

## JACOB LEWIS BOURJAILY

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<http://www-personal.umich.edu/~jbourj/>

### Academic Positions:

<b>Penn State University</b> , University Park, Pennsylvania, USA. Associate Professor of Physics	2020–
<b>Harvard University</b> , Cambridge, Massachusetts, USA. Visiting Professor	2019
<b>Niels Bohr Institute</b> , University of Copenhagen, Copenhagen Ø, Denmark. Affiliated Professor of Physics	2020–
Associate Professor of Physics (fixed term)	2019–2020
Assistant Professor of Physics (fixed term)	2014–2019
<b>Harvard University</b> , Cambridge, Massachusetts, USA. Junior Fellow, Harvard Society of Fellows	2011–2014

### Education:

<b>Princeton University</b> , Princeton, New Jersey, USA. Ph.D. in Theoretical Physics	2008–2011
M.A. in Physics	2006–2008
<b>Cambridge University</b> , Trinity College, Cambridge, UK. M.A.St. (Master of Advanced Studies) in Mathematics	2005–2006
<b>University of Michigan</b> , Ann Arbor, Michigan, USA. B.S. with Highest Honors in Physics and Mathematics	2002–2005

### Research Funding, Grants and Fellowships:

<b>US Department of Energy Grant (CO-PI)</b> : \$215,000	2021
<b>Royal Society (UK) University Research Fellowship</b> (declined): £782,205 (≈\$955,600)	2019
<b>Ernest Rutherford Fellowship, STFC</b> (declined): £503,405.60 (≈\$670,000)	2019
<b>ERC Starting Grant</b> : €1,499,695 (≈\$1,759,000)	2018
<b>Villum Foundation Young Investigator Research Grant</b> : 7,390,515 DKK (≈\$1,035,000)	2017
<b>Danish Council for Independent Research MOBILEX Grant</b> : 2,000,187 DKK (≈\$335,000)	2014
<b>Harvard University Milton Grant</b> : \$40,000	2012

### Academic Honors and Other Awards:

<b>Simons Visiting Scientist</b> , Galileo Galilei Institute	2018
<b>Young Investigators Award</b> , Villum Foundation	2017
<b>Elected Junior Fellow</b> , Harvard Society of Fellows	2011
<b>Marshall Scholarship</b> , Marshall Aid Commemoration Commission, UK	2005–2006
<b>National Science Foundation Graduate Research Fellowship</b>	2005–2009
<b>Casey Award for Public Outreach</b> , Public Museum of Grand Rapids	2014
<b>Prize for Outstanding Teaching</b> , Princeton University Physics Department	2010–2011
<b>Margaret Hunt Scholarship</b> , U of M College of Literature Science & the Arts <i>covering full tuition and living expenses</i>	2003–2005
<b>Writ and Mary Cornwell Scholarship</b> , University of Michigan Department of Physics	2005
<b>Barry M. Goldwater Scholarship</b>	2004
<b>Best Student</b> , Erice International School of Subnuclear Physics	2004
<b>Otto Graf Scholarship</b> , University of Michigan Honors Program	2004
<b>Frank C. Mock Fellowship</b> , University of Michigan Department of Physics	2004
<b>Arthur B. Singleton Distinguished Class Prize</b> , U of M College of Engineering <i>awarded to the most outstanding first year student at the College of Engineering</i>	2003
<b>Kikuchi Memorial Scholar</b> , U of M Dept. of Nuclear Engineering and Radiological Sciences <i>awarded to the most outstanding second [sic] year student of nuclear engineering</i>	2003
<b>Continuous Merit Scholar</b> , U of M Dept. of Nuclear Engineering and Radiological Sciences	2003
<b>Roger B. Chaffee Astronaut Memorial Scholar</b>	2002

