CURRICULUM VITAE

BENJAMIN HIMPEL

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Born on May 6, 1976, in Berlin, Germany.
Married, 2 children.

Teaching Interests

I enjoy teaching most of the usual undergraduate classes, and have a particular interest in topology, knot theory, differential geometry, global analysis and mathematics in music, as well as in guiding undergraduate research projects.

Research Interests

Gauge theory, invariants of knots and 3-manifolds, spectral flow, boundary value problems on manifolds, topological quantum field theory, geometry of music

Education

2004	**Doctor of Philosophy** in Mathematics, Indiana University, Bloomington. *Thesis Advisor: Prof. Paul A. Kirk* *Thesis Title: A splitting formula for spectral flow on closed* 3*-manifolds*.
2001	Studies in Berkeley (MSRI and University of California) during the spring semester.
2000	**Master of Arts** in Mathematics, Indiana University, Bloomington.
1997	**Vordiplom degree** in Mathematics with a minor in Computer Science from Freie Universität Berlin.
1995	**Abitur degree** from Goethe-Gymnasium Berlin-Wilmersdorf.

Employment

2009–	**Postdoc**, Center for Quantum Geometry of Moduli Spaces, Aarhus Universitet. *Teaching and research in the group of Prof. Jørgen Andersen*.
2008–2011	**Akademischer Rat (BaZ)** (assistant professor), Mathematisches Institut, Universität Bonn. *Teaching and research in the global analysis group of Prof. Matthias Lesch and Prof. Werner Müller*.

2005–2008	**Wissenschaftlicher Mitarbeiter** (postdoctoral research assistant), Mathematisches Institut, Universität Bonn. *Teaching and research in the global analysis group of Prof. Matthias Lesch and Prof. Werner Müller.*
2004–2005	**Postdoctoral Research Fellow**, Max Planck Institute for Mathematics in Bonn. *Research on Lim's* U(2)*-Seiberg-Witten/*SU(3)*-Casson invariant for homology 3–spheres.*
2003–2004	**Research Assistant** for Prof. Paul Kirk, Department of Mathematics, Indiana University, Bloomington. *Cut and paste methods for spectral flow of the odd signature operator on closed* 3*-manifolds.*
2002–2003	**Research Assistant** for Prof. Matthias Weber, Department of Mathematics, Indiana University, Bloomington. *Visualization of surfaces, particularly minimal surfaces, using Mathematica and Scalable Vector Graphics (SVG).*
2002	**Associate Instructor**, Department of Mathematics, Indiana University, Bloomington. *Creating and grading exercises for topology courses.*
2001	**Research Consultant**, YY Technologies, Mountain View, California. *Optimization of algorithms for problems in graph theory.*
1999–2001	**Associate Instructor**, Department of Mathematics, Indiana University, Bloomington. *Teaching and assisting calculus courses.*
1997–1998	**Teaching Assistant**, Fachbereich Mathematik und Informatik, Freie Universität Berlin. *Assisting undergraduate computer science and mathematics courses.*

Teaching experience

Aarhus Universitet

Fall 2011	Assisting several courses at *Matlab*.
Fall 2009	Teaching *Lie groups and Chern-Simons theory*.

Universität Bonn

Summer 2009	Seminar *Numbers*. Seminar *Differential topology and quantum field theory*.
Winter 2008/09	Seminar *Knot theory*.
Summer 2008	Seminar *Selected problems in Hodge theory*.
Winter 2007/08	Organization of the exercises for the course *Mathematics for physicists I*. Teaching *Global analysis I*.
Summer 2007	Seminar *Morse theory*.
Winter 2006/07	Exercises for the course *Atiyah-Singer index theory I*. Seminar *Global analysis: spectral theory and Riemannian geometry*.
Summer 2006	Exercises for the course *Analysis on manifolds II*. Seminar *Global analysis: differential forms and characteristic classes*.

Winter 2005/06	Exercises for the course *Analysis on manifolds I*. Seminar *Selected problems in global analysis and spectral theory*.

Indiana University, Bloomington

Spring 2002	Exercises for the courses *Topology I* and *Knot Theory*.
Fall 2001	Teaching *Calculus I*.
Fall 2000	Exercises for the course *Calculus I*.
Spring 2000	Teaching *Calculus I*.
Fall 1999	Exercises for the course *Calculus I*.

