

Paweł Buczek

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PERSONAL PARTICULARS:

Date and place of birth 7th of July 1981 in Rybnik, Upper Silesia, Poland
Address c/o Max Planck Institute of Microstructure Physics
Weinberg 2
06120 Halle (Saale), Germany
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PROFESSIONAL EXPERIENCE

since April 2009

Postdoctoral fellow in the newly founded group of Prof. Gross in the Max Planck Institute of Microstructure Physics in Halle (Saale), Germany
Topic: spin excitations as the coupling mechanism in iron based superconductors.

EDUCATION

October 2005 – April 2009

PhD student
International Max Planck Research School in Halle (Saale), Germany
Supervisor: Patrick Bruno. Thesis: δ Spin dynamics of complex itinerant magnets.
Final grade: *summa cum laude* (1.0, the highest on the German scale).

September 2003 – June 2005

Master of Science in Physics
University of Alberta, Edmonton, Canada.
Major: fluid dynamics of multiphase flows.
The main subject of my thesis was development of a model of momentum transfer between fluid and granular phase. Supervisor: Andrzej Czarnecki. Thesis: δ On the drag experienced by particles in fluid.
The program was parallel to my studies in Poland. Final grade: 4.0 (the highest on the Canadian scale).

October 2000 – July 2005

Batchelor & Master of Science in Technical Physics
AGH University of Science and Technology, Kraków, Poland.
Combined majors: computational physics and crystallography of quasiperiodic systems.
The thesis δ Decorated quasicrystals in the average unit cell formalismö was devoted to the problem of description of complex aperiodic lattices. Supervisor: Janusz Wolny.
Final average grade: 6.0 (the highest on the Polish scale).

1996-2000

Frycz-Modrzewski Secondary School in Rybnik, Poland. Graduated with honours.

1988-1996

Jan III Sobieski Primary School in Lyski, Poland.

PUBLICATIONS

1. Buczek, P., Ernst, A., Sandratskii, L. M., "Standing Spin Waves as a Basis for the Control of Terahertz Spin Dynamics: Time Dependent Density Functional Theory Study", *Physical Review Letters* **105**, 097205 (2010)
2. A. Schmidt, M. Pickel, M. Donath, P. Buczek, A. Ernst, V. P. Zhukov, P. M. Echenique, L. M. Sandratskii, E. V. Chulkov, M. Weinelt, "Ultrafast Magnon Generation in an Fe Film on Cu(100)", *Physical Review Letters* **102**, 197401 (2010)
3. Zhang, Y., Buczek, P., Sandratskii, L., Tang, W. X., Prokop, J., Tudosa, I., Peixoto, T. R. F., Zakeri, Kh., Kirschner, J., "Non-monotonous thickness dependence of spin wave energy in ultrathin Fe films: experiment and theory", *Physical Review B* **81**(9), 094438 (2010)
4. Buczek, P., Ernst, A., Bruno, P., Sandratskii, L. M., "The energies and life times of magnons in bulk iron and one-monolayer Fe film", *Journal of Magnetism and Magnetic Materials* **322**, 1396 (2010)
5. Buczek, P., Ernst, A., Sandratskii, L. M., "Spin dynamics of half-metallic Co_2MnSi ", *Journal of Physics: Conference Series* **200**, 042006 (2010)
6. Buczek, P., Ernst, A., Bruno, P., Sandratskii, L. M., "Energies and Lifetimes of Magnons in Complex Ferromagnets: A First-Principle Study of Heusler Alloys", *Physical Review Letters* **102**, 247206 (2009)
7. Buczek, P., "Can aperiodic crystals have periodic diffraction patterns?", *Zeszyty Naukowe AGH*, June 2003 (batchelor thesis)
8. Buczek, P., Sadun, L., Wolny, J., "Periodic diffraction patterns for 1D quasicrystals", *Acta Physica Polonica B* **36**(3), 2005. <http://www.arxiv.org/abs/cond-mat/0309008>
9. Buczek, P., Wolny, J., "An extinction rule for a class of 1D quasicrystals", *Philosophical Magazine* **86**(6-8), 889-894 (2005)
10. Buczek, P., Wolny, J., "Physical space description of decorated 1D aperiodic sequences", *Philosophical Magazine* **86**(27), 4181-4194 (2006)

SCIENTIFIC INTERESTS

- time dependent processes in magnets (in particular "magnon-electron coupling")
- magnetization dynamics, recently in strongly interacting electron systems
- inelastic transport/tunneling of electrons (inelastic scanning tunneling spectroscopy)
- high temperature superconductivity

EXPERIENCE

- linear response time dependent density functional theory (implementation of dynamic susceptibility code for calculating magnon spectra in complex magnetic systems)
- *ab initio* calculations and code development
- ground state density functional theory and its extensions to strongly correlated systems (self interaction correction)
- high performance supercomputing, parallelization
- many body perturbation theory, GW

