

CV

Robert Berman
Department of Mathematical Sciences
Univ. of Gothenburg/Chalmers Univ. of Technology, SE-412 96 Göteborg, Sweden
e-mail: robertb@chalmers.se

Personalia

Place of birth: Göteborg, Sweden, October 14th 1976
Citizenship: Swedish
Residence: Göteborg
Marital Status: married, two daughters

Professional degrees.

2013- Professor at Chalmers Univ. of Technology
2010-2012 Associate Professor at Chalmers Univ. of Technology

Professional preparation.

2007-01-01–2008-07-01 **Post Doctoral activity (Marie Curie Intra European Fellowship)** at *Institut Fourier, Grenoble (France)* in the group of Prof. Jean-Pierre Demailly
2001-01-01–2006-05-15 **PhD thesis** Title: Bergman kernel asymptotics and holomorphic Morse Inequalities. Adviser: Prof. Bo Berndtsson. *Department of mathematics, Chalmers University of Technology, Göteborg, Sweden.* Opponent: Prof. S.Zelditch, Johns Hopkins University, USA
2003-11-24–2004-02-20 **Marie Curie Early Stage Research Training** at Analyse complexe à plusieurs variables (Several complex variables). Organizers: G. Henkin, N. Sibony. *Institut Henri Poincaré (IHP), Paris*
2003-11-20 **Licentiate of Philosophy.**
1999-09-02–2000-09-02 **Master of Science (with distinction).** Thesis title: The Seiberg-Witten equations and the proof of the Thom Conjecture. Adviser: Dr. Mario Micallef. *Department of mathematics, University of Warwick, England*
1996-09-01–1999-09-01 **Undergraduate studies** at *Göteborg University, Sweden*
(During the period 2005-06-01–2006-01-01 I was on a paternity leave)

Employments/grants

- 2012–2016: Researcher/Professor at *Chalmers University of Technology* (100% research). (Financed by grants from the Swedish Research Council, an ERC starting grant, Wallenberg Academy Fellow, KAW foundation).
- 2008-01-01–2011-12-31 Research assistant at *Chalmers University of Technology* (100% research). (Financed by the Swedish Research Council). (I was on leave in Grenoble 2008-01-01–2008-07-01)
- 2007-01-01–2008-07-01 Post Doc position at *Institut Fourier, Grenoble (France)*. (100% research) (a Marie Curie Intra European Fellowship).
- 2001–2006 (June) PhD student: *Chalmers University of Technology* (80% research and 20% teaching)

Tutoring experience.

- Ph D advisor of David Witt Nystöm, who finished his PhD in 2012 (now at Cambridge, UK)
- Current PhD advisor of Jacob Hultgren (from 2012)
- Current PhD advisor of Magnus Önnheim (from 2013)
- Current Post Doc host for Hoang Chinh Lu (University of Toulouse)
- Long term host (two months in 2012) for Tomoyuki Hisamoto (PhD student at the University of Tokyo)
- Long term host (one month in 2012) for Henri Guenencia (PhD student at Ecole Normale Sup., Paris)

Prizes

- The Wallenberg Prize in Mathematics 2010
- The Tage Erlander Prize in Mathematics 2014

Current grants.

- *ERC Starting Grant*: (five years starting 2013)
- *Wallenberg Academy Fellow (KAW)*: (five years starting 2013)
- *Swedish Scientific Research Council*: a grant for Young Researchers (four years from summer 2012)
- I am also a Supporting Researcher for the project “*Stochastics for big data and big systems – bridging local and global*” (which involves ten other researchers led by Holger Rootzen) financed by the *Knut och Alice Wallenberg Foundation (KAW)*

Previous grants.

- 2008-01-01–2012-06-30 Research Assistant at *Chalmers University of Technology*. Project title: *Bergman kernel asymptotics in complex and CR geometry*.