**Research Publications:** (total papers: 59; *h*-index: 31; total citations: 3,400+)

- J. Bourjaily, N. Kalyanapuram, *The Stratification of Rigidity*, [arXiv:2207.00596].
- J. Bourjaily, J. Brödel, E. Chaubey, C. Duhr, *et al.*, *Functions Beyond Multiple Polylogarithms for Precision Collider Physics*, [arXiv:2203.07088].
- J. Bourjaily, C. Langer, and Y. Zhang, *All Two-Loop, Color-Dressed, Six-Point Amplitude Integrands in sYM*, [arXiv:2112.06934], Phys.Rev. **D105** (2022) 10, 105015 .
- J. Bourjaily, E. Herrmann, C. Langer, K. Patatoukos, J. Trnka, and M. Zheng, *Integrands of Less-Supersymmetric Yang-Mills at One Loop*, JHEP **03** (2022) 126, [arXiv:2112.06901].
- J. Bourjaily, C. Langer, and Y. Zhang, *Illustrations of Integrand-Basis Building at Two Loops*, JHEP (in press.), [arXiv:2112.05157].
- J. Bourjaily, Y-H. He, A. J. McLeod, M. Spradlin, C. Vergu, M. Volk, M. von Hippel, and M. Wilhelm, *Direct Integration for Multi-leg Amplitudes: Tips, Tricks, and When They Fail*, [arXiv:2103.15423].
- J. Bourjaily, C. Langer, and K. Patatoukos, *Locally Finite Observables in sYM*, JHEP **04** (2021) 298, [arXiv:2102.02821].
- J. Bourjaily, N. Kalyanapuram, C. Langer, and K. Patatoukos, *Prescriptive Unitarity with Elliptic Leading Singularities*, Phys.Rev. **D104** (2021) 12, 125009 [arXiv:2102.02210].
- J. Bourjaily, N. Kalyanapuram, C. Langer, K. Patatoukos, and M. Spradlin, *An Elliptic Yangian-Invariant, ‘Leading Singularity’*, Phys.Rev.Lett. **125** (2021) 20, 201601 [arXiv:2012.14438].
- J. Bourjaily, E. Herrmann, C. Langer, and J. Trnka, *Building Bases of Loop Integrands*, JHEP **11** (2020) 116, [arXiv:2007.13905].
- J. Bourjaily, H. Holmfridur Hannesdottir, A. J. McLeod, M. Schwartz, and C. Vergu, *Sequential Discontinuities of Feynman Integrals and the Monodromy Group*, JHEP **01** (2021) 205, [arXiv:2007.13747].
- J. Bourjaily, E. Gardi, A. J. McLeod, and C. Vergu, *All-Mass  $n$ -gons in  $n$  Dimensions*, JHEP, **08** (2020) 029, [arXiv:1912.11067].
- J. Bourjaily, M. Volk, and M. von Hippel, *Conformally Regulated Direct Integration of the Two-Loop Heptagon Remainder*, JHEP **02** (2020) 095, [arXiv:1912.05690].
- J. Bourjaily, E. Herrmann, C. Langer, A. J. McLeod, and J. Trnka, *All-Multiplicity Non-Planar MHV Amplitudes in sYM at Two Loops*, Phys.Rev.Lett. **124** (2020) 11, 111603 [arXiv:1911.09106].
- J. Bourjaily, A. J. McLeod, C. Vergu, M. Volk, M. von Hippel, and M. Wilhelm, *Rooting Out Letters: Octagonal Symbol Alphabets and Algebraic Number Theory*, JHEP **2002** (2020) 025, [arXiv:1910.14224].
- J. Bourjaily, A. J. McLeod, C. Vergu, M. Volk, M. von Hippel, and M. Wilhelm, *Embedding Feynman Integral (Calabi-Yau) Geometry in Weighted Projective Space*, JHEP **2001** (2020) 078, [arXiv:1910.01534].
- J. Bourjaily, E. Herrmann, C. Langer, A. J. McLeod, and J. Trnka, *Prescriptive Unitarity for Non-Planar Six Particle Amplitudes at Two Loops*, JHEP **012** (2019) 073, [arXiv:1909.09131].
- J. Bourjaily, F. Dulat, and E. Panzer, *Manifestly Dual-Conformal Loop Integration*, Nucl.Phys. **B 942** (2019) 251, [arXiv:1901.02887].
- J. Bourjaily, E. Herrmann, and J. Trnka, *Amplitudes at Infinity*, Phys.Rev. **D99** (2019) 6, 66006 [arXiv:1812.11185].
- J. Bourjaily, A. J. McLeod, M. von Hippel, and M. Wilhelm, *A (Bounded) Bestiary of Feynman Integral Calabi-Yau Geometries*, Phys.Rev.Lett. **122** (2019) 3, 031601, [arXiv:1810.07689].
- J. Bourjaily, A. J. McLeod, M. von Hippel, and M. Wilhelm, *Rationalizing Loop Integration*, JHEP **1808** (2018) 184, [arXiv:1805.10281].
- J. Bourjaily, Y-H. He, A. J. McLeod, M. von Hippel, and M. Wilhelm, *Traintracks Through Calabi-Yaus: Amplitudes Beyond Elliptic Polylogarithms*, Phys.Rev.Lett. **121** (2018) 7, 071603, [arXiv:1805.09326].
- J. Bourjaily, A. J. McLeod, M. Spradlin, M. von Hippel, and M. Wilhelm, *Elliptic Double-Box Integrals*, Phys.Rev.Lett. **120** (2018) 12, 121603, [arXiv:1712.02785].
- J. Bourjaily, E. Herrmann, and J. Trnka, *Prescriptive Unitarity*, JHEP **1705** (2017) 1, [arXiv:1704.05460].
- J. Bourjaily, S. Haco, S. Hawking, and M. Perry, *The Conformal BMS Group*, JHEP **1711** (2017) 12, [arXiv:1701.08110].
- C. Baadsgaard, N. E. J. Bjerrum-Bohr, J. Bourjaily, and P. H. Damgaard, *String-Like Dual Models for Scalar Theories*, JHEP **1612** (2016) 019, [arXiv:1610.04228].
- J. Bourjaily, P. Heslop, V-V. Tran, *Amplitudes and Correlators to Ten Loops Using Simple, Graphical Bootstraps*, JHEP **1611** (2016) 125, [arXiv:1609.00007].

