Jaroslav Trnka

Contact Information

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Research Interests

High Energy Theory, Quantum Field Theory, New Methods for Scattering Amplitudes.

Academic Positions

University of California, Davis, USA, *Associate Professor*	2019–
University of California, Davis, USA, *Assistant Professor*	2015–2019
California Institute of Technology, Pasadena, USA, *Prize Postdoctoral Fellow*	2013–2015

Education

Princeton University, Princeton, USA, *PhD in Physics*	2013
Charles University, Prague, Czech Republic, *MS in Theoretical Physics*	2008
Charles University, Prague, Czech Republic, *Bc in Physics*	2006

Grants, Honors & Awards

Henry Primakoff Award in Particle Physics, *American Physical Society*	2020
LS Teaching Award, *College of Letters of Sciences, UC Davis*	2020
Particle Physics Prize, *International Union of Pure and Applied Physics (IUPAP)*	2018
UC Davis Award for Creativity and Innovation, *UC Davis*	2018
DOE Grant Award, *Department of Energy,* $857.000 (with two colleagues)	2017–2020
Prize Postdoctoral Award, *Caltech*	2013
Vaclav Votruba Award, *for best PhD thesis in theoretical physics*	2013
Milan Odehnal Prize, *Czech Physical Society*	2012
Joseph Henry Prize, *Princeton University*	2008
Fulbright Science and Technology Award, *Department of State*	2008
McKinsey Award, *Czech Republic*	2008
GAUK, *Student research grant, Czech Republic*	2007
Praemium Bohemiae Prize, *for representation of the Czech Republic at the IPhO*	2003
Honorary Sheet, *Minister of Education of the Czech Republic*	2003

Publications & Preprints

Total: 42 papers, 3600+ citations, h-indes 31 (Google Scholar)

42. Positive geometry, local triangulations, and the dual of the Amplituhedron
arxiv:2009.05607. (with E. Herrmann, C. Langer, M. Zheng)

41. Building Bases of Loop Integrands
arxiv:2007.13905. (with J. L. Bourjaily, E. Herrmann, C. Langer)

40. Positive Geometries for One-Loop Chiral Octagons
arxiv:2007.12191. (with E. Herrmann, C. Langer, M. Zheng)

39. All-Multiplicity Non-Planar MHV Amplitudes in sYM at Two Loops
Phys. Rev. Lett. **124**, no. 11, 111603 (2020). (with J. Bourjaily, E. Herrmann, C. Langer, A. McLeod)

38. New Soft Theorems for Goldstone Boson Amplitudes
Phys. Rev. Lett. **124**, no. 11, 111601 (2020). (with K. Kampf, J. Novotny, M. Shifman)

37. Gravity loop integrands from the ultraviolet
arXiv:1909.02003. (with A. Edison, E. Herrmann, J. Parra-Martinez)

36. Prescriptive Unitarity for Non-Planar Six-Particle Amplitudes at Two Loops
JHEP **1912**, 073 (2019). (with J. L. Bourjaily, E. Herrmann, C. Langer, A. J. McLeod)

35. Maximally supersymmetric amplitudes at infinite loop momentum
Phys. Rev. D **99**, no. 6, 066006 (2019). (with J. L. Bourjaily, E. Herrmann)

34. Deep Into the Amplituhedron: Amplitude Singularities at All Loops and Legs

Phys. Rev. Lett. **122**, no. 5, 051601 (2019). (with N. Arkani-Hamed, C. Langer, A. Y. Srikant)

33. UV cancellations in gravity loop integrands
JHEP **1902**, 084 (2019). (with E. Herrmann)

32. Vector Effective Field Theories from Soft Limits
Phys. Rev. Lett. **120**, no. 26, 261602 (2018). (with Cheung, Kampf, Novotny, Shen, Wen)

31. Unwinding the Amplituhedron in Binary
JHEP **1801**, 016 (2018). (with N. Arkani-Hamed, H. Thomas)

30. Locality and Unitarity from Singularities and Gauge Invariance
Phys. Rev. Lett. **120**, no. 23, 231602 (2018). (with N. Arkani-Hamed, L. Rodina)

29. Prescriptive Unitarity
JHEP **1706**, 059 (2017). (with J. L. Bourjaily, E. Herrmann)

28. Multi-loop positivity of the planar $\mathcal{N} = 4$ SYM six-point amplitude
JHEP **1702**, 112 (2017). (with L. J. Dixon, M. von Hippel, A. J. McLeod)

