October 8, 2026

Curriculum Vitae

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Background

University of Chicago - M.S. Physics (1980); Ph.D. Physics (1984)
Yale University - B.S. Physics and Mathematics (1979), cum laude.
Richmond College, Richmond, Surrey, England (1974-5).

1999-present, Full Professor, University of Wisconsin-Madison

1993-99, Associate Professor, University of Wisconsin-Madison
1987-93, Assistant Professor, University of Wisconsin-Madison
1984-87, Project Associate, University of Wisconsin-Madison
1980-84, Research Assistant, University of Chicago

Research in elementary particle physics

LUX-ZEPLIN (LZ) Collaboration, 2014-19
Public website: lz.lbl.gov. Direct search for dark matter with a two-phase liquid xenon detector. Institutional Board, Publications and Speakers Committee, Skin Region Task Force, Geometry L4, CAD to GEANT scripting, simulations and code development.

Compact Muon Solenoid (CMS) Collaboration, CERN LHC, 1994-2015.
Public website: cms.web.cern.ch. Physics in pp collisions at $\sqrt{s}$= 7 TeV at the Large Hadron Collider (LHC). Endcap system design, cathode strip chamber R&D. Production planning. Laser alignment source and sensor installation, data acquisition hardware and software development and commissioning. Laser alignment system and Alignment Task Management, USCMS Election Committee 2008-9, Endcap Muon CSC commissioning and operations, CSC Data Quality monitor 2011-12

Collider Detector at Fermilab (CDF), Fermilab, 1984-2004.
Public website: www-cdf.fnal.gov. Physics in $p\bar{p}$ collisions at $\sqrt{s} = 1.8$ TeV, CDF I Forward Muon Spectrometer System construction and operation, Muon Group Convener, Muon Upgrade Group Leader, Annual Shift Captain/Scientific Coordinator, Executive Board. CDF II Intermediate Muon System design, fabrication, maintenance and operation.

Solenoidal Detector Collaboration (SDC), SSCL, 1991-1993.
Proton-proton collisions at $\sqrt{s} = 40$ TeV. Muon Chamber Selection Committee, Muon Technical Board, Air Core Toroid Task Force, Intermediate Muon System Task Leader, RPC Committee (1993), Muon Trigger Review Committee (1993), Institutional Board.

Superconducting Super Collider Subsystem R&D, 1986-1991.
1986 Snowmass Muon Group Co-leader, WI SSC Workshop Group Leader, SSC Generic Muon Subsystem Design Activities, Drift Chamber Development, High Pressure Gas Calorimetry Development, Muon Detector and Facilities Design, Engineering and Integration, Fermilab Experiment T816: SSC Muon Subsystem Beam Tests.

Fermilab Experiment E617, 1980-1984.
Measurements of K^0 and $\bar{K^0}$ meson CP violation parameters and of the strange-quark magnetic moment.

External Grants and Contracts as Principal Investigator

Venturewell
National Collegiate Inventors and Innovators Alliance (NCIIA)/VentureWell, grant no. 11659-14 Garage Physics (2014-17), mini-grant program for undergraduate entrepreneurs.

Department of Energy
Research in High Energy Physics (1988-2014) (DE-AC0276ER00881)
Task T (CMS): R&D for Major Detector Subsystems Detectors (1992-2014) with Prof. S. Dasu, Prof. M. Herndon, and Prof. W. Smith.
Task E (CDF): Ultra High Energy Colliding Beam Physics (1988-2012) with Prof. Lee Pondrom.

Lawrence Berkeley Laboratory/SDC
SDC Muon Magnet and Chamber Preliminary Design (EOI)(1990)
SDC Muon Magnet and Chamber Preliminary Design (LOI)(1991)

Superconducting Super Collider Laboratory
Construction of Intermediate Muon System (1992-94) with Prof. Don Reeder
Iron Toroid Design and Muon Chamber Engineering (1990-1993)
Development of a Muon Subsystem for a Solenoidal Detector (1990-91) with Prof. Don Reeder.

Texas National Laboratory Research Commission
Intermediate Muon Detector for the SDC (1993)

Internal Grants and Contracts as Principal Investigator

Provost's Office, Educational Innovation Small Grants program, University of Wisconsin-Madison
Phone Labs: Mobile phones and new computation environments for low-cost active learning in physics (2017-18, 2018-19).
Flexible Resources for 3rd Semester Physics (2016), video channel, Video resources for Physics 307.
Flexible Physics Mobile (2013-14), video channel, Video resources for Physics 103-4, 109, 201-2, and 207-8.
Flexible Physics for the Google World (2011-12), Video-based learning objects for labs for undergraduates and teaching assistants in physics, flexible.physics.wisc.edu.

Office of Sustainability, University of Wisconsin-Madison
WI Make Sustain (2013-14) with Prof. E. Halverson and Prof. G. Venkataramanan, Pilot interdisciplinary project-oriented learning in sustainability.

The Graduate School, University of Wisconsin-Madison

FY14 Bridge Funding for Sequestration Effect, LZ project development, UW PRJ82AJ (2014)
CMS Engineering, Project 951668, Fund 135-3517 (1995)

Kemper Knapp Bequest, University of Wisconsin-Madison
Garage Physics (2014-15), Garage Physics (2016-17), Garage Physics (2018-19) support for project-based learning by undergraduates in Garage Physics.

Board of Visitors Fund for Undergraduate Research
(administrator) (2014-), project and travel support for undergraduate research in physics.

Leaves/Sabbaticals

Fall 2008 Sabbatical leave, CMS at CERN, Geneva, Switzerland.
Fall 2015 Sabbatical leave, LZ Design and UW program development.

University of Wisconsin teaching

Physics 103: General Physics
Physics 107: The Ideas of Modern Physics
Physics 115: Energy
Physics 198-9: Directed Study
Physics 201: General Physics
Physics 207: General Physics
Physics 241: Introduction to Modern Physics
Physics 247-9 A Modern Introduction to Physics
Physics 298-9: Directed Study
Physics 301: Physics Today
Physics 307: Intermediate Laboratory
Physics 311: Classical Mechanics
Physics 321: Wave Motion and Optics
Physics 322: Electromagnetic Fields
Physics 415: Thermal Physics
Physics 531: Introduction to Quantum Mechanics
Physics 535: Elementary Particle Physics
Physics 601: Scientific Presentation
Physics 682: Senior Honors Thesis
Physics 900: Colloquium
Physics 990: Research in Physics
ECE 379: WI Make Sustainability

Physics course descriptions are available at physics.wisc.edu/academic/undergrads/course-descriptions.