- N. E. J. Bjerrum-Bohr, J. Bourjaily, P. H. Damgaard, and B. Feng, *Manifesting Color-Kinematics Duality in the Scattering Equation Formalism*, JHEP **1609** (2016) 094, [[arXiv:1608.00006](#)].
- J. Bourjaily, S. Franco, D. Galloni, and C. Wen, *Stratifying On-Shell Cluster Varieties: the Geometry of Non-Planar On-Shell Diagrams*, JHEP **1610** (2016) 003, [[arXiv:1607.01781](#)].
- N. E. J. Bjerrum-Bohr, J. Bourjaily, P. H. Damgaard, and B. Feng, *Analytic Representations of Yang-Mills Amplitudes*, Nucl.Phys. **B 913** (2016) 964, [[arXiv:1605.06501](#)].
- J. Bourjaily, P. Heslop, V-V. Tran, *Perturbation Theory at Eight Loops: Novel Structures and the Breakdown of Manifest Conformality*, Phys.Rev.Lett. **116** (2016) 19, 191602, [[arXiv:1512.07912](#)].
- C. Baadsgaard, N. E. J. Bjerrum-Bohr, J. Bourjaily, S. Caron-Huot, P. H. Damgaard, and B. Feng, *New Representations of the Perturbative S-Matrix*, Phys.Rev.Lett. **116** (2016) 6, 061601, [[arXiv:1509.02169](#)].
- C. Baadsgaard, N. E. J. Bjerrum-Bohr, J. Bourjaily, P. H. Damgaard, and B. Feng, *Integration Rules for Loop Scattering Equations*, JHEP **1511** (2015) 080, [[arXiv:1508.03627](#)].
- C. Baadsgaard, N. E. J. Bjerrum-Bohr, J. Bourjaily, and P. H. Damgaard, *Scattering Equations and Feynman Diagrams*, JHEP **1509** (2015) 136, [[arXiv:1507.00997](#)].
- C. Baadsgaard, N. E. J. Bjerrum-Bohr, J. Bourjaily, and P. H. Damgaard, *Integration Rules for Scattering Equations*, JHEP **1509** (2015) 129, [[arXiv:1506.06137](#)].
- J. Bourjaily and J. Trnka, *Local Integrand Representations of All Two-Loop Amplitudes in Planar SYM*, JHEP **1508** (2015) 119, [[arXiv:1505.05886](#)].
- N. Arkani-Hamed, J. Bourjaily, F. Cachazo, A. Postnikov, and J. Trnka, *On-Shell Structures of MHV Amplitudes Beyond the Planar Limit*, JHEP **1506** (2015) 179, [[arXiv:1412.8475](#)].
- N. Arkani-Hamed, J. Bourjaily, F. Cachazo, and J. Trnka, *On the Singularity Structure of Maximally Supersymmetric Scattering Amplitudes*, Phys.Rev.Lett. **113** (2014) 26, 261603, [[arXiv:1410.0354](#)].
- J. Bourjaily, S. Caron-Huot, and J. Trnka, *Dual-Conformal Regularization of Infrared Loop Divergences and the Chiral Box Expansion*, JHEP **1501** (2015) 001, [[arXiv:1303.4734](#)].
- J. Bourjaily, *Positroids, Plabic Graphs, and Scattering Amplitudes* in MATHEMATICA, [[arXiv:1212.6974](#)].
- N. Arkani-Hamed, J. Bourjaily, F. Cachazo, A. Goncharov, A. Postnikov, and J. Trnka, *Scattering Amplitudes and the Positive Grassmannian*, [[arXiv:1212.5605](#)].
- J. Bourjaily, A. Dire, A. Shaikh, M. Spradlin, and A. Volovich, *The Soft-Collinear Bootstrap:  $\mathcal{N} = 4$  Yang-Mills Amplitudes at Six and Seven Loops*, JHEP **1203** (2012) 032, [[arXiv:1112.6432](#)].
- N. Arkani-Hamed, J. Bourjaily, F. Cachazo, A. Hodges, and J. Trnka, *A Note on Polytopes for Scattering Amplitudes*, JHEP **1204** (2012) 081, [[arXiv:1012.6030](#)].
- N. Arkani-Hamed, J. Bourjaily, F. Cachazo, and J. Trnka, *Local Integrals for Planar Scattering Amplitudes*, JHEP **1206** (2012) 125, [[arXiv:1012.6032](#)].
- J. Bourjaily, *Efficient Tree Amplitudes in  $\mathcal{N} = 4$ : Automatic BCFW Recursion* in MATHEMATICA, [[arXiv:1011.2447](#)].
- N. Arkani-Hamed, J. Bourjaily, F. Cachazo, S. Caron-Huot, and J. Trnka, *The All-Loop Integrand for Scattering Amplitudes in  $\mathcal{N} = 4$  SYM*, JHEP **1101** (2011) 041, [[arXiv:1008.2958](#)].
- J. Bourjaily, J. Trnka, A. Volovich, and C. Wen, *The Grassmannian and the Twistor String: Connecting All Trees in  $\mathcal{N} = 4$  SYM*, JHEP **1101** (2011) 038, [[arXiv:1006.1899](#)].
- N. Arkani-Hamed, J. Bourjaily, F. Cachazo, and J. Trnka, *Unification of Residues and Grassmannian Dualities*, JHEP **1101** (2011) 049, [[arXiv:0912.4912](#)].
- N. Arkani-Hamed, J. Bourjaily, F. Cachazo, and J. Trnka, *Local Spacetime Physics from the Grassmannian*, JHEP **1101** (2011) 108, [[arXiv:0912.3249](#)].
- J. Bourjaily, *Effective Field Theories for Local Models in F-Theory and M-Theory*, [[arXiv:0905.0142](#)].
- J. Bourjaily, *Local Models in F-Theory and M-Theory with Three Generations*, [[arXiv:0901.3785](#)].
- J. Bourjaily and S. Espahbodi, *Geometrically Engineerable Chiral Matter in M-Theory*, [[arXiv:0804.1132](#)].
- J. Bourjaily, *Unfolding Geometric Unification in M-Theory*, [[arXiv:0706.3364](#)].
- J. Bourjaily, *Geometrically Engineering the Standard Model: Locally Unfolding Three Families out of  $E_8$* , Phys.Rev. **D76** (2007) 045004, [[arXiv:0704.0445](#)].
- J. Bourjaily, *Multiple Unfoldings of Orbifold Singularities: Engineering Geometric Analogies to Unification*, Phys.Rev. **D79** (2009) 046005, [[arXiv:0704.0444](#)].
- J. Bourjaily, G. Kane, P. Kumar, and T. Wang, *Outside the mSUGRA Box*, [[hep-ph/0504170](#)].
- J. Bourjaily and G. Kane, *What is the Cosmological Significance of a Discovery of Wimps at Colliders or in Direct Experiments?*, [[hep-ph/0501262](#)].

