

Nanospintronic Design and Realization

International conference – May 21 - 25, 2007



Scientific Coordinators:

[Stefan Blügel](#) (Forschungszentrum Jülich, Germany)

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Summary

Spintronics is currently among of the most active research themes in condensed matter physics. The field is progressing very fast and continues branching into an increasingly wider area of condensed matter: these involve the strongly correlated electron systems, the connection to semiconductors in terms of diluted magnetic semiconductors, to organic and inorganic molecules in terms of molecular magnets, to carbon nano-tubes in the field of nanospintronics or even to ferro-electric materials in terms of multiferroics. This is a field where first-principles theory meets transport theory, mesoscopic physics and device oriented concepts. It is thus a field providing a challenge for our community. The conference provided an international forum for theoretical and experimental researchers, in the rapidly developing field of nanospintronics.

In the many invited and contributed talks and posters the conference covered a wide range of subjects in the field including:

- overviews of our current understanding of the physics of spin transport in (magnetic) semiconductors and hybrid magnetic/semiconductor structures including the problems of spin-injection and the possibility the magnetic semiconductors can offer
- open discussions the latest developments in spin-dependent phenomena employed in nano-(opto-) electronics and computing applications
- assessment of the effects of temperature in nanospintronics, spin-lifetime and coherence
- presentations on relativistic effects like the Spin-Hall effect and related issues
- research on new materials and spintronic problems such as multiferroic materials or ferroelectric tunnelling barriers with magnetic leads.

Program

	Sunday, May 20
18:00 - 19:00	Registration
	Monday, May 21
09:00 -	Registration
13:00	Opening
13:20 - 14:00	Albert Fert Spin transport in a lateral channel between spin-polarized source and drain: Advantage of carbon nanotubes on semiconductors
14:00 - 14:40	Jonathan Finley Manipulating charge and spin in quantum dot nanostructures
14:40 - 15:20	Laurens Molenkamp Spin-orbit effects in HgTe quantum wells and nanostructures
15:20 - 16:00	Bart van Wees Electronic spin transport and spin precession in single graphene layers at room temperature Coffee break
16:30 - 17:30	ICNDR07-Colloquium Hiroshi Katayama-Yoshida Computational nano-materials design for semiconductor spintronics
	Tuesday, May 22
09:00 - 09:40	Taro Nagahama Giant tunneling magnetoresistance in magnetic tunnel junctions with MgO(001) barrier

- 09:40 - 10:20 Phivos Mavropoulos
High-temperature properties of ferromagnets for magnetic tunnel junctions: Calculations based on first principles
Coffee break
- 11:00 - 11:40 Evgeny Tsymbal
Ferroelectric and multiferroic tunnel junctions
- 11:40 - 12:20 Ingrid Mertig
Spintronics on the subnanometer scale
- 12:30 - 14:00 Lunch
- 14:00 - 15:30 Poster session I
- 15:30 - 16:00 Coffee break
- 16:00 - 16:40 Ron Jansen
Tunable spin-tunnel contacts to silicon
- 16:40 - 17:20 Jaroslav Fabian
Theory of spin-polarized tunneling through single, double, and tripple barrier magnetic junctions
- 17:20 - 18:00 John Schliemann
Zitterbewegung and side jump motion in the two-dimensional electron gas

Wednesday, May 23

- 09:00 - 09:40 YoshiChika Otani
Spin accumulation and spin Hall effect in metallic systems
- 09:40 - 10:20 Teruo Ono
Manipulation of nano-spin-structure by electric current
- 10:20 - 11:00 Coffee break
- 11:00 - 11:40 Hiroshi Kohno
Microscopic theory of current-driven spin dynamics
- 11:40 - 12:20 Dale Kitchen
Atomic scale studies of magnetic atoms substituted into GaAs(110) one atom at a time
- 12:30 - 13:00 Lunch
- 14:00 - 14:40 Junsaku Nitta
Spin control by electric field in semiconductor 2DEGs
- 14:40 - 15:20 Thomas Schäpers
Spin-orbit coupling and Zeeman effect in semiconductor nanostructures
- 15:45 - Excursion into Dresden's old city centre

Thursday, May 24

- 09:00 - 09:40 Hisazumi Akai
Transport properties of half-metallic antiferromagnetic semiconductors
- 09:40 - 10:20 Inanc Adagideli
Creation and detection of current-induced spin accumulations: Voltage signatures and spin transfer torque
- 10:20 - 11:00 Coffee break
- 11:00 - 11:40 Sergio Valenzuela
Spin dynamics and the spin Hall effect in metallic nanostructures
- 11:40 - 12:20 Jörg Wunderlich
Extraordinary magnetoresistance effects and local control of magnetocrystalline anisotropy in (Ga,Mn)As devices
- 12:30 - 14:00 Lunch
- 14:00 - 15:30 Poster session II
- 15:30 - 16:00 Coffee break

