Curriculum vitae Joerg Wunderlich

- Institut für experimentelle Physik, Universität Regensburg,
  Universitätsstrasse 3, 93051 Regensburg, Germany

- Institute of Physics ASCR, v.v.i.
  Cukrovarnická 10, 162 53 Praha 6, Czech Republic

Education

- 1995-96 Diploma-Thesis, performed at the Institut d'Électronique Fondamentale (Orsay/France), within a collaboration between the University of Regensburg, the Institut d'Électronique Fondamentale and Thomson CSF (Orsay/France), with partial funding from Thomson. Title: "Spin-dependent resonant tunneling through a double-barrier heterostructure" Supervisor: Prof. Patrick Bruno
- 1997 internship at SIEMENS Automotive Systems (Regensburg /Germany)
- 1998-01 Ph.D. Thesis (experimental and theoretical), within a "co-tutelle" between Institut d'Electronique Fondamentale (Orsay/France) and the Max Planck Institute for Mikrostrukturphysik (Halle/Germany). The work was funded under a Marie-Curie PhD scholarship from the European Union. Title: "Extraordinary Hall effect and dynamics of magnetization reversal in ultrathin ferromagnetic stripes". Supervisors: Prof. Claude Chappert (IEF, Orsay) for the experimental part, and Prof. Patrick Bruno (MPI, Halle) for the theoretical part

Academic career

- 2001-04 Research Scientist at Hitachi Cambridge Laboratory, UK
- 2010-15 J.E. Purkyne Fellow at the Institute of Physics ASCR in Prague, CR
- 2004-17 Senior Research Scientist and Group Leader at Hitachi Cambridge Laboratory, UK
- 2018-19 Chief Research Scientist and Group Leader at Hitachi Cambridge Laboratory, UK
- Oct. 2019 Chair holder at the Institute for experimental physics, University of Regensburg, Germany

Research interests

- spin-transport phenomena, spin-generation/detection in semiconductor systems with low dimensionality
- spin-orbit related magnetoresistance effects and spin torque phenomena
- magnetic nanostructures, domain wall and vortex dynamics
- electric field controlled magnetic properties
- materials research of ferromagnetic and antiferromagnetic semiconductors and metals
- semiconductor device physics
- organic spintronics

Prizes

- 2006 Hitachi R&D Group Technology (Kenkai) Prize for the discovery of the CBAMR effect
- 2009 Hitachi R&D Group Technology Prize (Kenkai) for the discovery of the spin injection Hall effect
- 2010 J.E. Purkyne Fellowship
- 2016 IEEE-IoP Wohlfarth Prize for the experimental discovery of the spin Hall effect
- 2018 RCAST Fellowship at the University of Tokyo

Key Scientific Achievements:

- 2004: discovery of the Spin Hall effect
- 2006: discovery of the Coulomb blockade anisotropic magnetoresistance effect
- 2010: realization of a Spin transistor based on the Spin Hall effect
- more than 80 publications co-authored in peer reviewed journals including 2 article in Science, 10 articles in Nature Publishing Group journals, and 12 articles in Physical Review Letters, 3 book chapters
- 25 patent applications (22 primary inventor) in EU and USA from which are 13 granted, 1 int. to grant, 11 are pending
- ~70 invited talks at international conferences since 2005
- 4 press-releases: February 2005: Spin Hall effect; August 2006: Coulomb Blockade Anisotropic Magnetoresistance effect; September 2009: Spin Injection Hall effect, January 2011: Spin Hall effect transistor

Funding ID

EU Grants:

(1) ERC Synergy Grant (SyG), ERC-2013-SyG2014-08-01, SC2, End date: 2014 – 2020, (PI)
(2) EMRP Researcher Grant x-01 REG FZU, parent JRP: x-01 SpinCal 2013-2016, (PI)
(3) Marie Curie ITN Grant (SpinIcur) EU FP7 316657 2012-2016,
(4) EMRP Researcher Grant IND08-REG1, parent JRP: IND08 MetMags 2011-2014, (PI)
(5) Initial Training network in Nanoscale Semiconductor Spintronics (SemiSpinNet) 2008-12,EU FP7 215368-2 (PI)
(6) Nanostructured Magnetic materials for Nano-Spintronics (NAMASTE) 2008-2011, EU FP7 214499 (PI)
(7) Semiconductor Nano-Spintronics (NANOSPIN) 2006-2008, IST - 015728 - 2 (PI)

Private

- married, two children

List of publications

Peer-reviewed journals:

91: H. Reichlova, T. Janda, J. Godinho, A. Markou, D. Kriegner, R. Schlitz, J. Zelezny, Z. Soban, M. Bejarano, H. Schultheiss, P. Nemec, T. Jungwirth, C. Felser, J. Wunderlich, and S. T. B. Goennenwein, Nat. Comm. 10, 5459 (2019), Imaging and writing magnetic domains in the non-collinear antiferromagnet Mn3Sn

90: Shu-Jen Wang, Deepak Venkateshvaran, MR Mahani, Uday Chopra, Erik R McNellis, Riccardo Di Pietro, Sam Schott, Angela Wittmann, Guillaume Schweicher, Murat Cubukcu, Keehoon Kang, Remington Carey, Thomas J Wagner, Janis NM Siebrecht, Daniel PGH Wong, Ian E Jacobs, Razan O Aboljadayel, Adrian Ionescu, Sergei A Egorov, Sebastian Mueller, Olga Zadvorna, Piotr Skalski, Cameron Jellett, Mark Little, Adam Marks, Iain McCulloch, Joerg Wunderlich, Jairo Sinova, Henning Sirringhaus, Nature Electronics, 2(3), 98 (2019), Long spin diffusion lengths in doped conjugated polymers due to enhanced exchange coupling

89: E. Pfitzner, X. Hu, H. W. Schumacher, A. Hoehl, D. Venkateshvaran, M. Cubukcu, J. W. Liao, S. Auffret, J. Heberle, J. Wunderlich, and B. Kastner, AIP Advances 8, 12, 125329 (2018), Near-field magneto-caloritronic nanoscopy on ferromagnetic nanostructures

88: J. Godinho, H. Reichlova, D. Kriegner, V. Novak, K. Olejnik, Z. Kaspar, Z. Soban, P. Wadley, R. P. Campion, R. M. Otxoa, P. E. Roy, J. Zelezny, T. Jungwirth, and J. Wunderlich, Nat. Comm. 9, 4686 (2018), Electrically induced and detected Neel vector reversal in a collinear antiferromagnet

87: Murat Cubukcu, Deepak Venkateshvaran, Angela Wittmann, Shu-Jen Wang, Riccardo Di Pietro, Stephane Auffret, Laurent Vila, Joerg Wunderlich, Henning Sirringhaus, Appl. Phys. Letts. 112, 26, 262409 (2018), Electrical nucleation and detection of single 360° homochiral Néel domain walls measured using the anomalous Nernst effect

86: K. R. Jeon, C. Ciccarelli, H. Kurebayashi, J. Wunderlich, L. F. Cohen, S. Komori, J. W. A. Robinson, and M. G. Blamire, Phys. Rev. Appl. 10, 1, 014029 (2018), Spin-Pumping-Induced Inverse Spin Hall Effect in Nb/Ni80Fe20 Bilayers and its Strong Decay Across the Superconducting Transition Temperature

85: K. Olejník, T. Seifert, Z. Kaš par, V. Novák, P. Wadley, R.P. Campion, M. Baumgartner, P. Gambardella, P. Ně mec, J. Wunderlich, J. Sinova, P. Kuž el, M. Müller, T. Kampfrath, and Tomas Jungwirth, Science Adv. Vol. 4, no. 3, eaar3566 (2018), Terahertz electrical writing speed in an antiferromagnetic memory

84: P. Wadley, S. Reimers, M. J. Grzybowski, C. Andrews, M. Wang, J. S. Chauhan, B. L. Gallagher, R. P. Campion, K. W. Edmonds, S. S. Dhesi, F. Maccherozzi, V. Novak, J. Wunderlich, and T. Jungwirth, Nature Nanotechnology 13, 362 (2018), Current-polarity dependent manipulation of antiferromagnetic domains

83: T. Jungwirth, J. Sinova, A. Manchon, X. Marti, J. Wunderlich, and C. Felser, Nat. Phys. 14, 3, 200 (2018), The multiple directions of antiferromagnetic spintronics

82: D. Kriegner, H. Reichlova, J. Grenzer, W. Schmidt, E. Ressouche, J. Godinho, T. Wagner, S. Y. Martin, A. B. Shick, V. V. Volobuev, G. Springholz, V. Holy, J. Wunderlich, T. Jungwirth, and K. Vyborny, Phys. Rev. B 96, 21, 214418 (2017), Magnetic anisotropy in antiferromagnetic hexagonal MnTe

81: T. Wagner, J. A. Haigh, K. Olejnik, A. C. Irvine, V. Novak, and J. Wunderlich, Appl. Phys. Lett. 111, 14, 142401 (2017), Noise-based approximation to thermal spin-injection in Fe/GaAs