J. Bourjaily, *Determining the Actual Local Density of Dark Matter Particles*, Eur.Phys.J. C Direct (2005), [[astro-ph/0410470](#)].

J. Bourjaily, *Weighing the Dark Matter Halo*, “IDM 2004: The 5th International Workshop on the Identification of Dark Matter,” eds. N. Spooner *et al.*, [[astro-ph/0411409](#)].

### Books:

N. Arkani-Hamed, J. Bourjaily, F. Cachazo, A. Goncharov, A. Postnikov, and J. Trnka, *Grassmannian Geometry of Scattering Amplitudes*, Cambridge University Press, 2016.

### Invited Contributions and Reviews:

J. Bourjaily and H. Thomas, *What is the Amplituhedron?*, Notices, American Mathematical Society, **60**, 2018.

### Reviews of Research in the Popular Press:

A. Ananthaswamy, “The Geometry of Space-Time”, (Cover Story,) *New Scientist*, **3136**, 29 July 2017.

N. Wolchover, “A Jewel at the Heart of Quantum Physics,” *Quanta Magazine*, 2013.

E. Reich, “Rethinking Particle Dynamics,” *Nature*, **502**, 2013, 19.

R. Highfield, “Physics Won’t be the Same Again,” *The Telegraph*, 8 October 2013.

A. Hodges, “Particle Physics: Theory with a Twistor,” *Nature Physics* **9**, 2013, 205-206.

N. Turok, “Particle Physics: Beyond Feynman’s Diagrams,” *Nature* **469**, 2011, 165-166.

### Invited Colloquia, Seminars, Conferences, Workshops, Schools, and Public Lectures:

#### 2022

May **Invited Speaker**, *LoopFest 2022*, University of Pittsburgh, Pittsburgh, PA.

**Plenary Lecture**, *Phenomenology 2022*, University of Pittsburgh, Pittsburgh, PA.

Apr. **Invited Seminar**, Physics Theory Workshop, Arizona State University, Tempe, AZ.

Jan. **Invited Seminar**, *Combinatorics Seminar*, CMSA, Harvard Mathematics, Cambridge, MA.

#### 2021

Dec. **Panelist**, Golden Webinar, Institute of Astrophysics, Pontificia Universidad Católica de Chile, Santiago, Chile.

**Invited Seminar**, Department of Physics, TUM, München, Germany.

Nov. **Colloquium**, Department of Physics, Trinity College, Dublin, Ireland.

**Public Lecture**, Society of Physics Students, Penn State University, State College, PA.

Oct. **Invited Seminar**, *Geometry, Algebra, and Physics*, Penn State Mathematics Dept., State College, PA.

Aug. **Session Chair**, *SUSY 2021*, Shanghai, China.

**Primary Organizer**, *Amplitudes 2021*, Niels Bohr Institute, Copenhagen, Denmark.

**Invited Lecture**, *Nankai Symposium*, Chern Institute for Mathematics, Nankai, China.

July **Invited Lecturer**, *Amplitudes Game 2021 PhD School*, MITP, Mainz, Germany.

Jun. **Discussion Leader**, *Positive Geometries Workshop*, Mainz Institute for Theoretical Physics, Mainz, Germany.

#### 2020

Dec. **Conference Organizer**, *QCD Meets Gravity VI*, Northwestern University, Evanston, IL.

Nov. **Public Lecture**, *Maron Memorial Lecture*, GR Amateur Astronomical Association, Grand Rapids, MI.

**Public Lecture**, Public Museum of Grand Rapids, Grand Rapids, MI.

Sept. **Conference Organizer**, *Elliptics and Beyond, 2020*, Zoom.

July **Invited Lecture**, *Recent Developments in S-Matrix Theory*, ICTS, TIFR, Bangalore, India.

Mar. **Invited Seminar**, Institute for Gravitation and Cosmology, Penn State University, PA.

**Invited Lecture**, *Cluster Algebras Workshop*, Higgs Centre, University of Edinburgh, Edinburgh, UK.

Feb. **Invited Lecturer**, 2nd SageX Training School, Humboldt-Universität, Berlin, Germany.

#### 2019

Nov. **Invited Speaker**, Joint MIT-Harvard-MSR *Combinatorics Seminar*, Harvard Mathematics, Cambridge, MA.

**Invited Seminar**, University of New Hampshire, Durham, NH.

**Invited Seminar**, Theoretical Physics Group, Brown University, Providence, RI.

Oct. **Invited Seminar**, High Energy Theory Group, McGill University, Montréal, Canada.

July **Workshop Organizer**, *Amplitudes and the Conformal Bootstrap*, Aspen Center for Physics, Aspen, CO.

June **Invited Speaker**, *Amplitudes 2019*, Trinity College, Dublin, Ireland.

**Invited Seminar**, Theoretical Physics Seminar, Nikhef, Amsterdam, Netherlands.

May **Invited Lecturer**, *PhD School on Amplitudes, Cosmology, and Positive Geometry*, Lecce, Italy.