27. A Periodic Table of Effective Field Theories
JHEP **1702**, 020 (2017). (with C. Cheung, K. Kampf, J. Novotny, C. H. Shen)

26. Gravity On-shell Diagrams
JHEP **1611**, 136 (2016). (with E. Herrmann)

25. Evidence for a Nonplanar Amplituhedron
JHEP **1606**, 098 (2016). (with Z. Bern, E. Herrmann, S. Litsey, J. Stankowicz)

24. On-Shell Recursion Relations for Effective Field Theories
Phys. Rev. Lett. **116**, no. 4, 041601 (2016). (with C. Cheung, K. Kampf, J. Novotny, C. H. Shen)

23. Local Integrand Representations of All Two-Loop Amplitudes in Planar SYM
JHEP **1508**, 119 (2015). (with J. L. Bourjaily)

22. Simple Recursion Relations for General Field Theories
JHEP **1506**, 118 (2015). (with C. Cheung, C. H. Shen)

21. Logarithmic Singularities and Maximally Supersymmetric Amplitudes
JHEP **1506**, 202 (2015). (with Z. Bern, E. Herrmann, S. Litsey, J. Stankowicz)

20. Positive Amplitudes In The Amplituhedron
JHEP **1508**, 030 (2015). (with N. Arkani-Hamed, A. Hodges)

19. On-Shell Structures of MHV Amplitudes Beyond the Planar Limit
JHEP **1506**, 179 (2015). (with N. Arkani-Hamed, J. L. Bourjaily, F. Cachazo, A. Postnikov)

18. Effective Field Theories from Soft Limits of Scattering Amplitudes
Phys. Rev. Lett. **114**, no. 22, 221602 (2015). (with C. Cheung, K. Kampf, J. Novotny)

17. Anatomy of the Amplituhedron
JHEP **1503**, 128 (2015). (with S. Franco, D. Galloni, A. Mariotti)

16. Dual-Conformal Regularization of Infrared Loop Divergences
JHEP **1501**, 001 (2015). (with J. L. Bourjaily, S. Caron-Huot)

15. Singularity Structure of Maximally Supersymmetric Scattering Amplitudes
Phys. Rev. Lett. **113**, no. 26, 261603 (2014). (with N. Arkani-Hamed, J. L. Bourjaily, F. Cachazo)

14. Into the Amplituhedron
JHEP **1412**, 182 (2014). (with N. Arkani-Hamed)

13. The Amplituhedron
JHEP **1410**, 030 (2014) (with N. Arkani-Hamed)

12. Tree-level Amplitudes in the Nonlinear Sigma Model
JHEP **1305**, 032 (2013). (with K. Kampf, J. Novotny)

11. Recursion relations for tree-level amplitudes in the $SU(N)$ nonlinear sigma model
Phys. Rev. D **87**, no. 8, 081701 (2013). (with K. Kampf, J. Novotny)

10. A Note on Polytopes for Scattering Amplitudes
JHEP **1204**, 081 (2012). (with N. Arkani-Hamed, J. L. Bourjaily, F. Cachazo, A. Hodges)

9. Local Integrals for Planar Scattering Amplitudes
JHEP **1206**, 125 (2012). (with N. Arkani-Hamed, J. L. Bourjaily, F. Cachazo)

8. New differential equations for on-shell loop integral
JHEP **1104**, 083 (2011). (with J. M. Drummond, J. M. Henn)

7. The All-Loop Integrand For Scattering Amplitudes in Planar N=4 SYM
JHEP **1101**, 041 (2011). (with N. Arkani-Hamed, J. L. Bourjaily, F. Cachazo, S. Caron-Huot)

6. The Grassmannian and the Twistor String: Connecting All Trees in N=4 SYM
JHEP **1101**, 038 (2011). (with J. L. Bourjaily, A. Volovich and C. Wen)

5. Unification of Residues and Grassmannian Dualities
JHEP **1101**, 049 (2011). (with N. Arkani-Hamed, J. Bourjaily, F. Cachazo)

4. Local Spacetime Physics from the Grassmannian
JHEP **1101**, 108 (2011). (with N. Arkani-Hamed, J. Bourjaily, F. Cachazo)

