u>[han-You-C</u>	
Invited Respondent at the Annual Meeting of the American Scientific Affiliation https://asa2021.us2.pathable.com/meetings/virtual/pjLACpRDNbN7dMNd	July 2021 <u>w</u>	
Invited Participant at the Dabar Conference hosted by the Henry Center at Trinity Evangelical Divinity School (Deerfield, Illinois), "God saw that it was good: Uniting the Natural and Moral Order," Participated in discussions <i>in French</i> with attendees from Institut Biblique de Nogent. June 2021		
Interviewed on Christ and Culture Podcast (as part of the Science for Seminaries program of the American Association for the Advancement of Science, AAAS) January 2021 https://intersectproject.org/faith-and-science/erica-carlson-science-in-the-sanctuary/		
Interviewed by Adam Hamilton, (reach of ~ 30,000) Ja	nuary 2021	
Keynote Speaker, Southeastern Baptist Theological Seminary, Wake Forest, NC, as part of the Science for Seminaries program of the American Association for the Advancement of Science (AAAS) September 2020		
"Quantum Physics and Emergence for Non-Experts." One of 7 invited presenters at the Dabar conference on Divine Action, Trinity Evangelical Divinity School, IL June 2019		
"Quantum Mechanics for Everyone," 6 th Annual Meeting of the Christian Scientific Society, Pittsburgh, PA 2018		
Kounata Speaker Canaardia Seminany St. Louis MO, as part of the Spiance for		

Keynote Speaker, Concordia Seminary, St. Louis, MO, as part of the Science for Seminaries program of the American Association for the Advancement of Science (AAAS) April 2018

Teaching

Prof. Carlson has implemented course transformations in Phys 272 Electric and Magnetic Interactions in conjunction with Purdue's IMPACT Program, and was chosen to be part of Purdue's First in the World Grant.

In Fall 2014, I video recorded lectures of Phys 272, for future use as a resource for the Department. View the edited videos on the YouTube Channel here (editing completed 2016-2017): www.youtube.com/profcarlson

Purdue University, West Lafayette, IN

Instructor, Physics 344, Introduction to Quantum Science (sophomor	e phys majors)Fall 2023, 2024
Instructor, Physics 630 Adv. Theory of Electricity and Magnetism (gra	aduate) Fall 2021, 2022
Instructor, Physics 645, Electron Theory of Solids I (graduate)	Fall 2018; Fall 2019; Fall 2020
Instructor, Physics 646, Electron Theory of Solids II (graduate)	Spring 2019, Spring 2021
Guest Speaker, HONR 399 "Purdue at 150"	Spring 2019
Instructor and Coordinator, Physics 272 Electric and Magnetic Intera	ctions
(undergraduate)	Fall 2012-2017
Instructor, Physics 630 Adv. Theory of Electricity and Magnetism (gra	aduate) Spring 2011-2013
Instructor, Physics 172H Modern Mechanics Honors (undergraduate) Fall 2009, 2011
Instructor, Physics 545 Solid State Physics (undergraduate/ graduate/	e) Spring 2004-2009
Instructor, Physics 416 Statistical Mechanics (honors physics majors) Fall 2004-2008

University of California, Los Angeles

Office of Instructional Development	1996-2000
incoming physics teaching assistants	
Office of Instructional Development	1997, 1999
Dept. of Physics and Astronomy	1996-1997
Depts. of Art and Women's Studies	1999
Dept. of Physics and Astronomy	1994-1995
	Office of Instructional Development incoming physics teaching assistants Office of Instructional Development Dept. of Physics and Astronomy Depts. of Art and Women's Studies Dept. of Physics and Astronomy

California Institute of Technology, Pasadena, CA

Dean's Tutor	Office of the Undergraduate Dean	1994
Workshop Facilitator	Summer Undergraduate Research Fellowship Office	1993
Peer Coach	Summer Undergraduate Research Fellowship Office	1993
Private Tutor	Pasadena, CA	1990-1994

Teaching Innovations

- YouTube Channel "Electric and Magnetic Interactions" online supplement for Phys 272 http://www.youtube.com/profcarlson (250,000+ views; 5.8K Subscribers).
- First college science course to be **podcast** on the iTunes music service: Physics 416 Thermal and Statistical Physics, Fall 2005.
- Lecture **blogs** provide summaries of class material and important student questions, including links to videos, simulations, and applets used in class. (See http://physics416.blogspot.com, http://physics545.blogspot.com).
- Set up a course **wiki**, an online document students create collaboratively, as a dynamic supplement to the course textbook.

Media Coverage of Research and Teaching Innovations / Media Appearances

1. "<u>The Quantum Age: How It Will Change Your World</u>," interview on the Agents of Tech Podcast, 74,000+ views (December 2024)

