

Prof. Dr. Bernhard Johann D. Krötz

Curriculum Vitae

- Personal information:** Born: July 16, 1970 in Weißenburg. German citizen. Married, two children.
- Academic Positions:**
- Professor (W3), Paderborn (since 11/2012)
 - Professor (W2), Hannover (04/2009 - 10/2012)
 - Senior Researcher, MPIM (01/2008 - 03/2009)
 - Heisenberg fellow (09/2004 – 12/2007)
 - Assistant professor (tenure track), University of Oregon (10/2003 – 08/2004)
 - Hans Zassenhaus Assistant Professor, Ohio State (09/1999 – 09/2003)
 - Postdoc, TU Clausthal (03/1998 – 08/1999)
- Degrees in mathematics:** Habilitation (2001), Doktor (1998), Diplom (1995)
- Awards/Stipends:**
- ERC Advanced Investigator Grant HARG (joint with Eric M. Opdam, 2011 – 2015)
 - Heisenberg grant (received June 2003)
 - Programme-Postdoc, MSRI (08 – 12/2001)
 - NSF grant (2001 – 2003)
 - Habilitationsstipendium (received in 1999, declined)
 - Graduate student stipend Mittag-Leffler (01 – 05/1996)
 - Graduate student stipend (Landesstipendium) Freistaat Bayern (04/1996 – 02/1998)
- Visited Institutes:** MPIM (3,5y), RIMS (6m), MSRI (5m), Mittag-Leffler (5m), Paris VI (4m), IISC (1m), IAS (1m)
- Organized matters:** Two special terms at MPIM, several international conferences, one spring school, one summer school, one autumn school.

Publications

Selecta:

1. (with Ólafsson) *The c -function for non-compactly causal symmetric spaces*, Invent. math. **149(3)** (2002), 647–659.
2. (with Gindikin and Ólafsson) *Holomorphic H -spherical distribution vectors in principal series representations*, Invent. math. **158 (3)** (2004), 643–684.
3. *Domains of holomorphy for irreducible unitary representations of simple Lie groups*, Invent. math. **172 (2)** (2008), 277–288.
4. (with Stanton) *Holomorphic extension of representations: (I) automorphic functions*, Ann. math. **159(2)** (2004), 641–724.
5. (with Stanton) *Holomorphic extension of representations: (II) geometry and harmonic analysis*, GAFA, Geom. funct. anal. **15** (2005) 190–245.
6. (with Opdam) *Analysis on the crown domain*, GAFA, Geom. funct. anal. **18** (2008), 1326–1421.
7. *Formal dimension for semisimple symmetric spaces*, Compositio Mathematica **125** (2001), 155–191.
8. (with Gindikin) *Invariant Stein domains in Stein symmetric spaces and a non-linear complex convexity theorem*, IMRN **2002:18** (2002), 959–971.
9. (with Gimperlein and Lienau) *Analytic factorization of Lie group representations*, J. Funct. Analysis **262** (2012), 667–681.
10. (with Bernstein) *Smooth Fréchet Globalizations of Harish-Chandra Modules*, Israel Journal of Math. **199 (1)** (2014), 45–111.
11. (with Knop and Schlichtkrull) *The tempered spectrum of a real spherical space*, Acta Mathematica **218 (2)** (2017), 319–383.

Overview articles:

1. *Spherical inversion on $\mathrm{Sl}(n, \mathbb{R})$* , book review, Bull. Amer. Math. Soc. **40(1)** (2003), 137–142.
2. (with Ólafsson) *The c -function for non-compactly causal symmetric spaces and its relations to harmonic analysis and representation theory*, Amer. Math. Soc. Transl. (2) Vol. **210** (2003), 171–193.
3. *Crown theory for the upper halfplane*, Contemp. math. **488** (2009), 147–182.
4. (with Schlichtkrull) *Harmonic analysis for real spherical spaces*, Acta Math. Sinica, to appear

Complete list:

