

CONTACT INFORMATION	Kavli Institute for Theoretical Physics University of California, Santa Barbara	<i>e-mail:</i> remmen@kitp.ucsb.edu <i>web:</i> grantremmen.com
POSITIONS	University of California, Santa Barbara , Fundamental Physics Fellow Kavli Institute for Theoretical Physics , Postdoctoral Scholar University of California, Berkeley , Miller Research Fellow Harvard University Society of Fellows , Junior Fellow (declined)	2020–present 2017–2020 2017
EDUCATION	California Institute of Technology Ph.D., Physics M.S., Physics Hertz Fellow and NSF Graduate Research Fellow University of Minnesota, College of Science & Engineering B.S., Physics, <i>summa cum laude</i> , High Distinction, 4.0 GPA B.S., Astrophysics, <i>summa cum laude</i> , High Distinction, 4.0 GPA B.S., Mathematics, <i>summa cum laude</i> , High Distinction, 4.0 GPA	2012–2017 June 2017 June 2015 2008–2012 May 2012 May 2012 May 2012
HONORS & AWARDS	Appointed as Hertz Fellowship Interviewer Sakurai Dissertation Award in Theoretical Particle Physics American Physical Society award citation: “For his contributions to understanding the structure and self-consistency of gravity and effective field theories using ideas from quantum field theory and holography.” Stemple Memorial Prize in Physics , Caltech Delegate to the 66th Lindau Nobel Laureate Meeting Hertz Fellow NSF Graduate Research Fellow , National Science Foundation Goldwater Scholar Chambliss Astronomy Achievement Student Award , American Astronomical Society Dean’s Summer International Student Scholarship , University College London United States Presidential Scholar , White House Commission on Presidential Scholars & U.S. Dept. of Education National Merit Scholar Byrd Honors Scholar Hagstrum Award in Physics , Univ. of MN Outstanding Graduate in Mathematics , Univ. of MN Franklin Scholarship in Physics , Univ. of MN Lando Scholarship in Mathematics , Univ. of MN Richards Scholarship in Mathematics , Univ. of MN Nier Scholarship in Physics , Univ. of MN Thorp Scholarship in Mathematics , Univ. of MN Undergraduate Research Scholarship , Univ. of MN Basford Award in Physics , Univ. of MN Institute of Technology Alumni Award , Univ. of MN Institute of Technology Honors Undergraduate Research Scholarship , Univ. of MN Maroon & Gold Leadership Award , Univ. of MN 3M/Alumni Award , Univ. of MN Bentson Scholar , Univ. of MN Dean’s List , Univ. of MN College of Science & Engineering/Institute of Technology McGraw Hill Student Achievement Recognition , Univ. of MN, for Meritorious Work in General Chemistry	2018–present 2018 2016 2016 2012–2017 2012–2017 2010–2012 2011 2011 2008 2008–2012 2008–2011 2012 2012 2011–2012 2011–2012 2011–2012 2010–2011 2010–2011 2010 2009–2010 2009–2010 2009 2008–2012 2008–2012 2008–2012 2008–2012 2008–2012 2008

