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Denis Sheka

Curriculum Vitæ

Personal

Date of birth 5th May, 1969
Place of birth Kyiv, Ukraine
Sex Male
Marital Status married, one child
Citizenship Ukraine

Education and Academic Grades

- 2009 **D. Sc. in Theoretical Physics**, *Bogolyubov Institute for Theoretical Physics, Kyiv, Ukraine.*
D.Sc. thesis "Dynamics of two-dimensional magnetic solitons"
- 2005–2008 **Dr.Cand. (habilitation) in Theoretical Physics**, *Radiophysics Faculty, National Taras Shevchenko University of Kyiv, Kyiv, Ukraine.*
- 1996 **Cand. Sc. in Magnetism**, *National Taras Shevchenko University of Kyiv, Kyiv, Ukraine.*
Ph.D thesis "Vortices in Two-Dimensional Easy-Plane Magnets. Dynamics, Relaxation, and Contribution to the Magnet Response Functions"
- 1991–1995 **PhD Student in Physics**, *Radiophysics Faculty, National Taras Shevchenko University of Kyiv, Kyiv, Ukraine.*
- 1991 **M. Sc. in Physics**, *Department of Crio- and Micro- electronics, Radiophysics Faculty, National Taras Shevchenko University of Kyiv, Kyiv, Ukraine.*
M.Sc thesis "Dynamics of Two-Dimensional Solitons (Magnetic Vortices) and Their Contribution to the Thermodynamics of Layered Magnets"
- 1986–1991 **Undergraduate Student in Physics**, *Radiophysics Faculty, National Taras Shevchenko University of Kyiv, Kyiv, Ukraine.*

Experience

Full-time appointments

- 2013–present **Professor**, *Department of Mathematics and Theoretical Radiophysics, Faculty of Radio Physics, Electronics and Computer Systems, Kyiv University, Kyiv, Ukraine.*
- 2008–2012 **Associate Professor**, *Department of Mathematics and Theoretical Radiophysics, Radiophysics Faculty, Kyiv University, Kyiv, Ukraine.*
- 2006–2007 **Humboldt Fellow**, *Bayreuth University, Bayreuth, Germany.*
- 2000–2005 **Associate Professor**, *Department of Mathematics and Theoretical Radiophysics, Radiophysics Faculty, Kyiv University, Kyiv, Ukraine.*
- 1994–2000 **Assistant Professor**, *Department of Mathematics and Theoretical Radiophysics, Radiophysics Faculty, Kyiv University, Kyiv, Ukraine.*

Part-time appointments

- 2010–present **Professor (partial time)**, *Institute of High Technologies, Kyiv University, Kyiv, Ukraine.*
- 2009–2010 **Senior Research Fellow (half time)**, *Bogolyubov Institute for Theoretical Physics, Kyiv, Ukraine.*

Long-Time Commitments

- 2013–present **Scientific Secretary**, *Coordinating Council of the Complex Scientific Programme "Modern Technologies and Matherials", Kyiv University, Kyiv, Ukraine.*

2004–2005 **Scientific Secretary**, *Department of Mathematics and Theoretical Radiophysics, Radiophysics Faculty, Kyiv University, Kyiv, Ukraine.*

2000–2004 **Acting as the Deputy Dean (Scientific Affairs)**, *Radiophysics Faculty, Kyiv University, Kyiv, Ukraine.*

Visits for Joint Research

University of Bayreuth, Germany **Group of Prof. F. Mertens**, *Nov 99-Jan 00; May-Jun 00; Nov-Dec 01; Nov-Dec 02; Jul-Sep 03; Jan-Feb 04; Jul 04; Jan-Feb 05; Jun 05; Jan 06-Aug 07; Jan-Feb 08; Jul 09; Feb 10; Jul-Aug 10; Jun-Aug 12; Jul-Aug 15*

HZDR Dresden, Germany **Group of Dr. D. Makarov**, *Jan-Feb 16; Jan-Feb 17*

IFW Dresden, Germany **Group of Dr. D. Makarov**, *Jun 11; Jun 12; Sep-Oct 13; Jan-Feb 15*

Bristol University, GB **Group of Prof. J. Robbins**, *Feb 15; Sep 16*

Los Alamos National Laboratory, USA **Group of Prof. A. Saxena**, *May 16*

Universidad Técnica Federico Santa María, Valparaíso, Chile **Group of Prof. P. Landeros**, *Mar-Apr 17*

MPI Stuttgart, Germany **Group of Dr. H. Stoll**, *Jan 07; Jan-Feb 09*

INSA de Rouen, France **Group of Dr. J.-G. Caputo**, *Nov 04; Jun 05; May 06; Jan-Feb 08*

Bose Centre, Kolkata, India **Group of Prof. A. Mookerjee**, *Dec 04*

Languages

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|-----------|--------|------------------------|
| Russian | Fluent | <i>Mother tongue</i> |
| Ukrainian | Fluent | <i>Native language</i> |
| English | Good | |

