Colin G. West

Curriculum Vitae
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EDUCATION

2016 **Ph.D., C. N. Yang Institute for Theoretical Physics, Stony Brook University**
"Applications of Tensor Network Algorithms in Quantum Many-Body Physics"

2010 **B.S., University of Colorado at Boulder**
Engineering Physics, Magna Cum Laude
Applied Mathematics, Cum Laude

UNIVERSITY TEACHING EXPERIENCE

2022- Present **University of Colorado at Boulder: Associate Teaching Professor**

2018-2022 **University of Colorado at Boulder: Assistant Teaching Professor**
Courses taught:
General Physics I, physics for bioscience students
General Physics II, physics for bioscience students
General Physics I, physics for engineers
General Physics II, physics for engineers
Experimental Physics 1 (developed new "flipped classroom" video content)
Experimental Physics 1 (remote, "CURE" version)
Calculus 1 for Engineers (applied math dept)
"Critical Encounters" – Seminar course for Engineering Honors Program

2018 **Front Range Community College at Westminster: Adjunct Professor**
Planetary Astronomy

2016 – 2017 **University of California at Santa Cruz: Postdoctoral Education Fellow**
Physics 7: Elementary Physics I & II (Designed new flipped-classroom course)
2020 Physics 6b: Introductory Physics 2 (Remote)

2016 **Stony Brook University: Graduate Student Instructor**
Talking Science (Co-instructor, science communication course)

RESEARCH EXPERIENCE

University of Colorado, Boulder

2018-Present Currently affiliated with PER group: I am interested in interventions in large-lecture contexts and laboratory courses and the role of authentic research in lab courses. I am very active in the role of AI in physics education

Other research: applications of classical simulation techniques to entangled quantum systems, topological phases, and topological invariants

University of California, Santa Cruz

2016-2018 HHMI Postdoctoral Fellow: designing new "active learning" introductory physics curriculum for bioscience students. Developing and assessing techniques to combat "stereotype threat" in STEM classrooms, and improved methods for TA teacher training.
Physics research: Extending quantum simulation algorithms from ground-state physics to study quantum thermodynamic effects such as many-body localization.

C.N. Yang Institute for Theoretical Physics, Stony Brook University

2012-2016 Research Assistant**:** Quantum information theory and many-body physics
Developed computational algorithms for simulating interacting quantum systems.

University of Colorado, Boulder

2006-2010 Undergraduate researcher: BaBar Collaboration and Fermilab E-906

PUBLICATIONS

Werth, A., West, C. G., Sulaiman, N. And Lewandowski, H. J. (2023). Enhancing students' views of experimental physics through a course-based undergraduate research experience. *Physical Review Physics Education Research*, 19(2), 020151.

Mason, J. P., Werth, A., West, C. G., Youngblood, A., Woodraska, D. L., Peck, C. L., ... & Lewandowski, H. J. (2023). Coronal Heating as Determined by the Solar Flare Frequency Distribution Obtained by Aggregating Case Studies. *The Astrophysical Journal*, *948*(2), 71.

West, C. G. (2023). Lessons for student interactions from the world of improvisational theater. *Phys. Teach. 61, 246* (editor's suggested article)

Schumm, B., Ishii, J., and West, C. G. (2023) The Problem project: Assessment via invitation to directed creativity. *Phys. Teach. 61, 292*

Werth, A., Oliver, K., West, C. G., & Lewandowski, H. J. (2022). Assessing student engagement with teamwork in an online, large-enrollment course-based undergraduate research experience in physics. *Physical Review: Physics Education Research,* 18(2), 020128.

Werth, A., Oliver, K., West, C.G., & Lewandowski, H.J. (2022) Engagement in collaboration and teamwork using Google Colaboratory. *PERC Proceedings*

West, C.G., Honig, S.E., Lui, L., & Raschke, L. (2022). Integration of authentic STEM practices in real-world education and research environments. In S. Seagroves, A. Barnes, L. Hunter, A. Metevier, & J. Porter (Eds.), *Impact through inquiry: Twenty years of preparing leaders in effective and inclusive education at the Institute for Scientist & Engineer Educators. UC Santa Cruz: Institute for Scientist & Engineer Educators*.