Selected invited conferences talks

- *Workshop on Ricci curvature: limit spaces and Kaehler geometry* (Edinburgh) 8–12 July 2013. Scientific Advisory Group: T. Colding, S. Donaldson, G. Tian, B. Wilking
- *Recent Developments in Kähler Geometry* (IHP, Paris): 10 December 2012 - 14 December 2012. Organizers: M. Gursky, E. Hebey, F. Pacard, J. Viaclovsky
- *Workshop on Manifolds of Metrics and Probabilistic Methods in Geometry and Analysis*, CRM (Montreal), July 2-6, 2012. Organizers: D.Jacobson, S.Zelditch
- *Advances in Geometric Analysis*, ICTP (Trieste), 24-29 June, 2012. Org. C. Arezzo, F. Pacard, R. Schoen, G. Tian
- *Kähler geometry*, Univ. of Cambridge, April 10-13, 2012. Org. J.Ross, I. Cheltsov
- *Israeli-Polish Mathematical Meeting* Łódź 2011, Sept 11-15
- *Analytic aspects of complex algebraic geometry*, at CIRM (Luminy, Marseille), Feb. 14-18, 2011, Organizers: V.Guedj, S. Boucksom, P.Eyssidoux
- **Plenary speaker:** *First Swedish-Catalan Conference in Mathematics* (Barcelona) . Organizers: Barja, Bosch, Consul, Mondelo, Ortega, Seara, Serra. September 16-18, 2010.
- *Complex Monge-Ampère Equation (BIRS, Canada)*, October 18-21, 2009. Organizers: Pengfei Guan, Zbigniew Blocki
- *Complex Geometry: A Conference Honoring Simon Donaldson* (Northwestern University, USA), October 24-27, 2009. Organizing Committee: Gui-Qiang Chen, Ezra Getzler, Jared Wunsch, Steve Zelditch
- *Dynamics and Complex Geometry at CIRM*, Luminy (France), Juin 15-19, 2009. Organizers: C. Dupont, T.C. Dinh, H. de Thélin.
- *Workshop on Complex Hyperbolic Geometry and Related Topics* (Fields institute, Toronto), November 17–21, 2008. Organizing Committee: J-P. Demailly, J. Noguchi, M. Ru, B. Shiffman, Y-T Siu, P. Vojtá
- *Complex Analysis and Geometry - XVIII*, May 28- June 1, 2007 (Trento). Organizers: V. Ancona, C. Arezzo, F. Bracci and A. Silva.
- *Complex Analysis 2006 in Slovenia*, June 7-10, Organizers. F.Forsternic et al
- *NORDAN 2005* (The Nordic Complex Analysis Meeting) Complex analysis, complex geometry and complex dynamics, April 22-24, 2005
- *JAMI 2004, Conference on Asymptotic and Effective Results in Complex Geometry* (In Honor of Bernie Shiffman's 60th Birthday), March 15-21, 2004, Organizers: J.P. Demailly, Y.T. Siu, and S. Zelditch.

Invited mini courses

- *Komplex Analysis Winter School* January 21-24, 2013 Toulouse, Organizers: V. Guedj, J. Marzo, J. Ortega-Cerdà, P. Thomas

Language skills

Swedish (mother tongue), *English* (fluent), *French* (fluent) *Italian* (good speaking level), *Polish* (good speaking level)

Other professional activities

- I have been in the jury for 3 *PhD defenses* (at Ecole Polytechnique at Paliseau, the Royal Inst. of Techn. (RIT) in Stockholm and Univ. de Barcelona) and I have been the opponent once (at RIT)
- *Refereeing* for *Annals of Math*, *Acta Math.*, *Duke Math. Journal*, *Comm. Pure and Appl. Math*, *Commun. in Math. Physics*, *Ann. de l'Institut Fourier*, *Journal d'Analyse*, *Indiana Univ. Math. Journal*, *Journal of Statistical Mechanics*, *Math. Research Letters*,....
- *Organizer* of the conference *Nordan 2010*, May 2010
- I have been a panel member of "Docentberedningen" at Naturvetenskapliga fakulteten at Göteborg Universitet
- *Initiator and organizer* of a working group on Gromov-Hausdorff convergence in Kähler-Geometry at Chalmers 2012
- *Initiator and coorganizer* of the working group on "Random matrices and Orthogonal polynomials" at Chalmers 2006
- *Initiator and coorganizer* of "Mathematics and Physics in symbiosis", joint PhD seminar with the Theoretical Physics Department at Chalmers University of Technology, Göteborg. 2002–2005

