

CONTACT INFORMATION	Center for Cosmology and Particle Physics New York University	<i>e-mail:</i> grant.remmen@nyu.edu <i>web:</i> grantremmen.com
POSITIONS	<p>New York University, James Arthur Postdoctoral Fellow 2023–present</p> <p>University of California, Santa Barbara, Fundamental Physics Fellow 2020–2023 Kavli Institute for Theoretical Physics, Postdoctoral Scholar</p> <p>University of California, Berkeley, Miller Research Fellow 2017–2020</p> <p>Harvard University Society of Fellows, Junior Fellow (declined) 2017</p>	
EDUCATION	<p>California Institute of Technology 2012–2017 Ph.D., Physics June 2017 M.S., Physics June 2015 Hertz Fellow and NSF Graduate Research Fellow</p> <p>University of Minnesota, College of Science & Engineering 2008–2012 B.S., Physics, <i>summa cum laude</i>, High Distinction, 4.0 GPA May 2012 B.S., Astrophysics, <i>summa cum laude</i>, High Distinction, 4.0 GPA May 2012 B.S., Mathematics, <i>summa cum laude</i>, High Distinction, 4.0 GPA May 2012</p>	
SELECTED HONORS & AWARDS	<p>Appointed as Hertz Fellowship Interviewer 2018–present</p> <p>Sakurai Dissertation Award in Theoretical Particle Physics 2018 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.”</p> <p>Stemple Memorial Prize in Physics, Caltech 2016</p> <p>United States Delegate to the 66th Lindau Nobel Laureate Meeting 2016</p> <p>Hertz Fellow 2012–2017</p> <p>NSF Graduate Research Fellow, National Science Foundation 2012–2017</p> <p>Goldwater Scholar 2010–2012</p> <p>Chambliss Astronomy Achievement Student Award, 2011 American Astronomical Society</p> <p>Dean’s Summer International Student Scholarship, University College London 2011</p> <p>National Merit Scholar 2008–2012</p> <p>Byrd Honors Scholar 2008–2011</p> <p>United States Presidential Scholar, 2008 White House Commission on Presidential Scholars & U.S. Dept. of Education</p>	
PRESS	<p>Phys.org September 2023 <i>Theoretical Study Shows That Kerr Black Holes Could Amplify New Physics</i></p> <p>Physics Magazine, APS <i>New Physics Magnified in Spinning Black Holes</i> August 2023</p> <p>The Current, UCSB <i>Quantum Zeta Epiphany</i> January 2022</p> <p>Physics Magazine, APS <i>A Physical Match for the Riemann Zeta Function</i> December 2021</p> <p>Quanta Magazine May 2020 <i>Black Hole Paradoxes Reveal a Fundamental Link Between Energy and Order</i></p>	