Freie Universität Berlin

Summer 1998	Exercises for the course *Topology I*.
Winter 1997/98	Exercises for the course *Algorithms und programming III*.

I have also organized several research seminars and colloquia at Aarhus Universitet and Universität Bonn.

Grants and stipends

2011	Grants for the *Aarhus Gauge Theory Workshop* from Hausdorff Center for Mathematics and the ITGP network of the European Science Foundation.
2011	Research in Teams *The SU(3) Casson invariant for spliced sums*, 11rit159, Banff International Research Station, Canada.
2010-2012	Research and Development Project *Probabilistic approach to finite and infinite dimensional dynamical systems*, PTDC/MAT/104173/2008, Fundação para a Ciência e a Tecnologia, Portugal.
2009	Grants for the workshop *Chern-Simons gauge theory* from Hausdorff Center for Mathematics and the ITGP network of the European Science Foundation.
2004–2005	Research Fellowship from the Max-Planck-Institute for Mathematics in Bonn.
2000–2004	Fellowship from e-fellows.net.
1998–2001	Member of the German National Merit Foundation.
1998–1999	Graduate Student Exchange Fellowship, Freie Universität Berlin and Indiana University, Bloomington.

Honors

2004	**William B. Wilcox Mathematics Award** in recognition of outstanding scholastic achievement in graduate studies and in expectation of continued academic success.
1999	Third Prize at the **6th International Mathematics Competition for University Students** in Keszthely, Hungary.

Professional Service

August 2011	Organization of the workshop *Gauge Theory*, Aarhus Universitet (with Jørgen Andersen, Robert Penner and Nicolai Reshetikhin).
August 2009	Organization of the workshop *Chern-Simons Gauge Theory: 20 years after*, MPIM Bonn (with Jørgen Andersen, Hans Boden and Atle Hahn).
July 2009	Helped to organize the workshop *Noncommutative Geometric Methods in Global Analysis*, Universität Bonn/MPIM.
May 2008	Helped to organize the workshop *New Paths Towards Quantum Gravity/Quantum Gravity: An Assessment*, Søminestationen in Holbæk, Denmark.
January 2006	Helped to edit the conference proceedings *Analysis, Geometry and Topology of Elliptic Operators, Papers in Honour of Krzysztof P. Wojciechowski's 50th birthday*, World Scientific Singapore, 2006.

Furthermore Referee/Reviewer for

- Quarterly Journal of Mathematics
- Zentralblatt Mathematik

Refereed journal publications

1. *Splitting the spectral flow and the* SU(3) *Casson invariant for spliced sums* (with Hans Boden), Algebr. Geom. Topol. 9 (2009), no. 2, 865–902.
2. *A splitting formula for the spectral flow of the odd signature operator on 3-manifolds coupled to a path of* SU(2) *connections*, Geom. Topol. 9 (2005), 2261–2302.
3. *Calderón projector for the Hessian of the perturbed Chern-Simons function on a 3-manifold with boundary* (with Paul Kirk and Matthias Lesch), Proc. London Math. Soc. (3) 89 (2004), no. 1, 241–272.

Lecture notes, reports, and other publications

1. *The Witten-Reshetikhin-Turaev invariant of finite order mapping tori II* (with Jørgen E. Andersen), `arXiv:1107.1813v1 [math.GT]`.
2. *Lecture notes on Chern-Simons theory*, `http://aula.au.dk/courses/IMFLIECHEE09`, 2009.
3. *A splitting formula for the su(N) spectral flow of the odd signature operator coupled to a path of* SU(*N*) *connections*, Oberwolfach Reports, Report No. 21/2006, 31–34.
4. *A splitting formula for spectral flow on closed 3-manifolds*, 2004, Ph.D. thesis, Indiana University, Bloomington, 144 pages.

Books edited

1. *Chern-Simons gauge theory: 20 years after* (with Jørgen E. Andersen, Hans U. Boden and Atle Hahn (editors)), AMS/IP Studies in Advanced Mathematics, 50. American Mathematical Society, Providence, RI; International Press, Cambridge, MA, 2011.