80: L. Nadvornik, M. Surynek, K. Olejnik, V. Novak, J. Wunderlich, F. Trojanek, T. Jungwirth, and P. Nemec, Physical Review Applied 8, 3, 034022 (2017), Fast Optical Control of Spin in Semiconductor Interfacial Structures

79: P. Krzysteczko, J. Wells, A. F. Scarioni, Z. Soban, T. Janda, X. K. Hu, V. Saidl, R. P. Campion, R. Mansell, J. H. Lee, R. P. Cowburn, P. Nemec, O. Kazakova, J. Wunderlich, and H. W. Schumacher, Phys. Rev. B 95, 22, 220410 (2017), Nanoscale thermoelectrical detection of magnetic domain wall propagation

78: T. Janda, P.E. Roy, R.M. Otxoa, Z. Soban, A. Ramsay, A.C. Irvine, F. Trojanek, M. Surynek, R.P. Campion, B.L. Gallagher, P. Nemec, T. Jungwirth, J. Wunderlich, Nature Communications (2017), Inertial displacement of a domain wall excited by ultra-short circularly polarized laser pulses (in press)

77: J. Wunderlich, Nature Materials 16, 284 (2017), Current-switched magnetic insulator

76: L. Nadvornik, K. Olejnik, P. Nemec, V. Novak, T. Janda, J. Wunderlich, F. Trojanek, and T. Jungwirth, Phys. Rev. B 94, 7, 075306 (2016), Enhancement of the spin Hall voltage in a reverse-biased planar p-n junction

75: P. E. Roy, R. M. Otxoa, and J. Wunderlich, , Phys. Rev. B 94, 014439 (2016), Robust picosecond writing of a layered antiferromagnet by staggered spin-orbit fields

74: H. Reichlova, V. Novak, Y. Kurosaki, M. Yamada, H. Yamamoto, A. Nishide, J. Hayakawa, H. Takahashi, M. Marysko, J. Wunderlich, X. Marti, and T. Jungwirth, Materials Research Express 3, 7, 076406 (2016), Temperature and thickness dependence of tunneling anisotropic magnetoresistance in exchange-biased Py/IrMn/MgO/Ta stacks

73: L. Nadvornik, P. Nemec, T. Janda, K. Olejnik, V. Novak, V. Skoromets, H. Nemec, P. Kuzel, F. Trojanek, T. Jungwirth, J. Wunderlich, Scientific Reports 6:22901 (2016) Long-range and high-speed electronic spin-transport at a GaAs/AlGaAs semiconductor interface

72: T Jungwirth, X. Marti, P. Wadley, J. Wunderlich, Nature Nanotechnology 11, 231 (2016), Antiferromagnetic spintronics

71: P. Wadley, B. Howells, J. Železný,3, C. Andrews, V. Hills, R. P. Campion, V. Novák, K. Olejník, F. Maccherozzi, S. S. Dhesi, S. Y. Martin, T. Wagner, J. Wunderlich, F. Freimuth, Y. Mokrousov, J. Kuneš, J. S. Chauhan, M. J. Grzybowski, A. W. Rushforth, K. W. Edmonds, B. L. Gallagher, T. Jungwirth, Science 351, 587 (2016), Electrical switching of an antiferromagnet

70: J. Sinova, S. Valenzuela, J. Wunderlich, C. H. Back, and T. Jungwirth, Rev. Mod. Phys. 87, 4, 1213 (2015), Spin Hall effects

69: H. Reichlova, D. Kriegner, V. Holy, K. Olejnik, V. Novak, M. Yamada, K. Miura, S. Ogawa, H. Takahashi, T. Jungwirth, and J. Wunderlich, Phys. Rev. B 92, 16, 165424 (2015), Current-induced torques in structures with ultrathin IrMn antiferromagnets

68: K. Olejnik, V. Novak, J. Wunderlich, and T. Jungwirth, Phys. Rev. B 91, 18, 180402(R) (2015), Electrical detection of magnetization reversal without auxiliary magnets

67: J. A. Haigh, C. Ciccarelli, A. C. Betz, A. Irvine, V. Novak, T. Jungwirth, and J. Wunderlich, Phys. Rev. B 91, 14, 140409(R) (2015), Anisotropic magnetocapacitance in ferromagnetic-plate capacitors

66: M. F. Gonzalez-Zalba, C. Ciccarelli, L. P. Zarbo, A. C. Irvine, R. P. Campion, B. L. Gallagher, T. Jungwirth, A. J. Ferguson, and J. Wunderlich, Plos One 10, 4, 1504.01231 (2015), Reconfigurable Boolean Logic using Magnetic Single-Electron Transistors