Werth, Alexandra, West, C.G., and Lewandowski, H.J. (2022). Impacts on student learning, confidence, and affect in a remote, large-enrollment, course-based undergraduate research experience in physics. *Phys. Rev. Phys. Educ. Res. 18, 010129*

Lewandowski, H. J., Pollard, B., & West, C. G. (2020). Using custom interactive video prelab activities in a large introductory lab course. *PERC Proceedings.*

Prakash, A., West, C. G., & Wei, T. C. (2016). Detection of gapped phases of a one-dimensional spin chain with on-site and spatial symmetries. *Physical Review B, 94(4), 045136*.

West, C. G., Garcia-Saez, A., & Wei, T. C. (2015). Efficient evaluation of high-order moments and cumulants in tensor network states. *Physical Review B, 92(11), 115103*.

Bevan, A. J., et al. (BaBar Collaboration, including C.G. West)(2014) "The physics of the B factories." *The European Physical Journal C 74.11: 3026*.

Mueller, K., Vidal, A., Robbins, S., Golombek, M., & West, C. G. (2014) "Fault and fold growth of the Amenthes uplift: Implications for Late Noachian crustal rheology and heat flow on Mars." *Earth and Planetary Science Letters 408: 100-109*.

Aubert, B., et al. (BaBar Collaboration, including C. G. West) (2013) "The BaBar detector: upgrades, operation and performance." *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment 729: 615-701*.

Damle, A. S., West, C. G., & Benzel, E. J. (2010) "Centroids, Clusters, and Crime: Anchoring the Geographic Profiles of Serial Criminals. *UMAP Journal, 129* .

Aubert, B. et al (BaBar Collaboration, including C.G. West). (2008). "Observation of B+→ η ρ + and search for B 0 decays to η ' η , η π 0, η ' π 0, and ω π 0" *Physical Review D 78.1: 011107*.

ACCEPTED PUBLICATIONS

PUBLICATIONS UNDER REVIEW

West, C. G. (2023) Apparent Advances in Conceptual Physics Reasoning in A Large Learning Model. Under review at *Phys Rev: PER*

PREPRINTS

West, C. G. (2023). AI and the FCI: Can ChatGPT Project an Understanding of Introductory Physics?. *arXiv preprint arXiv:2303.01067*.

West, C. G., & Wei, T. C. (2020). Global and short-range entanglement properties in excited, many-body localized spin chains. *arXiv preprint arXiv:1809.04689*.

IN PREPARATION

CONFERENCES AND PRESENTATIONS

Invited Talks and Participation

2024 APS DAMOP Invited Speaker: "Large Language Models an Conceptions of Reasoning"
2017 Institute for Scientist and Engineer Educators: Professional Development Program

Presentations

2023 STEM Teaching and Learning Center, UC Santa Cruz: "Why Teach Physics to Nonphysicists?" Invited Talk
2023 Partnership for Integration of Computation in Undergraduate Physics (PICUP) Invited Panelist: "Exploring the Intersection of Physics Education and AI: The Role of ChatGPT"
2022 Conference on Advancing Inclusive Leaders in STEM, Hilo HI
"Integration of authentic STEM practices in real-world education and research environments"
2019 APS March Meeting, Boston MA
"Global and Short-Range Entanglement Properties in Many-Body Localized Systems"
2017 HHMI UC-STEM Faculty Learning Community Annual Meeting
"Strategies for active engagement in large lecture settings"
2017 UCSC STEM Collaboration Hour: "Forming and Facilitating Productive Student Groups in the Classroom"
2017 UC Santa Cruz Symposium on Assessment: "Assessing our Assessments: Do We Really Know What Our Students Know?"
2016 APS March Meeting, Baltimore, MD
"Characterizing Gapped Phases of a 1D Spin Chain"
2015 APS March Meeting, San Antonio, TX
"Evaluation of High-Order Moments and Cumulants in Quantum Spin Systems"
2014 APS March Meeting, Denver, CO
"The Extended Haldane Phase in Bilinear-Biquadratic Spin-1chains"