3. Renormalization and additional degrees of freedom within the chiral effective theory
Phys. Rev. D **81**, 116004 (2010). (with K. Kampf, J. Novotny)

2. High energy constraints in the octet SS-PP correlator and resonance saturation
Phys. Rev. D **81**, 056005 (2010). (with J. J. Sanz-Cillero)

1. On different lagrangian formalisms for vector resonances within ChPT
Eur. Phys. J. C **50**, 385 (2007). (with K. Kampf, J. Novotny)

Books

Grassmannian Geometry of Scattering Amplitudes, Cambridge University Press (2016)
(with N. Arkani-Hamed, J. L. Bourjaily, F. Cachazo, A. Goncharov, A. Postnikov)

Mentoring

Minshan Zheng, PhD student, UC Davis	expected 2022
Cameron Langer, PhD student, UC Davis (then postdoc at Penn State)	2020
Enrico Herrmann, PhD student, Caltech (then postdoc at SLAC)	2017

Invited talks

Total: 50+ invited talks at conferences and workshops, 40+ invited seminars and colloquia.

ICHEP 2020 (panel discussion), Prague, Czech Republic (virtual)	Jul 2020
Invited seminar, UCLA, Los Angeles, CA (virtual).	Apr 2020
Invited seminar, Caltech, Pasadena, CA (virtual).	Apr 2020
QCD meets gravity IV, University of California, Los Angeles, CA	Dec 2019
Invited seminar, IPMU, Tokyo, Japan.	Dec 2019
String theory workshop, KEK, Japan	Dec 2019
Invited seminar, at Brown University, Providence, MA	Nov 2019
From Scattering to Expansion, Northwestern, Chicago, IL	Oct 2019
Quantum Mechanics and Spacetime, CMSA, Harvard University, MA	Oct 2019
Invited seminar, SLAC, Menlo Park, CA	Sep 2019
Invited seminar, Czech Academy of Sciences, Prague, Czech Republic	Aug 2019
Invited seminar, Humboldt University, Berlin, Germany	Aug 2019
Invited seminar, Max-Planck Institute, Munich, Germany	Jul 2019
Invited seminar, Niels Bohr Institute, Copenhagen, Denmark	Jul 2019
Integrable Systems and Quantum Symmetries, Prague, Czech Republic	Jul 2019
Lie Groups and Their Applications in Physics Varna, Bulgaria	Jun 2019
Invited seminar, University of Michigan, Ann Arbor, MI	May 2019
Invited seminar, Lund University, Sweden	Dec 2018
Invited seminar, University of Minnesota, Minneapolis, MN	Nov 2018
Amplitudes at LHC, Galileo Galilei Institute, Florence, Italy	Oct 2018
Supergravity and Superstring Theory, Penn State, State College, PA	Sep 2018

