

# Pavel Hájek

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Personal website: <https://p135246.github.io>



## ACADEMIC POSITIONS

- Oct 2019–Mar 2024 *Postdoc* with Prof. Dr. Janko Latschev at the University of Hamburg (position interrupted Sep 2020–Feb 2021).  
Jan–Feb 2021 *Visiting researcher* in the symplectic geometry group at the Humboldt University of Berlin.  
Sep–Dec 2020 *Research fellow* in the program "Knots, strings, symplectic geometry and dualities" at the Mittag-Leffler Institute in Stockholm.

## RESEARCH INTERESTS

*Current focus:* Chern-Simons Maurer-Cartan element, chain models of string topology coming from symplectic geometry.

*Current tools:* Homotopy algebras, Sullivan models, modular operads, BV formalism, Chern-Simons theory, cyclic homology, string topology, symplectic geometry.

*Other interests:* Integrability, semi-classical physics, spinning tops, celestial mechanics, string field theory, applications of operads and higher algebra.

## EDUCATION

- 2015–2019 *Ph.D. in Mathematics, University of Augsburg (with Prof. Dr. Kai Cieliebak).* Thesis on an IBL-infinity chain model of equivariant string topology based on perturbative Chern-Simons theory. Final grade Magna cum laude.  
2011–2014 *MSc in Theoretical and Mathematical Physics, LMU Munich.* Thesis on Eilenberg-Steenrod axioms for a homology theory based on manifolds with corners (supv. Prof. Dr. Kai Cieliebak). Graduated with high distinctions.  
2007–2011 *BSc in Physics, Charles University in Prag.* Thesis on dynamical symmetries in classical and quantum mechanics (supv. prof. RNDr. Pavel Cejnar, Dr., DSc.). Graduated with distinctions.  
2007–2010 *BSc in Mathematics, Charles University in Prag.* Thesis on Liouville integrability of a generalization of the Lagrange top to higher dimensions (supv. doc. RNDr. Svatopluk Krýsl, Ph.D.). Graduated with high distinction.

## SCHOLARSHIPS

- Sep–Dec 2020 Junior Fellowship from the Mittag-Leffler institute.  
2012–2013 Scholarship for master studies by the DAAD.

2007–2011 Merit based scholarship from the Charles University.

### PREPRINTS AND PUBLICATIONS

- [1] Kai Cieliebak, Pavel Hájek, and Evgeny Volkov. *Chain-level equivariant string topology for simply connected manifolds*. 2022. arXiv: 2202.06837 [math.AT]. Submitted to Algebraic and Geometric Topology.
- [2] Pavel Hájek. *Hodge decompositions and Poincaré duality models*. 2020. arXiv: 2004.07362 [math.AT]. Submitted to Journal of Homotopy and Related Structures.
- [3] Pavel Hájek. *IBL-Infinity Model of String Topology from Perturbative Chern-Simons Theory*. 2020. arXiv: 2003.07933 [math-ph]. Ph.D. thesis.
- [4] Pavel Hájek. *Twisted IBL-infinity-algebra and string topology: First look and examples*. 2019. arXiv: 1811.05281 [math-ph]. Working paper.

In preparation:

- Chern-Simons Maurer-Cartan element for  $S^1$  (with K. Cieliebak)
- Chern-Simons Maurer-Cartan element and modular operads (with J. Pullman and B. Jurco)
- Chern-Simons Maurer-Cartan element for product manifolds

### TEACHING

- WS23 • TA: Mathematics for physicists I
- Lecturer: Preparatory course for Master's in Mathematical physics
- SS23 TA: Symplectic geometry
- WS22 TA: Introduction to Euclidean geometry
- SS22 TA: Mathematics for physicists IV
- WS21 TA: Mathematics for physicists III
- SS21 Organizer: Proseminar on geometry of curves
- SS20 TA: Floer Theory
- WS19 • TA: Mathematics for physicists I
- TA: Symplectic Geometry
- SS17 TA: Analysis II
- WS16 TA: Analysis I
- SS16 Coorganizer: Seminar on Floer homology
- SS15 • TA: Linear Algebra II
- TA: Preparatory course for math teachers
- WS14 • TA: Linear Algebra I
- TA: Preparatory course for math teachers
- WS13 HW corrector: Algebraic Topology II
- SS12 HW corrector: Algebraic Topology I

### OTHER ACADEMIC TASKS

- 2022 Opponent on Bachelor's thesis.
- 2021 Opponent on Master's thesis.

- 2018 Help with organization of Workshop on Symplectic Field Theory IX, University of Augsburg, August 25–31.