Research visits

2011	Research in Teams with Hans Boden and Chris Herald in Banff, Canada. *The* SU(3) *Casson invariant for spliced sums.*
2010/2011	Visiting Atle Hahn, Universidade de Lisboa. *Witten's invariants via White Noise Analysis and Discretization.*
2010	Visited by Atle Hahn, Universidade de Lisboa. *Witten's invariants via White Noise Analysis and Discretization.*
2008	Visited by Hans Boden, McMaster University. *Splitting the spectral flow and the* SU(3) *Casson invariant for spliced sums.*
2007	Visiting Hans Boden, McMaster University. *Splitting the spectral flow and the* SU*(3) Casson invariant for spliced sums.*
2003	Visiting Matthias Lesch, Universität zu Köln. *Calderón projector for the Hessian of the perturbed Chern-Simons function on a 3-manifold with boundary.*
2001	Visiting Chris Herald, MSRI, Berkeley. *Casson's invariant for homology 3-spheres und gauge theory.*

Invited conference talks

- *The Witten-Reshetikhin-Turaev invariant of finite-order mapping tori*.
  QGM Nielsen Retreat, Sandbjerg Estate, October 2011
- *An introduction to Reidemeister torsion and the Rho invariant with a view towards Chern-Simons theory*.
  QGM Nielsen Retreat, Sandbjerg Estate, October 2010
- *A splitting formula for spectral flow and the* SU(3) *Casson invariant for spliced sum*.
  CTQM Nielsen Retreat, Sandbjerg Estate, October 2009
- *A splitting formula for spectral flow and the* SU(3) *Casson invariant for spliced sums*.
  Interactions of geometry and topology in low dimensions, Banff International Research Station, March 2007.
- *A splitting formula for the su*(N) *spectral flow of the odd signature operator coupled to a path of* SU(N) *connections*.
  DMV Tagung 2006, Universität Bonn, September 2006.
- *A splitting formula for the su*(N) *spectral flow of the odd signature operator coupled to a path of* SU(N) *connections*.
  Mini-Workshop: Zeta Functions, Index and Twisted K-Theory; Interactions with Physics, Mathematisches Forschungsinstitut Oberwolfach, May 2006.
- *The Casson Invariant for Homology 3-Spheres and* SU(3) *generalizations*.
  Third NRW Topology Meeting, Universität Bochum, April 2005.
- *A Splitting Formula for Spectral Flow on Closed* 3*-Manifolds*.
  Annual Mini-Conference in Modern Analysis, IUPUI, March 2004.
- *A Splitting Formula for Spectral Flow on Closed* 3*-Manifolds*.
  AMS meeting (#993), Special Session on Low-Dimensional Topology, Phoenix, January 2004.

Contributed conference talks

- *On the geometry of music*.
  MAA Session on Arts and Mathematics, Together Again, II, AMS Joint Meeting, Boston, January 2012
- *The asymptotic expansion of the Witten-Reshetikhin-Turaev invariants*.
  AMS Session on Manifolds, Cell Complexes, and Global Analysis, I, AMS Joint Meeting, Boston, January 2012
- *A Gauge Theoretical Discussion of Casson's Invariant for Homology* 3*-Spheres*.
  Graduate Student Topology Conference, University of Notre Dame, April 2003.

Invited seminar talks

- *The asymptotic expansion of the Witten-Reshetikhin-Turaev invariants.*
  Universität zu Köln, July 2011.
- *The asymptotic expansion of the Witten-Reshetikhin-Turaev invariants.*
  Geometry & Topology Seminar, McMaster University, June 2011.
- *The asymptotic expansion of the Witten-Reshetikhin-Turaev invariants.*
  Topological Quantum Field Theory Club, Instituto Superior Técnico, Lisboa, January 2011.
- *The asymptotic expansion of the Witten-Reshetikhin-Turaev invariants.*
  Grupo de Física Matemática seminar, Universidade de Lisboa, January 2011.
- *The asymptotic expansion of the Witten-Reshetikhin-Turaev invariants.*
  Geometric Analysis Seminar, Humboldt Universität, October 2010.
- *Chern-Simons theory and classical topological invariants.*
  Mathematical Physics Seminar, Cardiff University, September 2010.
- *Chern-Simons theory, spectral flow and the* SU(3) *Casson invariant.*
  Grupo de Física Matemática seminar, Universidade de Lisboa, June 2010.
- *Chern-Simons theory, spectral flow and the* SU(3) *Casson invariant.*
  Seminar on Algebra, Geometry and Physics, Max Planck Institute for Mathematics, April 2010.
- *Splitting the spectral flow and the* SU(3) *Casson invariant for spliced sums*.
  Institut de Mathématiques à Jussieu, Université Paris Diderot-Paris 7, April 2009.
- *Splitting the spectral flow and the* SU(3) *Casson invariant for spliced sums*.
  Colloqium, Mathematics Department, University of Hawai'i at Mānoa, September 2007.
- *A splitting formula for spectral flow and the* SU(3) *Casson invariant for spliced sums*.
  Geometry & Topology Seminar, McMaster University, March 2007.
- *The* SU(3) *Casson Invariant and spliced sums*.
  Gauge Theory Seminar, Max Planck Institute for Mathematics, December 2006.
- *A splitting formula for the su*(N) *spectral flow of the odd signature operator coupled to a path of* SU(N) *connections*.
  Universität Münster, November 2006.
- *Spectral Flow on Torus Bundles over* S^1.
  Oberseminar, Universität Bielefeld, February 2005.
- *Spectral flow on torus bundles over* S^1.
  Oberseminar Globale Analysis, Universität Bonn, December 2004.