- 2. "<u>Emerging Technologies through Engineering the Sub-Atomic Quantum World</u>," by Michelle Mohney (Northwestern University Engineering News, August 2024)
- 3. "<u>Purdue begins a pilot project in a half-dozen Indiana middle schools to make abstract</u> <u>quantum concepts more accessible and engaging</u>" by Jeanine Shannon (Purdue School of Engineering, August 2024)
- 4. Interviewed by <u>Superheroes of Science</u> (February 2024)
- 5. "Quantum Innovation in Education Innovation in Quantum Pedagogy, Application & Relation to Culture" by ASEE TV (June 2024)
- 6. "<u>Erica Carlson Leads Purdue's Charge into a New Quantum Era</u>" (by James Dargan, June 11, 2024)
- 7. "<u>New quantum materials promise unimagined innovations in computing, memory</u>" by Brittany Stef, Purdue Today (June 2024)
- 8. Careers in STEM: Theoretical Physicist by <u>Superheroes of Science</u> (February 2024)
- 9. Interviewed for <u>Purdue Experts</u> series. (January 2024)
- 10. "Boilermakers granted rare opportunity for hands-on experience with a quantum computer" by Cheryl Pierce, Interactions (Dept. of Physics and Astronomy, April 2024)
- 11. Carlson is quoted in "<u>At a WSU Vancouver lab, researchers test a sweet solution to faster,</u> <u>cleaner computers,</u>" Oregon Public Broadcasting, December 2023.
- 12. "<u>Neuromorphic computing will be great... if hardware can handle the workload</u>," Purdue News, October 2023. Also picked up by <u>EurekAlert! (AAAS)</u>, <u>Tech Xplore</u>, and <u>Nanowerk</u>
- "<u>Researchers at Purdue discover superconductive images are actually 3D and disorder-driven fractals</u>," Purdue News, May 2023. Also picked up by <u>EurekAlert (AAAS)</u> and <u>Phys.org</u>
- 14. "Quantum Summer School is Just Around the Corner," Campus Technology, April 2022 mentions youtube.com/quantumcoffeehouse
- 15. "<u>US Department of Defense Awards \$2.8M to Purdue University Scientists for Quantum Education Program</u>," Inside Quantum Technology News, October 2021
- 16. "<u>U.S. Department of Defense awards \$2.8M to Purdue University scientists for quantum education program</u>," by Cheryl Pierce, Purdue News, October 2021
- 17. "<u>Quantum Coffeehouse and other physics videos</u>," nanoscale.blogspot.com by Doug Natelson, July 13, 2020
- 18. "<u>Twelve Christian Women in Science You Should Know</u>," Rebecca Randall, Christianity Today, Feb. 17, 2020
- 19. "Purdue breaks its record with faculty Fulbright Scholars," Purdue Today, May 3, 2019
- 20. "Scientists discover fractal patterns in a quantum material," MIT News, October 16, 2019
- 21. "Erica Carlson named 150th Anniversary Professor," Purdue Today, Feb.7, 2018
- 22. "Murphy Award: Erica Carlson," Purdue Today, Apr. 21, 2017
- 23. "Science professors earn top Purdue teaching awards," College of Science News
- 24. Guest on Mysteries at the Museum, Season 11, Episode #5 "Black Knight UFO" about Purdue Alumnus and Astronaut Jerry Ross. First aired 7/29/16
- 25. Interview with Modesto Montoya, "Encuentro con la Ciencia," PERU, June 17, 2016
- 26. Quantum Mechanics public lecture is front page of Purdue's student newspaper, the Exponent, April 16, 2015. tinyurl.com/carlson-quantum
- 27. www.purdue.edu home page highlights Carlson Group Research, Sept. 21-27, 2012
- 28. "Purdue U Finds Evidence Imperfections Boost T_c in Cuprates," by Klaus Neumann, Superconductor Week, October 2012
- 29. "Fractal calculus may help explain superconductivity," Waves and Packets, August 25, 2012
- 30. "Superconductor 'flaws' could be key to its abilities," by Elizabeth Gardner, R&D Magazine August 2012

- 31. "Superconductivity associated with fractal structure of nanoscale electron lines," by Siv Schwink, University of Illinois at Urbana-Champaign, June 2012
- 32. Interviewed *(in French)* by Radio France Internationale, June 2012
- 33. "Where there's a wiki, there's a way," by Amira Zamin, Insights Magazine, Purdue College of Science, Fall/Winter 2007
- 34. "Professor honored for teaching, soft matter research," by Tanya Brown, Journal and Courier, June 12, 2006
- 35. "Missed Class? Try a Podcast," by Jodi S.Cohen, Chicago Tribune, Front page, Oct. 20, 2005
- 36. "Listen While You Learn," by Abe Aamidor, Indianapolis Star, December 18, 2005

Public Service

Visit with the local office of US Congressional Rep. Jim Baird Fall 2019 Scientific advice on pandemic management sent to their office Spring 2020

Capitol Hill visits with the American Physical Society, Washington, DC (*the only participant from Indiana*) Meetings with the offices of Sen. Evan Bayh, Sen. Richard Lugar, Rep. Steve Buyer, Rep. Julia Carson, Rep. Mike Pence

I occasionally correct physics articles at wikipedia.org

Areas of Research

- Multiscale Theory of Scanning Probe Experiments
- Pattern Formation in Strongly Correlated Electronic Systems
- Condensed matter theory of quantum materials
- Liquid crystalline vortex matter in type II superconductors
- Theory and phenomenology of high temperature superconductivity
- Stripe phases in doped antiferromagnets
- Noise and nonequilibrium behavior of stripe phases
- Granular superconductors
- Analytic work and Monte Carlo simulations of the XY and Ising models
- Field Theory and Bosonization of one dimensional electronic systems
- Dimensional crossover
- Spin Waves in Stripe Ordered Phases

Professional Activities

Session Chair, Quantum in Complex Matter, Ischia, ITALY	June 2024
Organized March Meeting Symposium,	March 2024
"Quantum Materials for Neuromorphic Computing"	
Member, American Physical Society, Division of Condensed Matter Physics	1997-present
Member, American Association for the Advancement of Science	2022-present
Presentation Coaching by Melissa Harris	Spring 2023
Presentation Training by Duarte.com	July 2019
Editorial Board, Nature Partner Journal Quantum Materials,	2017-Present
Elected Member-At-Large, DCMP Executive Committee of the APS	2016-2019

Media Training through PulsePoint and Purdue	July 2018
Session Chair, Gordon Research Conference on Correlated Electron System	ns June 2016
Communication Skills for Women	August 2015
Participant, Purdue Quantum Center Kickoff Workshop	October 2015
Session Chair, International Conference on Superstripes, Ischia, Italy	July 2015
Session Chair, International Conference on Superstripes, Erice, Italy	July 2014
Session Chair, Overarching issues in the Theory of Highly Correlated Electro	onic Fluids
	June 2014
Assistant Editor for Materials & Mechanisms of Superconductivity	2012
Session Chair, 55 th International School of Solid State Physics, Erice, Italy	July 2012
Review Panel for CMP, National Science Foundation	February 2012
Session Chair, Quantum Phenomena in Complex Matter, Rome, Italy	July 2011
Session Chair, Quantum Phenomena in Complex Matter, Erice, Italy	July 2010
Review Panel for PREM, National Science Foundation	May 2009
Session Chair, FeAs High T _c Superconducting Multilayers	December 2008
Session Chair, Quantum Phenomena in Complex Matter, Erice, Italy	July 2008
Session Chair, APS March Meeting	March 2008
Review Panel for I2CAM, National Science Foundation	January 2008
Session Chair, APS March Meeting	March 2007
Co-Organizer, Workshop on Pseudogaps in Strongly Correlated Metals,	
Aspen Center for Physics	Summer 2004
Visiting Scientist, Materials Science Division, Argonne National Laboratory	July 2003
Session Chair, Workshop on Complex Quantum Order,	
Aspen Center for Physics	February 2003
Visitor, Aspen Center for Physics	August 2002
Session Chair, APS March Meeting	March 2002