Graduate Student supervision

Dr. Jodi Lamoureux	CDF	PhD 1993	LBNL scientist
Dr. Liqun Zhang	CDF	PhD 1996	Federal Funded R&D Center (FFRDC),
Dr. James Olsen	CDF	PhD 1998	Princeton faculty
Dr. Shanhuei S. Chuang	CDF	PhD 2006	CMS postdoc
Daniel Cyr	CDF	MS 2001	Tektronix
Varsha Ramakrishnan	CDF	MS 2010	Tactile Inc.
Jeff Klukas	CMS	MS 2008	PhD with Prof. Herndon
Devin Taylor	CMS	MS 2013	PhD with Prof. Herndon
Ferdinand Schenck	LZ	summer 2014	Special student, S. Africa
Shaun Alsum	LZ	Jan-Aug 2015	PhD Candidate with Prof. Palladino
Kyriaki Chatzikyriakidou	2013-14	Delta Certif.	MS program UW-Madison School of Education

Undergraduate Venturewell award-winning entrepreneurs†

Kali Kinziger	2017	BadgerLoop Pod 3	BadgerLoop.com
Jim McGlade	2016	Smart dust, Kynect	Kynect (startup)
Daniel Litvak	2015	Weightup Solutions	WeightUpSolutions.com (startup)
Josh Cherek	2015	People Counter, Autolinkr (startup)	co-founder ZipMill Technologies (startup)
Felix Tsao	2015	Virtual Reality	NASA Goddard
Tieler Calazo	2015	BadgerLoop	Apple
Brett Sjostrom	2015-16	BadgerLoop	Boeing

† Students advised and supported by Carlsmith through minigrants from Venturewell and the Board of Visitors Fund for Undergraduate Research.

Undergraduate and MS Independent Research supervision

Keshev Handa	OSPO intern F26	Generative AI tools for physics students
Andrew Dirkse	OSPO intern S26	SIMULIK models of feline righting reflex
Sundararram Raju Datla	S25, P498 F25	Energy harvesting with vortex induced vibrations

Eschaan Chaturvedi	Spr and Sum 2025,	OSPO NN plate solver, GAN, LLM	
Lewis Ballard	2022	Detecting hidden exoplanets through gravitational perturbations	
Sam Christianson	2021-22	Dynamics of particles in gas-filled fluids,* Why do raisins dance	
William Cerne	2021	Asteroid motion modeling	
Lennart Justin	2020	Machine learning for tick species identification	
Shenwei Yin	2020	Positron emission tomography	
Samuel Benda	2020	Positron emission tomography	
Victor Fernandez(URS)	2020	Computational asteroid dynamics	
Eric Yin	2020	Computational asteroid dynamics	
Tayfield Reed	2018,19	Vector Borne Disease	
Tyler Walters	2018	Pint-sized PET	
Avinash Narisetty	2018	Multicontrast Microscope	
James Sinclair	2018	Multicontrast Microscope	
Yuhan Li	2018	Vector Borne Disease	
Jared Erb	2018	Muography	U. Maryland
Steven Carpenter	2018	Muography	
Bia Wang	2014	Muon tomography	WID Fellow
Anna Christensen	2014	Muon tomography	WID Fellow
Ahmed Saif	2014	quadcopters, EEG brain-computer interfaces	Abu Dhabi
Tenzin Wangdon	2014	quadcopters, EEG BCI	EPIC Systems
Jacob Beres	2013	CERN CMS CSC fabrication	UW-Madison
Joseph Sterle	2013/14	Foucault pendulum	

Listed are undergraduates who worked in Garage Physics for Physics 299 or Honors Thesis credit, as Undergraduate Research Scholars, or funded projects with Carlsmith as advisor. URS refers to Undergraduate Research Scholar. OSPO refers to the Open Source Internship Office internship.

College of Letters and Science and University Committees

Current

Physics Department Teaching and Learning Liaison	'24–
Faculty Senate	'90–95, '04–15, '24–27
Letters and Sciences Academic Planning Council	'25–26

Previous

Committee on Undergraduate Recruitment, Admissions and Financial Aid (CURAFA)		'17–22, '23–24
University Library Committee		'19–23
Campus Planning Committee	ULC rep.	'21–23
Blended Learning Fellows		'16–17
Blended Learning Fellowship Program (BLFP) Active Teaching and Learning Fellow		'17
Graduate Faculty Executive Committee	elected	'12–16
Teaching Academy Executive Committee		'14–16
Graduate School Academic Planning Council		'14–16
College of Letters and Science Senate		'90–95, '04–15
University General Education Committee		'11–14
UW Madison Bouchet Selection Committee		'10–12
Physical Sciences Division Fellowships Committee	chair '07	'96–98, '00–04, '06, '07
Wisconsin Space Grant	advisor	'95–06
Letters and Science Advising Center		'06
Hilldale Awards		'05
Faculty Senate alternate		'01–04
Faculty Advising Service		'89–92, '93–98
Honors Fellow		'94–97
Faculty Honors Committee		'95–97
Honors Faculty Mentor		'95

Department of Physics Committees

Current

Curriculum Committee		'26–
Physics Education Innovation seminar (with Prof. Timbie)	co-lead	'24–
Visiting International Scholars Program (VISP)	coordinator	'22–
Preliminary Exam		'89–90, '06, '12, '13, '24–27
Student Awards	chair '22–23, '25	'10, '21–27
Physics Major Curriculum Committee	chair '15–17	'15–17, '18–22, '24–27
Staff Recognition		'24–26
Ad Hoc Committee on AI		'26

Previous

Ph.D. Graduate Recruiting		'23–24

Graduate Admissions and Fellowships	chair '96	'89–90, '95, '96, '22–23
Service Courses Committee		'19–23
Alumni Relations and Board of Visitors		'13–20
Garage Physics	advisor	'18–20
Undergraduate Program Committee		'18
Innovation and Garage Physics	originator, chair	'13–17
Non-physics Major Curriculum Committee		'15–17
Laboratories		'17
Independent Study Review		'14–15
Educational Assessment Committee		'14–15
Intro. Courses/Labs/Lecture Rooms	chair '11	'99, '10, '11, '12–13
TA Policy and Review	chair '09	'01, '09, '10–12
Physics Learning Center Oversight Committee		'11
Physics certificate	originator	'07
Computing		'07
Climate and Diversity	originator, chair	'07
Honors		'89–04, '06
Degree Audit Record System Representative		'97–06
Physics Advisor		'98–05
Ombudsperson		'05
Electronic Shop		'05
Qualifying Exam		'89, '98, '99, '00, '01
Physics Council		'97–01
Salaries		'01
Faculty Minority Liaison		'98–99
Mentor		'87–95
Intermediate and Advanced Courses		'89–90, '94
Nominating		'88–89

Academic-year appointments are given by the fall year, so '26 denotes AY 2026-27. Chair and other leadership roles appear in the second column.

