

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 Achilleas P. Porfyriadis, **Grant N. Remmen** under review, JHEP
Large Diffeomorphisms and Accidental Symmetry of the Extremal Horizon arXiv:2112.13853
- Grant N. Remmen** Gen. Rel. Grav. **53** (2021) 101
Exploration of a Singular Fluid Spacetime arXiv:2111.08713
- Nima Arkani-Hamed, Yu-tin Huang, Jin-Yu Liu, **Grant N. Remmen** under review, JHEP
Causality, Unitarity, and the Weak Gravity Conjecture arXiv:2109.13937
- Grant N. Remmen** Phys. Rev. Lett. **127** (2021) 241602, Editors' Suggestion
Amplitudes and the Riemann Zeta Function arXiv:2108.07820
- 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
- Ning Bao, Aidan Chatwin-Davies, **Grant N. Remmen** JHEP **7** (2021) 113
Entanglement Wedge Cross Section Inequalities from Replicated Geometries arXiv:2106.02640
- Ning Bao, Jonathan Harper, **Grant N. Remmen** Phys. Rev. D **105** (2022) 026010
Holevo Information of Black Hole Mesostates arXiv:2103.06888
- Grant N. Remmen**, Nicholas L. Rodd accepted for publication, Phys. Rev. D
Signs, Spin, SMEFT: Sum Rules at Dimension Six arXiv:2010.04723
- Rafael Aoude et al. (including **Grant N. Remmen**) Snowmass 2021 Letter of Interest
On-Shell Methods for the SMEFT
- 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
- Grant N. Remmen**, Nicholas L. Rodd Phys. Rev. Lett. **125** (2020) 081601
Flavor Constraints from Unitarity and Analyticity arXiv:2004.02885
- Clifford Cheung, **Grant N. Remmen** JHEP **5** (2020) 100
Entanglement and the Double Copy arXiv:2002.10470
- Ning Bao, Aidan Chatwin-Davies, Jason Pollack, **Grant N. Remmen** JHEP **8** (2020) 65
Cosmological Decoherence from Thermal Gravitons arXiv:1911.10207
- Grant N. Remmen**, Nicholas L. Rodd JHEP **12** (2019) 32
Consistency of the Standard Model Effective Field Theory arXiv:1908.09845
- 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
- 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
- Raphael Bousso, Yasunori Nomura, **Grant N. Remmen** Phys. Rev. D **99** (2019) 046002
Outer Entropy and Quasilocal Energy arXiv:1812.06987
- Ning Bao, Aidan Chatwin-Davies, **Grant N. Remmen** JHEP **2** (2019) 110
Entanglement of Purification and Multiboundary Wormhole Geometries arXiv:1811.01983
- Grant N. Remmen** Phys. Rev. D **98** (2018) 124008
New Spacetimes for Rotating Dust in $(2+1)$ -Dimensional General Relativity arXiv:1810.12305
- 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
- Yasunori Nomura, **Grant N. Remmen** JHEP **8** (2018) 63
Area Law Unification and the Holographic Event Horizon arXiv:1805.09339

- PUBLICATIONS, Venkatesa Chandrasekaran, **Grant N. Remmen**, JHEP **11** (2018) 15
 CONTINUED Arvin Shahbazi-Moghaddam arXiv:1804.03153
Higher-Point Positivity
- Clifford Cheung, Junyu Liu, **Grant N. Remmen** JHEP **10** (2018) 4
Proof of the Weak Gravity Conjecture from Black Hole Entropy arXiv:1801.08546
- 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
- 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
- Clifford Cheung, **Grant N. Remmen**, Chia-Hsien Shen, Congkao Wen JHEP **4** (2018) 129
Pions as Gluons in Higher Dimensions arXiv:1709.04932
- Clifford Cheung, **Grant N. Remmen** JHEP **9** (2017) 2
Hidden Simplicity of the Gravity Action arXiv:1705.00626
- Sean M. Carroll, **Grant N. Remmen** Phys. Rev. D **95** (2017) 123504
A Nonlocal Approach to the Cosmological Constant Problem arXiv:1703.09715
- Ning Bao, **Grant N. Remmen** EPL (Europhysics Lett.) **121** (2018) 60007, Editor's Choice
Bulk Connectedness and Boundary Entanglement arXiv:1703.00018
- Clifford Cheung, **Grant N. Remmen** JHEP **1** (2017) 104
Twofold Symmetries of the Pure Gravity Action arXiv:1612.03927
- Clifford Cheung, **Grant N. Remmen** Phys. Rev. Lett. **118** (2017) 051601
Positivity of Curvature-Squared Corrections in Gravity arXiv:1608.02942
- 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
- Sean M. Carroll, **Grant N. Remmen** Phys. Rev. D **93** (2016) 124052
What is the Entropy in Entropic Gravity? arXiv:1601.07558
- Clifford Cheung, **Grant N. Remmen** JHEP **4** (2016) 2
Positive Signs in Massive Gravity arXiv:1601.04068
- Ning Bao, Jason Pollack, **Grant N. Remmen** JHEP **11** (2015) 126
Wormhole and Entanglement (Non-)Detection in the $ER=EPR$ Correspondence arXiv:1509.05426
- Brando Bellazzini, Clifford Cheung, **Grant N. Remmen** Phys. Rev. D **93** (2016) 064076
Quantum Gravity Constraints from Unitarity and Analyticity arXiv:1509.00851
- 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
- Ning Bao, ChunJun Cao, Sean M. Carroll, Aidan Chatwin-Davies, Phys. Rev. D **91** (2015) 125036
 Nicholas Hunter-Jones, Jason Pollack, **Grant N. Remmen** arXiv:1504.06632
Consistency Conditions for an AdS Multiscale Entanglement Renormalization Ansatz Correspondence
- Clifford Cheung, **Grant N. Remmen** JHEP **12** (2014) 87
Infrared Consistency and the Weak Gravity Conjecture arXiv:1407.7865