Selected Academic Service

Promotions Subcommittee	2023-2024
Advanced Materials Faculty Search Committee	2024
Chair, Condensed Matter Theory Faculty Search	2021-2022
CoS Area Committee	2020-2022
Presented nomination to University Bement Award Committee	May 2021
Physics and Astronomy Head Search Advisory Committee	2020-2021
University Faculty Advancement Committee	2018-2019
IPC Member (2 junior faculty), presented case 2018	2016-present
IPC Chair (2 junior faculty), presented cases 2017, 2019 2	2016-2018; 2019-present
Promotions Subcommittee	2017-2019
Mentor (2 junior faculty)	2015-present
Presentation at New TA Orientation Days, Purdue University	August 2017
Ombudsman, Physics and Astronomy Department	2014-2023
Facilitator, Search Committee Training Workshops for the University	y 2015-2018
Hubert M. James Lecture Series Member	2014-2019
Hubert M. James Lecture - Hosted Andrea Ghez	2016
Physics Advisory Committee, Purdue	2004-2006; 2014-2016
Chair, Physics Advisory Committee, Purdue	2015-2016
Diversity Committee	2013-2018

Graduate-Faculty Committee, Purdue	2004-2017
Referee for NSF, Phys. Rev. Lett., Phys. Rev. B, JPCS	1998-present
Area Committee Alternate	2015-2018
Family Day, College of Science, Purdue	2015
Chair, Physics and Astronomy Head Search Advisory Comm	nittee,
College of Science	2014-2015
College of Science Elections Committee	2009-2011
Selection Committee, CoS Award for Outstanding Contributi	ons to
Undergraduate Education by an Assistant Professor	2010
Institutional Communication Strategy (university)	Fall 2009
University Electronic Communications Committee	Fall 2008
Various Faculty Search Committee(s), Purdue	2003-2015; 2017-2019
Qualifying Exam Committee, Purdue	Fall 2003, Spring and Fall 2004
Graduate Core Review Committee, Purdue	Fall 2003
Graduate Examinations Review Committee, UCLA	1999
Graduate Representative to Academic Affairs Committee, U	CLA 1999
Graduate Representative to Department Review, UCLA	1999

Research Publications

Superscripts denote Carlson group members: (U) undergraduate student; (G) graduate student; (P) postdoc.

Google Scholar profile https://tinyurl.com/ewcarlson-googlescholar

ORCID https://orcid.org/0000-0003-2162-5301

51) R. Ramachandran, S. Anand^G, K. Eom, K. Lee, D. Yang, M. Yu, S. Biswas, A. Nethwewala, C.-B. Eom, E. W. Carlson, P. Irvin, J. Levy, "Magnetically Tuned Metal-Insulator Transition in LaAIO3/SrTiO3 Nanowire Arrays," <u>ArXiv:2410.01937</u>, submitted to Phys. Rev. Lett.

50) S. Anand^G, R. Ramachandran, K. Eom, K. Lee, D. Yang, M. Yu, S. Biswas, A. Nethwewala, C.-B. Eom, E. W. Carlson, P. Irvin, J. Levy, "Electric and Magnetic Field-Dependent Tunneling Between Coupled Nanowires," <u>ArXiv:2410.01936</u>, *submitted to Phys. Rev. B.*

49) M. Alzate Banguero, S. Basak^G, N. Raymond, F. Simmons^G, P. Salev, I. K. Schuller, L. Aigouy, E. W. Carlson, A. Zimmers, "<u>Optical mapping and on-demand selection of local hysteresis properties in VO₂</u>," Condensed Matter 10, 12 (2025).

48) Y.-C. Wu, G. B. Halasz, J. T. Damron, Z. Gai, H. Zhao, Y. Sun^G, K. A. Dahmen, C. Sohn, E. W. Carlson, C. Hua, S. Lin, J. Song, H. N. Lee, B. J. Lawrie, "<u>Nanoscale magnetic</u> <u>ordering dynamics in a high Curie temperature ferromagnet,</u>" *Nano Letters* 4, 1473 (2025).

47) Zhuoqun Fang, Melissa Alzate-Banguero, Amit R. Rajapurohita^U, Forrest Simmons^G, Erica W. Carlson, Zhuoying Chen, Lionel Aigouy, Alexandre Zimmers, "Tuning the Resistance of a VO2 Junction with a Focused Laser Beam and Atomic Force Microscopy," *Advanced Electronic Materials* aelm.202400249 (2024).

46) Zeynep Akdemir, Muhsin Menekse, Erica W. Carlson, Nicholas Dang, Mahdi Hosseini, Dongyang Li, "Supporting Middle School Students' Learning Outcomes and Engagement with NGSS-Aligned Quantum-Infused Science Curriculum (Evaluation)," <u>American Society for Engineering Education Annual Conference & Exposition, 42524 (2024)</u>.

45) S. Basak^G, Y. Sun^G, M. Alzate Banguero, P. Salev, I. K. Schuller, L. Aigouy, E. W. Carlson, A. Zimmers, "Spatially Distributed Ramp Reversal Memory in VO₂," <u>Advanced Electronic Materials aelm.202300085 (2023)</u>. Chosen for the <u>Back Cover</u> of the Journal. Media Coverage: <u>EurekAlert! (AAAS)</u>, <u>Tech Xplore, Nanowerk, Purdue News</u>, and <u>Purdue Today</u>

44) C.-L. Song, E. J. Main, F. Simmons^G, S. Liu^G, B. Phillabaum^G, K. A. Dahmen, E. W. Hudson, J. E. Hoffman, and E. W. Carlson, "<u>Critical Nematic Correlations Throughout the Superconducting Doping Range in BSCO</u>," *Nature Communications* **14**, 2622 (2023). Media Coverage: <u>EurekAlert! (AAAS)</u>, <u>Phys.org</u>, and <u>Purdue News</u>. Fig. 2 now graces the cover of a textbook on <u>Statistical Mechanics</u>.