16:00 - 16:40	Claude Ederer First principles investigation of magnetic ferroelectrics
16:40 - 17:20	Manuel Bibes Multiferroics for spintronics
17:20 - 18:00	Neil Mathur Phase separation mimics nanopatterning in manganite devices

Friday, May 25

09:00 - 09:40	Alexey Kimel Femtosecond opto-magnetism
09:40 - 10:20	Gerrit Bauer Spin caloritronics
10:20 - 11:00	Coffee break
11:00 - 11:40	Jörg Wrachtrup Single electron and nuclear spins in a carbon material: Readout and interaction with environment
11:40 - 12:20	Sergey Ganichev Zero-bias spin separation

Poster Contributions

Hadi Akbarzadeh	Crystal structure of ferromagnetic CrAs thin films on GaAs(001)
Farkhad Aliev	Low frequency noise in magnetic tunnel junctions
Nicolae Atodiresei	Towards biospintronic devices
Gabriel Autes	Theoretical study of spin dependent transport in iron atomic contact
Samvel Badalyan	Effect of exchange and correlation on the spin Coulomb drag in a 2DES of finite thickness
Alexej Bagrejs	Ab initio calculations of molecular conductance: How theory meets experiment
Swarnali Bandopadhyay	Circulating currents in multichannel mesoscopic ring
Cyrille Barretheau	Orbital contribution to the magnetic properties of iron from bulk to clusters
Dario Bercioux	Coherent spin ratchets
Lars Bergqvist	Halfmetallic antiferromagnetic diluted magnetic semiconductors
Bernd Beschoten and Gernot Güntherodt	Anisotropic electron spin lifetime in (In,Ga)As/GaAs(110) quantum wells
Karel Carva	Ab initio calculations of spin-mixing conductances
Dinh Van An	Spinodal decomposition thermodynamics and nano-scale phase separations in half-Heusler compounds XYZ from first principle calculations
Hubert Ebert	Ab initio calculations of tunnelling anisotropic magneto-resistance (TAMR) in Fe/GaAs/Au trilayer
Tetsuya Fukushima	First-principles design of fabrication process for tera-bit-density nano-magnets in dilute magnetic semiconductors
Martin Gradhand	Amorphous iron and magnetic tunnel junctions
Claudio Grimaldi	Electron-phonon effects on strongly spin-orbit coupled systems
Martina Hentschel	Many-body effects in the mesoscopic x-ray edge problem
Mahbube Hortamani	Ab-initio study of exchange interactions and critical temperature of bulk MnSi and ultrathin films MnSi/Si(001)
Perla Kacman	Spin-dependent tunneling in modulated structures of (Ga,Mn)As
Hideaki Kasai and Kunikata Shininchi	Dissociative adsorption of O ₂ on Pt/Fe(001)
Nikolay Kiselev	1. Multidomain states and enhanced stray field effects in perpendicularly polarized

	multilayer structures
	2. Transformation of polariton spectrum of thin-layers antiferromagnetic/nonmagnetic superlattice in the constant external electric field
Stavros Komineas	Rotating vortex dipoles in ferromagnets
Josef Kudrnovsky	Tc vs conductivity ratio: GaMnAs as a case study
Koichi Kusakabe	A first-principles study on meta-magnetic materials in the MgCu ₂ structure
Andrey Leonov	Reorientation effects, multidomain states and domain walls in diluted magnetic semiconductors
Marjana Lezaic	Magnetism and spin polarization of multicomponent half-metallic ferromagnets at finite temperatures
Zelia Maria Da Costa Ludwig	Formation of metallic nanoparticles in soda-lime-silica based glasses
Frantisek Maca	Mn-doped Ga(As,P) and (Al,Ga)As ferromagnetic semiconductors
Jacek A. Majewski	Theory of spin transport across domain-walls in (Ga,Mn)As
Francesc Malet Giralt	Ground state and conductance of quantum wires with Rashba and Dresselhaus spin-orbit interactions: Exchange-correlation effects
Maciej Misiorny	Switching of magnetic molecules attached to ferromagnetic leads
Yuriy Mokrousov	Supple magnetism in monoatomic 3d transition-metal chains
Hitose Nagara	Design of p-electron half-metals
Rashid Nazmitdinov	Simple model for spin-orbit effects in two-dimensional semiconductors in magnetic fields
Andreas Neudert	Spin-wave modes in patterned thin films investigated by time-resolved Kerr microscopy
Masako Ogura	First principles calculation of the magnetic and transport properties of La _{1-x} Ca _x MnO ₃
Tomoya Ono	First-principles study on quantum transport through thin films
Frederic Piechon	Boltzmann theory of spin transfer torque in continuous magnetic textures
Kay Potzger	Structural investigations of magnetic nanocrystals embedded in semiconductors using synchrotron radiation x-ray diffraction
Ponniah Ravindran	Density-functional studies on the origin of magnetoelectric behavior in BiFeO ₃
Vidya Ravindran	Effect of d-band filling on spin, charge, and orbital ordering in YbT ₂ O ₅ (T = Mn, Fe, Co)
Ivan Rungger	Bound states in electronic transport through Fe/MgO tunneling junctions
Leonid Sandratskii	Heisenberg-Hamiltonian description of complex itinerant-electron systems
Kazunori Sato	Spinodal decomposition and super-paramagnetism in dilute magnetic semiconductors
Sashi Satpathy	Effect of vacancy of ferromagnetism in the nitride-based dilute magnetic semiconductors
Matthias Scheid	Zeeman ratchets: Rectification of spin currents via magnetic fields
Lars Schreiber	Proof of coherent electrical spin injection across a Fe/GaAs interface
Nicholas Sedlmayr	Transport properties of non-collinear magnetic nanowires
Llorens Serra	Evanescence states in quantum wires with Rashba spin-orbit coupling
Alexander Sukhov	Temperature dependent magnetization reversal in magnetic nanoparticles
Rudolf Sykora	Transmission and reflection of spin-polarized electrons propagating through a model domain wall
Milan Tadic	Quantum mechanical coupling in stacks of strained quantum rings in a magnetic field
Georg Talut and Helfried Reuther	Ferromagnetism in GaN induced by Fe ion implantation
Piotr Trocha	Coherent transport through the systems of coupled quantum dots
Ilja Turek	Current-induced spin-transfer torques in non-collinear spin valves from Green's functions
Michel Viret	Magneto-resistance in atomic contacts
Nengping Wang	Spin-dependent transport in ferromagnetic nanowires
Steven Watts	Electrical detection of spin pumping