- PUBLICATIONS 56. Xi Dong, **Grant N. Remmen**, Diandian Wang, Wayne W. Weng, Chih-Hung Wu
Holographic Entanglement from the UV to the IR under review, JHEP arXiv:2308.07952
55. Clifford Cheung, **Grant N. Remmen** Phys. Rev. D **108** (2023) 086009 arXiv:2308.03833
Bespoke Dual Resonance
54. Gary T. Horowitz, Maciej Kolanowski, **Grant N. Remmen**, Jorge E. Santos Phys. Rev. Lett. **131** (2023) 091402 Editors' Suggestion arXiv:2303.07358
Extremal Kerr Black Holes as Amplifiers of New Physics
53. Clifford Cheung, **Grant N. Remmen** Phys. Rev. D **108** (2023) 026011 arXiv:2302.12263
Stringy Dynamics from an Amplitudes Bootstrap
52. Achilleas P. Porfyriadis, **Grant N. Remmen** JHEP **3** (2023) 125 arXiv:2301.08256
Charged Dilatonic Spacetimes in String Theory
51. Clifford Cheung, **Grant N. Remmen** JHEP **1** (2023) 122 arXiv:2210.12163
Veneziano Variations: How Unique are String Amplitudes?
50. Marat Freytsis, Soubhik Kumar, **Grant N. Remmen**, Nicholas L. Rodd JHEP **9** (2023) 41 arXiv:2210.10791
Multifield Positivity Bounds for Inflation
49. Juan Maldacena, **Grant N. Remmen** JHEP **8** (2022) 152 arXiv:2207.06426
Accumulation-Point Amplitudes in String Theory
48. **Grant N. Remmen**, Nicholas L. Rodd JHEP **9** (2022) 30 arXiv:2206.13524
Spinning Sum Rules for the Dimension-Six SMEFT
47. Yu-tin Huang, **Grant N. Remmen** Phys. Rev. D **106** (2022) L021902 arXiv:2203.00696
UV-Complete Gravity Amplitudes and the Triple Product
46. Achilleas P. Porfyriadis, **Grant N. Remmen** JHEP **3** (2022) 107 arXiv:2112.13853
Large Diffeomorphisms and Accidental Symmetry of the Extremal Horizon
45. **Grant N. Remmen** Gen. Rel. Grav. **53** (2021) 101 arXiv:2111.08713
Exploration of a Singular Fluid Spacetime
44. Nima Arkani-Hamed, Yu-tin Huang, Jin-Yu Liu, **Grant N. Remmen** JHEP **3** (2022) 83 arXiv:2109.13937
Causality, Unitarity, and the Weak Gravity Conjecture
43. **Grant N. Remmen** Phys. Rev. Lett. **127** (2021) 241602 Editors' Suggestion arXiv:2108.07820
Amplitudes and the Riemann Zeta Function
42. Achilleas P. Porfyriadis, **Grant N. Remmen** JHEP **10** (2021) 142 arXiv:2106.10282
Horizon Acoustics of the GHS Black Hole and the Spectrum of AdS_2
41. Ning Bao, Aidan Chatwin-Davies, **Grant N. Remmen** JHEP **7** (2021) 113 arXiv:2106.02640
Entanglement Wedge Cross Section Inequalities from Replicated Geometries
40. Ning Bao, Jonathan Harper, **Grant N. Remmen** Phys. Rev. D **105** (2022) 026010 arXiv:2103.06888
Holevo Information of Black Hole Mesostates
39. **Grant N. Remmen**, Nicholas L. Rodd Phys. Rev. D **105** (2022) 036006 arXiv:2010.04723
Signs, Spin, SMEFT: Sum Rules at Dimension Six
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 arXiv:2006.10762
Warping Wormholes with Dust: a Metric Construction of the Python's Lunch
36. **Grant N. Remmen**, Nicholas L. Rodd Phys. Rev. Lett. **125** (2020) 081601 arXiv:2004.02885
Flavor Constraints from Unitarity and Analyticity

- PUBLICATIONS, 35. Clifford Cheung, **Grant N. Remmen** JHEP **5** (2020) 100
CONTINUED *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
33. **Grant N. Remmen**, Nicholas L. Rodd JHEP **12** (2019) 32
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 Dyon 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**, JHEP **11** (2018) 15
Arvin Shahbazi-Moghaddam
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, Phys. Rev. D **97** (2018) 126014
Jason Pollack, **Grant N. Remmen** arXiv:1712.04955
Branches of the Black Hole Wave Function Need Not Contain Firewalls
22. Chris Akers, Raphael Bousso, Illan F. Halpern, Phys. Rev. D **97** (2018) 024018
Grant N. Remmen arXiv:1711.06689
Boundary of the Future of a Surface
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

- PUBLICATIONS, CONTINUED
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
 14. Sean M. Carroll, **Grant N. Remmen** Phys. Rev. D **93** (2016) 124052
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
- Boston University | High Energy Theory Seminar September 2023
 - Swamplandia Workshop | Instituto de Física Teórica, UAM-CSIC, and Harvard University, Madrid, Spain September 2023
 - Amplitudes 2023 | CERN August 2023
 - Strings 2023 | Perimeter Institute for Theoretical Physics July 2023
 - Kavli Institute for Theoretical Physics | Generalized Symmetries Reading Group June 2023