Research interests

- Nonlinear phenomena in nanomagnetism
- Dynamics of magnetic soliton-like excitations: domain walls, vortices, skyrmions, Bloch points
- Topological and curvature effects in nanomagnets

Activity as a Referee

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|--------------------------------|---|
| Referee of the Journals | Nature Phys., Phys. Rev. Lett., NPG Sci. Rep., Phys. Lett. A, Phys. Rev. B, Phys. Rev. E, J. Phys. A, J. Phys. D, J. Appl. Phys, New J. Phys., Nanotechnology, Low Temp. Physics, Ukr. Phys. J. |
| Expert reviewer of Foundations | National Science Foundation (NSF, USA), Deutscher Akademischer Austauschdienst (DAAD, Germany), Research Foundation Flanders (FWO, Belgium), Ukrainian State Agency for Science, Innovation and Informatization (Ukraine) |

Awards, grants, etc.

2015 **Renewal Grant**, *Alexander von Humboldt Foundation, Bayreuth University, Bayreuth, Germany.*

2012 **Renewal Grant**, *Alexander von Humboldt Foundation, Bayreuth University, Bayreuth, Germany.*

2011 **Research Grant of the President of Ukraine**, *State fund for fundamental researches, Kyiv, Ukraine.*

2007–2009 **Research Grant F25.2/081**, *State fund for fundamental researches, Kyiv, Ukraine, Principle Investigator.*

2010 **Renewal Grant**, *Alexander von Humboldt Foundation, Bayreuth University, Bayreuth, Germany.*

2006–2007 **Research Grant**, *Alexander von Humboldt Foundation, Bayreuth University, Bayreuth, Germany.*

2005 **Davydov Prize**, *National Academy of Science of Ukraine, Ukraine.*

1998 **Soros Grant for Young Teaching Scientists**, *Ukraine.*

1995 **Soros Postgraduate Student Grant**, *Ukraine.*

PhD theses supervised

- 2016 **O. V. Pylypovskyi**, “*Regular and chaotic dynamics of topological excitations in magnetic nanosystems*”, Kyiv, Ukraine.
- 2015 **O. M. Volkov**, “*Periodical magnetization structures induced by spin-polarized current in nanomagnets*”, Kyiv, Ukraine.
- 2009 **V. P. Kravchuk**, “*Vortex states of nanodots*”, Kyiv, Ukraine.

Publications

total number: more than 100 (see [The list of publications](#))

Key Research Achievements

- in Quantum Mechanics
- **Extension of the Levinson Theorem** for the Aharonov-Bohm scattering; this found numerous applications in magnetism for scattering of magnons by 2D solitons, vortices, skyrmions.
- in Field Theory
- **Generalization of the field-momentum equation** for a classical field with a singularity: in addition to the regular force, there appears the singular one. The collective-variable Lagrangian description is proposed for gyroscopical systems taking into account singularities with applications for magnetic solitons.
- in Theory of Magnetism
- **Exact analytical solution** of the soliton-magnon scattering was found for the isotropic 2D magnets;
 - **Prediction of truly local magnon modes** for the 2D skyrmion in ferromagnets; the resonance mechanism of the skyrmion dynamics was proposed;
 - **Extension of the soliton phenomenology** for the 2D systems with application to magnetic solitons;
 - **New intermediate vortex state** is predicted for ferromagnetic nanorings;
 - **A method of fast switching the vortex chirality** in a magnetic nanodisk by applying a field pulse is proposed.
 - **Prediction of ultrafast magnetic vortex switching by spin-polarized currents** in magnetic nanopillars;
 - **New chaotic regime of a vortex core reversal** by a resonant perpendicular magnetic field;
 - **A mechanism of dynamical formation of vortex-antivortex crystals** generated by spin-polarized current;
 - **Development a fully 3D theory of curved magnets**, which gives a possibility to derive the energy for arbitrary curves and surfaces, and arbitrary magnetization vector fields; numerous applications for different curved nanowires, nanocaps, nanoshells, and curve nanofilms;
 - **A new (geometrical) mechanism of the Dzyaloshinskii-Moriya interaction** is predicted with numerous applications to curved magnets.

Teaching Activity

- Lecture Courses
- Classical Electrodynamics (36 hours, general lecture course);
 - Complex Analysis (36 hours, general lecture course);
 - Mathematical Physics (36 hours, general lecture course);
 - Introduction to the Physics of Solitons (16 hours, lecture course for Masters);
 - Nanomagnetism (36 hours, lecture course for Masters);
 - Modern Magnetism (54 hours, lecture course for Masters).
- Seminars
- Classical Mechanics, Electrodynamics, Quantum Mechanics, Statistical Physics, Mathematical Physics, and Modern Magnetism
- Educational publications
- 6 publications, including 4 textbooks.