Publications in peer-reviewed Mathematics journals.

- 1 R.J. Berman: *K-polystability of Q-Fano varieties admitting Kahler-Einstein metrics*. *Invent Math.* (to appear)

- 2 R.J. Berman; H.Guenancia: *Kähler-Einstein metrics on stable varieties and log canonical pairs*. Geometric and Functional Analysis 2014, Volume 24, Issue 6, pp 1683-1730
- 3 R. J. Berman, B. Berndtsson: *The volume of Kähler-Einstein Fano varieties and convex bodies*. Crelle's journal (to appear).
- 4 R.J.Berman: *Determinantal point processes and fermions on complex manifolds: Large deviations and Bosonization*, 18 pages. Comm. in Math. Phys. Volume 327, Issue 1 (2014), Page 1-47
- 5 R.J. Berman, Gerard Freixas i Montplet: *An arithmetic Hilbert-Samuel theorem for singular hermitian line bundles and cusp forms*. Compositio Mathematica (to appear)
- 6 R.J.Berman: *A thermodynamical formalism for Monge-Ampere equations, Moser-Trudinger inequalities and Kahler-Einstein metrics*. Advances in Math. 1254. Volume: 248. 2013
- 7 R.J.Berman;B. Berndtsson: *Real Monge-Ampere equations and Kahler-Ricci solitons on toric log Fano varieties*. Ann. Math. de la fac. des sciences de Toulouse. (2013) vol. 22 n° 4
- 8 R.J. Berman, B. Berndtsson: *Symmetrization of plurisubharmonic and convex functions*. Indiana Univ. Math. Journal. (to appear)
- 9 R.J.Berman; S. Boucksom, V. Guedj, A. Zeriahi: *A variational approach to complex Monge-Ampere equations*, Publications Mathématiques de l'IHÉS (2012): 1-67 , November 14, 2012
- 10 R.J.Berman; S. Boucksom: *Growth of balls of holomorphic sections and energy at equilibrium*. 42 pages, Invent. Math. 181 (2010), no. 2, 337-394
- 11 R.J.Berman; S. Boucksom, D. Witt Nyström: *Fekete points and convergence towards equilibrium measures on complex manifolds*, 26 pages, Acta Math. Vol. 207, Issue 1 (2011), 1-27,
- 12 R.J.Berman: *Sharp asymptotics for Toeplitz determinants, fluctuations and the Gaussian free field on a Riemann surface*. Int. Math. Research. notices. (2012) (22)
- 13 R.J.Berman; *Relative Kahler-Ricci flows and their quantization*. 42 pages, Analysis and PDE Vol. 6 (2013), No. 1, 131–180
- 14 R.J.Berman: *Bergman kernels and equilibrium measures for line bundles over projective manifolds*. 35 pages. The American Journal of Mathematics, Volume 131, Number 5, October 2009
- 15 R.J.Berman: *Bergman kernels for weighted polynomials and weighted equilibrium measures of C^n* . 19 pages. Indiana Univ.Math. Journal, Volume 58, issue 4, 2009
- 16 R.J.Berman: *Bergman kernels and equilibrium measures for polarized pseudoconcave domains*. 22 pages. Internat. J. Math. 21 (2010), no. 1, 77–115.
- 17 R.J.Berman; J. Sjöstrand: *Asymptotics for Bergman-Hodge kernels for high powers of complex line bundles*. Ann. de la Fac. des Sciences de Toulouse Vol. XIV (2007) no. 4, p. 719–771
- 18 R.J.Berman; B. Berndtsson; J. Sjöstrand: *A direct approach to Bergman kernel asymptotics of positive line bundles*, Arkiv för Matematik. Volume 46 (2008) no. 2, 197–217
- 20 R.J.Berman: *Super Toeplitz operators on line bundles* Journal of Geometric Analysis 16 (2006), no.1, 1–22.
- 21 R.J.Berman: *Holomorphic Morse inequalities on manifolds with boundary* Ann. Inst. Fourier (Grenoble) 55 (2005), no. 4, 1055–1103.
- 22 R.J.Berman: *Bergman kernels and local holomorphic Morse inequalities* Math. Z. 248 (2004), no. 2, 325–344, 325–344.