**Colloquium**, Department of Applied Mathematics and Theoretical Physics, Cambridge University, UK.

**Invited Lecture**, *Simons Symposium: Amplitudes Meets Cosmology*, Elmau, Germany.

- Invited Seminar**, CERN Theory Division, Genève, Switzerland.
- Apr. **Colloquium**, Niels Bohr International Academy, Københavns University, Copenhagen, Denmark.  
**Colloquium**, Higgs Centre for Theoretical Physics, University of Edinburgh, Edinburgh, UK.
- Mar. **Invited Lecture**, *Frontiers of Theoretical Physics*, The Graduate Center, CUNY, New York, NY.  
**Local Organizer**, Simons Meeting: *Amplitudes in String and Field Theory*, NBIA, Copenhagen, Denmark.  
**Invited Seminar**, *Special Theoretical Physics Seminar*, Yale University, New Haven, CT.
- Feb. **Colloquium**, Physics Department, Penn State University, State College, PA.  
**Local Organizer**, Simons Meeting: *Hadronic Strings & Large- $N$  Theory*, NBIA, Copenhagen, Denmark.
- Jan. **Invited Seminar**, Theory Group Seminar, Max-Planck-Institut für Physik, München, Germany.  
**Invited Seminar**, String Theory Seminar, DESY & University of Hamburg, Hamburg, Germany.
- 2018** **Invited Seminar**, QMAP, Physics Department, University of California, Davis, CA.
- Dec. **Colloquium**, High Energy Physics Group, Zhejiang Institute of Modern Physics, Hangzhou, China.  
**Invited Seminar**, High Energy Physics Group, Zhejiang Institute of Modern Physics, Hangzhou, China.
- Nov. **Simons Visiting Scientist**, *Amplitudes in the LHC Era*, Galileo Galilei Institute, Arcetri, Florence, Italy.
- Oct. **Invited Speaker**, *Theoretical Tools for Precision Physics*, Galileo Galilei Institute, Arcetri, Florence, Italy.  
**Invited Seminar**, Physics Department, Oxford University, Oxford, UK.  
**Invited Seminar**, Mathematical Institute, Oxford University, Oxford, UK.
- Sept. **Invited Speaker**, *Cooks Branch/Mitchell Meeting*, Brinsop Court, Hereford, UK.  
**Invited Speaker**, *Elliptic Integrals in Mathematics and Physics*, Ascona, Switzerland.
- Aug. **Invited Speaker**, *Integrability in Gauge and String Theory 2018*, Niels Bohr Institute, Copenhagen, Denmark.  
**Local Organizer**, *Current Themes in High Energy Physics and Cosmology*, NBIA, Copenhagen, Denmark.
- June **Invited Speaker**, *Amplitudes 2018*, SLAC, Stanford University, Menlo Park, CA.  
**Invited Lecturer**, *Amplitudes Summer School 2018*, University of California, Davis, CA.  
**Invited Lecturer**, *Structures in Local Quantum Field Theory School*, Les Houches, France.
- May **Invited Seminar**, *Quantum Field and String Seminar*, Humboldt-Universität, Berlin, Germany.  
**Invited Speaker**, *N-Talk*, Niels Bohr International Academy, Københavns University, Copenhagen, Denmark.
- Apr. **Invited Seminar**, *String Duality Seminar*, Harvard Physics Department, Cambridge MA.  
**Invited Seminar**, *Geometry and Physics*, Department of Mathematics, Boston University, Boston, MA.  
**Invited Speaker**, *Simons Collaboration Meeting*, CMSA, Harvard Mathematics Department, Cambridge, MA.
- Mar. **Invited Speaker**, *Workshop on Holography and Gauge Theories*, Southampton University, Southampton, UK.  
**Colloquium**, IPhT CEA, Saclay, Paris, France.  
**Invited Seminar**, Mathematical Institute, Oxford University, Oxford, UK.
- Feb. **Invited Seminar**, *Rencontres Théoriciennes*, Institut Henri Poincaré, Paris, France.  
**Mini-Course**, *Cluster Varieties*, Niels Bohr Institute, Københavns University, Copenhagen, Denmark.
- Jan. **Invited Seminar**, Niels Bohr Institute, Københavns University, Copenhagen, Denmark.
- 2017**
- Dec. **Invited Speaker**, *UK Theory Christmas Meeting*, IPPP, Durham University, Durham, UK.  
**Invited Speaker**, *QCD Meets Gravity*, University of California, Los Angeles, CA.
- Nov. **Invited Seminar**, Physics Department, Uppsala University, Uppsala, Sweden.
- Oct. **Invited Seminar**, Department of Mathematics, Københavns University, Copenhagen, Denmark.
- Sept. **International Workshop**, *Mathematics and Physics of Scattering Amplitudes*, MIAPP, München, Germany.
- Aug. **Local Organizer**, *Current Themes in Physics and Cosmology*, Niels Bohr Institute, Copenhagen, Denmark.  
**Invited Seminar**, *Particle and Nuclear Theory Seminar*, Charles University, Prague, Czech Republic.
- Apr. **Invited Seminar**, *Scattering Amplitudes Workshop*, KITP, University of California, Santa Barbara, CA.  
**Invited Lecture**, *Scattering Amplitudes Conference*, KITP, University of California, Santa Barbara, CA.
- Mar. **Invited Seminar**, Physics Department, ETH, Zürich, Switzerland.  
**Colloquium**, Physics Department, Trinity College, Dublin, Ireland.  
**Invited Seminar**, High Energy Physics Theory, McGill University, Montréal, Canada.
- Feb. **Invited Seminar**, High Energy Physics Group, University of California, Los Angeles, CA.  
**Invited Lecture**, *Mainz Workshop on Amplitudes*, MITP, Mainz, Germany.
- Jan. **Invited Seminar**, CEA Saclay, Paris, France.  
**Invited Seminar**, *Seminar Fundamentale Wechselwirkungen*, Freiburg University, Freiburg, Germany.
- 2016** **International Conference**, *New Horizons in Twistor Theory*, Oxford University, Oxford, UK.
- Dec. **Invited Speaker**, *QMAP (Inaugural) Conference*, University of California, Davis, CA.

