

Matthew Grayson

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RESEARCH INTEREST

To engineer semiconductor systems to induce collective electron behavior, and to control quantum numbers such as the spin and valley degrees of freedom. Structures and fabrication techniques of interest include III-V semiconductor heterostructures, quantum wells, quantum wires, cleaved-edge overgrowth and e-beam patterning. Measurement techniques include electron transport at low temperatures and high magnetic fields. Systems of interest are Luttinger liquids, quantum Hall edges, quantum Hall ferromagnets, and multivalley quantum systems.

PROFESSIONAL PREPARATION

University of Notre Dame	Electrical Engineering with Highest Honors	B S.	1990
Princeton University	Electrical Engineering	M.S.	1992
Princeton University	Electrical Engineering	Ph.D.	1998
University of Maryland	Physics		1998 - 2001
Technische Univ. Muenchen	Physics		2001 - 2007

APPOINTMENTS

- Northwestern University, Dept. of Electrical Engineering and Computer Science, Assistant Professor (3/07-)
- Technische Univ. Muenchen, Walter Schottky Institut, Munich, Habilitation Researcher (1/03 - 2/07)
- Max-Planck-Institut für Festkörperphysik, Stuttgart, Research Scientist (9/03 – 12/03)
- Technische Univ. Muenchen, Walter Schottky Institut, Munich, Alexander von Humboldt Research Fellow (5/01-8/03)
- University of Maryland, Dept. of Physics, Post-doctoral Research Associate (1/98 – 4/01)

SELECTED PUBLICATONS

Five most related publications

- [1] S. Dasgupta, C. Knaak, J. Moser, M. Bichler, S. F. Roth, A. Fontcuberta i Morral, G. Abstreiter, and M. Grayson (*submitted to Applied Physics Letters, likely publication Aug. 2007*). "Donor binding energy and thermally activated persistent photoconductivity in high-mobility (001) AIAs quantum wells," arXiv:0707.1796
- [2] J. Moser, S. Roddaro, D. Schuh, M. Bichler, V. Pelligrini, and M. Grayson (2006). "Disordered AIAs wires : Temperature-dependent resonance areas within the Fermi liquid paradigm," *Physical Review B* **74**: 193307.
- [3] J. Moser, T. Zibold, D. Schuh, M. Bichler, F. Ertl, G. Abstreiter, M. Grayson, S. Roddaro, and V. Pelligrini (2005). "AIAs cleaved-edge overgrown quantum wires," *Applied Physics Letters* **87**, 052101.
- [4] S. F. Roth, H. Krenner, M. Bichler, D. Schuh, and M. Grayson (2006). "Vertical quantum wire realized with double cleaved-edge overgrowth," *Applied Physics Letters* **89**, 032102-032104.
- [5] F. Fischer, R. Winkler, D. Schuh, M. Bichler, and M. Grayson (2007). "Transport evidence of the lowest Landau-level spin-index anticrossing in (110) GaAs two-dimensional holes," *Physical Review B* **75**, 073303.

Five other significant publications

- [6] M. Huber, M. Grayson, M. Rother, W. Biberacher, W. Wegscheider, and G. Abstreiter (2005). "Structure of a single sharp quantum Hall edge probed by momentum-resolved tunneling," *Physical Review Letters* **94**, 016805.
- [7] M. Grayson, L. Rigal, D. Schmadel, H.D. Drew, P.-J. Kung (2002). "Spectral measurement of the Hall angle response in normal state cuprate superconductors," *Physical Review Letters* **89**, 037003.
- [8] M. Grayson, D.C. Tsui, L.N. Pfeiffer, K.W. West, A.M. Chang (2001). "Resonant tunneling into a biased fractional quantum Hall edge," *Physical Review Letters* **86**, 2645-2648.
- [9] M. Grayson, D.C. Tsui, L.N. Pfeiffer, K.W. West, and A.M. Chang (1998). "Continuum of chiral Luttinger liquids at the fractional quantum Hall edge," *Physical Review Letters* **80**, 1062-1065.
- [10] M. Grayson (2006). "Electron correlations on the fractional quantum Hall edge," *Solid State Communications* **140**, 66-71.