STUDENT ADVISING

Honors Thesis committees: Grace Merritt (2019), Makinzie Hamilton, Alina Harmann (2020)
Comps II committees: Yorick Andeweg (2023), Andrew Bradfield (2024) Jose Pagan (2024, 2025)
Comps III committees: Alex Engel (2022), Gayle Geschwin(2022)
Comps IV committees: Alex Engel (2023)

DEPARTMENTAL SERVICE

2024-Present Associate Chair for Engineering Physics
2022-Present EPEN Major Advising Committee
2022-2024 Diversity and Climate Committee
2022-2023 EIC organizing committee; Chair
2021-2024 Saturday Physics Organizing Committee (chair)
2021-2022 CU-B Common Curriculum Planning Committee (A&S Representative)
2020 Summer session project to develop online labs for 1140 and 2150
2019-2021 Learning Assistant Organizing Committee
2019 Teaching Circles (faculty group for mutual support improving teaching techniques)
2019 Met with and successfully recruited two Boettcher Scholar prospective students
2018-2022 Physics Major Advising committee
2018-Present "Equity, Inclusion, and Cookies" organizing committee

Events run:
Inclusive Mentorship (parts 1&2),
Impostor Syndrome
Metacognition
Colorblind Racism
Allyship
Inclusive Hiring Practices
Myth of Meritocracy
Intersectionality
"Strike for Black Lives" town hall
DEI Organization meet-and-greet
Understanding Privilege (parts 1 & 2)
Equity in undergraduate research
Inclusive Mentorship Training (Ongoing; 2022 – Present)
Undergraduate Research Info Session

2017 Co-designed and facilitated "CAISE (Creating Active and Inclusive Section Experiences): A Teaching Workshop for Graduate Students"
2017 Contributed a section on group work for the UCSC Graduate Division TA Manual
2016 Organizing member, UCSC STEM-Active Learning Speaker Series Committee
2016 Advised undergraduates pursuing top scholarships, including one Goldwater winner

OTHER PROFESSIONAL SERVICE

2025-Present CEAS Math Committee
2023-Present Faculty director, Engineering Honors Program
2022-Present CEAS UEC Member
2022-2023 Associate faculty director, Engineering Honors Program
2022-2023 Executive Committee, Center for Leadership, CU Boulder
2019 Co-authored five instructional videos on introductory physics to be published in the Journal of Video Experiments
2019-Present Contributes and reviews passage sets for a national higher education entrance exam
2018 Reviewed NGSS testing items as part of the ASPIRE physics assessment research
2018 Peer reviewer for "College Physics, 3rd ed" by Freedman et al
2018 Peer reviewer for to the Science Education Initiative (SEI) Handbook

(https://pressbooks.bccampus.ca/seihandbook/)
2018 Peer reviewer for "Communicating Science with the Public," by CITI
2014-Present Peer reviewer for Journal publications in TPT, Phys Rev, and Cogent Educ.

OUTREACH ACTIVITIES

CU Boulder Engineering Honors Program
2022 Annual Breakfast Banquet: Keynote Speaker

CU Boulder Tau Beta Pi
2021 Invited Panelist: "The Science of Interstellar"

CU Boulder Technology, Cybersecurity, and Policy Seminar
2020 Invited talk: The Truth and Myth of Quantum Technologies

CU Boulder Boettcher Scholars
2020 CU Boettcher Graduation Ceremony: Closing Remarks
2019 Alumni Seminar Series: "Cryptography in the Quantum Age"

CU Boulder LEAD 4000
2020 Guest lecture: Leadership in Diverse Disciplines

Boettcher Foundation
2019 Scholars' Weekend: Keynote Presentation and Senior Seminar

CU Boulder APPM 4720/5720: Cryptosystems
2019 Guest lecture: Shor's Algorithm for Prime Factorization

CU Boulder Presidents' Leadership Class
2019 "Taste of PLC" recruitment event: Keynote Speaker
2019 Annual Alumni Lecture Event: Keynote Speaker
2018 Annual Junior Retreat: Keynote Speaker

CU Boulder Engineering Honors Program
2018 Annual Breakfast Banquet: Keynote Speaker