#### INVITED TALKS

- 2023 Maurer-Cartan element from Chern-Simons theory, Research seminar, University of Odense, February 20.
- 2022 Chain models of string topology based on de Rham forms, Research seminar on algebraic topology, University of Hamburg, May 19.
- 2021 Chain models of string topology coming from symplectic geometry I & II, Symplectic seminar of the Humboldt University of Berlin, January 11 and 25.
- 2020
- Symplectic chain models of string topology, Mathematical Institute of Charles University in Prague, December 17.
  - Chern-Simons theory on  $S^1$  I & II, Informal seminar at the Mittag-Leffler institute, Stockholm, September 16 and 21.
  - $IBL_\infty$  chain model of equivariant string topology from perturbative Chern-Simons theory, Seminar on Lie groups and moduli spaces, University of Geneva, June 16.
- 2019
- Computations of the  $IBL_\infty$  structure, Workshop on String field theory, BV quantization, and moduli spaces, Simons Center for Geometry and Physics, Stony Brook, May 20–24.
  - Explicit computation of Feynman integrals, Seminar for symplectic geometry, University of Augsburg, May 13, 2019.
  - $IBL_\infty$  formality and Poincaré duality models, Seminar for symplectic and contact geometry at the University of Hamburg, April 25.
  - Chern-Simons theory and string topology, Seminar of the Research Institute for Mathematical Science, Kyoto, March 14.
  - Feynman integrals with the Green kernel, Seminar of the Mathematical Institute at the University of Potsdam, February 28.
  - $IBL_\infty$  structure and string topology conjecture, 39th Winter School Geometry and Physics, Srní, January 12–19.
- 2016 Presentation of a part of the proof of the Cheeger-Müller theorem, Block seminar on Torsion in Geometry and Topology, Schloss Gollwitz, Brandenburg, July 3–8.
- 2015 Homology theory based on manifolds with corners, Meeting of symplectic geometers, Weimar, Germany, 16–18 January.

#### SELECTED TALKS IN LOCAL SEMINARS

Abouzaid's generation criterion; Costello's work on TCFT; Chas-Sullivan string topology; Cyclic homology; Seiberg-Witten theory; Symplectic capacities and the ball packing problem; Witten's non-perturbative treatment of Chern-Simons theory; Propagators and linking numbers; Chaotic dynamics of the restricted three-body problem near the Lagrange points; Molecules of the Euler top.

#### CONFERENCES ATTENDED

- 2023 43rd Winter School Geometry and Physics, Srní, January 14–21.

- 2022 Geometry and Topology, ICM sectional workshop, University of Copenhagen, July 6–14.
- 2022 42nd Winter School Geometry and Physics, Srní, January 15–22.
- 2020 40th Winter School Geometry and Physics, Srní, January 11–18.
- 2019 • Geometric Dynamic Days 2019, RWTH Aachen, November 15–16.  
• Workshop on String field theory, BV quantization, and moduli spaces, Simons Center for Geometry and Physics, Stony Brook, May 20–24.  
• 39th Winter School Geometry and Physics, Srní, January 12–19.
- 2018 Workshop on Symplectic Field Theory IX, University of Augsburg. August 25–31.
- 2017 Meeting of symplectic geometers, Free University of Berlin, February 17–19.
- 2016 • Block seminar on Torsion in Geometry and Topology, Schloss Gollwitz, July 3–8.  
• X Workshop on Symplectic Geometry, Contact Geometry, and Interactions, University of Augsburg, February 25–27.
- 2015 • Summer School on String Topology and Rational Homotopy Theory, University of Hamburg, September 2–4.  
• Moduli Spaces in Symplectic Topology and in Gauge Theory, CIRM, June 1–5.  
• 35th Winter School Geometry and Physics, Srní, 17–24 January.  
• Meeting of symplectic geometers, Weimar, 16–18 January.
- 2014 Loop spaces in geometry and topology, University of Nantes, 1–5 September.
- 2013 Minicourse on free loop spaces in topology and physics, University of Münster, 24 April.
- 2012 Poisson Geometry in Mathematics and Physics, University of Utrecht, 23 July–3 August.

#### LANGUAGES

*Czech* mother tongue,  
*English* full professional proficiency,  
*German* full professional proficiency.

#### REFERENCES

- *Prof. Dr. Janko Latshev*: University of Hamburg, Bundesstraße 55 (Geomatikum), 20146 Hamburg, Germany. Phone: +49 40 42838 - 5147. Email: janko.latshev@uni-hamburg.de
- *Prof. Dr. Kai Cieliebak*: University of Augsburg, Universitätsstraße 14, 86159 Augsburg, Germany. Phone: +49 821 598 - 2138. Email: kai.cieliebak@math.uni-augsburg.de
- *Prof. Dr. Urs Frauenfelder*: University of Augsburg, Universitätsstraße 14, 86159 Augsburg, Germany. Phone: +49 821 598 - 2158. Email: urs.frauenfelder@math.uni-augsburg.de

#### HOBBIES

Wolfram Mathematica, Linux, Windsurfing