University Activities, other

Physics REACH initiative core team 2015-2018
Judge ERLC 100 Hour Challenge 2015
Audience Response System Evaluation working group 2015
3d-Print group 2015-17
Teaching Academy Fellow 2012-2018
Community of Educational Support Technology member 2010-present
comets.wisc.edu
UW Madison Information Technology Committee (alternate) www.itc.wisc.edu 2011-13
WARF Interdisciplinary Discovery Challenge Research Symposium (reviewer) 2013

Center for Technology Commercialization/Wisconsin Entrepreneurs– Network (reviewer) 2013
UW Residential Entrepreneurship Residential Learning Community (speaker, advisor) 2013-17
UW Molecular Archaeology Group Scientific Advisory Group, expedition to Troy 2012-13
Office of Sustainability recycling green team 2013
Office of Quality Improvement Showcase 2012, "Flexible Physics," (speaker and poster presenter) 2012
Office of Quality Improvement Showcase 2013, "Garage Physics," (poster presentation) 2013
Educational Innovation funded projects (speaker) 2012,13
Teaching and Learning Symposium poster session 2013
Teaching and Learning Symposium Makerspace session organizer 2014
Teaching and Learning Symposium 3d-printing session organizer 2016
Student Business Incubator Advisor 2014-2016
Member Holtz Center for Science and Technology Studies 2014-present

Books

Duncan Carlsmith, *Particle Physics*, Addison-Wesley (2013). A 575+ page comprehensive graduate-level textbook covering elementary particle physics and the standard model quantum field theory.
Doing Physics with MATLAB acknowledgment (2018).

Prizes, honors

MathWorks Pick of the Week, Jan 2026, Our first AI generated pick: Double Pendulum Chaos Explorer
EPS HEPP Prize 2013, to the CMS and ATLAS collaborations for the discovery of a Higgs boson as predicted by the Brout-Englert-Higgs mechanism.
UW Madison 2016 Administrative Improvement Award, UW-Madison Receipt Reduction Team
Honored Instructor, UW-Housing Honored Instructor program, Spring 2018, Fall 2018

Professional Organizations

MATLAB Central Community Advisory Board guest advisor (2026-), AAPT Committee on Membership and Benefits (2024-25), AAPT Committee on Space Science and Astronomy Friends (2023-), Athens Institute for Education and Research (ATINER) member (23-), AAPT Task force on Data Analysis and Visualization (22-24), AAPT Special Projects and Philanthropic Advisory Board (2021-2022), Partnership for Integration of Computation in Undergraduate Physics (PICUP) member (2021-), AIP The Physics Teacher reviewer (2021-), American Association of Physics Teachers (AAPT) Committee on International Physics Education (2022-25), Groupe International de Recherche sur l'Enseignement de la Physique (GIREP) (2018-20), American Association of Physics Teachers (AAPT) Committee on Undergraduate Education (2018-21), National Science Foundation (NSF) Graduate Research Fellowship Program (GRFP) panelist (2018), American Association of Physics Teachers (AAPT) Committee on Technology (2014-17), AAPT Physics program reviewer (2017-), American Association for the Advancement of Science (2015-16), American Physical Society (APS) member(1984-present), DoE SBIR/STTR reviewer (2015,2019), USCMS election Committee (2008-09), LHC Users Organization candidate for Executive Committee 08-09, Advances in High Energy Physics editor (2010-17), Journal of Modern Physics and Applications (JMPA) editor (2012), American Journal of Physics editor (2013-present), Yale Alumni Schools Committee (2009-present), Venturewell Faculty Grants reviewer (2017, 2018), DOE Office of Science Graduate Student Research (SCGSR) program 2018 Solicitation.

Talks, Conferences, Workshops

1. D. Carlsmith, "AI Superagents," AAPT Summer Meeting 2026, Pasadena CA, July 18-22, 2026

2. D. Carlsmith, "Disrupting STEM education with MATLAB and agentic AI", EDULEARN26, 18th International Conference on Education and New Learning Technologies, 29 June-1 July, Palma, Spain, 2026

3. D. Carlsmith, "Transforming Physics and Astronomy Education with Agentic AI" (invited), MathWorks Research Summit 2026, June 23-24, Natick MA, 2026

4. D. Carlsmith, "Transforming Physics and Astronomy Education with MATLAB and genAI," MathWorks webinar, April 14, 2026

5. D. Carlsmith, "Agentic AI," Partnership for Integration of Computation in the Physics Curriculum (PICUP) webinar, Jan 17-20, 2026

6. D. Carlsmith, "Live Scripts for Astronomy Education," American Association of Physics Teachers (AAPT) Winter Meeting, Las Vegas, NV, Jan 17, 2026

7. D. Carlsmith, "Live Scripts for Classical Mechanics Education," PICUP Mechanics Faculty Online Learning Community (online), Sept. 9, 2025

8. D. Carlsmith, "Beyond strings: Membrane Wave Explorer," American Association of Physics Teachers (AAPT) Summer Meeting, Washington, DC, Aug 2-6, 2025

9. D. Carlsmith, "Singing Buddha Bowls and Wine Glasses: Modal Analysis of Found Objects," American Association of Physics Teachers (AAPT) Winter Meeting, St Louis, Jan 19-21, 2025

10. D. Carlsmith, "Launching Physics Students Through Computation," University of Minnesota Physics Education Research Seminar (invited), 1 November, 2024

11. D. Carlsmith, "Singing Buddha Bowls and Wine Glasses: Modal Analysis of Found Objects," Joint UMN/Twin Cities + PICUP Regional Workshop 2024, U. Minn., 2 November, 2024