TEACHING

Designed two-semester course “Experimentalphysik I & II in English language” (Newtonian mechanics, electricity, magnetism & thermodynamics) 2005-07

Designed half of lectures for course “Semiconductor Science and Nanotechnology” with Prof. Jonathan Finley 2005

Guest lecture “Physics of Low-Dimensional Systems” with Prof. Gerhard Abstreiter 2004-05

SELECTED SYNERGISTIC ACTIVITIES

- Guest Editor, Special Issue of *Physica Status Solidi*, “Frontiers in Semiconductor Nanoscience” (2006)
- Program Committee Member: *Electronic Properties of Two Dimensional Systems*, Genoa (2007)
- Producer, Actor (Heisenberg) (2006), in play “Copenhagen” by Michael Frayn, about physics and ethics at the dawn of the nuclear age. Performed at universities in three countries in: Tech. Univ. Munich, Tech. Univ. Vienna, and University of Zagreb for students, faculty, and community.
- Advised underrepresented graduate students at Tech. Univ. Muenchen: 2 Masters, 2 Ph.D. (women).
- Semiconductor Team Leader, Sorting Session APS (1999), APS (2000) March Meeting.

HONORS

Bernard-Hess Lectureship Prize from the Univ. of Regensburg 2006:

6 week lectures “Correlations, Condensates and Quantum Devices in the Quantum Hall Regime”

Alexander von Humboldt Fellow, 2000-2002

National Science Foundation Graduate Fellow 1991-1994

Basil R. Meyers Award for “Outstanding performance in academics both within and without the electrical engineering program”, University of Notre Dame 1990

SELECTED RECENT INVITED TALKS

“Bending the quantum Hall effect: Novel metallic and insulating states in one dimension”

- *Interactions in quantum Hall systems* – Dresden, GERMANY, Oct. 2006
- *Int. Conference on the Application of High Magnetic Fields* – Wuerzburg, GERMANY, Aug. 2006
- *Spin and charge effects on the Nanoscale* -- Pisa, ITALY, July 2006
- *American Physical Society Meeting* – Baltimore, USA, Mar. 2006
- *German Physical Society Meeting (DPG Tagung)* – Dresden, GERMANY, Mar. 2006
- *14th International Winterschool on Solid State Physics* – Mauterndorf, AUSTRIA, Feb. 2006
- *Nanoelectronics 06: Quantum transport and noise in nanoscale systems* – Lancaster, UK, Jan. 2006
- *EPQHS 2007: Emergent Properties of Quantum Hall Systems* – Penn State U., USA, Jun. 2007

“Transport evidence of lowest Landau-level spin-index anticrossing in (110) GaAs two-dimensional

- Invited Seminar, Purdue University (2007) holes.”
- Invited Seminar, U. of Hannover (2006)

COLLABORATORS & CO-EDITORS: Gerhard Abstreiter (Tech. U. Muenchen), Werner Biberacher (Walther Meissner Institut), Dominique Bougeard (Tech. U. Muenchen), Erica Carlson (Purdue U.), Valeri Dolgoplov (ISSP, Chernogolovka), Klaus Ensslin (ETH Zurich), Jonathan Finley (Tech. U. Muenchen), Anna Fontcuberta-i-Morrall (Tech. U. Muenchen), Lutz Hoeppe (MPI-Stuttgart), Klaus von Klitzing (MPI-Stuttgart), Hubert Krenner (UCSB), Duncan Maude (Grenoble High Magnetic Field Labs / CNRS), Joel Moser (Univ. Barcelona), Karl Neumaier (Walther Meissner Institut), Eric Palm (Tallahassee High Magnetic Field Labs), Vittorio Pellegrini (Scuola Normale, Pisa), Stefano Roddaro (Scuola Normale, Pisa), Martin Rother (Tech. U. Muenchen), Dieter Schuh (U. Regensburg), Jurgen Smet (MPI-Stuttgart), Eric Stach (Purdue U.), Mark Tornow (U. of Braunschweig), Werner Wegscheider (U. Regensburg), Roland Winkler (Northern Illinois Univ. / Argonne), Ulrich Zeitler (Nijmegen U. / European High Magnetic Field Labs), Tobias Zibold (Tech. U. Muenchen)

GRADUATE ADVISOR: Daniel C. Tsui (Princeton U.)

POST-DOCTORAL SPONSORS: H. Dennis Drew (U. Maryland), Gerhard Abstreiter (Tech. U. Muenchen), K. von Klitzing (MPI-Stuttgart)

THESIS ADVISOR (13): (ALL of the following have Tech. U. Muenchen as the affiliation) Shivaji Dasgupta, Felix Erfurth, Frank Ertl, Matthias Fehr, Frank Fischer, Michael Huber, Nebile Isik, Claudius Knaak, Marco Neumair, Sebastian Roth, Lucia Steinke, Emanuele Uccelli, Ying Xiang

POST-GRADUATE SCHOLAR SPONSOR (1): Joel Moser (U. Barcelona)