43) S. Basak^G, M. Alzate Banguero, L. Burzawa^U, F. Simmons^G, P. Salev, I. K. Schuller, M.M. Qazilbash, D. N. Basov, L. Aigouy, A. Zimmers, and E. W. Carlson, "Deep Learning Hamiltonians from Disordered Image Data in Quantum Materials," *Physical Review B* **107**, 205121 (2023).

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Book Contributions

2) Contributed the articles entitled "Nature," "Quantum Vacuum State," and "James Clerk Maxwell" to the "Dictionary of Christianity and Science," ed. P. Copan, T. Longman III, C. L. Reese, and M. Strauss (Zondervan, 2017).

1) E. W. Carlson, V. J. Emery, S. A. Kivelson, D. Orgad, "Concepts in High Temperature Superconductivity," in "The Physics of Superconductors," ed. K.H. Bennemann and J.B. Ketterson (Springer-Verlag 2004), 180 pages. Updated version to appear in Springer Handbook of Physics, 2007.

Selected Research Presentations

** Most APS contributed talks are suppressed.**

116) "Quantum vs. Random Field Criticality in Cuprate Superconductors," **Invited Talk**, Condensed Matter Physics: New Frontiers in Long-Standing Problems (in honor of Steve Kivelson's 70th birthday), March 2025 (*upcoming*)

115) "Critical Nematic Correlations throughout the Superconducting Doping Range in BSCO," Seminar, Florida State University. *(upcoming, rescheduled due to weather.)*

114) "Creating New Universes Inside of Quantum Materials," **Colloquium**, Florida State University, January 2024. (Given virtually due to weather.)

113) "Universal Features of Emergent Electronic Fractals in Quantum Materials," **Invited Talk,** International Conference on 'Advanced Physics for Sustainable Future, IEMPHYS-24, Kolkata, INDIA, October 2024. *(virtual)*

112) "New Phases of Matter in Quantum Materials," **Invited Talk**, Cyberinfrastructure Symposium, Purdue University, October 2024. Available at https://nanohub.org/resources/41124

111) "Deep Learning Complexity in Neuromorphic Quantum Materials," **Invited Talk**, Fast Machine Learning for Science, Purdue University, October 2024

110) "Spontaneous Electronic Fractals in Disordered Quantum Materials," **Invited Talk**, conference on Topology and Correlations in Crystals and Quantum Matter, Les Houches, FRANCE, September 2024.

109) "Fractal Electronic Textures in Quantum Materials," **Invited Talk** at Quantum in Complex Matter, Ischia, ITALY, June 2024.

108) "Deep Learning Complexity in Neuromorphic Quantum Materials," **Invited Talk**, Neuromorphic Computing Meets Quantum Mechanics (NCMQM), Athens, GA, May 2024.

107) "Universality and Electronic Fractals in Quantum Materials," **Invited Talk**, American Physical Society, March Meeting, Minneapolis, MN, March 2024

106) "Deep Learning Complexity in Neuromorphic Quantum Materials," Virtual Seminar, Quantum Science Center and Elmore ECE Emerging Frontiers Center, Purdue University, February 2024.

105) "Critical Nematic Correlations throughout the Superconducting Doping Range in BSCO," **Invited Talk** at Disorder and Quantum Phases of Matter, Aspen Center for Physics, December 2023.

104) "Critical Nematic Correlations throughout the Superconducting Doping Range in BSCO," Seminar, École Supérieure de Physique et de Chimie Industrielles, Paris, FRANCE, June 2023

103) "New phases of matter in quantum materials," **Colloquium**, Purdue University, January 2023

102) "Critical Nematic Correlations throughout the Superconducting Doping Range in BSCO" **Invited Talk** at the International Conference on Quantum Materials and Technologies, Milas-Bodrum, TURKEY, October 2022

101) "Critical Nematic Correlations throughout the Superconducting Doping Range in BSCCO" **Invited Talk** at Superstripes 2022, Frascati-Rome, ITALY, June 2022 (delivered online)

100) "Al-enhanced detection of Fractal Electronic Textures in Vanadium Dioxide " Seminar, École Supérieure de Physique et de Chimie Industrielles, Paris, FRANCE, June 2022

99) "Fractal Electronic Textures in Quantum Materials," **Nico van Kampen Colloquium Series** at Utrecht University, Utrecht, THE NETHERLANDS, April 2022 (delivered online)

98) "Critical Nematic Correlations throughout the Doping Range in BSCCO," Seminar, University of Illinois at Urbana-Champaign, October 2021 (delivered online)

97) "New Phases of Matter in Quantum Materials," **Colloquium**, University of Southern California, Los Angeles, September 2021 (delivered online)

96) "Bulk vs. Surface Charge Order in Bi-2201," **Invited Talk** at Quantum Complex Matter, Rome Frascati, ITALY, June 2021 (delivered online)

95) "New Phases of Matter in Quantum Materials," **Colloquium**, University of British Columbia, CANADA, April 2021 (delivered online)

94) "Fractal Views on Quanum Materials," Seminar, University of British Columbia, CANADA, February 2021 (delivered online)

93) "Fractal Views on Quantum Materials," part of the international series *Frontiers of Condensed Matter Physics*, (online, organized by Yasutomo Uemura) Columbia University, February 2021

92) "Critical Pattern Formation at the Mott Metal-Insulator Transition," **Colloquium** for University of Pittsburgh and Carnegie Mellon, Pittsburgh, PA, November 2020 (delivered online)

91) "Universal Pattern Formation at the Mott Transition," **Invited Talk** at Quantum Complex Matter, Ischia, ITALY, June 2020 (delivered online)

90) "Critical Pattern Formation at the Mott Metal-Insulator Transition," Seminar, École Supérieure de Physique et de Chimie Industrielles, Paris, FRANCE, May 2020 (delivered online)

89) "Fractal Views on Quantum Materials: Learning Physics From Surface Probe Images," **Invited Talk** at Machine Learning Quantum Matter, Flatiron Institute, New York, January 2020