Current Themes in High Energy Physics, Niels Bohr Institute, Denmark	Aug 2018
Invited seminar, Humboldt University, Berlin, Germany	Jul 2018
Group Theoretical Methods in Physics, Prague, Czech Republic	Jul 2018
ICHEP 2018 (plenary talk), Seoul, Korea	Jul 2018
Cluster Algebras and Mathematical Physics, Michigan State, East Lansing, MI	May 2018
California Amplitudes Meeting, SLAC, Menlo Park, USA	Apr 2018
Invited seminar, Texas A&M, College Station, TX	Apr 2018
Invited seminar, Charles University, Prague, Czech Republic	Dec 2017
Bay Area Particle Theory Meeting, San Francisco, CA	Oct 2017
Mathematics and Physics of Scattering Amplitudes, Munich, Germany	Aug 2017
Invited seminar, University of Oregon, Eugene, OR	Apr 2017
Invited seminar, University of California, Irvine, CA	Apr 2017
Invited colloquium, San Francisco State University, CA	Apr 2017
Invited seminar, SLAC, Menlo Park, CA	Jan 2017
Invited seminar, University of Mainz, Germany	Nov 2016
Amplitudes in Asia, Beijing, China	Oct 2016
New Formulations for Scattering Amplitudes, Munich, Germany	Sep 2016
IGST 2016 Focus program, Berlin, Germany	Aug 2016
Electroweak matter 2016, University of Stavanger, Norway	Jul 2016
Amplitudes 2016, Nordita, Stockholm, Sweden	Jul 2016
Twistors, Gravity and Amplitudes, Newton Institute, Cambridge, UK	Jun 2016
Invited seminar, University of Chicago, IL	May 2016
Invited seminar, California Institute of Technology, Pasadena, CA	May 2016
Invited seminar, Perimeter Institute, Waterloo, Canada	May 2016
QCD meets gravity, Edinburgh, UK	Apr 2016
MHV at 30, Fermilab, Chicago, IL	Mar 2016
Emergent Themes in String Theory, University of Michigan, Ann Arbor, MI	Mar 2016
Invited seminar, University of California, Berkeley, CA	Mar 2016
Invited seminar, National Taiwan University, Taipei, Taiwan	Jan 2016
Invited seminar, City College of New York, NY	Sep 2015
Hidden Symmetries and Integrability Methods, CRM Montreal, Canada	Aug 2015
Positive Grassmannians, CRM Montreal, Canada	Jul 2015
Invited seminar, LMU Munich, Germany	Jun 2015
Radcor 2015, University of California, Los Angeles, CA	Jun 2015
Gravity: From UV to IR, University of California, Santa Barbara, CA	May 2015
String, Branes and Holography, Texas A&M, TX	Apr 2015
Eurostrings 2015, Cambridge, UK	Mar 2015
Invited seminar, Charles University, Prague, Czech Republic	Mar 2015
Invited seminar, University of California, Los Angeles, CA	Mar 2015
Invited seminar, University of California, Davis, CA	Mar 2015
Invited seminar, Arizona State University, Phoenix, AZ	Dec 2014
IAS Focused Program on Scattering Amplitudes, Hong Kong	Nov 2014
Geometry of Scattering Amplitudes, Oxford, UK	Sep 2014
Strings 2014, Princeton, NJ	Jun 2014
Invited seminar, University of Texas, Austin, TX	May 2014
Invited seminar, Stanford University, Stanford, CA	May 2014
Invited seminar, University of Michigan, Ann Arbor, MI	Mar 2014
Invited seminar, Brown University, Providence, RI	Mar 2014
Invited seminar, Harvard University, Cambridge, MA	Mar 2014
Invited seminar, University of California, Berkeley, CA	Feb 2014
Invited seminar, University of California, Los Angeles, CA	Feb 2014