- SU(2) *spectral flow of the twisted odd signature operator on torus bundles over* S^1.
  Oberseminar Geometrie, Topologie und Analysis, Universität zu Köln, November 2004.
- *The Spectral Flow on Torus Bundles over the circle*.
  Oberseminar Differentialgeometrie, Universität Bonn, November 2004.
- *Eine Spaltungsformel für Spektralfluß auf geschlossenen* 3*-Mannigfaltigkeiten*.
  Universität Münster, December 2003.
- *Eine Spaltungsformel für Spektralfluß auf geschlossenen* 3*-Mannigfaltigkeiten*.
  Universität Göttingen, December 2003.
- *Eine Spaltungsformel für Spektralfluß auf geschlossenen* 3*-Mannigfaltigkeiten*.
  Universität München, December 2003.
- *A Splitting Formula for Spectral Flow on Closed* 3*-Manifolds*.
  Topology Seminar, International University Bremen, December 2003.
- *Cassons Invariante für Homologie* 3*-Sphären und Eichtheorie*.
  Topology Seminar, Freie Universität Berlin, December 2002.

Conferences and workshops

- *Drinfeld associators and the Kashiwara-vergne problem* (Master Class by Anton Alekseev).
  QGM, Aarhus Universitet, October 2011.
- *Instantons, Knots and Khovanov* (Master Class by Tomasz S. Mrowka).
  QGM, Aarhus Universitet, August 2011.
- *Generalized Geometry* (Master Class by Nigel Hitchin & Marco Gualtieri).
  QGM, Aarhus Universitet, June 2011.
- *Spring School in Geometry and Quantum Topology*.
  Les Diablerets, Switzerland, March 2011.
- *Quantization of Singular Spaces*.
  QGM, Aarhus Universitet, December 2010.
- *Categorification* (Master Class by Volodymyr Mazorchuk).
  QGM, Aarhus Universitet, October 2010.
- *Wall-crossing*.
  QGM, Aarhus Universitet, August 2010.
- *Quantum Dilogarithm and Quantum Teichmueller Theory*.
  QGM, Aarhus Universitet, August 2010.
- *Quantum Geometry and Topology*.
  CIRM, Luminy, July 2010.
- *Homology Theories of Knots and Links*.
  MSRI, Berkeley, March 2010.
- *2nd Odense Winter School on Geometry and Theoretical Physics*.
  Syddansk Universitet, Odense, November 2009.
- *Quantization of Gauge Systems* (Master Class by Nicolai Reshetikhin).
  CTQM, Aarhus Universitet, November 2009.