12. D. Carlsmith, "Integrating Computation into the Physics Major: The role of AI" (panelist) Joint UMN/Twin Cities + PICUP Regional Workshop 2024, U. Minn., 2 November, 2024

13. D. Carlsmith, "Finite Element Analysis for Physics Students," Fall 2024 Joint Meeting of the Wisconsin and Illinois Sections of the American Association of Physics Teachers (AAPT), October 11-12, 2024, Rockford University, Rockford, IL

14. D. Carlsmith, "Launching the Future Physicist with Live Scripts," special session of the Math & Optim Community of Practice, MathWorks Internal Seminar, September 23 2024

15. D. Carlsmith, "Asteroid Shape Explorer and other free computational tutorials in astronomy and physics," Global Hands-On Universe Conference 2024 (online), NUCLIO - Núcleo Interativo de Astronomia e Inovação em Educação, Portugal, September 23-27

16. D. Carlsmith, "Using Live Scripts to Explore Student or Public Data," Teaching Academy Best Practices Showcase, University of Wisconsin-Madison, 22 Aug 2024.

17. D. Carlsmith, "Computational tutorial in relativistic motion with constant acceleration," American Association of Physics Teachers (AAPT) Summer Meeting, Boston, July 6 - 11, 2024

18. D. Carlsmith, "New Technologies and Dangerous Questions in Astronomy Education", (workshop participant), University of North Carolina - Chapel Hill, 3-5 June (2024).

19. D. Carlsmith, "AI-assisted coding in STEM education," Teaching Academy Winter Retreat 2024, Madison WI, February 2, 2024.

20. D. Carlsmith, "AI in Physics Education - Part 1" (session moderator), American Association of Physics Teachers (AAPT) Winter Meeting, New Orleans, January 6 - 9, 2024

21. D. Carlsmith, "AI in Physics Education - Part 2" (session moderator), American Association of Physics Teachers (AAPT) Winter Meeting, New Orleans, January 6 - 9, 2024

22. D. Carlsmith, "Introducing Mobile Phone Astrometry," (invited) American Association of Physics Teachers (AAPT) Winter Meeting, New Orleans, January 6 - 9, 2024

23. D. Carlsmith, "MATLAB Live Scripts to explore the damped shaken string," American Association of Physics Teachers (AAPT) Winter Meeting, New Orleans, January 6 - 9, 2024

24. D. Carlsmith, "Simple Camera Calibration Using Stars," Wisconsin Association of Physics Teachers (WAPT) and SPS Zone 9 Annual Meeting, Marquette University, Milwaukee, November 3 - 4, 2023

25. D. Carlsmith, "The Future of Physics and Physics Education: A Round-Table Discussion on The Future of Sciences and Engineering Education," Panelist, 11th Annual International Conference on Physics, 17-20 July 2023, ATINER, Athens, Greece (video).

26. D. Carlsmith, "A Computational Curriculum for 1st-year University Physics Students with MATLAB," 11th Annual International Conference on Physics, 17-20 July 2023, ATINER, Athens, Greece.

27. D. Carlsmith "AI-based code generation for physicists," Partnership for the Integration of Computation into Undergraduate Physics (PICUP) webinar panelist and presenter, virtual PICUP panel on ChatGPT/AI and teaching physics, 9 May 2023 (virtual)

28. D. Carlsmith "AI-based code generation experiments and their implications for STEM education," American Association of Physics Teachers (AAPT) MN and Gopher State Physics Teachers (GO4St8) Joint Spring Meeting, Augsburg University, 22 April 2023 (virtual)

29. D. Carlsmith "Acceleration in free fall spark train audio analysis," American Association of Physics Teachers (AAPT) Winter Meeting in Portland, Oregon, January 14 - 17,2023

30. D. Carlsmith (session organizer)" Teaching Machine Learning," American Association of Physics Teachers (AAPT) Winter Meeting in Portland, Oregon, January 14 - 17,2023

31. D. Carlsmith (invited speaker and panelist), "1st Year University Physics With Computation," Teaching Computation With MATLAB 2022 (online), Science Education Resource Center at Carleton College (SERC), 16-18 Oct. 2022.

32. D. Carlsmith, (Day 1) (Workshop lead presentations) "Day 1 Computation for first-year physics majors/Introduction to MATLAB," (Day 2) "Day 2 Audio Analysis, Gravitational Waves, Exoplanet Transits, World's Fastest Simplest Train," (Day 3) "Data collection and analysis in High Energy Physics, Quarknet Muon Lifetime, ParticlePhysicsDataExplorer," Nanyang Technological University, Singapore, 19-22 July 2022

33. D. Carlsmith, "Live Script Tutorials in Computational Magnetism," American Association of Physics Teachers (AAPT) Summer Meeting in Grand Rapids, Michigan, Jul 9-13,2022

34. D. Carlsmith, "Ed Tech (Best Practices I)" (session organizer), American Association of Physics Teachers (AAPT) Summer Meeting in Grand Rapids, Michigan, Jul 9-13, 2022

35. D. Carlsmith, "Ed Tech (Best Practices II)" (session organizer), American Association of Physics Teachers (AAPT) Summer Meeting in Grand Rapids, Michigan, Jul 9-13, 2022

36. D. Carlsmith, "Sums of arbitrary dice for physics students", American Association of Physics Teachers (AAPT) Winter Meeting 2022, (virtual), 6 Jan- 9 Jan 2022 (contributed).

37. D. Carlsmith (participant) Partnership for Integration of Computation in Undergraduate Physics (PICUP) 2021 Virtual Capstone Conference 20-22 July 2021. (State of Integrating computation, Assessment, Department-wide computational integration (workshop), Preparing and submitting an exercise set and becoming a reviewer (workshop)

38. D. Carlsmith, "Computational Optics in First Year University Physics", American Association of Physics Teachers (AAPT) Summer Meeting 2021, Washington (virtual), 31 July- 4 August 2021 (contributed).

39. D. Carlsmith, "Analysis of open data in physics education," Workshop Lead, Nanyang Technological University, Singapore, 10-14 May 2021: "NTU2021 Introduction," "Elementary Particles," "Introduction to MATLAB," "CMS Data Analysis," "Asteroids," "Planet Ephemeris."