- PUBLICATIONS
54. Gary T. Horowitz, Maciej Kolanowski, **Grant N. Remmen**, Jorge E. Santos
Extremal Kerr Black Holes as Amplifiers of New Physics arXiv:2303.07358
 53. Clifford Cheung, **Grant N. Remmen** under review, Phys.Rev.Lett.
Stringy Dynamics from an Amplitudes Bootstrap arXiv:2302.12263
 52. Achilleas P. Porfyriadis, **Grant N. Remmen** accepted, JHEP
Charged Dilatonic Spacetimes in String Theory arXiv:2301.08256
 51. Clifford Cheung, **Grant N. Remmen** JHEP **1** (2023) 122
Veneziano Variations: How Unique are String Amplitudes? arXiv:2210.12163
 50. Marat Freytsis, Soubhik Kumar, **Grant N. Remmen**, Nicholas L. Rodd under review, JHEP
Multifield Positivity Bounds for Inflation arXiv:2210.10791
 49. Juan Maldacena, **Grant N. Remmen** JHEP **8** (2022) 152
Accumulation-Point Amplitudes in String Theory arXiv:2207.06426
 48. **Grant N. Remmen**, Nicholas L. Rodd JHEP **9** (2022) 30
Spinning Sum Rules for the Dimension-Six SMEFT arXiv:2206.13524
 47. Yu-tin Huang, **Grant N. Remmen** Phys. Rev. D **106** (2022) L021902
UV-Complete Gravity Amplitudes and the Triple Product arXiv:2203.00696
 46. Achilleas P. Porfyriadis, **Grant N. Remmen** JHEP **3** (2022) 107
Large Diffeomorphisms and Accidental Symmetry of the Extremal Horizon arXiv:2112.13853
 45. **Grant N. Remmen** Gen. Rel. Grav. **53** (2021) 101
Exploration of a Singular Fluid Spacetime arXiv:2111.08713
 44. Nima Arkani-Hamed, Yu-tin Huang, Jin-Yu Liu, **Grant N. Remmen** JHEP **3** (2022) 83
Causality, Unitarity, and the Weak Gravity Conjecture arXiv:2109.13937
 43. **Grant N. Remmen** Phys. Rev. Lett. **127** (2021) 241602, Editors' Suggestion
Amplitudes and the Riemann Zeta Function arXiv:2108.07820
 42. Achilleas P. Porfyriadis, **Grant N. Remmen** JHEP **10** (2021) 142
Horizon Acoustics of the GHS Black Hole and the Spectrum of AdS_2 arXiv:2106.10282
 41. Ning Bao, Aidan Chatwin-Davies, **Grant N. Remmen** JHEP **7** (2021) 113
Entanglement Wedge Cross Section Inequalities from Replicated Geometries arXiv:2106.02640
 40. Ning Bao, Jonathan Harper, **Grant N. Remmen** Phys. Rev. D **105** (2022) 026010
Holevo Information of Black Hole Mesostates arXiv:2103.06888
 39. **Grant N. Remmen**, Nicholas L. Rodd Phys. Rev. D **105** (2022) 036006
Signs, Spin, SMEFT: Sum Rules at Dimension Six arXiv:2010.04723
 38. Rafael Aoude et al. (including **Grant N. Remmen**) Snowmass 2021 Letter of Interest
On-Shell Methods for the SMEFT
 37. Ning Bao, Aidan Chatwin-Davies, **Grant N. Remmen** JHEP **9** (2020) 102
Warping Wormholes with Dust: a Metric Construction of the Python's Lunch arXiv:2006.10762
 36. **Grant N. Remmen**, Nicholas L. Rodd Phys. Rev. Lett. **125** (2020) 081601
Flavor Constraints from Unitarity and Analyticity arXiv:2004.02885
 35. Clifford Cheung, **Grant N. Remmen** JHEP **5** (2020) 100
Entanglement and the Double Copy arXiv:2002.10470
 34. Ning Bao, Aidan Chatwin-Davies, Jason Pollack, **Grant N. Remmen** JHEP **8** (2020) 65
Cosmological Decoherence from Thermal Gravitons arXiv:1911.10207

- PUBLICATIONS, 33. **Grant N. Remmen**, Nicholas L. Rodd JHEP **12** (2019) 32
 CONTINUED *Consistency of the Standard Model Effective Field Theory* arXiv:1908.09845
32. Ning Bao, Aidan Chatwin-Davies, Jason Pollack, **Grant N. Remmen** JHEP **7** (2019) 152
Towards a Bit Threads Derivation of Holographic Entanglement of Purification arXiv:1905.04317
31. Clifford Cheung, Junyu Liu, **Grant N. Remmen** Phys. Rev. D **100** (2019) 046003