88) "Fractal Views on Quantum Materials," Purdue Quantum Science and Engineering Institute, December 2019

87) "Universality of Electronic Fractals in Correlated Oxides," **Invited Talk** at Quantum Complex Matter, Ischia, ITALY, June 2019

86) "Technology in the Physics Classroom," **Invited Talk** at Transforming Education for Student Success, Purdue University, March 2019

85) "Universal Pattern Formation in Correlated Oxides," **Colloquium**, University of Illinois, Urbana-Champaign, September 2018

84) "Universal Pattern Formation in Correlated Oxides," **Invited Talk** at Quantum Complex Matter, Rome Frascati, ITALY, June 2018

83) "Distinguishing XY from Ising Nematics," **Seminar**, California Institute of Technology, March 2018

82) "Spatial Complexity in Correlated Electronic Systems," **Colloquium**, Wheaton College, Wheaton, IL, April 2018

81) "Spatial Complexity and Universality in Correlated Electronic Systems," **Joan van der Waals Colloquium Series** at the Leiden Institute of Physics, NETHERLANDS, January 2018

80) "Spatial Complexity and Universality in Correlated Electronic Systems," **Seminar** at University of Texas, Austin, January 2018

79) "Decoding Spatial Complexity in Strongly Correlated Electronic Systems," **Colloquium** at Oregon State University, April 2017

78) "Spatial Complexity in Correlated Electronic Systems," **Invited Talk**, American Physical Society, March Meeting, 2017, New Orleans, LA https://absuploads.aps.org/presentation.cfm?pid=13341

77) "Decoding Spatial Complexity in Strongly Correlated Electronic Systems," **Theory Seminar**, Washington University St. Louis, March 2017

76) "Complejidad Espacial en Sistemas Electrónicos Fuertemente Correlacionados," (with Spanish translation by Fe Aguayo) **Colloquium**, Universidad Nacional de Ingeniería, Lima, PERU, June 2016

75) "Charge vs. Superconductivity," **Invited Talk**, Gordon Research Conference on Correlated Electronic Systems, South Hadley, MA, June 2016

74) "Random Field Driven Spatial Complexity at the Mott Transition in VO2," American Physical Society, March Meeting, 2016, Baltimore, MD

73) "Decoding Spatial Complexity in Strongly Correlated Electronic Systems," **Colloquium** at Wesleyan University, February 2016

72) "Decoding Spatial Complexity in Strongly Correlated Electronic Systems," **Colloquium** at Boston University, January 2016

71) "Decoding Spatial Complexity of Local Charge Modulations in Superconducting Pb-Bi-2201," American Physical Society, March Meeting, 2015, San Antonio, TX

70) "Decoding Spatial Complexity in Strongly Correlated Electronic Systems," **Colloquium** at University of California Davis, October 2015

69) "Spatial Complexity of Cuprate Superconductors and Other Oxides," **Invited Talk** at Superstripes 2015 Conference on Novel Superconductivity, Magnetism, Ferroelectric, Thermoelectric, and Multiferroic Phenomena in Complex Materials, Ischia, ITALY, June 2015

68) "Decoding Spatial Complexity in Strongly Correlated Electronic Systems," **Seminar** at the National High Magnetic Field Lab, Florida State University, April 2015

67) "Decoding Spatial Complexity of Local Charge Modulations in Superconducting Pb-Bi-2201," **Seminar** at University of Illinois at Urbana-Champaign, February 2015

66) "Random Field Driven Spatial Complexity at the Mott Transition in VO2," **Invited Talk** at Indo-US Workshop on Nanomaterials for Energy, Discovery Park, Purdue University. September 2014

65) "Decoding Spatial Complexity in Strongly Correlated Electronic Systems," **Invited Talk** at Superstripes 2014, at the Ettore Majorana Foundation and Centre for Scientific Culture, Erice, ITALY, July 2014

64) "New Geometric Universality Classes Shed Light on Scanning Probe Data," **Seminar** at University of Cincinnati, Cincinnati, OH, March 2014

63) "Spatial Complexity in Bi-2212 and Bi-2201," **Seminar** at Harvard University, Boston, MA, May 2013

62) **TEDx talk**: "Are You More Than Your Atoms?" **Invited Talk** at TEDxPurdueU, Purdue University, April 2013 <u>http://www.youtube.com/watch?v=fbU9I46Lz7c</u> (**15,000+ views**)

61) **Lecture Series** on Strongly Correlated Electronic Systems at Jawaharlal Nehru Center for Advanced Scientific Research (JNCASR), Bangalore, INDIA, April 2013

60) "Living the good life: Pursuing Excellence as a Scientist and as a Teacher," **Invited Talk** sponsored by the Forum on Education, March Meeting of the American Physical Society, Baltimore, MD, March 2013

59) "Decoding Spatial Complexity in Strongly Correlated Systems," **Physical Chemistry Seminar**, Purdue University, West Lafayette, IN, January 2013

58) "Decoding Spatial Complexity in Strongly Correlated Systems," **Colloquium**, Purdue University, West Lafayette, IN, August 2012

57) "A Fractal Nematic Superconductor," **Colloquium** at Emory University, Atlanta, GA, October 2011

56) "Spatial Complexity Due to Incipient Electronic Nematicity in Cuprates," **Invited Talk** at Quantum Phenomena in Complex Matter & Quantum Physics of Living Matter, Università di Roma La Sapienza, Rome, ITALY, July 2011

55) "Spatial Complexity Due to Incipient Electronic Nematicity in Cuprates," **Seminar** at Brookhaven National Laboratory, Upton, NY, May 2011

54) "Spatial Complexity Due to Incipient Electronic Nematicity in Cuprates," **Invited Talk** at the Workshop on Large Fluctuations & Collective Phenomena in Disordered Materials, Institute for Condensed Matter Theory, University of Illinois at Urbana-Champaign, May 2011

53) "Detecting Disordered Electron Nematics," Seminar at University of Illinois at Urbana-Champaign, February 2011

52) "Detecting Disordered Electron Nematics," **Invited Talk** at the 47th International School of Solid-State Physics: Quantum Phenomena in Complex Matter, Ettore Majorana Foundation and Centre for Scientific Culture, Erice, ITALY, July 2010