40. D. Carlsmith, "Remote introductory physics lab," UW-Madison Showcase 2021, poster session, 8 April 2021 (poster, flash talk at minute 37:54)

41. D. Carlsmith, "Explorations of ephemerides by first-year physics and astronomy students," American Association of Physics Teachers (AAPT) Winter Meeting 2021 (online), 10 Jan 2021

42. D. Carlsmith, "Advanced fitting and uncertainty analysis in introductory physics," American Association of Physics Teachers (AAPT) Winter Meeting 2021 (online), 10 Jan 2021

43. D. Carlsmith, "1st Year Physics with MATLAB, Partnership for Integration of Computation into Undergraduate Physics (PICUP) Spring Webinar Series: Computation in Undergrad Physics with an Emphasis on Using MATLAB, 28 Jan 2021

44. D. Carlsmith, "1st Year Physics with MATLAB," Teaching Computation Online with MATLAB workshop, Science Education Research Center (SERC),11 Oct. 2020, invited.

45. D. Carlsmith, "Visualization of the electric field of a charge undergoing arbitrary motion," American Association of Physics Teachers (AAPT) Winter Meeting 2020, Orlando 20 Jan 2020 (contributed)

46. D. Carlsmith, "LIGO Analysis in a few lines of MATLAB code," American Association of Physics Teachers (AAPT) Winter Meeting 2020, Orlando 20 Jan 2020 (poster session)

47. D. Carlsmith, "Applications of deep learning in undergraduate physics," American Association of Physics Teachers (AAPT) Winter Meeting 2020, Orlando, January 18-21 (Invited/contributed session organizer).

48. D. Carlsmith, "Foundational computation for first-year physics undergraduates," part of Teaching Computation in the Sciences Using MATLAB: Matlab Workshop 2019:Essays, Teaching Computation in the Sciences using MATLAB (essay).

49. D. Carlsmith, "Accelerated computation for accelerated physics," GIREP-ICPE-EPEC-MPTL 2019, Budapest, 1-5 Jul 2019, (poster).

50. D. Carlsmith, "Undergraduate education," Nanyang Technological University, Singapore, 21-23 May 2019. Workshop on Particle Physics and analyzing data from CERN and LIGO experiments.(Workshop lead)

51. D. Carlsmith, "Accelerated computation for introductory physics," UW-Madison Showcase 2019, poster session, April 2019, Madison WI (poster).

52. D. Carlsmith, "More MATLAB labs with Mobile Phones and Public Data," 14 Jan. 2019, AAPT Winter Meeting 2019, Houston, TX.

53. D. Carlsmith, "New approaches to learning physics," Invited Plenary Speaker, Wisconsin Association of Physics Teachers (WAPT) Annual Meeting (2018), University of Wisconsin-Whitewater, Whitewater, WI.

54. D. Carlsmith, "Smartphone Labs with MATLAB for accelerated physics," GIREP-MPTL, San Sebastian, 13 Jul 2018. Talk and session lead for Physics Teaching and Learning at University.

55. D. Carlsmith, "Workshop Overview," "Computation in an Introductory Physics Course," "MATLAB Introduction, Mobile Phone Physics Labs," "Garage Physics," "Cellphone Microscopy," "Summary and Next Steps," Computation in the Curriculum Workshop Lead, Nanyang Technological University, Singapore, 17-21 May 2018. (Workshop in undergraduate education lead)

56. D. Carlsmith, "Garage Physics: Cultivating an entrepreneurial mindset in a physics lab," Session: Jonathan F. Reichert and Barbara Wolff-Reichert Award for Excellence in Advanced Laboratory Instruction (invited), American Physical Society March Meeting, Los Angeles, CA, March 5-9, 2018. (Featured in Highlights of the 2018 American Physical Society March Meeting, Press Conference Tuesday 6 March 2018), presentation

57. D. Carlsmith, "Mobile Phone Physics Labs", Session: Low-Cost Sensors for Labs (contributed), American Association of Physics Teachers Winter Meeting, Jan 2018, San Diego, CA.

58. State of online Physics Courses & Building Online Communities of Learning (session organizer), American Association of Physics Teachers Winter Meeting, Jan 2018, San Diego, CA.

59. D. Carlsmith, "Online data and modeling labs," (contributed talk), Wisconsin section of AAPT (WAPT), joint meeting with ILAPT, Rockford IL, 21 Oct 2017

60. D. Carlsmith, "Innovation in Garage Physics," (poster), Venturewell OPEN 2017, Washington DC, 24 March 2017.

61. D. Carlsmith, "Science and Innovation in Garage Physics," 2016 WAPT, UW Oshkosh, 29 Sep 2016.

62. D. Carlsmith, "Nutshell TOPHAT, Diigo, Overleaf, Piazza," 2016 WAPT, UW Oshkosh, 29 Sep 2016.

63. Big Science Data in the Classroom, session organizer and chair, 2016 AAPT Winter Meeting, New Orleans, 12 Jan 2016.

64. Diigo, Active Teaching Lab, UW-Madison, 18 Sep 2015.

65. D. Carlsmith, "Open Labs for Innovation and Entrepreneurship in Physics," Beyond the First Year of College II (BFY II), University of Maryland, 23 July 2015.

66. D. Carlsmith, "WriteLaTeX, Diigo, Piazza, and a CLC for Physics," Teaching and Learning Symposium, UW-Madison, 2014.

67. D. Carlsmith, "Flexible Physics Mobile: YouTube Bridges From Lecture to Lab," American Association of Physics Teachers (AAPT) Conference, Minneapolis, 20 Jul 2014.

68. D. Carlsmith, "Majors tracks for innovation and entrepreneurship," American Association of Physics Teachers (AAPT) Physics Department Chairs Conference, College Park, Maryland, 28 May 2014

69. D. Carlsmith, "Flexible Physics Mobile - Videos Bridging Lecture and Lab for Higher Education," University of Wisconsin System Learning Technology Development Council Showcase, Madison WI, Apr 2014.

70. D. Carlsmith, "Garage Physics- Project orients learning in an open maker-style laboratory," University of Wisconsin System Learning Technology Development Council Showcase, Apr 2014, Madison, Wisconsin

71. D. Carlsmith, "Open Innovation Labs for Physics Undergraduate Independent Research," American Physics Society (APS) 2014 Savannah, Georgia, talk and session leader.

