Grant Newton Remmen — Curriculum Vitae

CONTACT INFORMATION

Center for Cosmology and Particle Physics
New York University

e-mail: grant.remmen@nyu.edu
web: grantremmen.com

POSITIONS

New York University, James Arthur Postdoctoral Fellow — 2023–present

University of California, Santa Barbara, Fundamental Physics Fellow — 2020–2023
Kavli Institute for Theoretical Physics, Postdoctoral Scholar

University of California, Berkeley, Miller Research Fellow — 2017–2020

Harvard University Society of Fellows, Junior Fellow (declined) — 2017

EDUCATION

California Institute of Technology — 2012–2017
Ph.D., Physics — June 2017
M.S., Physics — June 2015
Hertz Fellow and NSF Graduate Research Fellow

University of Minnesota, College of Science & Engineering — 2008–2012
B.S., Physics, *summa cum laude*, High Distinction, 4.0 GPA — May 2012
B.S., Astrophysics, *summa cum laude*, High Distinction, 4.0 GPA — May 2012
B.S., Mathematics, *summa cum laude*, High Distinction, 4.0 GPA — May 2012

HONORS & AWARDS

Appointed as Hertz Fellowship Interviewer — 2018–present

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."

Stemple Memorial Prize in Physics, Caltech — 2016
Delegate to the 66$^{\text{th}}$ Lindau Nobel Laureate Meeting — 2016
Hertz Fellow — 2012–2017
NSF Graduate Research Fellow, National Science Foundation — 2012–2017
Goldwater Scholar — 2010–2012
Chambliss Astronomy Achievement Student Award, American Astronomical Society — 2011
Dean's Summer International Student Scholarship, University College London — 2011
National Merit Scholar — 2008–2012
Byrd Honors Scholar — 2008–2011
Hagstrum Award in Physics, Univ. of MN — 2012
Outstanding Graduate in Mathematics, Univ. of MN — 2012
Franklin Scholarship in Physics, Univ. of MN — 2011–2012
Lando Scholarship in Mathematics, Univ. of MN — 2011–2012
Richards Scholarship in Mathematics, Univ. of MN — 2011–2012
Nier Scholarship in Physics, Univ. of MN — 2010–2011
Thorp Scholarship in Mathematics, Univ. of MN — 2010–2011
Undergraduate Research Scholarship, Univ. of MN — 2010
Basford Award in Physics, Univ. of MN — 2009–2010
Institute of Technology Alumni Award, Univ. of MN — 2009–2010
Institute of Technology Honors Undergraduate Research Scholarship, Univ. of MN — 2009
Maroon & Gold Leadership Award, Univ. of MN — 2008–2012
3M/Alumni Award, Univ. of MN — 2008–2012
Bentson Scholar, Univ. of MN — 2008–2012
Dean's List, Univ. of MN College of Science & Engineering/Institute of Technology — 2008–2012
McGraw Hill Student Achievement Recognition in Chemistry, Univ. of MN — 2008
United States Presidential Scholar — 2008

PUBLICATIONS

54. Gary T. Horowitz, Maciej Kolanowski, **Grant N. Remmen**, Jorge E. Santos — under review, Phys.Rev.Lett. 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 — under review, JHEP 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

35. Clifford Cheung, **Grant N. Remmen** — JHEP **5** (2020) 100 arXiv:2002.10470
Entanglement and the Double Copy

34. Ning Bao, Aidan Chatwin-Davies, Jason Pollack, **Grant N. Remmen** — JHEP **8** (2020) 65 arXiv:1911.10207
Cosmological Decoherence from Thermal Gravitons

PUBLICATIONS, CONTINUED

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 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, CONTINUED

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

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
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

TALKS, CONTINUED	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
	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

TALKS, CONTINUED

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 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 *Quantum Gravity Constraints for Effective Field Theories*	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

Talks, continued	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
Seminar Organization	Organizer | KITP Locals' Event Series	2022–2023
	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
Conference Organization	Conference Co-Chair | Kavli Institute for Theoretical Physics (virtual) *UV Meets the IR: Effective Field Theory Bounds from QFT to String Theory*	October 2020

Teaching Experience

UC Santa Barbara, Department of Physics Fall 2020
Instructor and organizer of graduate short course
Impossible Physics: Constraining the Laws of Nature, from Scattering Amplitudes to Black Holes

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
Defining Gravity: Effective Field Theory, Entanglement, and Cosmology
Thesis advisors: Clifford Cheung and Sean M. Carroll, California Institute of Technology

B.S., Mathematics, *summa cum laude* | University of Minnesota Defended May 2012
Grant N. Remmen
Dynamics of a Rigid Spinning Ring in the Schwarzschild Metric:
A Solution to a Gravitational Problem in Mathematical Physics
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, *summa cum laude* | University of Minnesota Defended December 2011
Grant N. Remmen
Hubble Space Telescope *Subpixel Modeling of Anomalous*
High-Excitation Emission Lines in the Ejecta of Eta Carinae
Thesis advisor: Kris Davidson, MN Institute for Astrophysics, University of Minnesota

B.S., Physics, *summa cum laude* | University of Minnesota Defended April 2010
Grant Remmen
Distortion of Black Holes caused by Motion relative to the Cosmic Microwave Background
Thesis advisor: Robert Gehrz, Director, MN Institute for Astrophysics, University of Minnesota

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 2022–2023

Outreach talk for KITP administrative staff May 2021

Guest lecturer for Caltech's *Storytelling for Scientists* course April 2021

Presented talks on dark matter to physics classes in rural Minnesota 2011

Press

The Current | UCSB January 2022
Quantum Zeta Epiphany

Physics Magazine | American Physical Society December 2021
A Physical Match for the Riemann Zeta Function

Quanta Magazine May 2020
Black Hole Paradoxes Reveal a Fundamental Link Between Energy and Order

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, *From the Earth to the Moon*, based on the Verne novel

Caltech production of *From the Earth to the Moon* |
- 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, *Boldly Go!*, a musical parody based upon *Star Trek*

Caltech production of *Boldly Go!* |
- Mainstage production, Music Director 2016
- Public reading, Music Director 2015

University Study Abroad May Seminar: *Great Minds of the Renaissance*, 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

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