51) "Using Disorder to Detect Local Order: Noise and Nonequilibrium Effects in Disordered Electron Nematics," University of Cambridge, UNITED KINGDOM, April 2010

50) "Using Disorder to Detect Local Order: Noise and Nonequilibrium Effects in Disordered Electron Nematics," Université Paris-Sud, Orsay, FRANCE, April 2010

49) "Using Disorder to Detect Local Order: Noise and Nonequilibrium Effects in Disordered Electron Nematics," University of Oxford, UNITED KINGDOM, March 2010

48) "Using Disorder to Detect Local Order: Noise and Nonequilibrium Effects in Disordered Electron Nematics," École Supérieure de Physique et de Chimie Industrielles de la Ville de Paris, FRANCE, February 2010

47) "Magnetic Excitations in the Iron-Based Superconductors", **Invited Talk** at FeAs High Tc Superconducting Multilayers and Related Phenomena, Università di Roma La Sapienza, Rome, ITALY, December 2008

46) "Electronic Noise Due to Thermal Stripe Switching," **Seminar**, University of Heidelberg, GERMANY, December 2008

45) "Stripe Switching Noise in Cuprate Superconductors: Predictions For Local STM Noise", **Invited Talk** at the 6th International Stripes Conference, Quantum Phenomena in Complex Matter, Ettore Majorana Foundation and Centre for Scientific Culture, Erice, ITALY, July 2008

44) E. W. Carlson, D. X. Yao, D. K. Campbell, "Magnetic Excitations of Stripes Near a Quantum Critical Point", **Invited Talk** at the Theoretical and Experimental Magnetism Meeting organized by the Centre for Materials Physics and Chemistry and the Institute of Physics Magnetism Group, Abingdon, Oxfordshire, UNITED KINGDOM, July 2007

43) E. W. Carlson, B. Phillabaum, Y. Loh, K. A. Dahmen, E. Fradkin, and S. A. Kivelson, "Hysteresis and Noise from Electronic Nematicity in High Temperature Superconductors," **poster** presented at the Cottrell Scholars' Conference, Research Corporation, Tucson, AZ, July 2007

42) E. W. Carlson, D. X. Yao, D. K. Campbell, "Magnetic Excitations of Stripes Near a Quantum Critical Point", **poster** presented at the Gordon Research Conference on Superconductivity, Buellton, CA, January 2006

41) E. W. Carlson, K. Dahmen, E. Fradkin, and S. A. Kivelson, "Using Disorder to Detect Local Order: Hysteresis and Noise of Nematic Stripe Domains in High Temperature Superconductors" **Seminar:** University of Illinois, Urbana-Champaign, September 2005

40) E. W. Carlson, K. Dahmen, E. Fradkin, and S. A. Kivelson, "Electronic Ising Nematic in

High Temperature Superconductors: Can Electrons Crackle? "**Seminar**: University of Cincinnati, Ohio, June 2005

39) E. W. Carlson, D. X. Yao, D. K. Campbell, "Magnetic Excitations of Stripes", **Invited Talk** at the Midwest Solid State Conference, Purdue University, October 2004

38) E. W. Carlson, D. X. Yao, D. K. Campbell, "Magnetic Excitations of Stripes", **Invited Talk** at Nanoscale Heterogeneity and Quantum Phenomena in Complex Matter, Rome, ITALY, September 2004

37) E. W. Carlson, D. Orgad, S. A. Kivelson, and V. J. Emery, "The Role of Mesoscale Structure in High Temperature Superconductors," **Invited Talk** at ICAM Workshop on Evolution of Quantum Effects from the Nano- to the Macroscale, Institut d'Etudes Scientifiques de Cargese, Corsica, FRANCE, May 2004

36) "Spin Waves in Stripe-Ordered Systems," Seminar at Purdue University, February 2004

35) "Spin Waves in Stripe-Ordered Systems," **Seminar** at Argonne National Laboratory, July 2003

34) "Concepts in High Temperature Superconductivity," **Colloquium** at Washington University, February 2003

33) "Concepts in High Temperature Superconductivity," **Seminar** at University of Michigan, Ann Arbor, March 2004

32) "Concepts in High Temperature Superconductivity," **Seminar** at Northwestern University, March 2004

31) "Concepts in High Temperature Superconductivity," **Seminar** at Ohio State University, February 2004

30) "Concepts in High Temperature Superconductivity," **Seminar** at Stanford University, February 2004.

29) "Concepts in High Temperature Superconductivity," **Seminar** at University of Notre Dame, November 2003

28) "Concepts in High Temperature Superconductivity," **Seminar** at University of Texas at Austin, February 2003

27) "Concepts in High Temperature Superconductivity," **Seminar** at City College of New York, February 2003

26) "Concepts in High Temperature Superconductivity," **Seminar** at Purdue University, February 2003.

25) "Concepts in High Temperature Superconductivity," **Seminar** at University of Connecticut, July 2002.

24) "The Secret Life of Electrons in Cuprate Oxides," **Colloquium** at Wesleyan University, February 2003

23) "Vortex Liquid Crystals," Colloquium at Clark University, December 2002

22) "Vortex Liquid Crystals," **Colloquium** at Los Alamos National Laboratory, December 2002

21) "Vortex Liquid Crystals," Seminar at Washington University, February 2003

20) "Vortex Liquid Crystals," Seminar at Wesleyan University, February 2003

19) "Vortex Liquid Crystals," Seminar at Argonne National Laboratory, October 2002

18) "Vortex Liquid Crystals," **Seminar** at University of Illinois at Chicago, October 2002

17) "Vortex Liquid Crystals," **Seminar** at University of Illinois at Urbana-Champaign, October 2002

16) "Vortex Liquid Crystals," Seminar at University of Connecticut, March 2002

15) "Vortex Liquid Crystals," Seminar at Brandeis University, May 2002

14) "Dimensional Crossover in Quasi One-Dimensional and High T_c Superconductors," **Seminar** at University of Connecticut, June 2001

13) "Dimensional Crossover in Quasi One-Dimensional and High T_c Superconductors," **Seminar** at Brown University, February 2001

12) "Dimensional Crossover in Quasi One-Dimensional and High T_c Superconductors," **Seminar** at Northeastern University, February 2001

11) "Dimensional Crossover in Quasi One-Dimensional and High T_c Superconductors," **Seminar** at Harvard University, February 2001

10) "Dimensional Crossover in Quasi One-Dimensional and High T_c Superconductors," **Seminar** at Boston University, July 2000.