72. D. Carlsmith, "WI Make Sustainability: Project-oriented physics sustainability education," American Association of Physics Teachers (AAPT) 2014 Orlando, Florida, 6 Jan 2014.

73. D. Carlsmith, "Garage Physics: Flexible Space for Innovative Student-Focused Research and Education," American Association of Physics Teachers (AAPT) 2013 Portland, Oregon, 7 July 2013.

74. D. Carlsmith, "Flexible Physics: A multimedia bridge from lecture to lab," American Association of Physics Teachers (AAPT) 2012, Philadelphia, Pennsylvania, 30 July 2012.

75. D. Carlsmith, "Flexible Physics," (poster) Conference on Laboratory Instruction Beyond the First Year Conference, 2012 Philadelphia, 26 July 2012.

Press

By dropping, throwing smartphones, students key into a 21st-century approach to physics, University of Wisconsin-Madison news, 27 July 2019
Classroom Clickers, UW-Madison Letters and Science, Spring 2019 Bulletin.
Hunting Dark Matter, UW-Madison Letters and Science 2017 Annual Review
Dark matter detection receives 10-ton upgrade, UW-Madison News, 10 Mar 2017
Garage Physics, Letters and Science, 2015- 2016 Annual Review.
Campus dining spots going receipt-free, UW-Madison News
University dining halls go paperless, Badger Herald, 2 Oct 2015
Students create inventions of the future in UW-Madison Garage, CH27 WKOW ABC news story by Savanna Tomei, 29 Sep 2015
Garage Physics is a makerspace for undergraduate brainstorms, UW-Madison news

Outreach

"Interactive Live Scripts for Astronomy and Physics Education", American Astronomical Society (AAS) Education Committee Blog, 28 Oct. 2025
"Lessons from Dappled Light During a Solar Eclipse", Celebrating the Wonder of Science in the Shadow II, Bulletin of the AAS, Dec 2024, doi:10.3847/25c2cfeb.7367d937
"Launching the future astronomer: Innovation in physics education," Madison Astronomical Society (MAS) (speaker), 9 June 2023
WISCIENCE Stem Immersion Faculty Panel 24 Aug 2021
TOPHAT Faculty Panel, UW-Madison Academic Technology Wisconsin TOPHAT certification day, 28 August 2019
AAPT Advanced Laboratory Physics Association (ALPHA) video production project lead (2017)
Advanced Labs for Physics Association videos (posted Fall 2017): Muon Mean Lifetime, Electron Spin Resonance, Relativistic Electrons, Ultrafast Optics with a Fiber Laser.
Dark Matter, Lectures, SoundWaves, Wisconsin Institute for Discovery, 9 Dec 2016
Badger Startup Summit, Merlin Mentors Venfair tech/startup advisor, 22 Aug. 2016, Madison, WI.
SpaceX Hyperloop Design Weekend Judge, Texas A&M, Jan 29-30 2016.
Adopt-a-Physicist (adoptaphysicist.org) 2012, 2013
The Higgs Boson Particle, The God Particle, CERN, Dark Matter, WYOU TV Newsdesk with Jason Miller, interview 14 Aug. 2012.
National Society of Black Physicists and National Society of Hispanic Physicists Annual Meeting, Austin (2011), escort and recruiter
The Large Hadron Collider: A fantastic experiment, Rotary Club of Madison, Alliant Energy Center Exhibition Hall, 24 Feb 2010.
The Large Hadron Collider at CERN, Madison West Rotary Club, 30 Apr 2009.

Generative AI Community

All entries by Duncan Carlsmith, MATLAB Central AI Discussions. Titles link to the posts.

Claudifying MATLAB (2026)
Running Octave and other applications in a ChatGPT container (2026)
Vibe Coding with a Remote Desktop (2026)
Physics and astronomy with AI on your phone (2026)
How much faster does a small GPT train on an Apple Silicon GPU? (2026)
nanoGPT Arithmetic Explorer: A small MATLAB GPT that groks integer addition (2026)
Prototyping MATLAB code in Claude's container with Octave (2026)
Hey AI, add computation to my modern physics course. Thanks (2026)
Mitigating chat failures in AI code development (2026)
Live Script deployed as a 3D web application with AI (2026)
Giving Your Claudes The Keys To Everything (2026)

Web Automation with Claude, MATLAB, Chromium, and Playwright (2026)
AI Skills for deployment of a MATLAB Live Script as a free iOS App (2026)
Claude's Constitution (2026)
Live Script to Mobile-Phone App Conversion with AI (2026)
A universal agentic AI for your laptop and beyond (2026)
Double Pendulum Chaos Explorer: From HTML5 Prototype to MATLAB interactive application with AI (2026)
How to set up and use AI Desktop Apps with MATLAB and MCP servers (2026)
Perplexity App with MATLAB MCP Core Server and FileSystem server (2025)
Claude-code, MATLAB MCP, and Puppeteer Experiment (2025)
Experiments with Claude code and MATLAB MCP Core Server (2025)
Perplexity's Comet operating MATLAB Online and other web GUIs (2025)

Open source educational materials

Applications

All 2026, Duncan Carlsmith. Names link to the repository or live application.

PhysBot, AI Physics Tutor (live)
Tidal Disruption Explorer
Feynman Diagrams, Standard Model tree-level $1 \to 2$, $1 \to 3$, $2 \to 2$, $2 \to 3$ processes
Classical Stark Effect, interactive classical Stark effect simulation
Double Pendulum Chaos Explorer
Cat Righting Reflex, two-cylinder model
KeyScore, browser-based multitrack music composition tool
Newton's Cradle, Unbound, Apple App Store simulation of two-dimensional Newton's cradles

MathWorks File Exchange Interactive Live Scripts

Open Source Educational interactive Live Scripts introduce students of physics, astronomy, and engineering to a variety of everyday and advanced science and technology while teaching them skill in data analysis and computational methods. Each script develops a technique and applies it to a system where the technique is needed. For example, the gravitational wave script applies band- pass filtering and Fourier analysis visualization to raw LIGO gravitational wave observatory strain data to reproduce the chirp signal leading to a Nobel Prize. A student working through a sequence of scripts acquires real skills in signal processing, parameter estimation, numerical integration, image analysis and statistical inference on problems and numerical and symbolic modeling techniques.

171 submissions, 2021 through 2026, total downloads 10,133. The complete chronological list appears in Appendix A.