Entropy Bounds on Effective Field Theory from Rotating Dyonic Black Holes arXiv:1903.09156
30. Raphael Bousso, Yasunori Nomura, **Grant N. Remmen** Phys. Rev. D **99** (2019) 046002
Outer Entropy and Quasilocal Energy arXiv:1812.06987
29. Ning Bao, Aidan Chatwin-Davies, **Grant N. Remmen** JHEP **2** (2019) 110
Entanglement of Purification and Multiboundary Wormhole Geometries arXiv:1811.01983
28. **Grant N. Remmen** Phys. Rev. D **98** (2018) 124008
New Spacetimes for Rotating Dust in $(2+1)$ -Dimensional General Relativity arXiv:1810.12305
27. Ning Bao, Aidan Chatwin-Davies, Jason Pollack, **Grant N. Remmen** JHEP **11** (2018) 71
Traversable Wormholes as Quantum Channels: Exploring CFT Entanglement Structure and Channel Capacity in Holography arXiv:1808.05963
26. Yasunori Nomura, **Grant N. Remmen** JHEP **8** (2018) 63
Area Law Unification and the Holographic Event Horizon arXiv:1805.09339
25. Venkatesa Chandrasekaran, **Grant N. Remmen**, Arvin Shahbazi-Moghaddam JHEP **11** (2018) 15
Higher-Point Positivity arXiv:1804.03153
24. Clifford Cheung, Junyu Liu, **Grant N. Remmen** JHEP **10** (2018) 4
Proof of the Weak Gravity Conjecture from Black Hole Entropy arXiv:1801.08546
23. Ning Bao, Sean M. Carroll, Aidan Chatwin-Davies, Jason Pollack, **Grant N. Remmen** Phys. Rev. D **97** (2018) 126014
Branches of the Black Hole Wave Function Need Not Contain Firewalls arXiv:1712.04955
22. Chris Akers, Raphael Bousso, Illan F. Halpern, **Grant N. Remmen** Phys. Rev. D **97** (2018) 024018
Boundary of the Future of a Surface arXiv:1711.06689
21. Clifford Cheung, **Grant N. Remmen**, Chia-Hsien Shen, Congkao Wen JHEP **4** (2018) 129
Pions as Gluons in Higher Dimensions arXiv:1709.04932
20. Clifford Cheung, **Grant N. Remmen** JHEP **9** (2017) 2
Hidden Simplicity of the Gravity Action arXiv:1705.00626
19. Sean M. Carroll, **Grant N. Remmen** Phys. Rev. D **95** (2017) 123504
A Nonlocal Approach to the Cosmological Constant Problem arXiv:1703.09715
18. Ning Bao, **Grant N. Remmen** EPL **121** (2018) 60007, Editor's Choice
Bulk Connectedness and Boundary Entanglement arXiv:1703.00018
17. Clifford Cheung, **Grant N. Remmen** JHEP **1** (2017) 104
Twofold Symmetries of the Pure Gravity Action arXiv:1612.03927
16. Clifford Cheung, **Grant N. Remmen** Phys. Rev. Lett. **118** (2017) 051601
Positivity of Curvature-Squared Corrections in Gravity arXiv:1608.02942
15. **Grant N. Remmen**, Ning Bao, Jason Pollack JHEP **7** (2016) 48
Entanglement Conservation, $ER = EPR$, and a New Classical Area Theorem for Wormholes arXiv:1604.08217

- PUBLICATIONS, 14. Sean M. Carroll, **Grant N. Remmen** Phys. Rev. D **93** (2016) 124052
CONTINUED *What is the Entropy in Entropic Gravity?* arXiv:1601.07558
13. Clifford Cheung, **Grant N. Remmen** JHEP **4** (2016) 2
Positive Signs in Massive Gravity arXiv:1601.04068
12. Ning Bao, Jason Pollack, **Grant N. Remmen** JHEP **11** (2015) 126
Wormhole and Entanglement (Non-)Detection in the ER=EPR Correspondence arXiv:1509.05426
11. Brando Bellazzini, Clifford Cheung, **Grant N. Remmen** Phys. Rev. D **93** (2016) 064076
Quantum Gravity Constraints from Unitarity and Analyticity arXiv:1509.00851
10. Ning Bao, Jason Pollack, **Grant N. Remmen** Fortschr. Phys. **63** (2015) 705
Splitting Spacetime and Cloning Qubits: Linking No-Go Theorems across the ER=EPR Duality arXiv:1506.08203