9) "Dimensional Crossover in Quasi One-Dimensional and High T_c Superconductors," **Seminar** at Ohio State University, February 2000.

8) "Dimensional Crossover in Quasi One-Dimensional and High T_c Superconductors," **Seminar** at McMaster University, February 2000

7) E. W. Carlson, D. Orgad, S. A. Kivelson, V. J. Emery, X. J. Zhou, and Z. X. Shen "Stripes, Electron Fractionalization, and ARPES," **Invited Talk** at Spectroscopies of Novel Superconductors, Chicago, Illinois, May 2001

6) E. W. Carlson, D. Orgad, S. A. Kivelson, V. J. Emery, X. J. Zhou, and Z. X. Shen, "Quasi One-Dimensional Behavior in High Temperature Superconductors", **Invited Talk** at the

March 2001 meeting of the American Physical Society, Seattle, Washington

5) E. W. Carlson, S. A. Kivelson, D. Orgad, V. J. Emery , "Dimensional Crossover in QuasiOne-Dimensional and High T_c Superconductors", **Invited Talk** at M2S-HTSC-VI 2000, Houston, Texas, February 2000

4) E. W. Carlson, S. A. Kivelson, D. Orgad, V. J. Emery, "Spectral Signatures of Quasi One-Dimensional Superconductors", **Invited Talk** at the US-Japan Neutron Scattering Workshop, Honolulu, Hawaii, February 2000

3) E. W. Carlson, S. A. Kivelson, D. Orgad, V. J. Emery, "Stripes and ARPES", **poster** presented at the XI Workshop on Strongly Correlated Electrons at the Abdus Salaam International Center for Theoretical Physics, Trieste, ITALY, July 1999

2) E. W. Carlson, S. A. Kivelson, V. J. Emery, E. Manousakis, "Classical Phase Fluctuations in High-Temperature Superconductors", **contributed talk** presented at the March 1999 meeting of the American Physical Society, Atlanta, Georgia

1) E. W. Carlson, S. A. Kivelson, Z. Nussinov, V. J. Emery, "Doped Antiferromagnets in High Dimension", **contributed talk** presented at the March 1998 meeting of the American Physical Society, Los Angeles, California

Students and Postdoctoral Researchers

Postdoctoral Mentor Dr. Sayan Basak (2020) Dr. Daoxin Yao (2007-2009) Professor of Physics, Sun-Yat Sen University, Guangzhou, CHINA Dr. Yen-Lee Loh (2005-2008) Associate Professor of Physics, University of North Dakota

PhD Dissertation Advisor Yuxin Sun PhD Expected 2025 Shashank Anand PhD Expected 2025 Dr. Forrest Simmons PhD 2023 Dr. Sayan Basak PhD 2019 Data Scientist, KLA Dr. Shuo Liu PhD 2016 Data Scientist, Emerald Cloud Lab Dr. Benjamin Phillabaum PhD 2012 Data Scientist, Allstate Insurance Dr. Wan-Ju Li PhD 2012 Institute of Physics, Academia Sinica, Taiwan Dr. Trinanjan Datta PhD 2007 Professor of Physics, Augusta State University

<u>Masters Students</u> Stylianos Gregoriou, MS Yifan Wang, MS Undergraduate Student Researchers Po-Yu "Boyle" Chen Amit Rajapurohita Lukasz Burzawa Oscar Dillman (Ascarelli Fellow) Elisha Rothenbush Jhan Harp (Ascarelli Fellow) Nicole Pfeister Paris Miles-Brendan Kate Wooley (Ascarelli Fellow)

Graduate Student Awards:

Yuxin Sun	APS Travel Fellowship	\$500	March 2023
Sayan Basak	Ramdas Prize (Departmental	\$5,000	2021
	Outstanding Dissertation Award)		
Sayan Basak	Bilsland Dissertation Fellowship	\$11,270.50 plus	Spring 2019
		tuition	
Sayan Basak	APS Travel Fellowship	\$500	March 2018
Forrest Simmons	Purdue Research Foundation	\$3,597	Summer 2018
	Summer Research Grant		
Shuo Liu	Bilsland Dissertation Fellowship	\$11,270.50 plus	Spring 2015
		tuition	
Trinanjan Datta	Bilsland Dissertation Fellowship	\$22,000 plus tuition	2008
Wan-Ju	PRF Summer Grant	\$2625.00	2012
Shuo Liu	PRF Summer Grant	\$2625.00	2012

Undergraduate Student Awards:

Po-Yu "Boyle" Chen	OUR Scholar	\$1000	Fall 2024 and Spring 2025
Amit Rajapurohita	Purdue Undergraduate Research Expo	3rd place, College of Science	Fall 2022
Lukasz Burzawa	SURF	\$6,000	Spring 2019

Funding History

Since coming to Purdue, Prof. Carlson has attracted **over \$2M in external funding** to Purdue. Carlson has **over \$1M in active grants.**

Agency	Title	Amount	Dates
Center for Quantum Technologies	Qubits-based simulation of quantum criticality to enable Hamiltonian discovery in quantum materials (PI = Arnab Banerjee; joint support of	\$50,000	09/2025-05/20 26 (Pending)
Center for Quantum Technologies	Disordered Quantum Criticality in Quantum Materials	\$60,000	09/2025-05/20 26 (Pending)
Center for Quantum Technologies	Designing Emergent Phases in Coupled Quantum Wire Metamaterials	\$60,000	09/2025-05/20 26 (Pending)