INVITED ORAL PRESENTATIONS

- *Spin dynamics of complex metallic magnets*, Hauptvortrag at DPG Spring Meeting of the Condensed Matter Section, March 25, 2010, Regensburg, Germany
- *Spin dynamics of complex metallic magnets*, Theory Group Seminar at Forschungszentrum Jülich, January 26, 2010, Jülich, Germany
- *Magnetic susceptibility in Korringa-Kohn-Rostoker framework*, Workshop on Linear Response Functions in Multiple Scattering Theory, December 12, 2009, Halle/Germany
- *Elementary magnetic excitations of metals*, Donostia International Physics Center Seminar, May 27, 2009, San Sebastian/Donostia, Basque Country, Spain
- *Spin dynamics of complex metallic magnets*, Meeting of the Scientific Advisory Board of MPI Halle, March 5, 2009
- *From bulk to ultrathin films – the impact of the dimensionality on the spin dynamics*, Physics Department Seminar, Technical University Karlsruhe, December 8, 2008, Karlsruhe, Germany
- *Magnetism and magnetization dynamics with HUTSEPOD*, KKR Workshop, July 4, 2008, Canterbury, England

CONTRIBUTED ORAL PRESENTATIONS (SELECTED)

- *Standing spin-waves in ultrathin magnets*, μ Conference, September 16, 2010, Berlin, Germany
- *Paramagnons of palladium hydrate*, Theoretical and Experimental Magnetism Meeting, Cosenerø House, September 9, 2010, Abingdon, Oxford, UK
- *Controlling terahertz magnetization dynamics in nanostructures*, Joint European Magnetic Symposia, August 27, 2010, Kraków, Poland
- *Energies and life times of magnons in half-metallic Heusler alloys*, International Conference on Magnetism, July 30, 2009, Karlsruhe, Germany
- *Spin-waves of Fe/W(110) films*, 20th International Colloquium on Magnetic Films and Surfaces, July 23, 2009, Berlin, Germany
- *Magnons in half-metallic Heusler compounds*, KKR Workshop, June 12, 2009, Budapest, Hungary
- *Spin dynamics of complex metallic magnets*, Young Researchers Meeting, June 5, 2009, Berlin, Germany
- *Spin dynamics in bulk iron and ultrathin iron films*, Joint European Magnetic Symposia, September 2008, Dublin, Ireland

POSTER PRESENTATIONS (SELECTED)

- *Magnon assisted scanning tunneling microscopy*, Workshop Excitements in Magnetism, November 2009, Ringberg Castle, Germany (with E. V. Chulkov)
- *Spin dynamics of half-metallic Heusler alloys*, International Summer School on Spintronics, September 2008, Prague, Czech Republic

All contributions feature Arthur Ernst and Leonid Sandratskii as coauthors.

LONGER EXTERNAL SCIENTIFIC VISITS

- May 2010, Daresbury Labs, England. Self-interaction correction within linear response density functional theory.
- September 2009, Donostia International Physics Center, Basque Country, Spain. Magnon assisted scanning tunneling microscopy.
- May 2009, Donostia International Physics Center, Basque Country, Spain. Magnon-electron interaction in pump-probe experiments.

TEACHING

- *Time dependent quantum processes*, lectures for the International Max Planck Research School, winter semester 2010.

AWARDS (SELECTED)

- **2005**
Scholarship of the International Max Planck Research School for Science and Technology of Nanostructures, Halle (Saale), Germany
- **2004**
Golden Bell Jar Graduate Recruitment Scholarship in Physics, University of Alberta, Edmonton, Canada
- **2003**
Helena and Tadeusz Zieliński Scholarship
Polish Minister of Education Scholarship
Gilded Youth Scholarship founded by Silesian Region
- **before 2003**
3rd place in Silesian Physics Competition (2000)
scholarship of Polish Prime Minister (1999 and 2000)
laureate of XLVII Polish Physics Competition (1998)

SIDE AND OFF-SCIENTIFIC INTEREST

- active member of PhD Network of Max Planck Society
- computational symbolic algebra
- space flights and exploration
- extraterrestrial physics, planetary science
- jazz & rock music (John Coltrane, Miles Davies, Talking Heads, Pearl Jam, Radiohead, and many more)
- reading (everything), recently European prehistory (Celtic culture) and history
- cinema (member of local film club)
- swimming & sailing, badminton, biking

LANGUAGES

- English (fluent in speech and writing)
- German (fluent in speech and writing)
- Polish (native speaker)

PROGRAMMING SKILLS

- I worked extensively with the following programming languages: Fortran 77, Fortran 90/95, C, C++, BlackBox (object-oriented mutation of Pascal).
- Parallelization techniques, in particular MPI (Message Passing Interface)
- Experience with Java
- Good working knowledge of *Mathematica*
- Hydrodynamic simulation packages: *Fluent*, *CFX*
- Basics of XML (including Scalable Vector Graphics (SVG) format)

REFERENCES

- Hardy Gross, hardy@mpi-halle.mpg.de (Germany)
- Leonid Sandratskii, lsandr@mpi-halle.mpg.de (Germany)
- Andrzej Czarnecki, andrzej.czarnecki@cern.ch (Canada)