9. Ning Bao, ChunJun Cao, Sean M. Carroll, Aidan Chatwin-Davies, Nicholas Hunter-Jones, Jason Pollack, **Grant N. Remmen** Phys. Rev. D **91** (2015) 125036
Consistency Conditions for an AdS Multiscale Entanglement Renormalization Ansatz Correspondence arXiv:1504.06632
8. Clifford Cheung, **Grant N. Remmen** JHEP **12** (2014) 87
Infrared Consistency and the Weak Gravity Conjecture arXiv:1407.7865
7. **Grant N. Remmen**, Sean M. Carroll Phys. Rev. D **90** (2014) 063517
How Many e-Folds Should We Expect from High-Scale Inflation? arXiv:1405.5538
6. Clifford Cheung, **Grant N. Remmen** Phys. Rev. Lett. **113** (2014) 051601
Naturalness and the Weak Gravity Conjecture arXiv:1402.2287
5. **Grant N. Remmen**, Sean M. Carroll Phys. Rev. D **88** (2013) 083518
Attractor Solutions in Scalar-Field Cosmology arXiv:1309.2611
4. **Grant N. Remmen**, Kris Davidson, Andrea Mehner Astrophys. J. **773** (2013) 27
Unexpected Ionization Structure in Eta Carinae's "Weigelt Knots" arXiv:1302.2659
3. **Grant N. Remmen**, Kinwah Wu Mon. Not. R. Astron. Soc. **430** (2013) 1940
Complex Orbital Dynamics of a Double Neutron Star System Revolving around a Massive Black Hole arXiv:1301.2836
2. **Grant Remmen**, Elwood McCreary JURP **25** (2012)
Measurement of the Speed and Energy Distribution of Cosmic Ray Muons
1. **Grant Remmen** JURP **23** (2010)
A New Assessment of Dark Matter in the Milky Way Galaxy

- TALKS
- California Amplitudes Meeting | UC San Diego March 2023
- University of Michigan, LCTP | High Energy Theory Seminar (two parts) March 2023
- Indiana University | High-Energy Physics/Astrophysics Seminar March 2023
- California Institute of Technology | Amplitudes Group Meeting February 2023
- Bootstrapping Quantum Gravity Program | Kavli Institute for Theoretical Physics February 2023
- Stony Brook University, Simons Center for Geometry and Physics | Special Physics Seminar February 2023
- UC Davis, QMAP | Particles/Cosmology Seminar January 2023
- Brown University | High Energy Theory Seminar November 2022
- Number Theory and Physics Workshop | Simons Center for Geometry and Physics, Stony Brook University (virtual) October 2022

TALKS,	Institute for Advanced Study Amplitudes Group Meeting	October 2022
CONTINUED	Simons Symposium on Amplitudes Meet Cosmology Scotland	May 2022
	UC Santa Barbara High Energy and Gravity Seminar	May 2022
	Possible and Impossible in Effective Field Theory: From the S-Matrix to the Swampland Workshop Institute for Advanced Study	May 2022
	Argonne National Laboratory High Energy Physics Theory Seminar (virtual)	April 2022
	Kavli IPMU, Univ. Tokyo Mathematics - String Theory Seminar (virtual)	April 2022
	California Amplitudes Meeting UC Davis	March 2022
	California Institute of Technology Amplitudes Group Meeting	February 2022
	UC Irvine Particle Physics Seminar	January 2022
	QCD Meets Gravity Workshop UCLA (virtual)	December 2021
	Kavli Institute for Theoretical Physics Locals' Event	November 2021
	UC Santa Barbara High Energy and Gravity Seminar (virtual)	November 2021
	International Centre for Theoretical Physics High Energy, Cosmology, and Astroparticle Physics Seminar (virtual)	November 2021
	Brandeis University Quantum/Gravity Seminar (virtual)	November 2021
	ETH Zürich QFT, Strings and Beyond Seminar (virtual)	October 2021
	Perimeter Institute Quantum Fields and Strings Seminar (virtual)	October 2021
	Hertz Foundation Innovation Hour (virtual)	June 2021