Theme	No.	Representative submissions
AI, machine learning, and code generation	31	Claude API from MATLAB for Coursework; nanoGPT Arithmetic Explorer; Identify Objects Acoustically with a Neural Network
Mechanics and relativity	31	Double Pendulum Chaos Explorer; Relativistic Motion in a Coulomb Field; Two-dimensional Newton Cradles
Astronomy and astrometry	27	Fourier Transform Plate Solver; GAIA Data Explorer; SgrA Black Hole Stellar Orbit Explorer
Probability, statistics, and fitting	19	Bootstrap Resampling Statistics Explorer; Fisher Information Explorer; Propagation of Uncertainty Explorer
Electromagnetism and optics	17	Method of Images Explorer; Electric Field of a Charge in Uniform Relativistic Motion; Diffraction Calculator
Waves, sound, and signal processing	15	Membrane Wave Explorer; Singing Wine Glass and Bowl Explorer; Gravitational Wave Data Explorer
Quantum and atomic physics	13	Quantum Mechanics in 3D with the PDE Toolbox; Squeezed Quantum States in Two Dimensions; Classical Stark Effect
Computing, tooling, and fabrication	10	Solid STL Extruder; Camera View Transformer; Introduction to MATLAB
Thermodynamics and kinetic theory	5	Thermodynamic Cycle Explorer; Single Molecule Gas Explorer
Particle and nuclear physics	3	Particle Physics Data Explorer; QuarkNet Muon Lifetime Explorer

Peer-reviewed teaching activities, Science Education Research Center (SERC), Carleton College

"Bouncing Ball Explorer", Exemplary Collection Based on Peer Review, 18 Oct 2022
"Intro to Image Processing with MATLAB", Peer Reviewed Teaching Activities collection, 11 Sep 2020
"MATLAB LIGO Analysis", Peer Reviewed Teaching Activities collection, 6 Nov 2019

Publications

Refereed articles and proceedings with named authorship

[1] Carlsmith D., "Disrupting STEM education with MATLAB and agentic AI," 18th International Conference on Education and New Learning Technologies, 29 June-1 July, 2026.

Palma, Spain, EDULEARN26 Proceedings, ISBN: 978-84-09-88444-5, ISSN: 2340-1117, doi:10.21125/edulearn.2026.0498

[2] Justen L, Carlsmith D, Paskewitz SM, Bartholomay LC, Bron GM (2021), "Identification of public submitted tick images: A neural network approach." PLoS ONE 16(12): e0260622, doi:10.1371/journal.pone.0260622

[3] C Vuosalo, D Carlsmith, S Dasu, K Palladino and LUX-ZEPLIN Collaboration, "A tool to convert CAD models for importation into Geant4," Journal of Physics: Conference Series **898**, 042024 (2017), doi:10.1088/1742-6596/898/4/042024, arXiv:1702.04427 [physics.ins-det].

[4] B. J. Mount *et al.* [The LZ Collaboration], "LUX-ZEPLIN (LZ) Technical Design Report," arXiv:1703.09144 [physics.ins-det]. (2017)

[5] D. S. Akerib *et al.* [The LZ Collaboration], "LUX-ZEPLIN (LZ) Conceptual Design Report," arXiv:1509.02910 [physics.ins-det].

Collaboration publications

Co-author on approximately 1,500 publications of the CDF, SDC, CMS and LUX-ZEPLIN collaborations, 1984-2019. Complete record at the INSPIRE-HEP author profile inspire-hep.net/authors/1014486 (ORCID 0000-0003-0614-2934).

Appendix A. MATLAB Central File Exchange submissions

All entries by Duncan Carlsmith, MATLAB Central File Exchange, listed newest first. Titles link to the submission. The bracketed number is the File Exchange item number.

2026

LHC Explorer[184890]
Room Acoustics Explorer[184875]
Muography Explorer[184837]
Vera Rubin Asteroid Explorer[184801]
Electromagnetic Shower Explorer [184792]
Claude API from MATLAB for Coursework [184751]
Fourier Transform Plate Solver [184559]
SOFT Plate Solver [184551]
SOFT Plate Solver Simulation in One Dimension [184443]
Mobile Phone Plate Solver [184405]
Celestial Plate Solver [184369]
Pitchfork Bifurcations of a Bead on a Hoop [184308]
Mac GPT GPU Benchmark Explorer [184058]
nanoGPT Arithmetic Explorer [184054]
Closed Form Single Particle Gas Explorer [183962]
nanoGPT Explorer [183953]
Single Molecule Gas Explorer [183931]
How a Cat Lands on Its Feet [183804]
Tidal Disruption Explorer [183760]
Classical Stark Effect - Interactive Web Simulation [183454]
Volleyball Statistics [183348]
Giving All Your Claudes the Keys to Everything [183281]
Web Automation with Claude, MATLAB, Chromium, and Playwright [183263]
Electric Field Of A Charge in Uniform Relativistic Motion [183184]
Live Script to Mobile-Phone App Conversion with AI [183070]
Universal Agentic AI with MATLAB [183062]
Double Pendulum Chaos Explorer (AI built) [182985]

2025

Lorenz Attractor - Claude-code, MATLAB MCP, and Puppeteer [182930]
Origins of Quantum Band Structure in One Dimension [182706]
Classical Stark Effect [182704]
Sliding Top Explorer [182659]
Bound States In A One-Dimensional Coulomb Potential [182603]
Lagrangian Mechanics of a Triple Pendulum System [182489]
Normal Modes of a System of Masses [182377]
Mobile Phone Pendulum Doppler Experiment [182357]
Relativistic Chaotic Motion Explorer [182321]
Two-dimensional Newton Cradles [182264]
Relativistic motion in a Coulomb field [182191]
Exact 3D Doppler Effect Explorer [182148]
Newton's Cradle Simulation [181946]