1. (with Neeb) *On hyperbolic cones and mixed symmetric spaces*, Journal of Lie Theory **6:1** (1996), 69–146.
2. (with Neeb and Ólafsson) *Spherical Representations and Mixed Symmetric Spaces*, Representation Theory **1** (1997), 424–461.
3. *On Hardy and Bergman spaces on complex Ol'shanskii semigroups*, Math. Ann. **312** (1998), 13–52.
4. *The Plancherel Theorem for Biinvariant Hilbert Spaces*, Publ. RIMS **35** (1999), Kyoto Univ., 91–122.
5. *Equivariant embeddings of Stein domains sitting in complex semigroups*, Pacific J. of Math. **189 (1)** (1999), 55–73.
6. *Norm estimates for unitary highest weight modules*, Ann. Inst. Fourier **49(4)** (1999), 1241–1264.
7. (with Hilgert) *Representations, characters and spherical functions associated to causal symmetric spaces*, J. Funct. Anal., **169** (1999), 357–390.
8. (with Hilgert) *Weighted Bergman spaces associated to causal symmetric spaces*, manuscripta math. **99(2)** (1999), 151–180.
9. (with Hilgert) *The Plancherel Theorem for invariant Hilbert spaces*, Math. Z. **37(1)** (2001), 31–59.
10. *On the dual of complex Ol'shanskii semigroups*, Math. Z. **237(3)** (2001), 505–529.
11. *Formal dimension for semisimple symmetric spaces*, Compositio Mathematica **125** (2001), 155–191.
12. (with Neeb and Ólafsson) *Spherical Functions on Mixed Symmetric Spaces*, Representation Theory **5** (2001), 43–92.
13. (with Ólafsson) *The c -function for non-compactly causal symmetric spaces*, Invent. math. **149(3)** (2002), 647–659.
14. (with Neeb) *Spherical unitary highest weight representations*, TAMS, Trans. Amer. Math. Soc. **354** (2002), 1233–1264.
15. (with Gindikin) *Complex crowns of Riemannian symmetric spaces and non-compactly causal symmetric spaces*, TAMS], Trans. Amer. Math. Soc. **354** (2002), 3299–3327.
16. (with Gindikin) *Invariant Stein domains in Stein symmetric spaces and a non-linear complex convexity theorem*, IMRN **2002:18** (2002), 959–971.
17. (with Otto) *Vanishing properties of analytically continued matrix coefficients*, Journal of Lie Theory **12:2** (2002), 409–421.
18. *Spherical inversion on $Sl(n, \mathbb{R})$* , book review, Bull. Amer. Math. Soc. **40(1)** (2003), 137–142.
19. (with Ólafsson) *The c -function for non-compactly causal symmetric spaces and its relations to harmonic analysis and representation theory*, Amer. Math. Soc. Transl. (2) Vol. **210** (2003), 171–193.
20. (with Gindikin und Ólafsson) *Hardy spaces for non-compactly causal symmetric spaces and the most continuous spectrum*, Math. Ann. **327 (1)** (2003), 25–66.
21. (with Achab and Betten) *Discrete group actions on Stein domains in complex*