- Invited Speaker**, *QCD Meets Gravity Conference*, University of California, Los Angeles, CA.  
**Invited Seminar**, Instituto Superior Técnico, Universidade de Lisboa, Lisbon, Portugal.
- Nov. **Invited Seminar**, Physics Department, University of California, Los Angeles, CA.
- Oct. **Invited Seminar**, Mathematics Department, University of California, Davis, CA.  
**Invited Lecture**, *Amplitudes in Asia 2016*, Beijing, China.
- Sept. **Invited Lecture**, *Mitchell Meeting on Theoretical Physics*, Brinsop Court, Hereford, England.  
**Invited Lecture**, *New Formulations of Amplitudes*, Ludwig-Maximilians-Universität, München, Germany.
- Aug. **Local Organizer**, *Current Themes in Physics and Cosmology*, Niels Bohr Institute, Copenhagen, Denmark.
- July **Invited Lecture**, *Amplitudes 2016*, NORDITA, Stockholm, Sweden.
- June **International Workshop**, *Aspects of Amplitudes*, NORDITA, Stockholm, Sweden.  
**Invited Lectures**, *California Amplitudes Meeting*, University of California, Davis, CA.
- May **Invited Lecture Series**, *Cracow School of Theoretical Physics*, Zakopane, Poland.
- Mar. **Invited Seminar**, Physics Department, University of California, Los Angeles, CA.  
**International Conference**, *MHV@30*, Fermilab, Batavia, IL.
- Feb. **Invited Seminar**, Mathematics Department, University of California, Davis, CA.  
**Invited Seminar**, Physics Department, Brown University, Providence, RI.
- 2015** **Invited Seminar**, Physics Department, University of California, Davis, CA.
- Dec. **Invited Seminar**, Ludwig-Maximilians-Universität, München, Germany.
- Nov. **Invited Lecture**, *Amplitudes in Asia 2015*, National Center for Theoretical Sciences, Taipei, Taiwan.
- Oct. **Public Lecture**, *Great Lakes Planetarium Association Annual Conference*, Grand Rapids, MI.
- Aug. **Local Organizer**, *Current Themes in Physics and Cosmology*, Niels Bohr Institute, Copenhagen, Denmark.  
**Invited Lecture**, *Positive Grassmannians Workshop*, CRM, University of Montréal, Canada.
- July **Invited Lecture**, Aspen Center for Physics, Aspen, CO.  
**Public Lecture**, Aspen Science Center and the Aspen Center for Physics, Aspen, CO.
- June **Invited Lecture**, *Strings 2015*, Tata Institute of Fundamental Research, Bangalore, India.  
**Invited Lectures**, Humboldt-Universität, Berlin, Germany.
- May **Invited Seminar**, Joint Belgium High Energy Seminar, University of Leuven, Leuven, Belgium.  
**Invited Seminar**, CERN Theory Division, Genève, Switzerland.
- Apr. **Public Lecture**, Grand Rapids Amateur Astronomical Association, Grand Rapids, MI.  
**Colloquium**, *NBIA-Oxford Theory Colloquium*, NBIA, Copenhagen, Denmark.  
**Invited Seminar**, California Institute of Technology, Pasadena, CA.
- Mar. **Public Lecture**, Kendall College of Art and Design, Ferris State University, Grand Rapids, MI.  
**Invited Seminar**, Niels Bohr International Academy, University of Copenhagen, Copenhagen, Denmark.  
**Invited Seminar**, *Schrödinger Institute Workshop*, Vienna, Austria.  
**Invited Lecture Series**, *Schrödinger Institute Master Class*, Vienna, Austria.
- Feb. **Invited Seminar**, INFN University of Rome, Tor Vergata, Italy.
- Jan. **Invited Lecture Series**, *Nordic Winter School on Cosmology and Particle Physics*, Lillehammer, Norway.
- 2014**
- Dec. **Invited Lectures**, *Grassmannian Geometry of Scattering Amplitudes*, Caltech, Pasadena, CA.
- Nov. **Invited Lecture**, *IAS Focused Program on Scattering Amplitudes*, HKUST, Hong Kong, China.  
**Public Lecture**, *News from the Niels Bohr International Academy*, NBIA, Copenhagen, Denmark.
- Sept. **International Workshop**, *New Geometric Structures in Scattering Amplitudes*, Oxford, England.  
**Invited Seminar**, CP<sup>3</sup> Origins, University of Southern Denmark, Odense, Denmark.
- Aug. **Invited Lecture**, *Current Themes in Physics and Cosmology*, Niels Bohr Institute, Copenhagen, Denmark.
- July **Plenary Lecture**, *SUSY 2014*, Manchester University, Manchester, England.
- May **Invited Lecture**, *Rep. Theory, Integrable Systems & Quantum Fields*, Northwestern University, Evanston, IL.
- Apr. **Invited Seminar**, Niels Bohr International Academy, Copenhagen, Denmark.
- Mar. **Invited Seminar**, *AMS Sectional Meeting*, University of Tennessee, Knoxville, TN.  
**Invited Seminars**, Physics and Mathematics Departments, University of Texas, Austin, TX.  
**Plenary Lecture**, *IEEE Aerospace Conference*, Yellowstone, MT.
- Feb. **Colloquium**, Triangle Nuclear Theory, Duke University, Durham, NC.  
**Invited Lecture**, *Workshop on Amplitudes*, California Institute of Technology, Pasadena, CA.
- Jan. **Invited Seminar**, Physics Department, University of California, Berkeley, CA.  
**Combinatorics Seminar**, Mathematics Department, University of California, Berkeley, CA.