65: L. Nadvornik, J. A. Haigh, K. Olejnik, A. C. Irvine, V. Novak, T. Jungwirth, and J. Wunderlich, Phys. Rev. B 91, 12, 125205 (2015), Efficient conversion of light to charge and spin in Hall-bar microdevices

64: A. J. Ramsay, P. E. Roy, J. A. Haigh, R. M. Otxoa, A. C. Irvine, T. Janda, R. P. Campion, B. L. Gallagher, and J. Wunderlich, Phys. Rev. Lett. 114, 6, 067202 (2015), Optical Spin-Transfer-Torque-Driven Domain-Wall Motion in a Ferromagnetic Semiconductor

63: J. Zelezny, H. Gao, K. Vyborny, J. Zemen, J. Masek, A. Manchon, J. Wunderlich, J. Sinova, and T. Jungwirth, Phys. Rev. Lett. 113, 157201 (2014), Relativistic Neel-order fields induced by electrical current in antiferromagnets.

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61: T. Jungwirth, J. Wunderlich, V. Novak, K. Olejnik, B. L. Gallagher, R. P. Campion, K. W. Edmonds, A. W. Rushforth, A. J. Ferguson, and P. Nemec, Rev. Mod. Phys. 86, 3, 855 (2014), Spin-dependent phenomena and device concepts explored in (Ga, Mn) As

60: H. Kurebayashi, J. Sinova, D. Fang, A. C. Irvine, T. D. Skinner, J. Wunderlich, V. Novak, R. P. Campion, B. L. Gallagher, E. K. Vehstedt, L. P. Zarbo, K. Vyborny, A. J. Ferguson, and T. Jungwirth, Nature Nanotechnology 9, 3, 211 (2014), An antidamping spin-orbit torque originating from the Berry curvature

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58: E. De Ranieri, P. E. Roy, D. Fang, E. K. Vehsthedt, A. C. Irvine, D. Heiss, A. Casiraghi, R. P. Campion, B. L. Gallagher, T. Jungwirth, and J. Wunderlich, Nature Materials 12, 9, 808 (2013), Piezoelectric control of the mobility of a domain wall driven by adiabatic and non-adiabatic torques

57: D. Petti, E. Albisetti, H. Reichlova, J. Gazquez, M. Varela, M. Molina-Ruiz, A. F. Lopeandia, K. Olejnik, V. Novak, I. Fina, B. Dkhil, J. Hayakawa, X. Marti, J. Wunderlich, T. Jungwirth, and R. Bertacco, Appl. Phys. Lett. 102, 19, 192404 (2013), Storing magnetic information in IrMn/MgO/Ta tunnel junctions via field-cooling

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55: E. Mikheev, I. Stolichnov, E. De Ranieri, J. Wunderlich, H. J. Trodahl, A. W. Rushforth, S. W. E. Riester, R. P. Campion, K. W. Edmonds, B. L. Gallagher, and N. Setter, Phys. Rev. B 86, 23, 235130 (2012), Magnetic domain wall propagation under ferroelectric control

54: J. Wunderlich, L. P. Zarbo, J. Sinova, and T. Jungwirth, Spin Current, Oxford University Press, (2012), Spin-injection Hall effect

53: C. Ciccarelli, L. P. Zarbo, A. C. Irvine, R. P. Campion, B. L. Gallagher, J. Wunderlich, T. Jungwirth, and A. J. Ferguson, Appl. Phys. Lett. 101, 12, 122411 (2012), Spin gating electrical current

52: K. Olejnik, J. Wunderlich, A. C. Irvine, R. P. Campion, V. P. Amin, J. Sinova, and T. Jungwirth, Phys. Rev. Lett. 109, 076601 (2012), Detection of Electrically Modulated Inverse Spin Hall Effect in an Fe/GaAs Microdevice

51: S. Mooser, F. K. Cooper, K. Banger, J. Wunderlich, and H. Sirringhaus, Phys. Rev. B 85, 23, 235202 (2012), Spin injection and transport in a solution-processed organic semiconductor at room temperature

50: T. Jungwirth, J. Wunderlich, and K. Olejnik, Nature Materials 11, 5, 382 (2012), Spin Hall effect devices

49: C. Ciccarelli, L. P. Zarbo, A. C. Irvine, R. P. Campion, B. L. Gallagher, J. Wunderlich, T. Jungwirth, and A. J. Ferguson, Appl. Phys. Lett. 101, 122411 (2012), Spin gating electrical current