	California Amplitudes Meeting UCLA (virtual)	March 2021
	New York University Physics Department Colloquium (virtual)	March 2021
	New York University Physics Research Seminar (virtual)	February 2021
	University of Florida High Energy Physics Seminar (virtual)	January 2021
	University of Chicago Particle Theory Seminar (virtual)	January 2021
	Korea Institute for Advanced Study High Energy Physics Seminar (virtual)	December 2020
	UC Santa Barbara High Energy and Gravity Seminar (virtual)	November 2020
	Yale University Particle Theory Seminar (virtual)	October 2020
	Brookhaven National Laboratory High Energy Theory Seminar (virtual)	April 2020
	Kavli IPMU, Univ. Tokyo Astronomy-Cosmology-Particle Physics Seminar (virtual)	April 2020
	UC Davis, QMAP Fields, Strings, Gravity Seminar (virtual)	April 2020
	The String Swampland and Quantum Gravity Constraints on Effective Theories Program Kavli Institute for Theoretical Physics	March 2020
	Brandeis University High-Energy and Gravitational Theory Chalk Talk	January 2020
	Brandeis University Physics Department Colloquium	January 2020
	University of Michigan, LCTP High Energy Theory Seminar	November 2019
	From Scattering to Expansion Workshop Northwestern University	October 2019
	UC Santa Barbara Particle Physics Phenomenology Seminar	October 2019
	UC Santa Barbara High Energy and Gravity Seminar	October 2019

TALKS, CONTINUED	Navigating the Swampland Conference Instituto de Física Teórica, UAM-CSIC, Madrid, Spain	September 2019
	University of Washington AdS/CFT Group Meeting	May 2019
	University of Washington Particle Theory Seminar	May 2019
	University of Minnesota, FTPI High Energy Theory Seminar	April 2019
	Stanford University Stanford Institute for Theoretical Physics Colloquium	April 2019
	UC Berkeley 4D Seminar	April 2019
	California Institute of Technology High Energy Theory Seminar	February 2019
	UC Davis Joint Theory Seminar	January 2019
	Harvard University Black Hole Initiative Colloquium	November 2018
	Cornell University Particle Theory Seminar	October 2018
	Institute for Advanced Study High Energy Theory Seminar	October 2018
	Vistas over the Swampland Conference Instituto de Física Teórica, UAM-CSIC, Madrid, Spain	September 2018
	King's College London Special Seminar, Theoretical Particle Physics & Cosmology	June 2018
	Gravity, Cosmology & Physics Beyond the Standard Model Conference LPNHE, UPMC, Paris, France	June 2018
	Sakurai Thesis Prize Talk American Physical Society April Meeting, Columbus, OH <i>Quantum Gravity Constraints for Effective Field Theories</i>	April 2018
	University of Illinois, Urbana-Champaign Mathematical and Theoretical Physics Seminar	April 2018
	McGill University High Energy Theory Group Seminar (virtual)	March 2018
	California Institute of Technology High Energy Theory Seminar	February 2018
	California Institute of Technology Quantum Spacetime Meeting	February 2018
	UC Berkeley String Seminar	February 2018
	Stanford University Stanford Institute for Theoretical Physics Seminar	January 2018
	SLAC National Accelerator Laboratory Elementary Particle Physics Theory Seminar	October 2017
	Institute for Advanced Study High Energy Theory Seminar	October 2017
	Massachusetts Institute of Technology String/Gravity Theory Seminar	May 2017
	California Institute of Technology Theoretical Physics Research Group Meeting	April 2017
	California Institute of Technology Theoretical Physics Journal Club	April 2017
