Curriculum Vitae — Peter Spacek

Personal information

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Current research

My current research concerns mirror symmetry for (quasi-)cominuscule homogeneous spaces, especially for those of type E_6 (the Cayley plane) and E_7 (the Freudenthal variety).

I consider mirror symmetry on the level of the *(small) quantum cohomology* of a variety. This is a modification of the cohomology ring by replacing the cup product with the so-called quantum product whose structure constants are given by *Gromov-Witten invariants*. These invariants can be considered to count the number of rational curves between three given subvarieties.

Homogeneous spaces are varieties that can be realized as the quotient of a (complex) Lie group. For these spaces, the quantum cohomology can be constructed as the coordinate ring of a so-called *mirror variety* modulo relations obtained from the derivatives of a function called the (super)potential. This construction has been worked out in a number of cases (Grassmannians, quadrics and Lagrangian Grassmannians).

I have found *generalized Plücker coordinate* expressions for Rietsch's construction in the case of the Cayley plane and the Freudenthal variety, and have been looking at the cluster structures of the mirror varieties together with Charles Wang at Harvard University. We will release these results on arXiv shortly. Before, I have constructed a type-independent local *Laurent polynomial expression* for Rietsch's potential in the cases of cominuscule homogeneous spaces, published in Transformation Groups. I have been collaborating with Prof Nicolas Perrin at the Laboratoire de Mathématiques de Versailles under an Early Career Fellowship funded by the London Mathematical Society to find an analogous expression for adjoint homogeneous spaces (i.e. the quasi-cominuscule cases that are not cominuscule).

Career

2021 – now	Post-doctoral Researcher (Wissenschaftlicher Mitarbeiter), TU Chemnitz (Germany)
	Supervised by Prof C. Sevenheck
2021	Early Career Fellow of the London Mathematical Society, hosted by Prof Nicolas Perrin
	at the Laboratoire de Mathématique de Versailles (France), UK-based due to COVID

Education

2017 – 2021	University of Kent (UK), PhD in Mathematics
	Thesis: *Laurent polynomial Landau-Ginzburg models for cominuscule homogeneous spaces and mirror symmetry for the exceptional family*
	Supervised by Dr C.M.A. Pech & Prof A.N.W Hone
2014 – 2017	University of Amsterdam (NL)
	– Master in Mathematics (track Algebra & Geometry), cum laude
	– Master in Physics (track Theoretical Physics), cum laude
	Thesis: *Supersymmetric string theory, derived categories, lattices and a generalized Mukai-Kondo theorem on K3-surfaces.*
	Supervised by Dr M.C.N. Cheng & Dr H.B. Posthuma
2011 – 2014	University of Amsterdam (NL)
	– Bachelor in Mathematics, cum laude, cum honore
	– Bachelor in Physics & Astronomy, cum laude, cum honore
	Thesis: *Symmetries of the Kepler problem.*
	Supervised by Dr R.R.J. Bocklandt
2005 – 2011	Barlaeus Gymnasium, Amsterdam (NL), cum laude

Publications

- *Laurent polynomial Landau-Ginzburg models for cominuscule homogeneous spaces*,
  Transformation Groups, https://doi.org/10.1007/s00031-020-09636-7, 2021 (arxiv/abs/1912.09122)
- *Laurent polynomial potentials for cominuscule homogeneous spaces*,
  summary for the Oberwolfach Workshop Report 2020, **10**, 16-18
- *Mirror symmetry and cluster structures for exceptional cominuscule homogeneous spaces*,
  joint with C. Wang, in preparation (planned for release on arXiv shortly), 30 pages written, 2022

Grants awarded

2021	LMS Early Career Fellowship, to visit Prof Perrin at the Laboratoire de Mathématiques de Versailles, on the project "Mirror symmetry for adjoint homogeneous spaces"
2019	LMS Postgraduate Research Conference Grant (scheme 8), for the conference "Young Researchers in Lie Theory" at the University of Kent
2019	Anglo-Frenco-German Network in Representation Theory and its Applications, support awarded for the conference "Young Researchers in Lie Theory"

Teaching experience and qualifications

2021 – now	Teaching assistant for the BSc Mathematics, TU Chemnitz (Germany) – algebraic geometry course
2018 – 2019	Acquired qualification of Associate Fellow of the Higher Education Academy (UK)
2017 – 2020	Teaching assistant for the BSc Mathematics, University of Kent (UK) – (linear) algebra, differential equations, quantum mechanics and calculus courses
2014 – 2017	Teaching assistant for the BSc Mathematics, University of Amsterdam (NL) – linear algebra and differential equations courses

Organisational and administrative experience

(cancelled) (COVID)	Organiser of the conference "Young Researchers in Lie Theory" at the University of Kent, with support of LMS and the Anglo-Franco-German Network in Representation Theory
2019 – 2020	Organiser of the quarterly Junior Cambridge-Oxford-Warwick regional algebraic geometer's seminar (also known as the "Calf seminar")
2018 – 2020	Representative for Graduate Teaching Assistants, University of Kent (UK)
2018 – 2019	Organizer of the weekly PhD student seminars, University of Kent (UK)
2013	Liaison between Professional Services and the Mathematics Department, University of Amsterdam (NL)

External talks given

14/07/2021	Conference "IMPANGA 20", Bedlewo (online, Poland) *Landau-Ginzburg models for the small quantum cohomology of cominuscule homogeneous spaces*
18/06/2021	Junior Cambridge-Oxford-Warwick regional algebraic geometers' seminar (online, UK) *Landau-Ginzburg models for the small quantum cohomology of cominuscule homogeneous spaces*
16/12/2020	Conference "Quantum Groups and Cohomology Theory of Quiver and Flag Varieties", Centre International de Rencontres Mathématiques, Marseille (online, France)
04/12/2020	Stockholm Mathematics Center, Algebra & Geometry seminar (online, Sweden) *Mirror symmetry for cominuscule homogeneous spaces*
08/09/2020	COW/EmSG/GLEN joint summer school (online, UK) *Laurent polynomial Landau-Ginzburg models for cominuscule homogeneous spaces*
25/02/2020	Mini-workshop "Superpotentials in Algebra and Geometry", Mathematisches Forschungsinstitut Oberwolfach (Germany) *Laurent polynomial potentials for cominuscule homogeneous spaces*
21/06/2019	Conference "Géométrie Algébrique en Liberté" at U. of Bucharest (Romania) *Introducing Mirror Symmetry for Homogeneous Spaces*
11/04/2019	Workshop "Tropical Geometry meets Representation Theory II", U. of Leicester (UK) *Introducing Mirror Symmetry for Homogeneous Spaces*
22/10/2018	Junior Algebraic Geometers' Seminar at U. of Warwick (UK) *Mirror Symmetry for Homogeneous Spaces*
13/07/2018	Workshop "Cluster Algebras and Algebraic Geometry" at U. of Nottingham (UK) *Constructing a Mirror for the Cayley Plane*