- groups, Forum Math. **16(1)** (2004), 37–68.
22. (with Stanton) *Holomorphic extension of representations: (I) automorphic functions*, Ann. math. **159(2)** (2004), 641–724.
 23. (with Otto) *A convexity property for the $SO(2, \mathbb{C})$ -double coset decomposition in $SL(2, \mathbb{C})$ with applications to spherical functions*, Math. Z., **247(2)** (2004), 303–318.
 24. *A convexity property for real orbits in complexified Riemannian symmetric spaces*, Math. Research Letters **11**, no. **2-3** (2004), 197–211.
 25. (with Gindikin and Ólafsson) *Holomorphic H -spherical distribution vectors in principal series representations*, Invent. math. **158 (3)** (2004), 643–684.
 26. (with Stanton) *Holomorphic extension of representations: (II) geometry and harmonic analysis*, GAFA, Geom. funct. anal. **15** (2005) 190–245.
 27. (with Ólafsson and Stanton) *The image of the heat kernel transform on Riemannian symmetric spaces of the non-compact type*, IMRN, Int. Math. Res. Not. 2005, no. **22**, 1307–1329.
 28. (with Thangavelu and Xu) *The heat kernel transform for the Heisenberg group*, J. Funct. Analysis, **225** (2005), no. **2**, 301–336
 29. (with Kunze and Stanton) *The Bochner measure and holomorphic extension of elementary spherical functions*, Vestnik Tambov Univ. **10 (4)** (2005), 371–389.
 30. (with Otto) *Lagrangian submanifolds and moment convexity*, TAMS, Trans. Amer. Math. Soc. **358** (2006), 871–891.
 31. (with Otto) *A refinement of the complex convexity theorem via symplectic techniques*, Proc. Amer. Math. Soc. **134 (2)** (2006), 549–558.
 32. (with Gindikin and Ólafsson) *Horospherical model for the holomorphic discrete series and horospherical Cauchy transform*, Compositio Math. **142** (2006), 983–1008.
 33. (with Gindikin and Ólafsson) *Holomorphic horospherical transform on non-compactly causal spaces*, IMRN Volume **2006** (2006), Article ID 76857, 47 p.
 34. *Corner view on the crown domain*, Japanese J. Math. **2** (2007), 303–311.
 35. *A novel characterization of the Iwasawa decomposition of a simple Lie group*, in Springer LNP **723: Basic Bundle Theory and K -Cohomology Invariants** by Husemöller et al., 195–201 (2007)
 36. *Domains of holomorphy for irreducible unitary representations of simple Lie groups*, Invent. math. **172 (2)** (2008), 277–288 .
 37. (with Thangavelu and Xu) *Heat kernel transform on nilmanifolds associated to the Heisenberg group*, Revista Matemática Iberoamericana **24 (1)** (2008), 243–266.
 38. (with Opdam) *Analysis on the crown domain*, GAFA, Geom. funct. anal., **18** (2008), 1326–1421.
 39. (with Schlichtkrull) *Normal forms of real quadratic forms*, Archiv der Mathematik **92 (2)** (2009), 129–136.
 40. *Horospherical transform on real symmetric varieties: kernel and cokernel*, Funct. Anal. Appl. **43 (1)** (2009), 30–43.
 41. *Crown theory for the upper halfplane*, Contemp. math. **488** (2009), 147–182.
 42. (with Schlichtkrull) *Holomorphic extensions of eigenfunctions*, Math. Ann. **345**