Maarten Wegewijs	Quantum phase interference and spin-parity effects in transport through single-molecule magnets
Ireneusz Weymann	Spin-polarized transport through quantum dots in the cotunneling regime
Daniel Wortmann	All electron calculations of electronic transport: Applications to magnetic tunnel junctions
Karol Izydor Wysokinski	Thermoelectric effects in strongly interacting quantum dot coupled to normal and ferromagnetic leads
Peter Zahn	The spin diffusion length in metals: Ab initio treatment of impurity scattering in Cu

List of participants

1. Inanc Adagideli
2. Hisazumi Akai
3. Hadi Akbarzadeh
4. Farkhad Aliev
5. Nicolae Atodiresei
6. Gabriel Autès
7. Samvel Badalyan
8. Alexej Bagrets
9. Swarnali Bandopadhyay
10. Cyrille Barreteau
11. Gerrit Bauer
12. Dario Bercioux
13. Bernd Beschoten
14. Manuel Bibes
15. Karel Carva
16. Elisa De Ranieri
17. Van An Dinh
18. Claude Ederer
19. Hubert Ebert
20. Jonathan Eroms
21. Jaroslav Fabian
22. Paolo Ferriani
23. Albert Fert
24. Jonathan Finley
25. Tetsuya Fukushima
26. Sergey Ganichev
27. Martin Gradhand
28. Claudio Grimaldi
29. Gernot Güntherodt
30. Seyed Javad Hashemifar
31. Martina Hentschel

32. Mahbube Hortamani
33. Perla Kacman
34. Hideaki Kasai
35. Hiroshi Katayama-Yoshida
36. Nikolay Kiselev
37. Stavros Komineas
38. Jens Kortus
39. Josef Kudrnovsky
40. Koichi Kusakabe
41. Andrei Leonov
42. Marjana Lezaic
43. Zélia Maria Da Costa Ludwig
44. Frantisek Maca
45. Jacek A. Majewski
46. Francesc Malet Giralt
47. Neil Mathur
48. Phivos Mavropoulos
49. Ingrid Mertig
50. Maciej Misiorny
51. Yuriy Mokrousov
52. Laurens Molenkamp
53. Hitose Nagara
54. Rashid Nazmitdinov
55. Andreas Neudert
56. Junsaku Nitta
57. Masako Ogura
58. Teruo Ono
59. Tomoya Ono
60. YoshiChika Otani
61. Man Hon Samuel Owen
62. Frederic Piechon
63. Kay Potzger
64. Uzma Rana
65. Ponniah Ravindran
66. Vidya Ravindran
67. Helfried Reuther
68. Ivan Rungger
69. Leonid Sandratskii
70. Kazunori Sato
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72. Thomas Schäpers

73. Matthias Scheid
74. John Schliemann
75. Lars Schreiber
76. Nicholas Sedlmayr
77. Llorens Serra
78. Kunikata Shininchi
79. Tatsuya Shishidou
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82. Milan Tadic
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91. Steven Watts
92. Maarten Wegewijs
93. Ireneusz Weymann
94. Daniel Wortmann
95. J. Wrachtrup
96. Karol Izidor Wysokinski
97. Peter Zahn