CU Boulder "Saturday Physics" Series
2023 "The C-PhLARE project: One Thousand Students vs the Paradox of the Sun"
2018 "The Physics of Keeping Secrets: A Look Inside the World of Quantum Encryption"

"Think About This!" YouTube Channel
2016-2018 Short-form web videos about memorable science in our everyday lives
YouTube.com/c/ThinkAboutThis

UCSC Algebra Academy Day
2017 Keynote speaker: "Math, Spies, and Theoretical Physics"

Alan Alda Center for Communicating Science

2017 Science communication instructor, University of Nebraska workshop
2017 Science communication instructor, University of Utah workshop
2017 Science communication instructor, Utah State University workshop
2016 Webcast guest, "Quantum Mechanics and Theoretical Physics"
2015 Patchogue-Medford High School Career Day
Guest lecture: "The Power of a Quantum Computer"

2014 Video Presentation: "2014 Nobel Prize in Physics"
https://vimeo.com/112136911
2014 Video Presentation: "The Superhero in the Machine"
https://vimeo.com/97270987
2014 Brentwood Senior High School
Guest lecture: "The Power of a Quantum Computer"
2013 Assistant Trainer for Physics TA training initiative

New York "CSTEP" Program

2015 Created "Physics Activity Day" at Country Fair Entertainment Park

Mount Sinai-Port Jefferson STEM Initiative

2015 Guest lecture: "Journey to the Fourth Dimension"
2014 Guest lecture series: "Cryptography through Number Theory"

Della Pietra High School Applied Math Program

2015 Guest lecture: "Game Theory, Probability, and Poker!"
2014 Guest lecture series: "Cryptography through Number Theory"

Mathematics Summer Camp, Stony Brook University

2015 Guest lecture series "The Mathematics of Cracking Secret Codes"

National Museum of Mathematics Enrichment Program

2015 Guest lecture: "Journey to the 4th Dimension"

Courant Institute "CSPLASH" Enrichment Program (NYU)

2013 Guest lecture: "The Unbreakable Quantum Code"

Graduate Council Lecture Series at Stony Brook University

2011 Guest lecture: "Quantum Physics and Technology"

AWARDS AND RECOGNITION

2022 Outstanding Teaching Award, Physics Department, CU Boulder
2022 Selected for participation in CU Boulder Online Teaching Academy, Feb 2022

2020 Selected for participation in CU Boulder Active Learning Academy, Oct 2020
2017 Inaugural Faculty Fellow at the UCSC Center for Innovation in Teaching and Learning
2016 NASA FameLab National Finalist
Video: https://www.youtube.com/watch?v=Fm_PvBhtYAA
2015 NASA FameLab Regional Competition for science communication: 1st place
Video: https://www.youtube.com/watch?v=qQwmUyB4dqA
https://www.youtube.com/watch?v=k0E7taL6Hss
2015 Stony Brook University Science Playwriting Competition: 3rd place
Play title: "Counting Sheep" (available upon request)
2014 Stony Brook University Science Playwriting Competition: 1st place
Play title: "Understanding" (available upon request)
2012 12th Canadian Summer School on Quantum Information Scholarship
2011 "Best in School" distinction for highest TA evaluations at Stony Brook University
2010 MAA Prize for best paper in mathematical modelling
2010 Mathematical Competition in Modeling: Outstanding Paper (highest distinction)
2006 Boettcher Scholarship (merit-based full ride to Colorado colleges and universities)

ADDITIONAL TEACHING EXPERIENCE

CSTEP Program (NY program for underrepresented minorities in STEM fields)
2013, 2015 Intro to College Physics (Instructor and course designer; non-credit summer course)
2012-2015 Physics Workshop Instructor (weekly workshop on material from Physics I and II)

ADDITIONAL PEDAGOGICAL TRAINING

2022 Online Teaching Academy, CU Boulder
Completed training in best-practices for online courses
2020 Active Learning Academy, CU Boulder:
Completed "Learning By Design" professional development course
2017 Institute for Scientist & Engineer Educators, Santa Cruz CA:
Certificate in Inclusive Inquiry STEM Education

REFERENCES

Michael Dubson
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