	UC Berkeley String Seminar	February 2017
	QCD Meets Gravity Workshop UCLA	December 2016
	California Institute of Technology Theoretical Physics Research Group Meeting	November 2016
	California Institute of Technology Theoretical Physics Research Group Meeting	October 2016
	Johns Hopkins University High Energy Theory/Cosmology Seminar	October 2016
	California Institute of Technology Theoretical Physics Research Group Meeting	May 2016
	New York University High Energy Seminar	April 2016

TALKS, CONTINUED	Harvard University Particle Theory Seminar	April 2016
	California Institute of Technology Theoretical Physics Research Group Meeting	February 2016
	California Institute of Technology Theoretical Physics Research Group Meeting	November 2015
	California Institute of Technology Theoretical Physics Journal Club	October 2015
	California Institute of Technology Theoretical Physics Research Group Meeting	April 2015
	California Institute of Technology Theoretical Physics Research Group Meeting	February 2015
	California Institute of Technology Theoretical Physics Research Group Meeting	October 2014
	California Institute of Technology Theoretical Physics Journal Club (two parts)	October 2014
	20 th International Symposium on Particles, Strings and Cosmology (PASCOS 2014) Warsaw, Poland	June 2014
	California Institute of Technology Theoretical Physics Research Group Meeting	May 2014
	California Institute of Technology Theoretical Physics Journal Club	February 2014
	California Institute of Technology Theoretical Physics Research Group Meeting	February 2014
	California Institute of Technology Theoretical Physics Journal Club	September 2013
	Hertz Foundation 50 th Anniversary Symposium Poster Presentation	August 2013
	American Physical Society April Meeting, Denver, CO	April 2013
	Mullard Space Science Laboratory, United Kingdom Theory Group Meeting	August 2011
	Dean's Summer International Student Day of Talks University College London, United Kingdom	August 2011
	217 th Meeting of the American Astronomical Society, Seattle, WA Poster Presentation	January 2011
THESES	Ph.D., Physics California Institute of Technology Grant Newton Remmen <i>Defining Gravity: Effective Field Theory, Entanglement, and Cosmology</i> Thesis advisors: Clifford Cheung and Sean M. Carroll, California Institute of Technology	Defended May 2017
	B.S., Mathematics , <i>summa cum laude</i> University of Minnesota Grant N. Remmen <i>Dynamics of a Rigid Spinning Ring in the Schwarzschild Metric: A Solution to a Gravitational Problem in Mathematical Physics</i> Thesis advisor: Willard Miller, School of Mathematics, University of Minnesota Research supervised by Kinwah Wu, Head of Theory, Mullard Space Science Laboratory, University College London.	Defended May 2012
	B.S., Astrophysics , <i>summa cum laude</i> University of Minnesota Grant N. Remmen Hubble Space Telescope <i>Subpixel Modeling of Anomalous High-Excitation Emission Lines in the Ejecta of Eta Carinae</i> Thesis advisor: Kris Davidson, MN Institute for Astrophysics, University of Minnesota	Defended December 2011
	B.S., Physics , <i>summa cum laude</i> University of Minnesota Grant Remmen <i>Distortion of Black Holes caused by Motion relative to the Cosmic Microwave Background</i> Thesis advisor: Robert Gehr, Director, MN Institute for Astrophysics, University of Minnesota	Defended April 2010

CONFERENCE	Conference Co-Chair Kavli Institute for Theoretical Physics (virtual)	October 2020