- *International School on Geometry and Quantization*.
  Université du Luxembourg, September 2009.
- *Chern-Simons Gauge Theory: 20 years after*.
  MPIM Bonn, August 2009.
- *Noncommutative Geometric Methods in Global Analysis*.
  Universität Bonn, July 2009.
- *Topology and Geometry*.
  Universität Münster, June 2009.
- *Eleventh NRW Topology Meeting*.
  Universität Bielefeld, May 2009.
- *The manifold geometries of quantum field theory*.
  MPIM Bonn, July 2008.
- *New Paths Towards Quantum Gravity/Quantum Gravity: An Assessment*.
  Søminestationen in Holbæk, May 2008.
- *Partial differential equations and analysis on singular spaces*.
  Hausdorff Center for Mathematics, Bonn, February 2008.
- *3-manifold geometry and topology*.
  Mathematics Research Centre, University of Warwick, July 2007.
- *Interactions of geometry and topology in low dimensions*.
  Banff International Research Station, March 2007.
- *DMV Tagung 2006*.
  Universität Bonn, September 2006.
- *Four-dimensional Manifolds*.
  Mathematisches Forschungsinstitut Oberwolfach, August 2006.
- *Zeta Functions, Index and Twisted K-Theory; Interactions with Physics*.
  Mathematisches Forschungsinstitut Oberwolfach, May 2006.
- *Fourth NRW Topology Meeting*.
  Universität Wuppertal, October 2005.
- *Clay Mathematics Institute Summer School on Ricci Flow, 3-Manifolds and Geometry*.
  MSRI, Berkeley, June-July 2005.
- *Geometric Topology and Connections with Quantum Field Theory*.
  Mathematisches Forschungsinstitut Oberwolfach, June 2005.
- *Krzysztof Wojciechowski 50 Years – Analysis and Geometry of Boundary Value Problems*.
  Roskilde Universitet, May 2005.
- *Third NRW Topology Meeting*.
  Universitä Bochum, April 2005.
- *Clay Mathematics Institute Summer School on Floer Homology, Gauge Theory, and Low Dimensional Topology*.
  Alfréd Rényi Institute of Mathematics, Budapest, Hungary, June 2004.
- *Conference on Geometry and Topology of Manifolds*.
  McMaster University, Hamilton, May 2004.

- *Annual Mini-Conference in Modern Analysis*.
  IUPUI, Indianapolis, March 2004.
- *AMS meeting (#993)*.
  Phoenix, January 2004.
- *Floer Homology for* 3*-manifolds*.
  Banff International Research Station, November 2003.
- *Von Neumann Symposium on Complex Geometry, Calibrations, and Special Holonomy*.
  Differential Geometry Program, MSRI, Berkeley, August 2003.
- *Triangulation of Point Sets*.
  Summer Graduate Program, MSRI, Berkeley, July 2003.
- *AMS Meeting (#985)*.
  Central Section, Bloomington, April 2003.
- *Dirac Operators and Their Neighborhood*.
  IUPUI, Indianapolis, February 2003.
- *Geometric Scattering Theory and Elliptic Theory on Noncompact and Singular Spaces*.
  Spectral Invariants Program, MSRI, Berkeley, May 2001.
- *Geometric Aspects of Spectral Theory*.
  Spectral Invariants Program, MSRI, Berkeley, March 2001.
- *Midwest Opera-Topology Conference*.
  Bloomington, October 2000.
- *AMS Meeting (#953)*.
  Central Section, Notre Dame, April 2000.

Miscellaneous

Computer Skills	Familiarity with HTML, PHP, Javascript, Java, C, C++, Lisp, Scheme, Perl, Assembly language, SVG and 3D graphics software. Good knowledge of Unix and Windows. Good knowledge of Maple and Mathematica. Experience in software development.
Languages	Native language German; fluent in English; certificates of *Latinum* and *Graecum*.
Musical activities	saxophone performances at Aarhus Jazz Festival 2011, CD production, radio and television appearances with the *Saxophone Cartel* (2004), first prize at *Jugend Musiziert* (1995), .

References

- Professor Dr. Jørgen E. Andersen, `andersen@imf.au.dk`
  Center for Kvantegeometri af Modulirum, Aarhus Universitet, Denmark
- Professor Dr. Paul A. Kirk, `pkirk@indiana.edu`
  Department of Mathematics, Indiana University, Bloomington, Indiana, USA
- Professor Dr. Matthias Lesch, `lesch@math.uni-bonn.de`
  Mathematisches Institut, Universität Bonn, Germany

- Professor Dr. Nicolai Reshetikhin, reshetik@math.berkeley.edu
  Department of Mathematics, University of California, Berkeley, California
- Professor Dr. Alberto Torchinsky, torchins@indiana.edu
  Department of Mathematics, Indiana University, Bloomington, Indiana, USA

Aarhus, November 7, 2011