- (2009), 835–841.
43. (with Gimperlein and Schlichtkrull) *Analytic representation theory of Lie groups: General theory and analytic globalization of Harish-Chandra modules*, *Compositio Math.* **147** (5) (2011), 1581–1607.
 44. (with Gimperlein and Lienau) *Analytic factorization of Lie group representations*, *J. Funct. Analysis* **262** (2012), 667–681.
 45. (with Camporesi) *The complex crown for homogeneous harmonic spaces*, *TAMS, Trans. Amer. Math. Soc.* **364** (4) (2012), 2227–2240.
 46. (with Schlichtkrull) *On function spaces on symmetric spaces*, in *Representation Theory, Complex Analysis and Integral Geometry*, 1–8 (2012), Birkhäuser.
 47. (with Offen and Sayag, editors) *Representation Theory, Complex Analysis and Integral Geometry*, Birkhäuser, 2012, 275 p.
 48. (with Bernstein) *Smooth Fréchet Globalizations of Harish-Chandra Modules*, *Israel Journal of Math.* **199** (1), 2014, 45–111.
 49. (with Sayag and Schlichtkrull) *Decay of matrix coefficients on reductive homogeneous spaces of spherical type*, *Math. Z.* **278** (2014), no. 1-2, 229–249.
 50. (with Danielson and Schlichtkrull) *Decomposition Theorems for Triple Spaces*, *Geometriae Dedicata* **174** (1) (2015), 145–154.
 51. (with Knop and Schlichtkrull) *The local structure theorem for real spherical spaces*, *Compositio Math.* **151** (2015), 2145–2159.
 52. (with Knop, Sayag and Schlichtkrull) *Simple compactifications and polar decomposition of real spherical spaces*, *Selecta Math.* **21** (2015), no. 3, 1071–1097.
 53. (with Schlichtkrull) *Finite orbit decomposition of real flag manifolds*, *J. Europ. Math. Soc.* **18** (6) (2016), 1391–1403.
 54. (with Schlichtkrull) *Multiplicity bounds and the sub-representation theorem for real spherical spaces*, *Trans. Amer. Math. Soc.* **368** (2016), 2749–2762.
 55. (with Knop, Sayag and Schlichtkrull) *Volume growth, temperedness and integrability of matrix coefficients on a real spherical space*, *J. Funct. Anal.* **271** (2016), 12–36.
 56. (with Sayag and Schlichtkrull) *The harmonic analysis of lattice counting on real spherical spaces*, *Documenta math.* **21** (2016), 627–660.
 57. (with Aizenbud, Gourevitch and Liu) *Hausdorffness for Lie algebra homology of Schwartz spaces*, *Math. Z.* **286** (2016), 979–992 and 993–994.
 58. (with Sayag and Schlichtkrull) *Vanishing at infinity on homogeneous spaces of reductive type*, *Compositio Math.* **152**(7) (2016), 1385–1397.
 59. (with Knop and Schlichtkrull) *The tempered spectrum of a real spherical space*, *Acta Mathematica* **218** (2) (2017), 319–383.
 60. (with Schlichtkrull) *Harmonic analysis for real spherical spaces*, *Acta Math. Sinica* **34**(3) (2018), 341–370.
 61. (with Sayag and Schlichtkrull) *Geometric counting on wavefront real spherical spaces*, *Acta Math. Sinica* **34**(3) (2018), 488–531.
 62. (with Knop, Pecher and Schlichtkrull) *The classification of reductive real spherical pairs I. The simple case*, *Transformation Groups* (2017), pp. 1–48.
<https://doi.org/10.1007/s00031-017-9470-5>
 63. (with Knop, Pecher and Schlichtkrull) *The classification of reductive real spherical*

- pairs II. The semisimple case*, arXiv 1703.08048
64. (with Knop) *Reductive group actions*, arXiv 1604.01005
 65. (with Delorme and Souaifi) *The constant term of tempered functions on a real spherical space*, arXiv 1702.04678
 66. (with Kuit, Opdam and Schlichtkrull) *The infinitesimal characters of discrete series for real spherical spaces*, arXiv 1711.08635
 67. (with Delorme, Knop and Schlichtkrull) *Plancherel theory for real spherical spaces: Construction of the Bernstein morphisms*, arXiv 1807.07541

Invited lectures

Out of the 3-digit number of invited lectures here are my five favorites:

1. *Holomorphic extensions of representations*, opening lecture, 50 Jahre Arbeitstagung, Bonn, 23. Juni 2007
2. *Four Theorems*, Birthday conference for Werner Müller, Jerusalem, March 2010
3. *Convexity theorems on the complex crown*, Analyse harmonique sur les groupes de Lie et les espaces symétriques, Strasbourg, 13. June 2005
4. *Working seminar on Integral Geometry VII*, RIMS, January 2005
5. *Die Hölle am Rand der oberen Halbebene*, Tag der offenen Tür, MPIM Bonn, 25. November 2006

Students

1. **PhD Michael Otto** with the thesis *Symplectic convexity theorems and applications to the structure theory of semisimple Lie groups*, May 2004, Ohio-State University.
2. **Dr. Heiko Gimperlein** with the thesis *Topics in Singular Analysis with Applications to Representation Theory and to Numerical Analysis*, May 2010, Hannover.
3. **Dr. Christoph Lienau** with the thesis *Aspects of analytic representation theory*, February 2012, Hannover.
4. **Dr. Sweitse van Leeuwen** with the thesis *Invariant Bergman spaces*, July 2012, Hannover.