48: X. Marti, B. G. Park, J. Wunderlich, H. Reichlova, Y. Kurosaki, M. Yamada, H. Yamamoto, A. Nishide, J. Hayakawa, H. Takahashi, and T. Jungwirth, Phys. Rev. Lett. 108, 1, 017201 (2012), Electrical Measurement of Antiferromagnetic Moments in Exchange-Coupled IrMn/NiFe Stacks

47: P. Balestriere, T. Devolder, J. Kim, P. Lecoeur, J. Wunderlich, V. Novak, T. Jungwirth, and C. Chappert, Appl. Phys. Lett. 99, 24 , 242505 (2011), Fast magnetization switching in GaMnAs induced by electrical fields

46: J. Sinova, J. Wunderlich, and T. Jungwirth, Handbook Of Spin Transport And Magnetism, Edited By E. Y. Tsymbal And I. Zutic, 497 (2011), Anomalous and Spin-Injection Hall Effects

45: P. E. Roy, and J. Wunderlich, Appl. Phys. Lett. 99, 12, 122504 (2011), In-plane magnetic anisotropy dependence of critical current density, Walker field and domain-wall velocity in a stripe with perpendicular

44: D. Fang, H. Kurebayashi, J. Wunderlich, K. Vyborny, L. P. Zarbo, R. P. Campion, A. Casiraghi, B. L. Gallagher, T. Jungwirth, and A. J. Ferguson, Nature Nanotechnology 6, 7, 413 (2011), Spin-orbit-driven ferromagnetic resonance

43: B. G. Park, J. Wunderlich, X. Marti, V. Holy, Y. Kurosaki, M. Yamada, H. Yamamoto, A. Nishide, J. Hayakawa, H. Takahashi, A. B. Shick, and T. Jungwirth, Nature Materials 10, 5, 347 (2011), A spin-valve-like magnetoresistance of an antiferromagnet-based tunnel junction.

42: T. Jungwirth, V. Novak, X. Marti, M. Cukr, F. Maca, A. B. Shick, J. Masek, P. Horodyska, P. Nemec, V. Holy, J. Zemek, P. Kuzel, I. Nemec, B. L. Gallagher, R. P. Campion, C. T. Foxon, and J. Wunderlich, Phys. Rev. B 83, 3, 035321 (2011), Demonstration of molecular beam epitaxy and a semiconducting band structure for I-Mn-V compounds

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38: K. Y. Wang, K. W. Edmonds, A. C. Irvine, J. Wunderlich, K. Olejnik, A. W. Rushforth, R. P. Campion, D. A. Williams, C. T. Foxon, and B. L. Gallagher, J. Magn. Magn. Mater. 322, 21, 3481 (2010), Domain wall resistance in perpendicular (Ga,Mn) As: Dependence on pinning

37: C. Ciccarelli, B. G. Park, S. Ogawa, A. J. Ferguson, and J. Wunderlich, Appl. Phys. Lett. 97, 8, 082106 (2010), Gate controlled magnetoresistance in a silicon metal-oxide-semiconductor field-effect-transistor

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35: P. Balestriere, T. Devolder, J. Wunderlich, and C. Chappert, Appl. Phys. Lett. 96, 14, 142504 (2010), Electric field induced anisotropy modification in (Ga,Mn)As: A strategy for the precessional switching of the magnetization

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30: M. H. S. Owen, J. Wunderlich, V. Novak, K. Olejnik, J. Zemen, K. Vyborny, S. Ogawa, A. C. Irvine, A. J. Ferguson, H. Sirringhaus, and T. Jungwirth, New J. Phys. 11, 023008 (2009), Low-voltage control of ferromagnetism in a semiconductor p-n junction

29: K. Y. Wang, A. C. Irvine, J. Wunderlich, K. W. Edmonds, A. W. Rushforth, R. P. Campion, C. T. Foxon, D. A. Williams, and B. L. Gallagher, New J. Phys. 10, 085007 (2008), Magnetic reversal under external field and current-driven domain wall motion in (Ga,Mn)As: influence of extrinsic pinning

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25: A. D. Giddings, O. N. Makarovsky, M. N. Khalid, S. Yasin, K. W. Edmonds, R. P. Campion, J. Wunderlich, T. Jungwirth, D. A. Williams, B. L. Gallagher, and C. T. Foxon, New J. Phys. 10, 085004 (2008), Huge tunnelling anisotropic magnetoresistance in (Ga,Mn)As nanoconstrictions

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