PUBLICATIONS, CONTINUED	Grant N. Remmen , Sean M. Carroll <i>How Many e-Folds Should We Expect from High-Scale Inflation?</i>	Phys. Rev. D 90 (2014) 063517 arXiv:1405.5538
	Clifford Cheung, Grant N. Remmen <i>Naturalness and the Weak Gravity Conjecture</i>	Phys. Rev. Lett. 113 (2014) 051601 arXiv:1402.2287
	Grant N. Remmen , Sean M. Carroll <i>Attractor Solutions in Scalar-Field Cosmology</i>	Phys. Rev. D 88 (2013) 083518 arXiv:1309.2611
	Grant N. Remmen , Kris Davidson, Andrea Mehner <i>Unexpected Ionization Structure in Eta Carinae's "Weigelt Knots"</i>	Astrophys. J. 773 (2013) 27 arXiv:1302.2659
	Grant N. Remmen , Kinwah Wu <i>Complex Orbital Dynamics of a Double Neutron Star System Revolving around a Massive Black Hole</i>	Mon. Not. R. Astron. Soc. 430 (2013) 1940 arXiv:1301.2836
	Grant Remmen , Elwood McCreary <i>Measurement of the Speed and Energy Distribution of Cosmic Ray Muons</i>	JURP 25 (2012)
	Grant Remmen <i>A New Assessment of Dark Matter in the Milky Way Galaxy</i>	JURP 23 (2010)
	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
TALKS	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
	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

TALKS,	Hertz Foundation Innovation Hour (virtual)	June 2021
CONTINUED	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
	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	April 2018
	<i>Quantum Gravity Constraints for Effective Field Theories</i>	

TALKS, CONTINUED	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
	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-part talk	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

TALKS, CONTINUED	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 ORGANIZATION	Organizer UC Santa Barbara High Energy and Gravity Seminar Series Organizer UC Berkeley HEP-QIS Seminar Series Organizer UC Berkeley String Seminar Series	2020–2021 2018–2019 2017–2019
TEACHING EXPERIENCE	UC Santa Barbara, Department of Physics 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 Guest lecturer in Prof. Petr Hořava's Quantum Field Theory course University of Minnesota, Institute of Technology, Department of Astronomy Teaching assistant to Prof. Robert Gehr, Department Chair	Fall 2020 April 2018 Fall 2009
JOURNAL REFEREE	Physical Review Letters Physical Review D Journal of High Energy Physics Nuclear Physics B Scientific Reports - Nature	
SCIENCE OUTREACH	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	May 2021 April 2021 2011
LEADERSHIP, SERVICE, & CULTURAL ACTIVITIES	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>From the Earth to the Moon</i> , based on the Verne novel Co-author/-composer of a two-act musical, <i>Boldly Go!</i> , a musical parody based upon <i>Star Trek</i> Music director of Caltech production of <i>Boldly Go!</i> Mainstage production Public reading University Study Abroad May Seminar: <i>Great Minds of the Renaissance</i> , Italy Examined history of Renaissance scientists (Galileo, daVinci, et al.) and their relationship to society 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	2013–2017 2016–2017 2013–2016 2013–2017 2016 2015 2011 2008–2010 2008–2010 2008–2012 2008–2009 2008

PRESS	Featured in APS <i>Physics Magazine</i> <i>A Physical Match for the Riemann Zeta Function</i>	December 2021
	Featured in <i>Quanta Magazine</i> <i>Black Hole Paradoxes Reveal a Fundamental Link Between Energy and Order</i>	May 2020
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
SCIENTIFIC & HONORARY	American Physical Society	
	American Astronomical Society	
AFFILIATIONS	International Society on General Relativity and Gravitation	
	Golden Key International Honour Society	
	Sigma Pi Sigma, National Physics Honor Society	