- 2013** **Invited Seminar**, SLAC, Stanford University, Menlo Park, CA.  
 Dec. **Invited Seminar**, Physics Department, Brown University, Providence, RI.  
 Nov. **Invited Seminar**, California Institute of Technology, Pasadena, CA.  
**Invited Lecture Series**, *SPOCK Symposium*, Thomas More College, Crestview Hills, KY.  
**Invited Seminar**, University of Cincinnati, Cincinnati, OH.  
**Invited Seminar**, University of Michigan, Ann Arbor, MI.  
 Oct. **Invited Lecture**, *Physics and Mathematics of Scattering Amplitudes*, Simons Center, Stony Brook, NY.  
 July **Invited Lecture**, Aspen Center for Physics, Aspen, CO.  
**Invited Lecture**, *Amplitudes, Strings and Branes*, CERN, Genève, Switzerland.  
**Invited Lecture Series**, *London Mathematical Society Summer School*, Durham, England.  
**Invited Lecture**, *London Mathematical Society Symposium*, Durham, England.  
 May **Invited Lecture Series**, Weizmann Institute, Rehovot, Israel.  
 Apr. **Invited Seminar**, Harvard University, Cambridge, MA.  
**Invited Seminar**, Massachusetts Institute of Technology, Cambridge, MA.  
**Keynote Speaker**, Roger B. Chaffee Astronaut Memorial Scholarship, Grand Rapids, MI.  
**Public Lecture**, Grand Rapids Amateur Astronomical Association, Grand Rapids, MI.  
 Mar. **Invited Lecture**, *Cook's Branch Workshop*, Montgomery, TX.  
**Invited Seminar**, University of New Hampshire, Durham, NH.  
**Invited Seminar**, Carnegie Mellon University, Pittsburgh, PA.  
 Feb. **Invited Seminar**, Syracuse University, Syracuse, NY.
- 2012**  
 Nov. **Invited Seminar**, Harvard University, Cambridge, MA.  
 Oct. **Invited Seminar**, Boston University, Boston, MA.  
 Sept. **Invited Seminar**, Tata Institute of Fundamental Research, Bangalore, India.  
 Aug. **Invited Lecture**, *Geometry of Scattering Amplitudes Workshop*, Banff, Alberta, Canada.  
**Invited Lecture**, *International Congress on Mathematical Physics*, Aalborg, Denmark.  
 Apr. **Invited Seminar**, Harvard University, Cambridge, MA.  
**TEDx Talk**, *TEDxUofM Conference*, Ann Arbor, MI.  
 Mar. **Invited Lecture**, *Amplitudes 2012*, DESY, Hamburg, Germany.  
 Feb. **Invited Seminar**, Brandeis University, Waltham, MA.  
 Jan. **Invited Seminar**, Cornell University, Ithaca, NY.
- 2011**  
 Nov. **International Conference**, *Amplitudes 2011*, University of Michigan, Ann Arbor, MI.  
 Oct. **Public Lecture**, Grand Rapids Amateur Astronomical Association, Grand Rapids, MI.  
 Aug. **Invited Lecture Series**, *MATHEMATICA Summer School on Theoretical Physics*, Waterloo, Canada.  
 June **Invited Seminars**, Institute for the Physics and Mathematics of the Universe, Tokyo, Japan.  
 Jan. **Invited Seminar**, University of North Carolina, Chapel Hill, NC.
- 2010**  
 Nov. **Invited Seminar**, Massachusetts Institute of Technology, Cambridge, MA.  
 Oct. **Invited Seminar**, Institute for Advanced Study, Princeton, NJ.  
**Invited Seminar**, University of Texas, Austin, TX.  
 Sept. **Invited Lecture**, *Integrability in Scattering Amplitudes*, Perimeter Institute, Waterloo, Canada.  
**Invited Seminar**, Johns Hopkins University, Baltimore, MD.  
 June **Summer School**, *Cargèse Summer School on Theoretical Physics 2010*, Corsica, France.  
 May **International Conference**, *Amplitudes 2010*, London, England.  
 Feb. **Invited Seminar**, Brown University, Providence, RI.
- 2009**  
 Nov. **Invited Seminar**, The Ohio State University, Columbus, OH.  
 June **International Conference**, *Strings 2009*, Rome, Italy.  
**Invited Lecture**, *String Phenomenology 2009*, Warsaw, Poland.  
 Mar. **Invited Lecture**, *Cook's Branch Workshop*, Montgomery, TX.  
 Feb. **Invited Seminar**, Harvard University, Cambridge, MA.  
 Jan. **Winter School**, *Winter School in Theoretical Physics*, Institute for Advanced Studies, Jerusalem, Israel.