ORGANIZATION	<i>UV Meets the IR: Effective Field Theory Bounds from QFT to String Theory</i>	
SEMINAR	Organizer KITP Locals' Event Series	2022–2023
ORGANIZATION	Organizer UC Santa Barbara High Energy and Gravity Seminar Series	2020–2021
	Organizer UC Berkeley HEP-QIS Seminar Series	2018–2019
	Organizer UC Berkeley String Seminar Series	2017–2019
SCIENCE	Outreach talk for KITP administrative staff	May 2021
OUTREACH	Guest lecturer for Caltech's <i>Storytelling for Scientists</i> course	April 2021
	Presented talks on dark matter to physics classes in rural Minnesota	2011
TEACHING	UC Santa Barbara, Department of Physics	Fall 2020
EXPERIENCE	Instructor and organizer of graduate short course <i>Impossible Physics: Constraining the Laws of Nature, from Scattering Amplitudes to Black Holes</i>	
	UC Berkeley, Department of Physics	April 2018
	Guest lecturer in Prof. Petr Hořava's Quantum Field Theory course	
	University of Minnesota, Institute of Technology, Department of Astronomy	Fall 2009
	Teaching assistant to Prof. Robert Gehrz, Department Chair	
JOURNAL	Physical Review Letters	
REFeree	Physical Review D	
	Journal of High Energy Physics	
	Nuclear Physics B	
	Scientific Reports - Nature	
	Communications in Mathematical Physics	
LEADERSHIP, SERVICE, & CULTURAL ACTIVITIES	Co-author/-composer of a two-act musical, <i>From the Earth to the Moon</i> , based on the Verne novel	
	Caltech production of <i>From the Earth to the Moon</i>	
	Mainstage production, Assistant to the Director	2022
	Public reading (virtual), Music Director	2021
	California Institute of Technology Graduate Student Council Board of Directors	2013–2017
	Member, Academics Committee and Director at Large	2016–2017
	Member, Academics Committee and Physics Representative	2013–2016
	California Institute of Technology Faculty Library Committee, Student Representative	2013–2017
	Co-author/-composer of a two-act musical, <i>Boldly Go!</i> , a musical parody based upon <i>Star Trek</i>	
	Caltech production of <i>Boldly Go!</i>	
	Mainstage production, Music Director	2016
	Public reading, Music Director	2015
	University Study Abroad May Seminar: <i>Great Minds of the Renaissance</i> , Italy	2011
	History of Renaissance scientists (Galileo, da Vinci, etc.) and societal context	
	University of Minnesota Gospel Choir	2008–2010
	Detroit Lakes Community Summer Band Program	2008–2010
	University of Minnesota Honors Student Association	2008–2012
	University of Minnesota volunteer caller for Admissions Office	2008–2009
	U.S. Department of Education volunteer	2008
	Assembled hygiene kits for Washington, D.C. homeless	

PRESS	<i>The Current</i> UCSB	January 2022
	<i>Quantum Zeta Epiphany</i>	
	<i>Physics Magazine</i> American Physical Society	December 2021
	<i>A Physical Match for the Riemann Zeta Function</i>	
	<i>Quanta Magazine</i>	May 2020
	<i>Black Hole Paradoxes Reveal a Fundamental Link Between Energy and Order</i>	
SCIENTIFIC & HONORARY AFFILIATIONS	American Physical Society American Astronomical Society International Society on General Relativity and Gravitation Golden Key International Honour Society Sigma Pi Sigma, National Physics Honor Society	
TEST SCORES	GRE Physics—Perfect Score: 990/990	2011
	GRE General—Quantitative: 800/800, Verbal: 720/800, Analytical Writing: 5.5/6.0	2011
	SAT—Perfect Score: 2400/2400	2008
	SAT II—Perfect Scores: Math Level II 800/800 and Biology—Molecular 800/800	2008