NSF-AISL (Advancing Informal STEM Learning)	Envisioning Quantum Futures: Co-Creating Digital Media to Spark Gen Z Curiosity about the Quantum Materials Revolution	\$1,731,742 (PI = E. W. Carlson; co-PI = Muhsin Menekse, Purdue)	08/01/2025-07/ 31/2027 (Pending)
Purdue University, Elevating the Visibility of Research (Seed funding for review papers)	Seed Funding for Review on "Emergence and Design of Fractals in Quantum Materials"	\$10,000	01/01/2025-12/ 31/2025 (Awarded)
École Supérieure de Physique et de Chimie Industrielle, Paris	Chaire Paris-Science	700€	06/01/2025-06/ 13/2025
NSF EAGER	EAGER: Developing and Testing Innovations: Integrating Quantum Concepts and Technologies into Middle School Science Lessons: A Participatory Co-design Approach	\$299,933 (PI = Muhsin Menekse; Carlson's part: \$60,000)	08/01/2024-07/ 31/2026 (Awarded)
École Supérieure de Physique et de Chimie Industrielle, Paris	Chaire Paris-Science	1,550€	06/01/2023-06/ 30/2023
National Science Foundation QISE International Supplement	"International Supplement for DMR-2006192 Electronic Fractals in Strongly Correlated Quantum Materials"	\$30,000	06/01/2023-05/ 31/2024
École Supérieure de Physique et de Chimie Industrielle, Paris	Chaire Joliot	2,600€	06/01/2022-06/ 30/2022
Department of Energy DE-SC0022277	QIS: Van der Waals Reprogrammable Quantum Simulator	\$4,500,000 PI = Ben Hunt (Carnegie Mellon); co-PI Carlson's part: \$441,000	09/01/2021-08/ 31/2024
Department of Defense	NDEP-STEM "Innovation in Quantum Pedagogy, Application, and its Relation to Culture (IQ-PARC)	\$2,500,000 PI = Mahdi Hosseini (ECE); co-PI Carlson's part: \$600,000	09/01/2021-08/ 31/2024
COVID-19 Relief Fund (Purdue)	Understanding Surface Probe Images in Strongly Correlated Quantum Matter Via Machine Learning	\$25,000	11/15/2021-02/ 15/2022
École Supérieure de Physique et de Chimie Industrielle, Paris	Chaire Joliot	2,600€	06/01/2020-06/ 30/2020
National Science Foundation, DMR-2006192	"Electronic Fractals in Strongly Correlated Quantum Materials"	\$330,000 (sole PI)	08/01/2020- 07/31/2024
Research Corporation for Science Advancement, SEED Award	"Understanding Surface Probe Images in Strongly Correlated Quantum Matter Via Machine Learning"	\$50,000	10/01/2019- 09/30/2021
Fulbright Foundation (US Dept. of State)	Fulbright Fellow	19,000€	01/01/2020- 06/30/2020

Purdue Research Foundation	"Quenched Disorder Effects in Quantum Hall Nematics"	\$30,144	06/01/2018- 05/31/2019
Purdue Research Foundation	International Travel Grant	\$1000	2018
National Science Foundation	Decoding Spatial Complexity in Strongly Correlated Electronic Systems	\$356,765	08/01/2015- 07/31/2018
Department of Education, First in the World	STEAM (Success Through Transformation Education and Active Mentoring)	\$25,000 (Carlson, to transform Physics 272); Total grant \$2,300,000 (PI = Chantal Levesque-Bristol)	2015-2017
IMPACT, Purdue	Transform Phys 272	\$10,000	2014-2016
American Physical Society	Condensed Matter: Science in Your Pocket for RFP on Public Outreach and Informing the Public	(\$10,532.78)	8/2016-7/2018 (Not Funded)
American Physical Society	Condensed Matter: Science in Your Pocket for RFP on Public Outreach and Informing the Public	(\$10,532.78)	8/2015-7/2017 (Not Funded)
Purdue Research Foundation	International Travel Grant	\$1000	2015
National Science Foundation	"Spatial and Temporal Complexity in Disordered Strongly Correlated Electronic Systems"	\$285,000	6/1/11-5/31/15
APS	APS-IUSSTF Professorship Award in Physics	\$4000	2/2013-1/2014
Purdue Research Foundation	International Travel Grant	\$1000	2010
National Science Foundation	Using Disorder to Detect Local Order: Noise and Nonequilibrium Effects of Stripes in the Presence of Quenched Disorder	\$240,000	9/1/2008- 8/31/2011
Research Corporation for Science Advancement	Quantum Soft Matter	\$100,000	7/1/2006- 6/30/2011
Purdue Research Foundation	Spin Waves in Stripe-Ordered Systems	\$29,430	8/16/2004- 8/15/2006

Proposals for Computational Time:

XSEDE DMR-190014	Electronic Fractals in Strongly	550.000 core-hours	03/01/2021-02/
	Correlated Quantum Materials	(Equivalent to	28/2022
		approx. \$2,470	(Renewed)
		according to	
		XSEDE)	

XSEDE DMR-190014	Bridges-2 Early Users Program: Electronic Fractals in Strongly Correlated Quantum Materials	11,800 core-hours	01/12/2021-2/1 1/2021
NSF PHY-180055 Through XSEDE	"Understanding the equilibrium and non-equilibrium phases of electron nematics in the presence of disorder"	65,142 Service Units (Equivalent to approx. \$15,143 according to XSEDE)	01/04/2019- 03/31/2020
NSF DMR-180098 Through XSEDE	"Understanding hysteresis of electron nematics in the presence of material disorder"	50,000 Service Units (Equivalent to approx. \$4545, according to XSEDE.)	10/04/2018- 10/03/2019
NSF DMR-160104 Through XSEDE	"Classifying pattern formation in strongly correlated electronic systems via machine learning"	50,000 Service Units	7/16/2016- 8/15/2017

Diversity

Diversity Committee, Dept. of Physics and Astronomy	2012-2019
Founder and Advisor of Graduate Women in Physics	2003-present
Facilitator, Search Committee Training Workshops for Purdue	2015-2018
Science Cafe at the Conference for Undergraduate Women in Physics, Purdue	January 2015

I informally mentor *several* young women and men in my field internationally, both experimentalists and theorists at various stages of their careers (from postdoctoral through full professor), providing, *e.g.* detailed career advice.

Through Graduate Women in Physics (and also informally), I mentor several junior women in the Department, including undergraduate and graduate students, postdocs, and faculty.

I informally mentored a Black graduate student in our Department. We have had several conversations about career advice. He now has a PhD, and is working in industry.

In my capacity as an Ombudsperson for the Department, I have done extensive work mentoring underrepresented faculty.