Web Scraper with Screenshots [181843]
MicroObservatory Robotic Telescope Explorer [181804]
Saturn moon shape visualizer [181773]
Moon Model Viewer [181767]
Pendulum Doppler Effect Theory and Simulation [181699]
Skyfield Night Sky Explorer [181605]
Two-Dimensional Tetherball Explorer [181579]
Camera View Transformer [181564]
Instantaneous Frequency Explorer [181513]
Infrared Science Archive Explorer [181478]
SgrA Black Hole Stellar Orbit Explorer [181435]
Markov Chain Monte Carlo Stellar Orbit Fit Explorer [181393]
Identify Objects Acoustically with a Neural Network [181343]
Acceleration of Gravity using the Doppler Effect [181301]
Feedforward Network Explorer [181253]
Neural Network Frequency and Phase Detector [181239]
How to Hook a Bowling Ball [181226]
Quantum Reflectionless Potential Well Explorer [181227]
Squeezed Quantum States in Two Dimensions [181085]
Quantum Delocalization and Revival [181005]
Thermodynamic Cycle Explorer [180938]
Quantum Mechanics in 3D with the PDE Toolbox [180818]
Quantum Mechanics in 2D with the PDE Toolbox [180798]
Quantum Mechanics in 1D with the PDE Toolbox [180797]
Numerical Quantum Mechanics in 3D III [180779]
Numerical Quantum Mechanics in 3D II [180778]
Airy Function Zeros [180708]
Numerical Quantum Mechanics in 3D [180659]
One-dimensional Quantum Bound State Explorer [180623]
Implicit Function Parameterization Explorer [180506]
Algebraic Curve Intersection Explorer [180476]
Galton Board Explorer [180444]
Access DeepSeek AI via API [180384]
Access Perplexity AI Via API [180376]
Sinusoidal Signal Significance Explorer [180374]
Bootstrap Resampling Statistics Explorer [180299]
Fit Sinusoidal Model Explorer [180280]
Normal Distribution Parameter Estimation Explorer [179074]
Binomial Distribution Explorer [178624]
Poisson Equation PDE Model Explorer [178489]
Poisson Equation for Electrostatic Potential [178404]
Electrostatic Equilibrium Explorer [178204]

2024
Electrostatic Induction Explorer [178094]
Method of Images Explorer [177904]
Camera Simulation Explorer [177754]
Simple data fitting explorer [177159]
Wave Equation Explorer [176748]

Image Processing Explorer [176413]
Curve Fitting for Physics Students [175968]
Rüchardt Experiment [175025]
Speed of Sound With Moving Mobile Phone [174620]
Speed of Sound with Multiple Mobile-Phone Microphones [172448]
Static Beam Bending Explorer [172324]
Solid STL Extruder [172154]
Helical Spring Maker [171929]
Singing Wine Glass and Bowl Explorer [171479]
Parametric 3D Bowl Maker [171264]
Membrane Wave Explorer [171104]
Physical Pendulum Explorer [168811]
Mobile Phone rotational Dynamics Explorer [168491]
Normality Test Explorer [168201]
Collision Explorer [167831]
Image manipulation and illustration with ChatGPT4o [167256]
Impact Mechanics Explorer [167251]
Coin Toss Explorer [166861]
Single Particle Gas Simulation [166386]
Propagation of Uncertainty Explorer [166266]
One dimensional motion with linear plus quadratic drag [166176]
Probability Transformation Explorer [166016]
Random Walk Explorer [165971]
Polynomial Fit Explorer [165941]
Live Script code, spelling, and grammar check with ChatGPT [165861]
Fisher Information Explorer [165336]
Woodpecker Drumming Explorer [164621]
Geiger Counter Audio Explorer [164031]
Vector And Surface Rotations Explorer [163221]
Calculus Explorer [163211]
Relativistic Constant Force Motion Explorer [158131]

2023

Simple camera calibration using stars [135086]
RA-Dec Alt-Az Conversion Explorer [134556]
Mobile Phone Star Explorer [133737]
iPhone Text2Speech Voice Controller [133202]
Color Panel Array Explorer [132737]
iPhone Voice Controller [132083]
Exiftool Explorer [131618]
Bright Stars, Variable Stars, Constellations, and Asterisms [131259]
GAIA Data Explorer [129934]
Celestial And Image Coordinate Projections Using FITS WCS [129849]
Hipparcos Astronomy Explorer [128664]
Mobile Phone Astrometry Explorer [127449]
Translate R to MATLAB and MATLAB to R with ChatGPT [127424]
Generate MATLAB Code With BING [127214]
April Fool's MATLAB Codes With ChatGTP [127204]
MATLAB Code Generation - ChatGPT versus Bard [127179]

Explain MATLAB code with ChatGPT [126929]
Generate MATLAB for non-English speakers with ChatGPT [126909]
Translate Python To MATLAB With ChatGPT Programmatically [126734]
Drag and drop PDF to MATLAB conversion with ChatGPT [126515]
Translate LaTeX to MATLAB with ChatGPT [126500]
Access Mathematica and ChatGPT-generate MATLAB code via APIs [126310]
Taut String Driven At One End With Realistic Drag [126260]
Nonlinearly-damped oscillator simulation [125885]
Generate unit-tested ChatGPT MATLAB codes [125565]
Generate MATLAB Code Using ChatGPT API [125220]
Driven Coupled Oscillator Explorer [124255]
ChatGPT-generated MATLAB program [124080]
Shaken String Explorer [123965]
Fit PASCO Motion Sensor Data [123795]
Harmonic Oscillator Explorer [123715]
SimplePendulumExplorer [123610]
SampleArbitraryProbabilityDistributionExplorer [123350]

2022
Bouncing Ball Explorer [117225]
Calceph Ephemeris Calculations With INPOP and JPL files [115185]
JPL Horizons Ephemeris Interpolants [114825]
Asteroid Shape Data Explorer [114555]
Particle Physics Data Explorer [114275]
QuarkNet Muon Lifetime Explorer [114065]
Exoplanet Transit Explorer [113480]
Example Physics Problem Live Script [113390]
Introduction to MATLAB [110925]
World's Fastest Simplest Electric Train [110480]
Optical Transport Matrices [110400]
DiffractionCalculator [110260]
ElectricFieldsOfChargeDistributionsIn3d [110140]
DappledLightExplorer [109815]
ElectricFieldOfAcceleratedCharge3d [109074]
GravitationalWaveDataExplorer [108859]
Acceleration in free fall audio analysis [108604]
Magnetic Field of a cylindrical current sheet [108034]
Magnetic Field of Bar Magnet [108009]
"Magnetic field of coils" [107874]

2021
Duhdohnium [97602]
DiceSums [98794]
"Fit3dParametricCurve" [101038]
Maximum likelihood estimator [100888]
Stacked Ball Drop [100983]