Book chapters.

- 23 R.J.Berman; J-P. Demailly: *Regularity of plurisubharmonic upper envelopes in big cohomology classes*, 27 pages in “Perspectives in Analysis, Geometry, and Topology”, *Progress in Math. 296, Birkhäuser/Springer, New York (2012) 39-66*
- 24 R.J.Berman; Keller, J: *Bergman geodesics* 20 pages in “Monge-Ampère Equations and Geodesics in the Space of Kähler Metrics”. Editor: V.Guedj, Lecture Notes in Math. *Springer-Verlag* (these are expanded notes written together with J.Keller which are based on two talks that I gave at a workshop in Marseille 2009)
- 25 R.J.Berman: *The Quillen metric, analytic torsion and tunneling for high powers of a holomorphic line bundle*. Proceedings for Geometric Analysis and Spectral Theory - Spring 2012 CRM, Montreal (to appear)

Publications in peer-reviewed Physics journals.

- 26 R.J.Berman: *Kahler-Einstein metrics emerging from free fermions and statistical mechanics*. 22 pages, J. of High Energy Phys. (JHEP), Volume 2011, Issue 10 (2011)

Preprints on Arxiv.org (mathematics).

- 27 R.J. Berman, Magnus Onnheim: *Propagation of chaos, Wasserstein gradient flows and toric Kahler-Einstein metrics*. arXiv:1501.07820

- 28 R.J. Berman: *On the optimal regularity of weak geodesics in the space of metrics on a polarized manifold.* arXiv:1405.6482
- 29 R. J. Berman, B. Berndtsson: *Convexity of the K-energy on the space of Kahler metrics and uniqueness of extremal metrics.* arXiv:1405.0401
- 30 R.J. Berman; Witt Nyström, D: *Complex optimal transport and the pluripotential theory of Kähler-Ricci solitons.* arXiv:1401.8264
- 31 R.J. Berman: *Kähler-Einstein metrics, canonical random point processes and birational geometry.* arXiv:1307.3634
- 32 R.J. Berman: *From Monge-Ampère equations to envelopes and geodesic rays in the zero temperature limit.* arXiv:1307.3008
- 33 R.J. Berman: *Statistical mechanics of permanents, real-Monge-Ampère equations and optimal transport.* arXiv:1302.4045
- 34 R. J. Berman, B. Berndtsson: *The projective space has maximal volume among all toric Kähler-Einstein manifolds.*
- 35 R.J.Berman; Eyssidieu, P; S. Boucksom, V. Guedj, A. Zeriahi: *Kähler-Einstein metrics and the Kähler-Ricci flow on log Fano varieties.*
- 36 R.J.Berman, Berndtsson, B: *Moser-Trudinger type inequalities for complex Monge-Ampère operators and Aubin's "hypothèse fondamentale",* arXiv:1109.1263.
- 37 R.J.Berman: *Analytic torsion, vortices and positive Ricci curvature.* 54 pages, arXiv:1006.2988.
- 38 R.J.Berman: *Determinantal point processes and fermions on complex manifolds: Bulk universality.* 44 pages, arXiv:0811.3341