TALKS, CONTINUED	Quark Confinement 2023 University of Minnesota Simons Collaboration on Confinement and QCD Strings	May 2023
	Kavli Institute for Theoretical Physics Locals' Lunch Talk	April 2023
	CERN Standard Model Electroweak Group Meeting, ATLAS Collaboration (virtual)	April 2023
	McGill University High Energy Theory Group Meeting (virtual)	April 2023
	University of Chicago, Kadanoff Center for Theoretical Physics Particle Theory Seminar	April 2023
	Princeton University High Energy Theory Seminar	March 2023
	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 (virtual)	November 2022
	Number Theory and Physics Workshop Simons Center for Geometry and Physics, Stony Brook University (virtual)	October 2022
	Institute for Advanced Study Amplitudes Group Meeting	October 2022
	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

TALKS, CONTINUED	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
	Navigating the Swampland Workshop 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 Workshop 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

TALKS, CONTINUED	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
	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
CONFERENCE ORGANIZATION	Conference Co-Chair Kavli Institute for Theoretical Physics (virtual) <i>UV Meets the IR: Effective Field Theory Bounds from QFT to String Theory</i>	October 2020

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
TEACHING EXPERIENCE	UC Santa Barbara, Department of Physics	Fall 2020
	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	
THESES	Ph.D., Physics California Institute of Technology	Defended May 2017
	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	
	B.S., Mathematics, <i>summa cum laude</i> University of Minnesota	Defended May 2012
	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.	
	B.S., Astrophysics, <i>summa cum laude</i> University of Minnesota	Defended December 2011
	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	
	B.S., Physics, <i>summa cum laude</i> University of Minnesota	Defended April 2010
	Grant Remmen <i>Distortion of Black Holes caused by Motion relative to the Cosmic Microwave Background</i> Thesis advisor: Robert Gehrz, Director, MN Institute for Astrophysics, University of Minnesota	
UNDERGRAD. HONORS & AWARDS, UNIVERSITY OF MINNESOTA	Hagstrum Award in Physics	2012
	Outstanding Graduate in Mathematics	2012
	Franklin Scholarship in Physics	2011–2012
	Lando Scholarship in Mathematics	2011–2012
	Richards Scholarship in Mathematics	2011–2012
	Nier Scholarship in Physics	2010–2011
	Thorp Scholarship in Mathematics	2010–2011
	Undergraduate Research Scholarship	2010
	Basford Award in Physics	2009–2010
	Institute of Technology Alumni Award	2009–2010
	Institute of Technology Honors Undergraduate Research Scholarship	2009
	Maroon & Gold Leadership Award	2008–2012
	3M/Alumni Award	2008–2012
	Bentson Scholar	2008–2012
	Dean's List , College of Science & Engineering/Institute of Technology	2008–2012
	McGraw Hill Student Achievement Recognition ,	2008
	Meritorious Work in General Chemistry	

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	
SCIENCE OUTREACH	Interacted with various major donors at the request of KITP Outreach talk for KITP administrative staff Guest lecturer for Caltech's <i>Storytelling for Scientists</i> course Presented talks on dark matter to physics classes in rural Minnesota	2022–2023 May 2021 April 2021 2011
JOURNAL REFEREE	Physical Review Letters 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 Public reading (virtual), Music Director California Institute of Technology Graduate Student Council Board of Directors Member, Academics Committee and Director at Large Member, Academics Committee and Physics Representative California Institute of Technology Faculty Library Committee, Student Representative 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 Public reading, Music Director University Study Abroad May Seminar: <i>Great Minds of the Renaissance</i> , Italy History of Renaissance scientists (Galileo, da Vinci, etc.) and societal context University of Minnesota Gospel Choir Detroit Lakes Community Summer Band Program University of Minnesota Honors Student Association University of Minnesota volunteer caller for Admissions Office U.S. Department of Education volunteer Assembled hygiene kits for Washington, D.C. homeless	2022 2021 2021 2013–2017 2016–2017 2013–2016 2013–2017 2016 2015 2011 2008–2010 2008–2010 2008–2012 2008–2009 2008
TEST SCORES	GRE Physics—Perfect Score: 990/990 GRE General—Quantitative: 800/800, Verbal: 720/800, Analytical Writing: 5.5/6.0 SAT—Perfect Score: 2400/2400 SAT II—Perfect Scores: Math Level II 800/800 and Biology–Molecular 800/800	2011 2011 2008 2008