**2008**

- Oct. **Invited Lecture**, *Stringy Reflections on The LHC*, Clay Mathematics Institute, Cambridge, MA.
- Aug. **International Conference**, *Strings 2008*, CERN, Genève, Switzerland.
- Invited Lecture**, *String Phenomenology 2008*, CERN Theory Institute, Genève, Switzerland.
- July **Invited Lecture**, *Simons Workshop in Mathematics and Physics 2008*, Stony Brook, NY.
- June **Summer School**, *Cargèse Summer School on Theoretical Physics 2008*, Corsica, France.
- May **Invited Seminar**, The Ohio State University, Columbus, OH.
- Invited Seminar**, Institute for Advanced Study, Princeton, NJ.
- Apr. **Invited Lecture**, *String Vacuum Project Workshop*, University of Arizona, Tucson, AZ.

**2007**

- Aug. **Invited Lecture**, *Simons Workshop in Mathematics and Physics 2007*, Stony Brook, NY.
- Invited Seminar**, Michigan Center for Theoretical Physics, University of Michigan, Ann Arbor, MI.
- July **Summer School**, *Les Houches Summer School on Theoretical Physics 2007*, Les Houches, France.
- June **International Conference**, *Strings 2007*, Madrid, Spain.
- Apr. **Invited Lecture**, *Physics and Mathematics of  $G_2$  Compactifications*, University of Michigan, Ann Arbor, MI.
- Mar. **International Conference**, *Physics at the LHC*, Princeton University, Princeton, NJ.

**2006**

- Oct. **International Conference**, *Axions at the IAS*, Institute for Advanced Study, Princeton, NJ.
- Sept. **Invited Scientist**, *Erice International School for Subnuclear Physics 2006*, Erice, Sicily, Italy.
- Apr. **International Conference**, *LHC Inverse Workshop*, University of Michigan, Ann Arbor, MI.

**2005**

- Sept. **Invited Seminar**, Case Western Reserve, Cleveland, OH.
- June **Summer School**, *Theoretical Advanced Study Institute (TASI) 2005*, Boulder, CO.
- Feb. **Invited Seminar**, Kavli Institute for Cosmological Physics, University of Chicago, Chicago, IL.

**2004**

- Nov. **Colloquium**, Michigan Center for Theoretical Physics, University of Michigan, Ann Arbor, MI.
- Sept. **Invited Lecture**, *International Workshop on the Identification of Dark Matter 2004*, Edinburgh, Scotland.
- Aug. **Summer School**, *International School of Subnuclear Physics 2004*, Erice, Sicily, Italy.
- International Conference**, *Strings at CERN*, CERN, Genève, Switzerland.
- June **International Conference**, *Strings 2004*, Paris, France.
- May **International Workshop**, *Dark Side of the Universe*, University of Michigan, Ann Arbor, MI.
- May **International Conference**, *Nonperturbative Quantum Gravity*, Marseilles, France.



## Teaching Experience:

**Associate Professor**, 2020 to present.

Penn State University, State College, PA.

*Introduction to Quantum Mechanics*, Fall 2020.

*Subatomic Physics*, Spring 2021, 2022.

**Associate Instructor**, Fall 2006 to Spring 2011.

Princeton University, Princeton, New Jersey.

*Relativistic Quantum Field Theory II*, Spring 2008 and 2010.

*Advanced (Graduate) Quantum Mechanics II*, Spring 2010.

*Analytical Mechanics*, Fall 2009.

*General Physics Laboratories*, Fall 2010 to Spring 2011.

*awarded the Physics Department's Prize for Outstanding Teaching*, 2010–2011

*Future Physics*, Fall 2006 to Spring 2011.

## Invited Lecture Series, Mini-Courses, and PhD Schools

*Amplitudes Summer School*, Charles University, Prague, Czech Republic, August 2022.

*The Amplitudes Games*, Mainz Institute for Theoretical Physics, Mainz, Germany, July 2021.

*2nd SageX Training School*, Humboldt-Universität, Berlin, Germany, February 2020.

*International School on Amplitudes, Cosmology, and Positive Geometry*, Lecce, Italy, May 2019.

*Amplitudes Summer School*, University of California, Davis, CA, June 2018.

*Structures in Local Quantum Field Theories*, Les Houches, France, June 2018.

Mini-Course on Cluster Varieties, Niels Bohr Institute, Copenhagen, Denmark, February 2018.

*Cracow School for Theoretical Physics*, Zakopane, Poland, May 2016.

*Schrödinger Institute Master Class*, Vienna, Austria, March 2015.

*Nordic Winter School on Cosmology and Particle Physics*, Lillehammer, Norway, January 2015.

*SPOCK Symposium*, Thomas More College, Crestview Hills, KY, November 2013.

*London Mathematical Society Summer School*, Durham, England, July 2013.

Mini-Course at the Weizmann Institute, Rehovot, Israel, May 2013.

*MATHEMATICA Summer School on Theoretical Physics*, Perimeter Institute, Waterloo, Canada, August 2011.

*Erice International School for Subnuclear Physics*, Erice, Sicily, Italy, September 2006.

## References:

### Nima Arkani-Hamed

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### Freddy Cachazo

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Waterloo, Ontario, Canada.

### Poul Henrik Damgaard

Niels Bohr International Academy  
Copenhagen Ø, Denmark.

### Lance Dixon

Stanford Linear Accelerator Center  
Menlo Park, California, USA.

### Marcus Spradlin

Brown University  
Providence, Rhode Island, USA.

### Andrew Strominger

Harvard University  
Cambridge, Massachusetts, USA.