	Invited seminar, Czech Technical University, Prague, Czech Republic	Jan 2014
	Geometry of Scattering Amplitudes, Stony Brook, NY	Dec 2013
	Invited seminar, Humboldt University, Berlin, Germany	Oct 2013
	Physics and Mathematics of Scattering Amplitudes, Stony Brook, NY	Oct 2013
	Integrability in Gauge and String Theory 2013, Utrecht, Netherlands	Aug 2013
	Amplitudes, Strings and Branes, CERN, Geneva, Switzerland	Jul 2013
	Polylogarithms: Number Theory and Particle Physics, Durham, UK	Jul 2013
	Amplitudes 2013, Schloss Ringelberg, Germany	Apr 2013
	Amplitudes and Periods, IHES, Paris, France	Dec 2012
	Invited seminar, Czech Academy of Sciences, Prague, Czech Republic	Nov 2012
	Invited seminar, Princeton University	Oct 2012
	Geometry of Scattering Amplitudes, Banff, Canada	Aug 2012
	Scattering Amplitudes: from QCD to Super Yang-Mills, Trento, Italy	Jul 2012
	Amplitudes 2012, Munich, Germany	Mar 2012
	Invited seminar, Charles University, Prague , Czech Republic	Dec 2011
	Amplitudes 2011, University of Michigan, Ann Arbor, MI	Nov 2011
	Exact results in Gauge/Gravity dualities, Perimeter Institute, Waterloo, Canada	Sep 2011
	Invited seminar, Humboldt University, Berlin, Germany	Jan 2011
	Invited seminar, Albert Einstein Institute, Potsdam, Germany	Jan 2011
	Quarks 2010, Kolomna, Russia	Jun 2010
	Effective Field Theories: from pion to upsilon, Valencia, Spain	Feb 2009
	14th International QCD Conference, Montpellier, France	Jul 2008
	EuroFlavor 07, Orsay, France	Nov 2007
	Hadron Structure, Modra, Slovakia	Sep 2007
Lecturing at summer schools	**Cluster Algebras School**, ICTS, Bengalore, India.	Dec 2018
	Qspace training school, Benasque, Spain.	Sep 2018
	Amplitudes 2017 Summer School, Edinburgh, UK.	Jul 2017
	Summer School on Particle Physics, ICTP, Trieste, Italy	Apr 2017
	School on Amplitudes in Beijing, Beijing, China	Nov 2016
	Asian Winter School, Okinawa, Japan	Jan 2016
	Winter School on Geometry and Physics, Srni, Czech Republic	Jan 2014
Organization of conferences and workshops	*Organizer of 18 conferences, workshops and scientific programs.*	
	Workshop **Geomplitudes 2020**, UC davis (virtual)	Sep 2020
	KITP reunion: Scattering Amplitudes and Beyond, KITP, CA (virtual)	Aug 2020
	Conference **ICHEP 2020** (session convener), Prague Czech Republic (virtual)	Jul 2020
	Conference **Amplitudes 2020**, University of Michigan, Ann Arbor, MI (virtual)	May 2020
	Conference **Amplitudes 2019**, Dublin, Ireland	Jul 2019
	Fourth workshop **Amplitudes in California**, University of California, Davis	Jun 2019
	Conference **Amplitudes 2018**, SLAC, Menlo Park, CA	Jun 2019
	QMAP Amplitudes Summer School, University of California, Davis	Jun 2018
	Workshop **QCD meets gravity**, University of California, Los Angeles	Dec 2017
	Program **Scattering Amplitudes and Beyond**, KITP, Santa Barbara	Apr-Jun 2017
	Program **Amplitudes, Motives and Beyond**, Mainz, Germany	Feb 2017
	Conference **Recent Developments in Fields, String, Gravity**, UC Davis	Dec 2016
	Workshop **QCD meets gravity**, University of California, Los Angeles	Dec 2016
	Second workshop **Amplitudes in California**, University of California, Los Angeles	Oct 2016
	First workshop **Amplitudes in California**, University of California, Davis	Jun 2016
	Workshop **Amplitudes in Asia**, Taipei, Taiwan	Nov 2015
	Program **From Scattering Amplitudes to Conformal Boostrap**, Aspen, CO	Jul 2015

	Conference **Grassmannian Geometry of Scattering Amplitudes**, Pasadena, CA	Dec 2014
	Workshop **Amplitudes at Caltech**, Pasadena, CA	Feb 2014

Professional Activities

Topical group convener for the 2021 Snowmass process (TF04 scattering amplitude)

Referee: Journal of High Energy Physics, Physical Review D, Physical Review Letters, Nuclear Physics B, Journal of Cosmology and Astroparticle Physics, Journal of Physics A, Physical Letters B, Classical and Quantum Gravity, Canadian Journal of Mathematics

Reviewer: European Research Council (ERC), National Science Foundation (NSF), STFC Particle Physics Grant Panel.

Editor: Special issue of Advances in High Energy Physics on Scattering Amplitudes.

Member: American Physical Society.

Teaching Experience

University of California, Davis

Instructor, PHY 232 Topics in String theory	Spring 2020
Instructor, PHY 9B Classical Physics	Winter 2020
Instructor, PHY 250 Topic course on string amplitudes	Spring 2019
Instructor, PHY 9B Classical Physics	Winter 2019
Instructor, PHY 250 Topic course on superstrings	Spring 2018
Instructor, PHY 9B Classical Physics	Winter 2018
Instructor, PHY 250 Topic course on bosonic strings	Winter 2017
Instructor, PHY 9B Classical Physics	Winter 2017
Instructor, PHY 250 Topic course on scattering amplitudes	Winter 2016

References

Nima Arkani-Hamed, Institute of Advanced Study, USA, arkani@ias.edu

Lance Dixon, SLAC, Stanford University, USA, lance@slac.stanford.edu

Zvi Bern, University of California, Los Angeles, USA, bern@physics.ucla.edu

Freddy Cachazo, Perimeter Institute, Waterloo, Canada fcachazo@perimeterinstitute.ca

Matthias Staudacher, Humboldt University, Berlin, Germany, staudacher@physik.hu-berlin.de

Marcus Spradlin, Brown University, Providence, RI, Marcus_Spradlin@brown.edu